ATLAS OF NEW PROFESSIONS AND COMPETENCIES OF KAZAKHSTAN АТЛАС НОВЫХ ПРОФЕССИЙ И КОМПЕТЕНЦИЙ КАЗАХСТАНА

ATLAS
OF NEW
PROFESSIONS AND
COMPETENCIES
IN KAZAKHSTAN

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OIL AND GAS

MINISTRY OF LABOUR AND SOCIAL PROTECTION OF THE REPUBLIC OF KAZAKHSTAN

THE WORLD BANK
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DEVELOPING WORK SKILLS AND STIMULATING JOBS

ATLAS OF NEW PROFESSIONS AND COMPETENCIES IN KAZAKHSTAN

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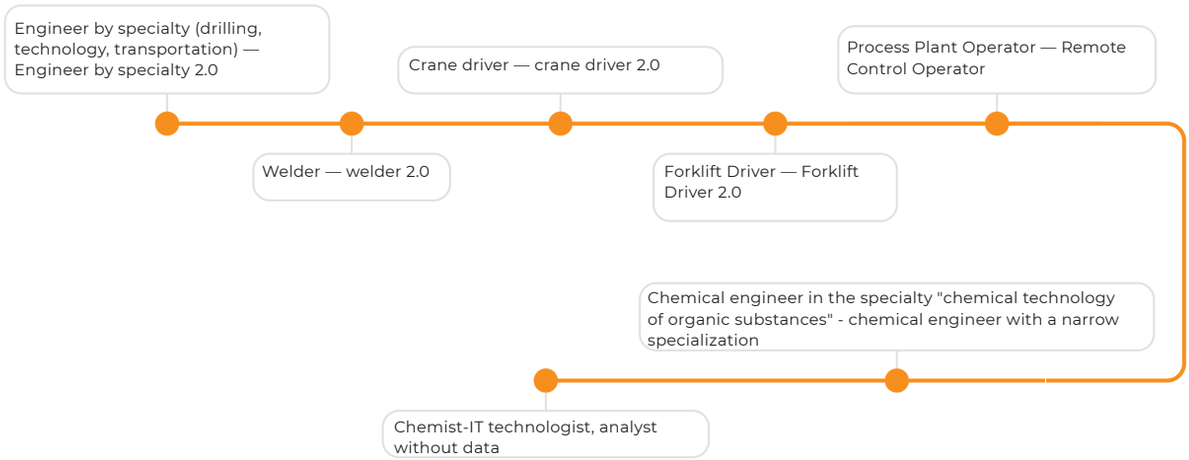
LIST OF ABBREVIATIONS

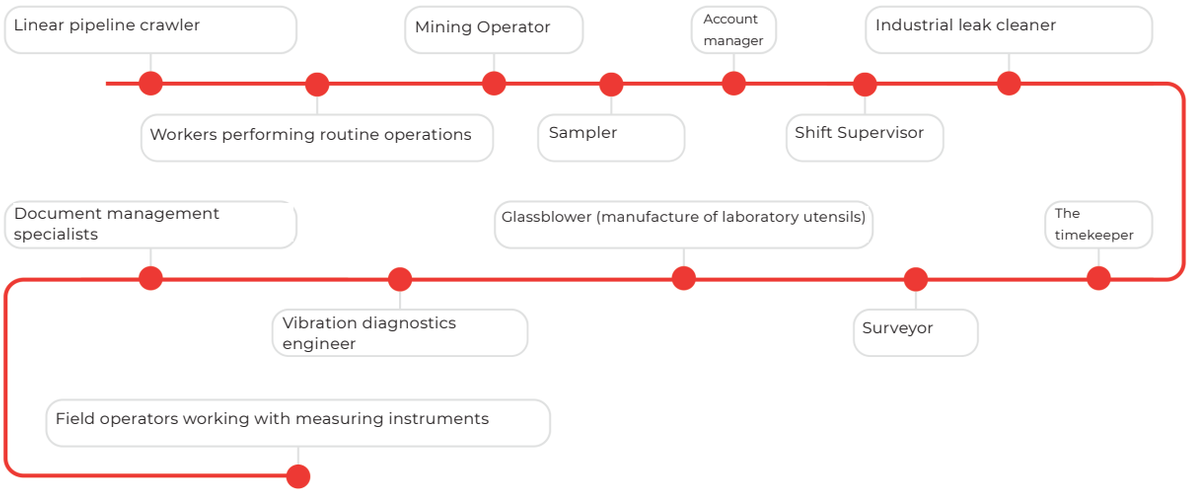
- AI - artificial intelligence.
- BAT – best available technologies.
- CPRP – the Chelyabinsk pipe rolling plant.
- EBRD – European Bank for Reconstruction and Development.
- GDP – gross domestic product.
- GIS - geographical information system.
- GPS- global positioning system.
- ILO – international labour organization.
- IOMC - integrated operational management center.
- IT – information technology.
- MLSP RK – ministry of labor and social protection of the Republic of Kazakhstan.
- MR – maintenance and repair.
- NC - national company.
- ORC - oil recovery coefficient.
- PwS - Price Waterhouse Coopers.
- R & D - research and development.
- RES – renewable energy sources.
- RPA - republican public association.
- SCADA - supervisory control and data acquisition.

- TPP – thermal power plants.
- UAV - unmanned aerial vehicle.

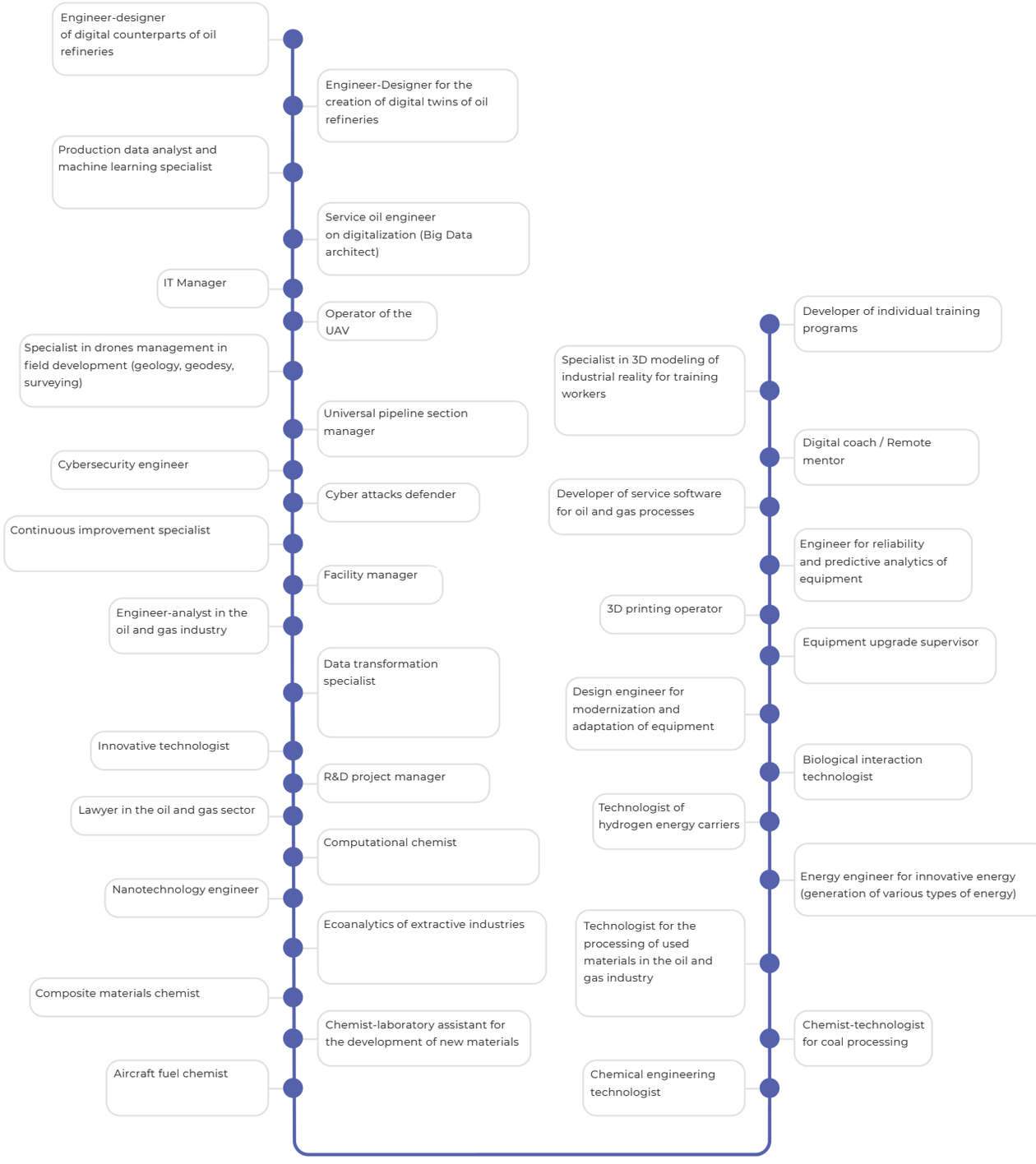
Transforming professions in the oil and gas industry



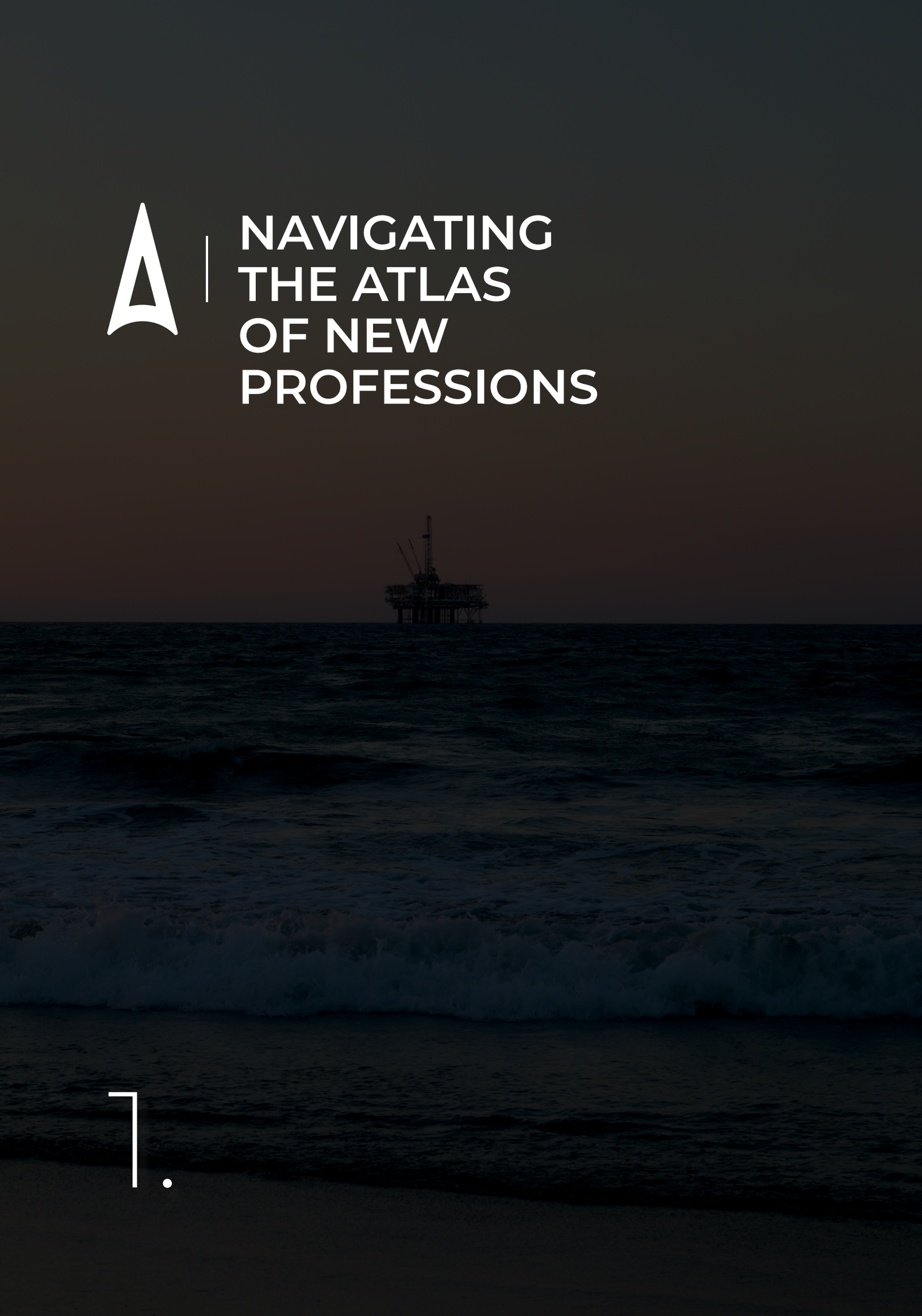
Disappearing professions in the oil and gas industry



New professions in the oil and gas industry



NAVIGATING THE ATLAS OF NEW PROFESSIONS



7.

NAVIGATING THE ATLAS OF NEW PROFESSIONS

Dear friends!

In the rapidly changing modern world, the labor market is also changing rapidly. Some professions are emerging and becoming popular, while other professions are becoming less popular and are becoming a thing of the past.

I'm sure you've asked yourself some questions:

- ***Who to become?***
- ***Which job should I choose?***
- ***Which profession – traditional or new - is better to master?***

You may have asked for advice from family and friends, searched for information on the Internet, and collected reviews from friends.

You were given various tips: following the dream of looking for a job that I love, or continuing my family's labor dynasty, or choosing a prestigious and well-paid job. Each option is good in its own way, but not so easy to achieve. Prestigious work attracts many people and the competition first for training, and then for the workplace will be high. Of course, you will get an incentive to develop, but not all of them will achieve the desired result. To achieve high income and career success, you must be prepared for challenging challenges and high competition. Continuing a family business is certainly a worthy choice that your family expects and encourages you to make. However, this may not be your vocation at all, and you will not be able to breathe in the secrets of professional skill that your loved ones are so willing to share with you. What if you find a profession that will be in demand for years to come, will allow you to realize yourself and will be in demand in the labor market, and your friends and parents will be proud of your choice?

Today, this choice can be made with the help of our Atlas of new professions.

THE ATLAS OF NEW PROFESSIONS IS A COLLECTION OF PROFESSIONS THAT EXPERTS IN EACH INDUSTRY BELIEVE ARE ALREADY IN DEMAND AND WILL APPEAR IN THE NEAR FUTURE. THE FUTURE SO CLOSE TO US IN THIS ATLAS IS DEFINED FOR 5-10 YEARS.

The materials of the presented Atlas of professions are based on the use of a methodology for predicting the future based on technological foresight.

TECHNOLOGICAL FORESIGHT ALLOWS YOU TO DETERMINE WHICH WORK SKILLS ARE MOST IN DEMAND WITH THE DEVELOPMENT OF ADVANCED TECHNOLOGY AND BROAD INNOVATIONS.

THE FORESIGHT METHODOLOGY ASSUMES THAT:

- The future cannot be predicted or predicted in any way.
- The future depends on our actions and efforts in the present.
- The development of the future has many options, and we can choose the scenario that suits us best.

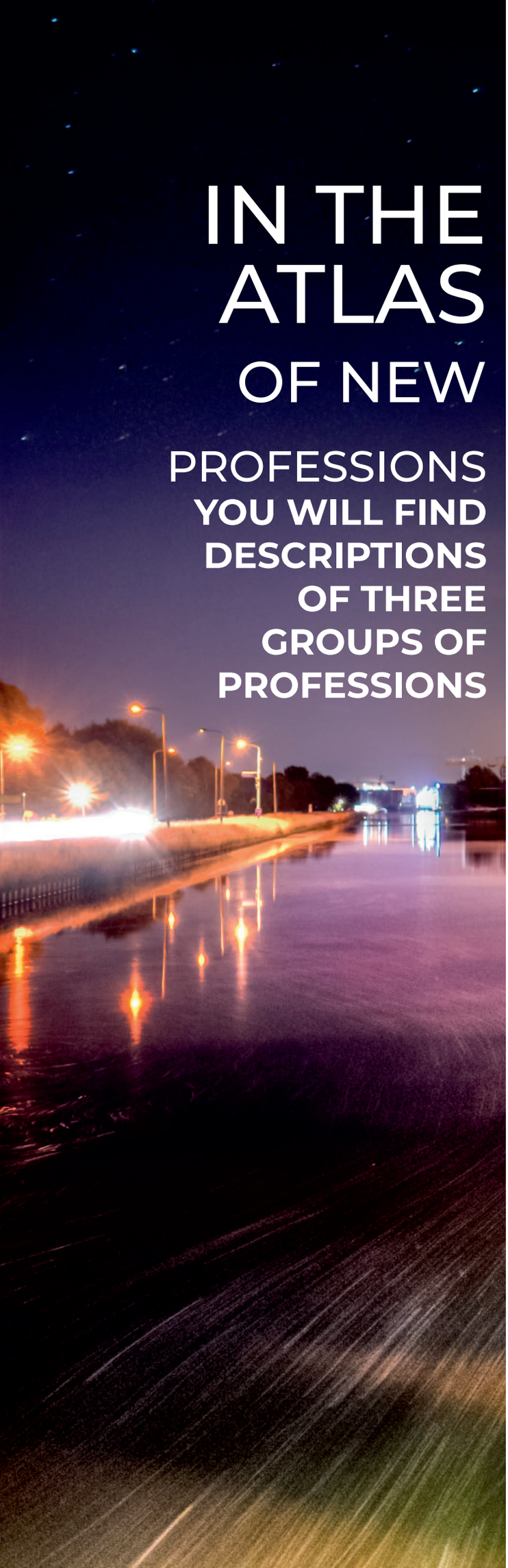
The leading role in the development of future scenarios belongs to industry experts-specialists who have significant experience in their field, have an impact on the development of the industry and have their own vision for the development of the future.

Future scenarios are developed and agreed upon by industry experts together in their work and during discussion at a special event called a foresight session. The main goal of the forum session is to identify and analyze future trends – long - term processes that develop over time and influence changes in professional activities.
The identified trends can have both positive and negative consequences: provide opportunities and generate threats.
For example, increasing the availability of information allows for free access to knowledge, but also carries the threat of information overload and even information attacks.

The response to future opportunities and emerging threats is technological responses that take advantage of opportunities and neutralize threats. Techno-logical responses allow you to create specific solutions that are most effective in each industry.

Emerging new technologies determine which competencies should be available specialists of the future for their use. Combining and grouping new competencies creates requirements for new professions – future professions that are emerging now, and the demand for them will be high in 5-10 years.

Professions that will not be in demand in the future are called disappearing professions; those that will remain, but will be significantly changed, are called TRANS-forming professions.



IN THE ATLAS OF NEW PROFESSIONS YOU WILL FIND DESCRIPTIONS OF THREE GROUPS OF PROFESSIONS

NEW PROFESSIONS

– professions that do not officially exist yet, but are likely to appear in the near future.

TRANSFORMING PROFESSIONS

– are already existing professions and specialties that are highly likely to change significantly.

DISAPPEARING PROFESSIONS

– are those professions and specialties that are highly likely to be out of demand in the near future.

Of course, the description of the new profession is a forecast, not a detailed job description. The best specialists in each industry, selected as experts, jointly assess the development, and define new tasks and competencies that future specialists need. After studying the description of new professions, you can form your own personal idea of what professions and employees will be in demand in the future and make your choice. Becoming a specialist of the future, you will fill your work with concrete content and create an image of a new profession.

THE PURPOSE OF OUR ATLAS IS TO HELP YOU DETERMINE THE DIRECTION OF CHOOSING AND UNDERSTANDING THE KNOWLEDGE AND COMPETENCIES THAT ARE DEFINITELY NEEDED FOR FUTURE WORK ACTIVITIES.

WHAT WILL HAPPEN
▸ WITH TRANSFORMING
▸ AND DISAPPEARING PROFESSIONS?

Most of the transformative professions are currently in demand, but to maintain their relevance, specialists already need to learn new skills, which are required by new equipment, new risks, and opportunities in the industry. The name of professions may not change, but the level of qualification requirements within the profession changes. This class of professions is useful for those who already have an education and plan to improve their qualifications.

You may be busy with in these professions, or would like to master them, you need to consider in which direction you should develop your competencies. Specialists also need to pay attention to disappearing professions.

THERE ARE TWO MAIN REASONS FOR THE DISAPPEARANCE OF PROFESSIONS:

1. ***Automation*** - in the context of the development of digital technologies: both manual labor professions and some simple knowledge labor professions are being reduced – they will be automated;

2. The loss of the need for labor results or services also leads to the fact that the profession gradually disappears; in the near future, such professions as accountant, translator, estimator, librarian, travel agent, waiter, miner, miner, etc. may disappear.

IN ADDITION TO THE OIL AND GAS INDUSTRY, THE ATLAS OF NEW PROFESSIONS HAS BEEN PREPARED FOR 9 INDUSTRIES:

1. MINING AND METALLURGICAL INDUSTRY
2. OIL AND GAS INDUSTRY
3. MECHANICAL ENGINEERING
4. IT INDUSTRY
5. CONSTRUCTION
6. TOURISM
7. ENERGY
8. TRANSPORT AND LOGISTICS
9. AGRICULTURE

To make it easier for you to work with the Atlas of new professions, we have built it on a universal model. The forecast of professions in all industry Atlases is based on six main trends that have the greatest impact on changes in the industry and the economy as a whole.

THE LEADING TRENDS ARE:

1. SPREADING THE INTRODUCTION OF ROBOTS AND SMART SYSTEMS;
2. EXPANDING THE SCOPE OF DIGITALIZATION AND BIG DATA;
3. DEPLETION OF NATURAL RESERVES OF RAW MATERIALS;
4. STRENGTHENING ENVIRONMENTAL REGULATIONS AND DEVELOPMENT OF RECYCLING;
5. MANIFESTATION OF NEW LABOR REQUIREMENTS FOR EMPLOYEES OF GENERATIONS Y AND Z;
6. CHANGING CONSUMER PREFERENCES OF THE POPULATION

ATLAS OF NEW PROFESSIONS AND COMPETENCIES OF KAZAKHSTAN

MMC

Complex of interrelated industries and stages of the production process from raw material extraction to production of finished products - ferrous and nonferrous metals and their alloys.

Energy

The sector of economy engaged in generation, transformation, distribution and use of resources of all types.

Oil and gas

Economic sector. Engaged in extraction, processing, storage and sale of natural minerals - oil and related petroleum products.

Mechanical Engineering

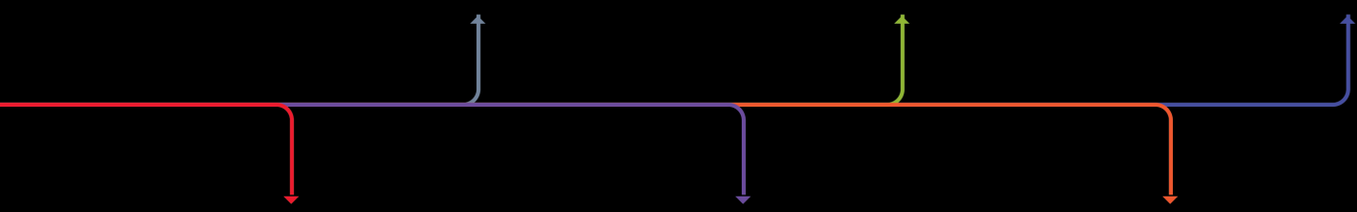
The sector of economy that designs, manufactures, maintains, disposes of all kinds of machines, technological equipment and their parts.

Agriculture

Economic sector aimed at production, storage and processing of food (food products) and raw materials for a number of industries

IT

Sector of economy aimed at finding, collecting, storing, processing, transmitting and providing useful information through technical means



Transportation and Logistics

The economy sector carrying passengers, as well as the management system for the purpose of optimization

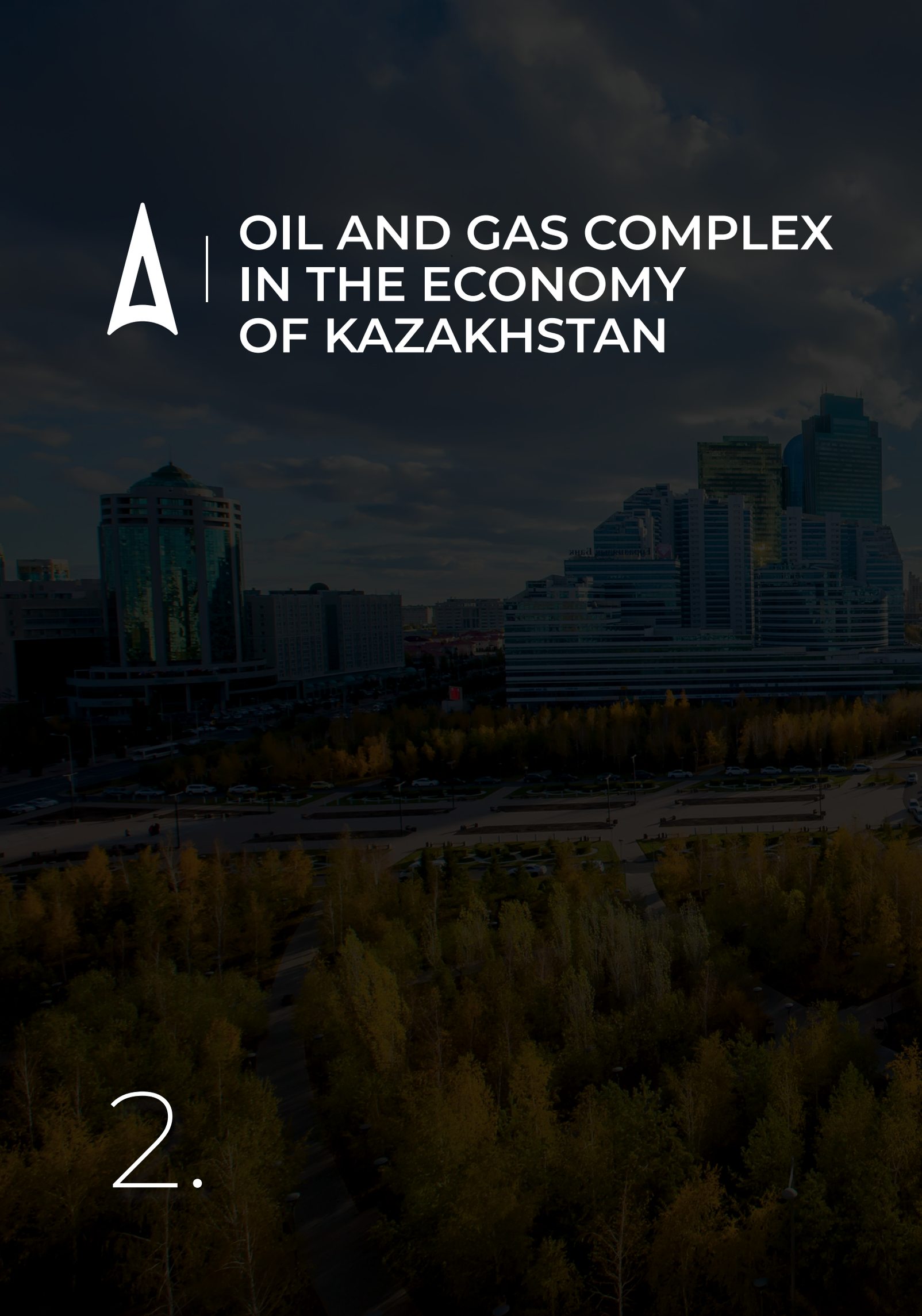
Tourism

An industry that organizes trips (travels) to another country or area other than its place of residence to learn about the lifestyle, gastronomy, nature, etc.

Construction

The sector of economy that designs, creates (erects) buildings, structures, as well as performs their capital and current repair.

OIL AND GAS COMPLEX IN THE ECONOMY OF KAZAKHSTAN



2.

OIL AND GAS COMPLEX IN THE ECONOMY OF KAZAKHSTAN

Kazakhstan is one of the most mineral - rich countries and therefore mining and processing of minerals is of great importance for our economy. Our country has about 3 % of the world's reserves and is among the top 15 oil-producing countries in the world, along with the countries of the Middle East, Russia, Venezuela, China, Norway, Canada, Great Britain, Indonesia, and Brazil. Kazakhstan's oil is purchased by the United States, Japan, China, Korea, India, and European countries, which provide 60 % of the world's consumption of hydrocarbons.

The first Kazakh oil was produced in November 1899 at the Karashungul field, in Atyrau region. Then two oil fields were put into operation – Dossor (1911) and Makat (1915). About 200 oil and gas deposits are located on the territory of Kazakhstan. The total volume of reserves is estimated at 11-12 billion tons. Oil and gas-bearing areas cover 62% of the country's area, almost 70% of these resources are concentrated in the Western regions of Kazakhstan. More than 90% of oil reserves are concentrated in 15 major fields – Tengiz, Kashagan, Karachaganak, Uzen, Zhetybai, Zhanazhol, Kalamkas, Kenkiyak, Karazhanbas, Kumkol, Northern Buzachi, Alibekmola, Central and Eastern Prorva, Kenbai, and Korolevskoe. Deposits are located on the territory of six of the fourteen regions of Kazakhstan. These are Aktobe, Atyrau, West Kazakhstan, Karaganda, Kyzylorda and Mangistau regions.

An important feature of the industry is the remoteness of its production from the main oil consumption markets (Europe, America, Asia-Pacific region). For Kazakhstan, located in the interior of the continent, geographical remoteness is a significant problem and the issue of external transport (main oil pipelines, tanker transportation) remains relevant. In addition to technical issues related to product delivery, the cost of delivery (tariff, freight, insurance, etc.) is a hindering factor.

Kashagan is one of the largest oil fields discovered in the last 40 years (in 2000). Located 80 km from Atyrau. The field is the ninth in the world in terms of reserves. Kashagan oil accounts for about 25% of the raw material reserves in the Caspian Sea. The reserves of the field are 6 billion tons, or 38 billion tons barrels.

Tengiz is a giant oil and gas field discovered in 1979 and located 160 km South-East of Atyrau. The place of birth provides about 30% of oil production from the national level. The total developed reserve is projected at 3.1 billion tons, or 26 billion tons. barrels. The field produces 45% of all gas and 16% of all liquid hydrocarbons in the country.

The oil and gas sector plays a huge role in the development of Kazakhstan's revenues. The oil and gas industry are the largest taxpayer of the state and provides 44% of tax revenues to the Republic's budget.

Oil and gas chemistry are a part of the chemical industry, which is based on products of oil refining, gas condensate, associated petroleum and natural gas. There are three major refineries in Kazakhstan:

- Pavlodar petrochemical plant, designed capacity-6 million tons of oil per year;
- Shymkent plant "Petro Kazakhstan oil products", design capacity – 5.25 million tons of oil per year;
- Atyrau refinery LLP, 8 design capacity – 5 million tons of oil per year.

About 30 producers of low - capacity oil products, the so - called "mi - Ni-refinery", are also registered in the Republic.

More than 80 % of the oil produced in Kazakhstan is exported, which requires an efficient pipeline and other transport system. Today, oil is exported via pipelines:

1. "Tengiz-Novorossiysk" of the Caspian pipeline consortium (CPC) with a length of more than 1.5 thousand km, through which up to 70% of exports go.
2. "Uzen-Atyrau-Samara" of joint-stock company "KazTransOil", which has a unique system of oil heating throughout. The pipeline simultaneously supplies the Atyrau refinery and connects to the Russian Transneft pipeline system. The length of the pipeline is more than 1.4 thousand km, including 1.2 thousand km through the territory of Kazakhstan. the Volume of transportation through this pipeline is 15 million tons of oil.
3. "Atasu-Alashankou" of the partnership "Kazakh-Chinese pipeline" (KKT), intended for transportation of oil from the fields of Western and Central Kazakhstan, as well as transit Russian oil to China. The total quantity per order 11 million tons, including the transit of Russian oil.

In addition to the above-mentioned pipelines, some of the oil is exported through the Aktau sea port, which has a potential of 8-10 million tons per year. A small part of Kazakhstan's oil is exported by rail.

Railway transportation is mainly used to deliver refined oil products (fuel oil, gasoline, diesel fuel, LPG, etc.) to consumers, as well as to deliver oil to the seaports of the Caspian and Black seas.

Over the years of independence, Kazakhstan has created its own tanker fleet that fully meets modern requirements for efficiency and safety. The largest domestic ship - owner is Kazmortransflot LLP, which has 8 tankers on the Caspian and Black seas with a total tonnage of 305 thousand tons, 5 tugs, 8 barge platforms with a cargo capacity of 3.6 thousand tons, 2 dry-cargo vessels with a deadweight of 6.2 thousand tons. The second largest tanker company is Terminalex LLP, which operates one of the terminals in the port of Aktau and several modern tankers with a deadweight of up to 15 thousand tons each.

The main operating routes for marine oil transportation are located in the water area The Caspian, Black, and Mid - earth seas. The country's strategy is aimed at creating and developing a national merchant marine fleet designed to provide at least 2/3 of the volume of oil transportation and 1⁄2 of the volume of dry cargo from the ports of the Republic Kazakhstan with its own fleet, to master multimodal transportation and other types of transport services.

Storage of fuel and lubricants is carried out at about 360 oil depots, of which about 50% is located in rural areas and provides the agricultural sector with oil products. Oil depots ensure uninterrupted supply of petroleum products to gas stations in the required quantity and range, and provide guarantees for the safety of the quality of petroleum products. The sale of petroleum products is carried out directly to consumers (industrial enterprises, agricultural associations, transport, construction, and other organizations) and other oil marketing organizations for further sale.
Retail sales of fuel and lubricants in the country are carried out at more than three thousand gas

stations. Major fuel distributors include KazMunayGas Onimderi (37 oil depots in 11 regions, 342 gas stations), Helios (26 oil depots, 270 installations in 61 localities), Sinooil 14 (3 own and 12 leased oil depots, 170 gas stations), Gazprom-Kazakhstan (70 gas stations) , etc. About 50% of all car rental stations in Kazakhstan are small retail sellers.

Kazakhstan has a well-developed gas transportation system, which includes more than 18 thousand kilometers of main gas pipelines with three large underground gas storage facilities, more than 40 thousand km of gas distribution networks, 56 compressor stations, where 316 gas pumping units are installed.

The global oil and gas industry employ more than five million people. The Republic's oil and gas production enterprises employ just over seventy-one thousand people, 96.6% of whom are citizens of Kazakhstan. Today, there are 187 operating enterprises in the industry, of which 22 are large, 20 are medium – sized, and 145 are small. Regionally, the largest number (67.9 %) is concentrated in Atyrau, Pavlodar regions and Shymkent.

The attractiveness of the oil and gas sector is still high due to the corresponding level of competitive wages in the industry. The average monthly nominal salary of an employee in the industry is one and a half times higher than the average monthly salary of an industrial employee. Companies in Kazakhstan, like most of the world's oil and gas companies, have a need for specialists. Kazakhstan needs to increase the volume of production and export of crude oil in the near future due to with global consumption peaking by 2029. Traditional deposits of oil, gas and other resources are being depleted, and mining companies are forced to move to more complex fields, as well as new types of resources, such as oil Sands, shale gas, offshore and deep - water fields. Well drilling processes are becoming more technologically complex and expensive every year. This is due to both an increase in the average depth of wells and an increase in the share of field sites with complex mining and geological conditions.

The industry carries a high social burden (construction and maintenance of social infrastructure, employment of young people, maintenance of veterans, etc.), because the industry's enterprises are mostly city - forming enterprises, in many cases the only ones in their regions.

The oil and gas industry are actively taking steps to integrate into the new digital economy, and is also striving to make production more friendly to nature. In recent decades, the practice of creating geological models using modern computer programs of Landmark, Roxar and Schlumberger companies has become widespread in Kazakhstan, which can significantly increase the effectiveness of work.

The creators of the equipment

are trying to produce installations that will reduce emissions and allow rational use of resources In addition, the requirements for environmental friendliness of mining and environmental protection during the transportation of minerals are increasing.

Companies are developing new deposits and types of resources, looking for new technological solutions, including automated and robotic development systems, remote methods of field exploration and management.

the past ten years, Kazakhstan's refineries have completed the modernization of technological installations and have reached the level of modern European requirements both in terms of processing depth and product quality, and environmental standards. The modernization was accompanied by the widespread introduction of automated production process control systems using microprocessors and computer systems.

All this entails the need for a new type of specialists. The personnel potential in the main segment-oil production – is not sufficiently developed, there is a need to raise its level. This problem is relevant due to the growing share of foreign workers with high unemployment in the oil-producing regions. The oil and gas industry, as well as the industry as a whole, feels a strong external impact, including affecting the nature of professions, the technical equipment and energy availability of workplaces and technological processes, and the organization of labor.

The need for new qualifications is due to the widespread transition from complex automation of technological processes to informatization of these processes, i.e. the implementation of computer systems in the management of technological, logistics, financial and other processes. The development of new areas of industry development, such as renewable energy sources, petrochemical production and new types of products, is increasing in the industry. There is an increasing need for the use of new devices, systems, technologies (membrane water desalinators, unmanned aerial vehicles, chemicalization of oil production processes, interpretation of satellite images, new, high-speed global information systems, etc.).

PROFESSIONS CAN BE OBTAINED IN **7 BASIC SPECIALTIES**

EVERY YEAR THEY STUDY **IN 21 BRANCH UNIVERSITIES** OF THE REPUBLIC OF KAZAKHSTAN

160 thousand
Number of employees in the industry

752 thousand tenge
Average monthly salary

THERE ARE **APPROXIMATELY 187 OPERATING ENTERPRISES** IN THE REPUBLIC OF KAZAKHSTAN

OF WHICH: **22 LARGE, 20 MEDIUM AND 145 SMALL**

22 **20** **145**

KAZAKHSTAN'S OIL RESERVES:

1,7 BILLION BARRELS

KAZAKHSTAN IS ONE **OF 12 COUNTRIES** WITH **LARGE** OIL RESERVES

RESERVES **OF THE LARGEST** DEPOSITS:

Kashagan
2 billion tons

Tengiz
1 billion tons

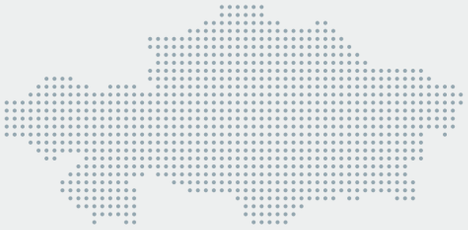
Karachaganak (WKO)
220 million tons

Uzen (Mangystau)
110 million tons

Zhanazhol (Aktobe region)
83 million tons

TAX REVENUES TO THE BUDGET OF THE REPUBLIC OF KAZAKHSTAN IN **2019**

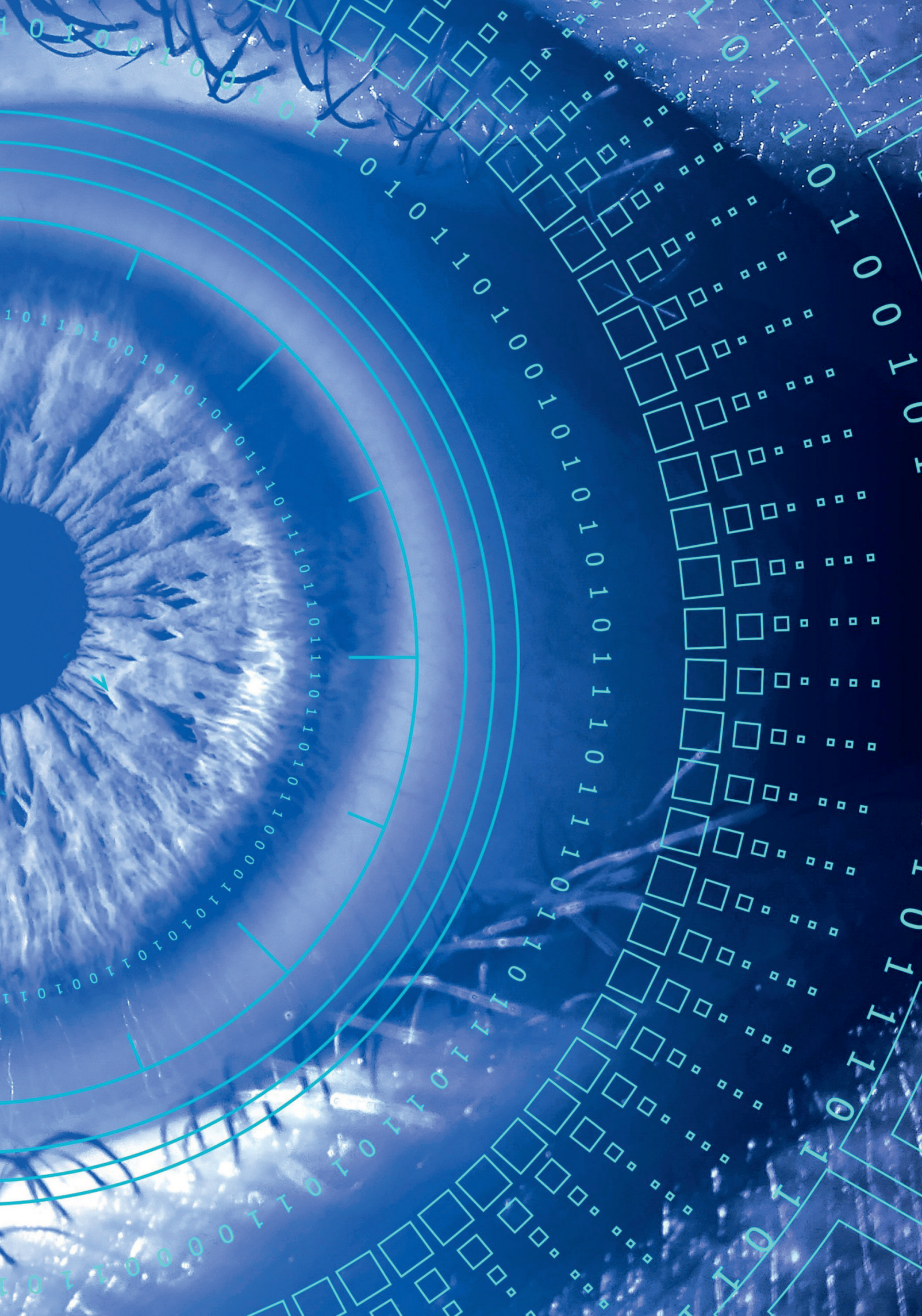
44%



№	Company name	Countries	Production, tons	share, %
1	KazMunayGas	Kazakhstan	2 3569 047	26,0
2	Chervon	USA	16 925 043	18,7
3	SNPS	China	11 210 521	12,4
4	ExxonMobil	USA	9 822 652	10,8
5	Shell	Netherlands	5 672 495	6,3
6	Eni	Italy	5 672 495	6,3
7	Lukoil	Russia	3 011 581	3,3
8	Total	France	2 771 594	3,1
9	Sinopec	China	1 237 024	1,4
10	CITIC	China	1 082 025	1,2

WHAT AWAITS THE OIL AND GAS INDUSTRY OF KAZAKHSTAN

3.



3.1.
EXPERT OPINIONS

3.1.1.

MAGAUOV ASSET MARATOVICH

Vice-minister of energy industry of the Republic of Kazakhstan.

– Asset Maratovich, please tell us what are the three key trends and technologies that can have the greatest impact on changing the appearance of the oil and gas industry in the next 10-15 years?

– First of all, this is digital vision. We recently visited several large offices of international companies and, indeed, the projects that are being implemented in Kazakhstan in the field of digitalization, I think, have not yet reached the depth that it could be implemented. We have seen from the example of international large companies that they have gone much wider, further, deeper, and I think that these companies can make significant changes in the oil and gas industry of Kazakhstan as they develop digitalization.

Of course, I think the introduction of new technologies related to with work with deep place-births, will be implemented. Today, experts say that our era is an era when easily accessible oil is a thing of the past, and it is necessary to drill deeper.

Accordingly, at the moment there is an urgent question of reducing the cost of this type of drilling. Companies will work to develop new technologies in the field of deep drilling, because costs increase with increasing depth not directly proportionally, but exponentially. There are also prospects in the field of oil refining in terms of developing new chemical materials.

– Today there is a shortage of personnel, and digitalization will entail the need for new professions. Could you give an example of two or three professions that are currently in short supply?

– First of all, digitalization has affected the digitization of the deposits themselves, that is, both in Kazakhstan and abroad, digital models have long appeared, and hydrodynamic models are being built, and simulation models, and geological models. We already understand that geologists should not just be geologists, they should be specialists "at the junction".

For example, an IT geologist who could build simulation models understood the principles of their construction. I think that these professions are very relevant. The need for such specialists will grow.

– If you look at the personnel issue from the other side, what specialists may be needed?

– I think that if we talk about the work related to visual inspection of equipment, for example, well inspection, then less resources will be required. Operators will rely more on instrument readings, remote monitoring of equipment

This, of course, will also depend on the pace of digitalization development. Recently, for example, we went to the company TOTAL, where only robots work on offshore platforms to develop deposits. Their principle is that no one arrives on the platform for six

months, robots must do the work themselves, and a mini-Mumm of staff works here.

– Please tell us, which subjects and market participants will or can play a crucial role in the next 10 years when introducing new technologies?

– I think that the state can only create conditions for attracting investment in order for companies to introduce new technologies through tax incentives, for example.

However, companies with large R&D centers should play a global role. If 15 years ago many international companies came to developing countries and said: "I have a lot of money, I will be an investor, give me a Deposit", now many countries have already accumulated capital, and international companies need to come and talk about new technologies, not money.

In other words, to say that they can develop a better place, better quality, produce more, get more taxes, and it is the development of new technologies that becomes the competitive advantage of an international company. However, I think that the state itself, at the expense of its state institutions, including scientific ones, will still not be able to attract a sufficiently large number of students.- it is not easy to attract them, and it will be very difficult to make the transition from science to practice in the conditions of state regulation. After all, technology development should be handled by research centers attached to the companies themselves. they will look at technology from a practical angle and bring more benefits. For example, we have such a center at KazMunayGas.

– If you had unlimited financial reserves, what problems would you solve first of all in the oil and gas industry?

– I would note the problem that we have a very diverse sector among the subsurface users of Kazakhstan, that is, not only large companies represented by KazMunayGas, CNPC and so on are represented on the market, we have a lot of small and medium - sized businesses in the field of subsurface use. But, unfortunately, due to financial circumstances and falling oil prices, they are not able to pay enough attention to better development of mineral resources: to introduce new equipment and technologies, they do not have a scientific and technical base, they do not have their own development institutions. In this regard, I am in favor of small and medium-sized businesses capitalizing and leaving the market, and new owners come to take their place, who could develop the project more widely and use the existing infrastructure.

In other words, I am in favor of a certain restructuring of the non-oil industry, so that major players with a history are represented on the market. The same Kazmunaygas has a fairly long history, taking into account the Soviet time of operation.

3.1.2.
EXPERT OPINIONS

AKCHULAKOV BOLAT URALOVICH

General director
of the "KAZENERGY" association

Recently, we celebrated the 120th anniversary of the first oil production in Kazakhstan, which means that significant progress has been made, but there is an observation that the speed of technological progress increases every year. If we take, for example, 100 years ago, when the era of the birth of the first cars and automation began, and compare the speed of technological progress at that time with the current one, we see that this is a huge difference.

From a historical point of view 100 years is a short time period, but if we talk about the progress of technology, then the path is enormous. Over the past 100 years, people have gone from the first mechanisms to, for example, space exploration, and all these were historical events.

It is clear that the energy sector is also subject to technological development. If they say that the XX century is the century of the struggle for bar-Rel, then the XXI century is the century of the struggle for kilowatts. Everything also depends on energy, and the question is always the same: where to get energy from? As a classic of the options that oil and gas play a significant role. There are several issues that need to be taken into account, not only from the point of view of the Atlas of new professions project, but in General. One of the main postulates is the finiteness and exhaustion of the required reserves. What does humanity want? It wants to get more energy, because the population of the Earth is growing as fast as the speed of technology development.

If we talk about the oil and gas

sector, there are also many indicators that are used in the industry, and one of them is the ratio of the volume of developed reserves to the volume of proven reserves, which should adhere to a certain bar.

Let me give you an example: since the first oil production, shallow deposits were accumulated, and there were even areas on the same Karashungul where Kazakhstan's oil production began, and the oil itself came to the surface. But since it became the raw material of industrialization, more and more of it was needed. If at that time it was enough to dig wells 20-50 meters deep for oil production, today methods are being developed for extracting oil reserves located at a depth of 6000 meters, this is a rather complex geological process. When extracting oil from such a depth, not all processes can be controlled by a person, each place of birth requires an individual approach.

LET'S GO BACK TO TECHNOLOGIES – THEIR NEW DEVELOPMENT IS, OF COURSE, VERY IMPORTANT. THIS APPLIES NOT ONLY TO THE IMPLEMENTATION OF SUCH PROCESSES AS DRILLING DEEP WELLS AND EXTRACTING OIL FROM SUCH DEPTHS, BUT ALSO ONE OF THE MAIN ISSUES IS THE RATIONAL USE OF SUBSURFACE RESOURCES. YOU CAN JUST TAKE THE AMOUNT OF OIL, GAS AND COAL TO BURN, BUT WE WOULD LIKE TO SEE TECHNOLOGIES THAT PROVIDE MORE EFFICIENT USE OF RAW MATERIALS FOR MAXIMUM EFFICIENCY. THIS TASK IS FACING THE WHOLE WORLD TODAY.

Also, humanity is increasingly using so - called renewable energy sources. However, there is a caveat here that today's renewable energy technologies are expensive. This means that in countries such as Kazakhstan or Russia, which have large reserves of coal - hydrogen, these technologies are still not competitive. However, the International Agency for renewable energy predicts that by 2025, renewable energy technologies will begin to approach the basic sources in terms of costs and cost, that is, progress will be observed. When this issue is resolved and RES becomes competitive, then a couple of other issues will be on the agenda.

The first is a sustainable system because renewable energy depends on natural conditions. For example, if the entire city is powered by wind farms and solar panels, then imagine a situation where there is no wind and no sun, then there will be a certain kind of problem. For example, an electric car – there is no sun, its battery is not recharged, and it will not go further, then it needs an engine that can burn fueland start the engine. This is due to the sustainability of energy.

Another issue is energy conservation. How does energy conservation work today? Each station has fuel reserves, whether it is coal or gas. However, today at the stations there are no large-capacity batteries that can store energy for a significant amount of time in order to deliver it when it is needed, in particular in solar and wind power stations. Such stations, when there is sun and wind, can produce excess energy, but they cannot accumulate and store it to give out the necessary amount of energy when it is needed (during peak hours). Thus, it is necessary to develop technologies to solve this

problem.

To ensure competitiveness in the oil and gas sector, technologies at different stages of the value chain must be improved. Most likely, the largest changes will affect the processing sector, because the well produces a liquid in which oil occupies about ten cents, the rest is water and related elements. However, the processing of such oil should be given attention. If we look at it in more detail, when oil and gas processing is underway, each new conversion gives up to several hundred thousand items and goods that can be obtained. This is petrochemistry, the boundless world. It is necessary to use the extracted oil efficiently and efficiently, and not just burn it. The same goes for gas.

Also, where a technological breakthrough is needed is the production sector, namely, an increase in the oil recovery coefficient (KIN). KIN requires a large amount of costs in order for the remaining oil and gas reserves to be extracted in a larger volume at the old developed sites. In other words, we need technologies that would allow us, at least, to stabilize what we produce today. Big decisions are needed here. Now let's look at what changes will occur in the field of training specialists in the oil and gas sector. Digitalization is on the agenda globally and in Kazakhstan.

It should not be understood one-sidedly.

Digitalization is not just about putting everything together in digital. This has existed before, for example, in punched card modes, in a binary system that is embedded in any software product. Another question: what should I do with these numbers? There is a question of artificial intelligence, since digital data is the basis for the next automation, or robots. Many specialties, in my understanding, in the future will turn into skills and abilities to manage such robots, automated processes, in order to perform the same work, but not with human resources, but with machines. This applies to all areas, not just the oil and gas industry.

A good example is medicine, this is surgery, because today in surgery, especially in neurosurgery, where millimeters and microns are important, they are beginning to trust technologies that can perform operations without pain for patients. These are now standardized surgical complexes, which, of course, are managed by people- surgeons-professionals. I gave this example as a "bridge", because in order to create such robots and manage them, you need specialists.

Classic professional skills should always be available to people, but these skills must be transformed. This means that classical specialties will not become a thing of the past, they will become the basis for any new professions. But perhaps there will be new professions that should be able to manage these processes at the middle and higher levels.

3.1.3.
EXPERTS' OPINION

KESHUBAEV GALIAUSAT KAIRBEKOVICH

Association of veterans of the oil and gas industry of the Republic of Kazakhstan

– Galiausat Kairbekovich, what do you think are the three trends/ technologies that can have an impact on changing the appearance of the oil and gas industry in the next 10-15 years?

– There are 7 major global companies operating in Kazakhstan. If we talk about trends, we need to start from our database. The base is the existing localities or expected discoveries, certain structures, etc. Today, for example, the Caspian basin has not yet been fully explored, although such deposits as Astrakhan, Karachaganak, and Tengiz have been discovered in the port area, and in fact Kashagan also belongs to this basin in its circumference. We continue to drill deep wells and conduct research there, but so far, we have not led to any results. So, what is the status of our database today? In principle, compared to other oil-producing countries, we are in a better position, because the basis of our industry - the Tengiz, Karachaganak and Kashagan fields - are relatively "young". Tengiz was commissioned in 1988, and both Kashagan and Karachaganak started operating during the same period.

The specificity of the oil and gas industry is that the main technology is the method and method of field development, is determined at the beginning of the field opening and the entire life of the project is subordinated to it, this document. There should be no other inventions. Another thing is that the meaning of this strategic document "development Project" is to achieve maximum oil recovery.

Today, there are no areas in the world that exceed 40% of production, that is, if 100 million

tons of geological reserves are lying, then at best 40 million will be taken away, and 60 million will remain. Therefore, this strategic document determines the ultimate recovery, and we must always focus, we were nearing the level Nude oil recovery in similar deposits in the world (at the time - measures, structure, porous and permeability, etc.). Accordingly, it makes no sense to talk about some new technologies at this stage.

But the method of extracting oil is another matter. I believe that some technologies can be applied to mining techniques. For our old deposits, we need to find ways to "extend the life" of the deposits, that is, to extract oil from the remaining reserves. For example, the Mahat field, where unique oil is produced and located, because since the Second world war it is still supplied to the Yaros-Lavsky plant for the production of excellent quality lubricating oil. My expectations are connected with the technique of extracting such oil rocks.

Also, the global trend of abandoning hydrocarbon fuels will necessarily affect Kazakhstan due to lower oil prices. Further, the technologies that have allowed us to extract oil from shale will have a big impact on us.

At the stage of development of placements, compared to what was in the Soviet Union, there are changes in the modeling plan. Nothing can be done without modeling today to do. For example, when all data is loaded into a computer, a model is created based on it. As the field is developed and new wells are added, geological/ geophysical information is added, and the model is refined accordingly. In fact, working without a specific model is like working with your eyes closed.

In the 1990s, we first used modeling in Kazakhstan at the Uzen field. For example, once a well was sampled, and GPS navigation was performed there, and they saw where the well was actually located on the map, and the drilling deviation was determined. There were cases when the deviation was up to 50-100 meters from the place where it was planned. In other words, we thought we were mining in a certain place, but it turned out that we were extracting oil from a neighboring reservoir. Modeling is very popular. And we have a shortage of people who have modeling skills.

– Which sub-sectors or boards of the oil and gas industry Would you say are at risk in terms of staff release? Can they worry about their jobs because of automation/robotization?

– There are no such people, and specialists cannot worry about jobs. At the time, the Uzen field was chosen first, which Minister Shashin chose as an object of complex automation. He went to Ka-Nadu and saw how the process of oil extraction, production, and so on was organized. He arrived and started implementing automation.

Workers, afraid of losing their jobs, began to break equipment. As a result, the chief engineer said: "All workers reduce the level by one." All 6000 workers are given a discharge in one day. They said that they would return the discharge only when the workers were trained, retrained, understood this automation

system and learned how to use it. My colleague and I taught all 6,000 employees for a year. For example, the job of an oil production operator was to for example, 30 wells are assigned to him, he will take the keys, a bucket of grease and make a detour. After implementing automation and training this employee, he (the employee) just came to work and immediately saw everything, where and what the situation is, without going around. Accordingly, it is not a question of freeing up jobs, but rather of training/ retraining employees to be able to use new equipment.

– Galiausat Kairbekovich, what skills should specialists have in the oil and gas industry of the future?

– Managers (managers) must understand civil law, must be legally savvy. Many people need to understand IT technologies, as they are implemented in almost all areas of life, including the workplace.

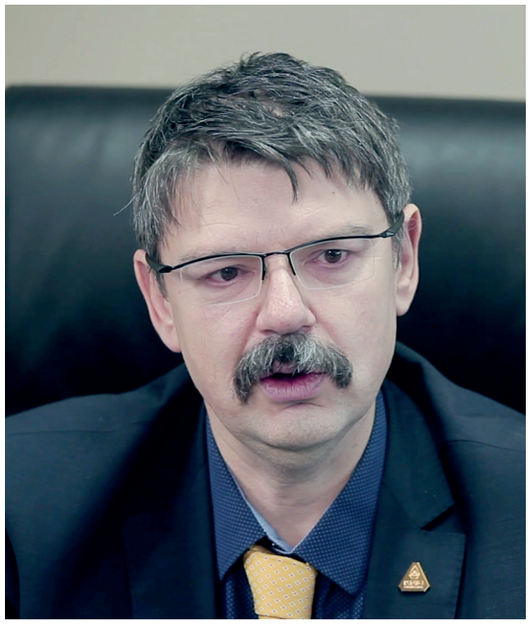
At the same time, IT professionals, as well as other professionals who are not directly related to the oil and gas industry, must have some knowledge and skills in the industry.

– If you had unlimited financial resources, what two or three main problems Would you spend them on?

– One of the problems is the lack of accuracy in measurements. Without accurate measurements, as well as means of transmitting these measurements, there will be no work in the industry. Imagine the Uzen field, 5000 producing wells, 3000 injection wells, you can't work at random there, a computer should do this, collect data on wells, process the information received and give recommendations. And in order for the computer to be able to process, you need to enter accurate information on measurements in it.

The second problem that needs to be solved is the system of organization and management of the branch. It is necessary to install a system similar to that of large Western companies. For example, it is necessary to optimize the system of taxation of enterprises in such a way that something is left for the development of enterprises, and not scattered across different levels of management.

3.1.4.
EXPERT OPINIONS



SVESHNIKOV ANDREY VLADIMIROVICH

Deputy general director for development
of LLP "KMG Engineering"

Despite the fact that much has been said recently about the end of the oil era, the oil industry, according to my estimates, will exist and develop in the next 100 years. If we talk about alternative sources, they are used by countries that do not have a sufficient resource base. And those countries that are more fortunate will continue to work with the existing resource base, the use of which is economically highly efficient.

The prospect of the prospect of oil and gas development does not mean that it will remain at the same level. In the near future, the industry will be subject to changes in accordance with the defining technological trends. The global industrial economy is moving towards digitalization and the increasing use of artificial intelligence in decision-making, including the oil and gas industry.

In general, employees who have knowledge not only in their own field, but also in the IT field, in the field of Analytics and decision - making are becoming more valuable.

Currently, technologies related to optical fiber are being actively implemented. It is used for communication channels, that is, it can be used to get information directly from wells, to get information on pressure, temperature, and their distribution over the well.

Modeling, which is used to calculate multivariate models, is becoming a very important part of oil and gas science. Using modeling, different implementations of biological models are selected, the most likely ones are selected, and

then a fairly extensive range of calculations for the level of oil production and expected reserves appears, which is very important.

Now the most important issue is the issue of increasing oil recovery, so we need to understand what technologies can be implemented to extract residual oil from the field. It is important to understand the structure of residual reserves, roughly speaking, we have already produced "light" oil today; the one that was produced without much effort. There is also a separate type of oil – high-viscosity oil, which Kazakhstan possesses in huge quantities. This type of oil will be used in the next 10-15 years. Today, KazMunayGas has started industrial work to involve these residual reserves in the development.

We have a large amount of high - viscosity oil with non-uniform permeability, where physical and chemical methods are used, the so-called methods of polymer flooding, surfactant-alkaline flooding. In this direction, China has gone far, and, for example, in Russia it is not so developed. I can say with pride that we use polymer flooding to a greater extent than it is used in Russia, and we have deposits where polymer flooding is used on an industrial scale.

In my opinion, the geological study of existing deposits and their further study is one of the most important priorities. Exploration of new sites is itself a long, expensive, and risky process. If geological exploration can "shoot" in 10-15 years, then additional exploration of existing fields within 5 years can lead to an increase in production, and the use of methods to increase oil recovery can be applied in the next year.

Technological change does not exist separately from people. In my opinion, in the oil and gas industry, first of all, it is necessary

to invest not in technologies, but in people, in their training and development, since any technology requires the perception of people who will work with these technologies. If we don't see support from people, then no technology will be implemented.

The problem of training and improving the skills of currently working specialists is also relevant for us. Even now, in our current production activities, we seriously lack chemical technologists, specialists in geological exploration and geomechanics, specialists in field development, and specialists in oil recovery methods.

The relationship between Universities and enterprises is also reaching a new level. We try to establish active cooperation with Universities that are engaged in research in the field of oil and gas. To solve current problems we need to involve fundamental science and solve fundamental problems. We want Universities to demonstrate their interest in solving these problems.

In conclusion, speaking about the future of our industry, which concerns employment and changes in requirements for specialists, I want to note the following. A very acute problem that we cannot yet solve is the problem of social employment and social protection of employees working in the oil and gas industry. We need to understand the mentality of people so that people believe that the state and companies are as interested in their development as possible. With the development of technology, we will not lose jobs. All people will have enough work in the new version of the oil and gas industry, with new technical and technological capabilities. In addition to specialized skills, there are also cross-professional skills and competencies that are just as important for successful employment and career development. So, during the interview, it is very important for me to look into the eyes of a person, they reflect how much a person has an active life position. It is important that a person strives to change their life, so that there is a desire to change something in the world around them. If a person is "crazy", who is ready to work day and night, if he dreams of work at night-this is our person. These are the people we hire and provide them with interesting tasks.

3.1.5.
EXPERT OPINIONS

KLIMOV PAVEL VIKTOROVICH

Chairman of the Repuplican council of gas industry veterans NGO

As an example, I will cite three major events in the industry that have taken place over the past 5 years.

First of all, the Turkmenistan – Kazakhstan – China main gas pipelines were built. Three lines of 1,316 km were built quickly, and the Beineu-BoZoi-Shymkent gas pipeline was 1,454 km long. The new gas pipeline is of great importance because it has made it possible to supply gas from Western fields to the South of Kazakhstan. If earlier gas was supplied to this region from Uzbekistan, now we have gained energy independence not only for the South of the country, but also for the state as a whole.

Second, gas was sold for export. If in 2017 it was 1.7 billion, in 2018-5.7 billion, in 2019 it is already 7.5 billion. Cubic meter[1].

In 2019, 4 compressor stations were built on the Beineu-Bozoy-Shymkent gas pipeline, and the pipeline reached a design capacity of 15 billion cubic meters. cubic meter. Of these, about 5 billion. cubic meters are sent to the South of Kazakhstan, and 10 billion rubles. cubic meters are planned for export.

This is the dynamic from which the transport system will develop. Another important point is the completion of the Saryarka gas pipeline. The whole region (the center and North of Kazakhstan) will receive gas, and gas in large volumes. The pipeline is designed for 2.4 billion rubles. at the initial stage, and at the second stage - up to 3 billion cubic meters. cubic meters.

Third, refineries were reconstructed in the cities of

Shymkent, Atyrau, and Pavlodar.

During the reconstruction, new technological equipment was installed and the product line was expanded. For example, there was a problem with aviation kerosene. This task is being successfully solved at the present time. Three domestic refineries have received a "new life", and the gasoline and diesel fuel produced there meet international standards. It is also important to note once again that our high - quality domestic kerosene will be produced. Another important point is that gas chemistry will be developed.

Significant results have been achieved in geological exploration. A lot of work is being done to improve the technology of its maintenance. In this direction, a significant groundwork has been created: various methods and programs, and technologies for conducting intelligence have been developed. Today, reserves of 2.2 billion tons of oil, 2.7 trillion, have been explored. m3 of gas, 0.7 billion tons of gas condensate. Today, there is a clear understanding that the geological reserves of the Caspian plume are estimated at 7 billion tons. oils. 62% of the territory of Kazakhstan is promising oil and gas.

Now let's look at the prospects for the development of the oil and gas industry, taking into account the specifics of Kazakhstan. First of all, stable development of the industry is predicted. However, structural changes are expected due to the results achieved. In the structure of consumption, 400 thousand tons of diesel fuel will be released due to the fact that 50% of transport in Almaty will be converted to gas-engine fuel. In addition, the Government plans to convert 50% of motor transport in the capital and 30% of transport in the regions to natural gas.

Another important point is the expansion of the share of energy obtained from alternative sources. Already in 2020, its share will be 3%, and today this is a serious indicator.

The most important promising area is gas industry. This direction will be seriously developed.[2]

In my opinion, this is the most promising direction. Selling gas or selling gas-chemical products are completely different things. Gas chemistry means high technologies and high added value.

Technological changes in the field of gas transportation are focused in three areas: modern compression technologies, pipes with improved smoothness, and the use of" smart " dispatching systems for gas transportation systems. The most important technology is compression (compression) of gas. Now the direction is taken to install modern tour-bin. Solar and General Electric units are used, which have a high efficiency.

Pipes with increased smoothness are also actively used, which significantly reduce the cost of

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[1] *Currently, the share of gas in Kazakhstan's GDP is 1.8%, and by 2030 it will be 3.6*

[2] *Currently, Kazakhstan consumes 12.5-13 billion rubles. M³ of gas per year. By 2030, it is planned to increase this figure to 25 billion rubles.*
Gas production Growth outstrips oil production growth: 5.6%

gas transportation. In addition, "smart" technologies are being developed, such as modern dispatching programs. They allow you to rely not only on the opinion of a qualified dispatcher, but first of all on the objective data of the system online.

When talking about future changes, it is necessary to take into account the training of qualified specialists. For example, turbines are the most complex installations. Processing of hydrocarbons is a very complex process, and of course we need highly qualified specialists. Recruitment of qualified specialists can become one of the main challenges in the industry. We need a lot of qualified specialists in the future and, above all, working specialists. Today there are qualified locksmiths, machinists, and electric welders, but where will these workers get a new shift?

If there were vocational schools before, but now specialists are not trained in the amount that our industry requires. At many enterprises, including KazTransGas JSC, additional classes and advanced training courses are held to improve the training of personnel in the industry. We expect that new personnel will come to the industry. They must be prepared and trained in advance.

Across the country, we need to strengthen training for the industry and, above all, for working professions. This must be done, otherwise, according to my subjective estimates, in 5-10 years the shortage of working professions will significantly increase. This is why we invite young professionals to our industry. They will be able to build a great career, realize their talents and become excellent specialists.

3.1.6.
EXPERTS' OPINION

MERALIEV SADUOKHAS TALOVIC

Chief operating director
of "KMG International" N.V.

The key global trend today is digitalization, followed by artificial intelligence. High-quality enterprises in the non-oil and gas sector mainly carry out the first stage of digitalization and develop an automatic control system. Today, we need to make a "superstructure" of the system with the help of artificial intelligence. This applies to production, processing, sales, and marketing.

Other significant changes in the field of oil and gas production, I do not expect. This is mainly due to the fact that many good technologies have been developed so far. For example, in the 1990s, the United States developed gas liquefaction technology for transportation. This can be considered a revolution in the oil and gas industry. Now, nothing new is predicted for transportation in the near future. The same applies to other parts of the value chain: many different technologies have already been developed, so you just need to take the right ones and apply them actively. It is not a matter of developing technologies, but of applying existing ones correctly.

The industry will be more exposed to structural changes than to global revolutions. For example, in the field of non - oil refining, modern technologies and installations are also used today, and we do not expect any changes in this area. There are other kinds of changes: for example, Ben-Zin, it turns out, is no longer needed by many people, this is a real problem. At the moment, the use of diesel fuel prevails. If you "disperse" all three plants at full capacity to

receive 5.5 million tons each from everyone, the plants will "drown" our country in oil.

Introduction of new technologies is the responsibility of the industry's enterprises. Each birthplace is unique, so the decision of what is worth implementing and what is not is made by the enterprises themselves.

Almost 12 years ago, it was calculated that for every 3 tons of diesel, 1 ton of gasoline should be produced. However, we have made the ratio 2:1, which is more flexible for us.

There are two conflicting trends. One trend suggests that the production of diesel cars is decreasing, while the production of gasoline cars is increasing. Another trend suggests that Europe is getting rid of diesel cars by selling them to developing countries, where the percentage of diesel cars has jumped. Of course, the demand for electric cars will grow, but not so much as to displace cars with traditional engines.

Another example of structural change is a reduction in oil consumption and an increase in gas consumption. There are several reasons for this. Europe categorically prohibits the production of NTPs, since this is an ecology, although the United States does not look at it. The increase in gas production is mainly due to the development of shale production, but I believe that this phenomenon is temporary changes affect not only the technological stages, but also, the areas of training. In the near future, in addition to their specialty, the employee should have digital skills, for example, a computer mechanic.

In order to train enough specialists, it is necessary to develop vocational schools, as it was before in the USSR. The student enters the school, where he is shoed, dressed, given education, and provided with work at the end of vocational school.

Now we need to focus on skilled labor, on working professions.

3.1.7.
EXPERT OPINIONS

YELEUSINOV MARAT KAIRBEKOVICH

Director of the oil and gas production department, NC KazMunayGas JSC

– Marat Kairbekovich, currently, many non - oil companies, not only in Kazakhstan, but also around the world, invest serious funds in education and training, as well as digitalization. Today, such concepts as the flow of human resources, the release of human resources have become fashionable, there are a lot of shocking estimates that a robot will replace a human, etc. In this regard, the first question will be of a General nature. Please tell us what, in your opinion, are three most significant trends and / or technologies that can radically change the image of the entire oil and gas industry in Kazakhstan?

– Regarding the oil and gas industry, surely, until now the most important indicators – i.e. of oil and gas production, have been usually provided directly by dispatchers, who have recorded the indicators on paper every two hours, then sending to you via email. Of course, in the age of digitalization and automation, all these areas will be rethought and redistributed, will be solved by some analytical, digital application that will automatically receive all this data, record it, accumulate it in the database and, accordingly, transmit it to all necessary instances, possibly to our mobile phones, tablets, etc.

– It turns out that one of the trends that you mentioned is Big Data, which permeates all industries. The second question is related to it. In Your opinion, what are the first professions that exist in the oil and gas industry today that will be formed in the next 10-15 years?

– I have already mentioned that we have dispatchers who collect information, synchronize it, form, and complete it for further analysis and research. This is, first of all, the daily work that will be excluded, and these professions will be redistributed. They will deal with the analysis and quality of that data.

– With the development of Big Data, will professions related to manual data collection and processing leave the industry, and, accordingly, new professions will appear? What names would you give to these new professions?

– So far, we believe that these will be Analytics centers. First of all, they will be responsible for the quality of this data.

– Marat Kairbekovich, you represent the direction of production in the industry, could you name exactly this direction, 2-3 main challenges that are currently slowing down the development of the industry as a whole?

– As I mentioned earlier, the oil and gas industry have a history of more than 100 years on all our operating assets. These deposits are already at a late stage of development and large capital and operational investments are required to continue the life of these deposits. Naturally, over the past 8-10 years, world oil prices have significantly decreased, which affects the development of our companies.

The first challenge is the oil price target. The second challenge is the availability of competent specialists. A good program has been adopted in our country - the Bolashak program, which has trained a lot of good qualified specialists. But, as you understand, these specialists still need to be retained, because there is a lot of competition for them in the world. A student who has graduated from a UNIVERSITY in the United States or in

Europe tends to work in global companies, which, accordingly, creates a shortage of personnel in our companies. This question, how to retain these specialists, requires special attention, but it is necessary to stop the outflow of specialists abroad.

– Tell us, if we take the oil and gas industry as a whole, where the most qualified personnel work, who can be retained, where it is easier to create conditions and where there is an acute shortage of personnel? Is it possible that they are attracted from abroad, which in turn leads to an increase in transaction costs?

– As You know, there are major projects in our country that are being implemented jointly with world leaders in the oil and gas industry, such as Shell. We take into account the significance and scale of these projects, the main highly qualified specialists are concentrated there, and these are companies such as Tengizchevroil, our well - known Kashagan project, and Karachaganak petroleum. These companies try to attract the most qualified employees with international experience. That however, KazMunaiGas faces the task of attracting such specialists to our operational assets, such as the Uzen, Kalamkas, and Zhetibay fields, which are famous for their ancient history.

It should be noted that our old fields employ specialists with good experience, whose knowledge is mainly accumulated through experience in these places. This is why there is a difference between those who are involved in large projects and our operating assets, where mostly local specialists work.

– If I understand correctly, expats are attracted to jobs with a high level of technological equipment, while local specialists are attracted to industries where the technological level is less developed. How, in Your opinion, can we reverse this trend, so that

we can fully manage with local cars and not be forced to attract expats? What measures are being taken in the company?

– As I mentioned earlier, we will have to try to retain those specialists who receive qualified education abroad.

In General, I will say that measures are being taken. For example, we already have about 30 years of experience in joint assets. during this period, we have grown a lot of good local specialists who can replace expats in principle. But, nevertheless, there are certain narrow specialties that require special focus and advanced training for point specialists, then we could replace expats.

– ***How realistic do you think the measures are being taken to train these specialists in narrow areas in Kazakhstan?***

– If we talk in particular about KazMunayGas, in this case, we, in KazMunayGas Engineering, which is the project Institute of our company, have formed competence centers for advanced training, and we plan to choose the most worthy and high-quality specialists that we could train abroad thanks to our partners.

Of course, certain conditions are set that this specialist must study and return to Kazakhstan, work in the our company. In addition, since last year, we have adopted a good practice of personnel rotation, that is, personnel who work in our major projects, in our operational projects, are rotated in order to improve the quality of employees and to be able to use them in more significant positions.

– ***You gave very good food for thought. And there will be another question that will sum up our conversation. We assume that your company has a large amount of free money and is able to solve some of the problems or challenges that You have identified. Which problem would you solve first?***

– Still, I believe that personnel are the first thing, no technologies and new trends will replace it if we do not train personnel.

We have a good example like Nazarbayev University, where international specialists are really attracted, where our children can get a decent education. I think that if I had the money, I would help increase the number of universities that will allow more people to receive quality education, and this should be concentrated not only in the capital or in the major cities of our country, but also in the regions. It is necessary that every resident can get access to such education, because, as practice shows, there are a lot of decent and strong children who are well trained, well prepared mentally and psychologically, but they do not have the opportunity to study, because educational places are limited.

3.1.8.
EXPERT OPINIONS

KABYLDIN KAIRGELDY MAKSUTOVICH

Deputy general director for RoK government relations, JSC "Caspian pipeline consortium - K"

Today, many analysts and experts say that the trend is shifting to the area of digitalization. The XX century was the century of information, and our century is the century of IT technologies. These technologies are used everywhere, from various gadgets in everyday life to their implementation at the production level, so we can assume that the composition of working professions and approaches to improving production efficiency will change.

For example, if the operator previously performed mechanical actions, then in the future it will manage devices that have intelligent software programs, and therefore, it must also have basic knowledge in IT technologies. As experts say, in the future, all this will lead us to artificial intelligence.

Now there are digital fields and financial and economic software that allow you to model the entire project process.

As for the production itself, IT technologies will certainly be used to increase the oil recovery coefficient. This is important for Kazakhstan, as the main fields have been producing oil for more than 120 years, and new technologies are needed for further exploitation of these fields, which will allow increasing the oil recovery coefficient. Thus, the oil industry of Kazakhstan will remain one of the largest players in the field of oil production on world markets.

The oil industry uses modern technologies in the field of processing. For example, in Kazakhstan, factories were modernized. As a result, more

high - tech equipment was installed, if earlier the volume of processing was 50-60%, now it is 80%.

These changes will affect all stages of the technological chain, as new technologies are used at all stages of production. For example, in the course of geological exploration, analog instruments were previously used, and now digital instruments are used.

I also believe that in the near future, at least for another 50 years, a revolutionary revolution in the energy sector will not occur, that is, the oil and gas industry will remain a source of energy.

I DO NOT CONSIDER ALL CHANGES TO BE POSITIVE, FOR EXAMPLE, THE CONCEPT OF AN ENGINEER IS GRADUALLY BEING EXPANDED IN THE PERSONNEL POLICY. IT SEEMS TO ME THAT WE PAY LITTLE ATTENTION TO THE TRAINING OF THESE PERSONNEL, ALTHOUGH THEY ARE THE CREATORS OF THE PROCESSES. ENGINEERING AS THE BASIS, AFTER THEM THERE SHOULD BE A SYSTEM ENGINEER AND A SOFTWARE ENGINEER.

Another problematic issue that has always existed is the issue of environmental safety. Everything we do using resources has its own environmental risk, and I would like to prevent problems of this kind, but the solution to this problem will not happen in the near future.

3.1.9.
EXPERT OPINIONS

KUATOV RUSLAN TURZHANOVIC

Manager of oil production technology, Tengizchevroil LLP

— Ruslan Turzhanovich, please tell us, as an industry expert, how do you see the future of the oil and gas industry in Kazakhstan? What actors will influence it, what risks and opportunities can we expect?

— First of all, I would like to thank You for the opportunity to participate in Your project. To answer Your question, the future will be connected with new exploration options. What was discovered before us, and what is being developed at this time, it has its own life limit in any case. This may be 10 years or 50 years, depending on the pace of development and further development of the industry. But I still think that the future belongs to geological exploration, although it seems that now is not the best time to talk about it. However, if we look far into the future, we need to invest in geological exploration right now. Many advanced companies are trying to optimize and reduce risks, reduce the cost of projects, but in any case, we must think about the future.

— If we are talking about geological exploration, are there any new methods being used now, for example, has this process become cheaper or has it changed? Will we have time to conduct geological exploration and discover new deposits in the next 5-10 years?

— First, we need to talk about the further exploration of the field equations. Most of the localities were opened during the Soviet period. We need to further explore the existing fields, and already reach new horizons. One good example is the Eurasia project.

— What do you think will be the key opportunities in the next 10 years?

— The return on exploration will not be soon, but at the moment we can talk about optimizing production and introducing new technologies. Technologies for improving the efficiency of oil production from old fields, horizontal drilling, polymer flooding, and others. We also need to develop the use of chemistry, thermal methods, and all the latest technologies that are used in world practice. The main thing is that it is profitable to invest in the introduction of technologies in our fields. Also technology adoption may be influenced by certain policy decisions.

— Which 3-4 professions are currently most in demand in the non-oil and gas industry?

— I am in close contact with Russian industry universities, as well as Western Universities, and the main problem is basic education.

We are now preparing bachelors (by the old standards, they are engineers), and we give them the theory and other basics that are already outdated. Although now universities are trying to introduce new training programs, as, for example, Satbayev University is doing, but it will still take some time, you need to wait. The implementation of these programs also requires qualified teaching staff.

— Are there not enough engineering personnel or workers now?

— Good question. Although we are currently in need of engineering personnel, I would like to focus on working

professions, but what do we mean by working professions? For example, if we are talking about an operator, then in the 60s this is a man in a sweatshirt and boots, who walked on wells, but now he must have a good computer knowledge, and, preferably, knowledge of languages. In other words, there is a need for such professions, with these additional skills.

I would also like to touch on the topic of intermediary professions, since there is no special need for them. There should not be a lot of intermediary specialists in the chain of professions between the boss and the worker.

— What is the main idea that will be incorporated in the concept of new professions in the industry? A person of a broad profile, a universal specialist, etc.?

— I would be careful with the term "universal specialist", since there are quite a lot of such specialists in our time. As for the idea itself, I would like to say about the introduction of advanced training courses, and that they are conducted by specialists who have many years of positive experience. I'm not talking about training sessions, "tick" classes, or workshops that simply turn into meetings. These activities usually do not lead to tangible positive results.

— Do you agree that the role of management used to be to maintain the functional work of the company, but now, due to the fact that everyone is required to introduce certain innovations, the main job of management is now to search for new ideas and quickly adapt them? If so, will it be necessary to introduce new skills in the management system?

— This is what I said earlier – advanced training courses. These courses should instill and develop the new skills you are talking about. There is also a problem – we need to change the mentality of people in this regard, and in a global way, not only to talk about management, but also to talk about engineers and workers. It is also worth noting that each company has its own mentality and vision of development. If some companies are ready for innovations and modern trends, then there are companies that work according to the old scheme. And in order to avoid such differences, it is necessary to introduce a coordinating body.

— If we talk about a young generation, what 2-3 competencies would you recommend them to develop in order to achieve success in the oil and gas sector?

— First, it is the desire to work. Also, a person's attitude and understanding of what they want, so that they have a vision for 3-5 years, so that they know who they see themselves as and what they want to achieve. Second, a person must have basic knowledge. Despite the fact that previously information was available only in libraries, and now any information can be found much easier on the Internet, there is an incomprehensible passivity of current students. This trend is not a good one.

3.1.10.
EXPERT OPINIONS

MURATOV NURLAN IBRAGIMOVICH

Director of the office of continuous production improvement,
NC KazMunayGas JSC

Dear friends and colleagues, the oil and gas industry has historically been very dynamic – oil and gas have always been the engine of progress since the end of the 19th century. Of course, our world is now slowly changing. The world is gradually switching to the use of alternative sources energy, and this will accordingly affect the development of the oil and gas industry in the future. For our country, oil and gas are very important, and I think it is very early to" bury " this industry because of the development of alternative energy. In any case, there will be a demand for oil products. Now the dependence on oil and gas as raw materials is quite large. This will not be replaced in a short time, but in certain regions, in my opinion, this dependence will change, shift. For example, in those countries where it is possible to switch to more expensive alternative energy sources at the moment, and where there are higher environmental requirements and mass pressure from eco - activists, this change will occur there.

We are already seeing the transition to alternative energy sources. Many oil companies are changing their image from oil and gas companies to energy companies. It is inevitable that in the future alternative energy sources will become the main ones, and oil will be auxiliary, as coal is now. Also, do not forget that carbohydrate raw materials are not a renewable source of energy, and sooner or later it will not be economically feasible to search for and develop such resources.

As a geologist with a specialty in the field of engineering, for me the main technologies in the oil and gas industry are those that allow me to remotely determine the location of a hydrocarbon cluster. One of these technologies is the collection and processing of seismic data.

And in this regard, geophysical

and service companies have made quite a sick progress when the data we receive can be used not only to accurately characterize the inter-shaft of hydrocarbon accumulations, but also to determine what type of hydrocarbons they contain.

If you look at the last century, when seismic data began to be used, it was a completely different quality, a different level, but it was still a kind of revolution, and we have already come a long way in this regard, in terms of technologies for seismic data. As for other technologies that will determine the future of the oil and gas industry, these are technologies that are used and will be used in the extraction of viscous oil, in the extraction of unconventional resources, which are very common in Europe and America. A striking example of the application of such technologies is oil production in the Permian basin in Texas (USA). It is quite inexpensive to extract oil from reservoirs that were previously considered inaccessible. I would like to note that now there is a lot of talk about an intelligent Deposit, when the entire chain is digitized, from collectors to dispatch points.

We have the ability to get real-time information on the entire value chain, in the collector, on the ground infrastructure. We can correctly interpret and model this data. It becomes possible to develop deposits with greater efficiency than before.

Speaking about the human resources potential for the future of the oil and gas industry, I would like to note that in my opinion, training is necessary cross-functional specialists who understand both Geology, drilling, development, commercial and project management issues. Such specialists see the entire chain that should occur, and these people will create value for existing and future projects. They will form the right direction in the work through critical and logical thinking. They will make the right decisions and conduct effective production operations. It is also very important to have personal qualities that will allow young professionals to be Champions, and not "victims of circumstances". Such specialists are the ones who achieve success.

Kazakhstan's oil and gas industry should focus on major projects such as Tengiz, Kashagan, and Karachaganak. Of course, the full potential of these fields will support the development of the oil and gas industry in Kazakhstan. Fortunately, these areas have great potential and can be developed and developed. Finding economically feasible development concepts, technologies, and bold and deliberate decisions will allow our country to reach an absolute new level.

I would like to note that many specialists who work in the non - oil and gas industry should not limit themselves and associate themselves only with the oil and gas industry. The oil and gas industry are an excellent school of life and a sphere for professional development. Specialists with experience in the oil and gas sector will be able to find themselves in other sectors of the economy of our country.

3.2.
INDUSTRY FORECAST

THE FUTURE OF KAZAKHSTAN'S OIL AND GAS INDUSTRY: SMART WELLS AND DIGITAL MODELING. PRAGMATIC APPROACH AND BALANCE OF INTERESTS.

The oil and gas industry are on the verge of major changes.

Environmental protection requirements are increasing and new types of energy are being developed. by 2040, renewable sources will provide about 15% of the world's energy demand.

Less and less oil is used just for fuel, and more and more complex methods of extraction and processing products. By 2030, the use of oil in petrochemicals will become the main source of demand growth, shifting the transport sector from the first position. Artificial intelligence participates in the development of new wells, and the work of drilling rig operators becomes akin to a specialist in the space flight control center.

About 200 experts assessed the development of the oil and gas industry in the next 10-15 years. The group of experts included specialists of 8 categories: practitioners working in different areas of production, managers, teachers, scientists, trade Union representatives, and government employees of the industry. From each of their assessments, based on the analysis of past experience and the ability to foresee, a General picture of the future was formed.

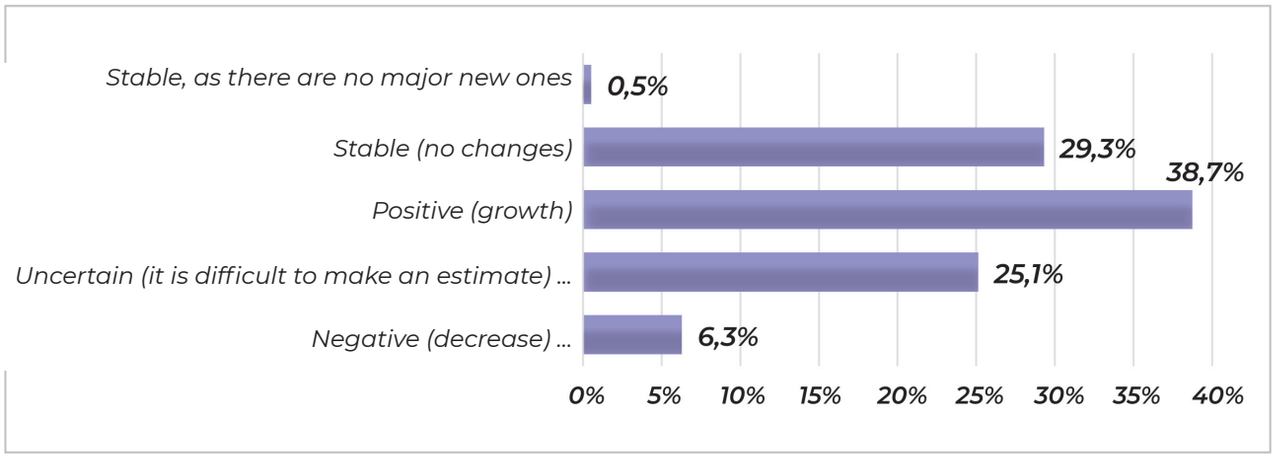
THE FUTURE OF KAZAKHSTAN'S OIL AND GAS INDUSTRY IS POSITIVE AND PRAGMATIC.

Experts assess the prospects for the development of the industry in a pragmatic way:

- see opportunities for improvement (38.7%)
- and hope for a stable situation (29.3%).

Kazakhstan is expected to increase oil production to 110-115 million tons by 2030 and maintain it at this level until 2050[1].

Figure 3.1.
Assessment of the future development of the oil and gas industry.



However, every third expert notes high uncertainty in the market and the possibility of deterioration of the situation.

According to experts, the following types of risk are most likely in the future:

- price instability (63%),
- technological backwardness (55.2%),
- irreplaceable disposal of inventory (54.1%)
- increased costs (51.9%).

The pragmatic view of Kazakhstan

Experts means searching for new ways of development while constantly improving existing processes.

In the modern oil and gas industry, easily accessible onshore and shallow offshore oil reserves are being reduced to a depth of 130 m. Reducing easily accessible reserves requires increased oil recovery,

[1] *P.S. Karens. Current state and priorities of development in the future of the oil industry in the world and Kazakhstan https://articlekz.com/article/11862*

since the current efficiency is around 30%. Oil reserves at great depth, in hard-to-recover reservoirs, oil Sands and shales involve high costs.

The era of cheap oil is coming to an end and the net profit of oil companies is inevitably declining. Companies will need to implement new technologies that reduce costs as much as possible. It will no longer be possible to make a profit by increasing oil production. The peak of oil production will be passed in the next 5-7 years, after which the decline will begin, which will continue at least until 2050. Kazakhstan's oil companies are aware of the need to accelerate the use of innovations in production.

Major non-oil and gas companies declare about the desire to become leading innovative companies. The majority of experts (71.73%) believe that industry enterprises are ready to support the introduction of innovations.

The main breakthrough is expected in the field of data monitoring and processing. The growth zones of the domestic oil and gas industry will be the development of technologies for the main production and processing processes and the introduction of digital technologies at all stages of the production process.

SUCCESSFUL COMPANIES WILL STRIVE TO ENSURE A BALANCE OF ECONOMIC AND SOCIAL INTERESTS, FULL USE OF THE POTENTIAL OF EMPLOYEES AND SOFTWARE- INCREASE OPERATIONAL EFFICIENCY.

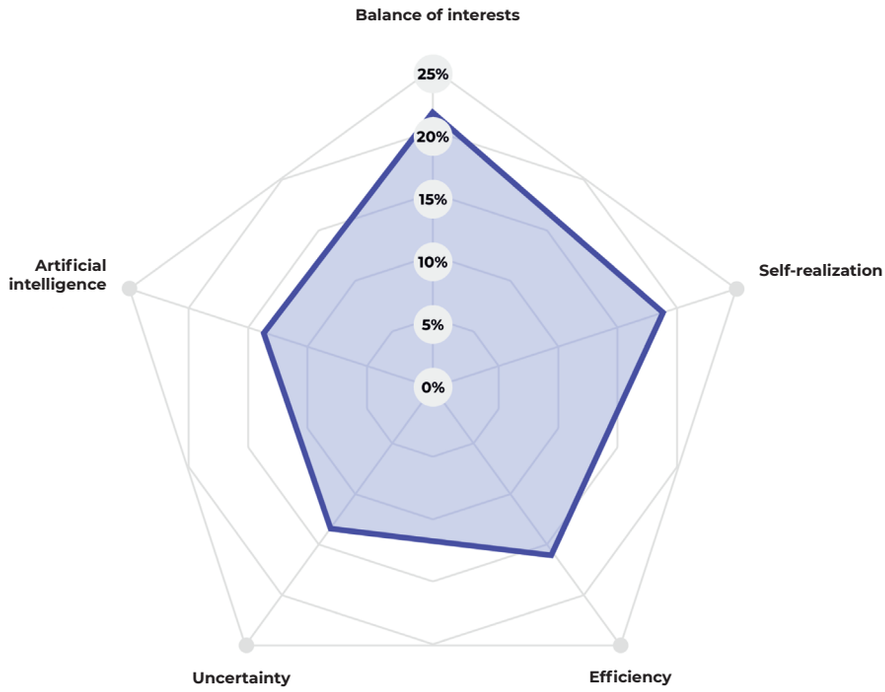
It is very important for the oil and gas industry to maintain a balance between economic development and social consequences. increasing environmental requirements to reduce the burden on the environment, increasing responsibility for the full development of territories, and the need to reduce the gap in staff income force the management of oil and gas companies to pursue a policy of balancing interests.

Experts noted the urgency of this problem in the first place.

The introduction of new technologies and improvement of the efficiency of existing production can only be carried out on the basis of active and conscious involvement of employees. Ensuring and encouraging maximum professional fulfillment of employees is also a priority for the future development of the industry.

Experts see new opportunities in the industry in the field of company consolidation, optimization of processes and costs (35.7%) and in the field of new field discovery (28.6%).

Figure 3.2.
Experts ' definition of the image of the future.



PROBLEMS OF THE FUTURE: FLUCTUATIONS IN THE WORLD MARKET AND NEW PERSONNEL.

The oil and gas industry has been in an extremely unstable state in recent years.

The most expensive Brent oil traded at $ 143.95 per barrel on July 4, 2008, but six months later in December, its price fell to $ 33.73 amid the global financial and economic crisis.

In the first half of 2020, jumps in oil prices repeated anti-records and a barrel of Brent oil fell in value three times, below the $ 20 mark. Such events have a strong impact on the state of Affairs in the industry and at each enterprise. Price volatility is becoming a dangerous game in a world that is on the verge of a global economic crisis.

Experts note as the most dangerous and influential external events:

- the presence and strengthening of trade barriers between countries (76.2% of respondents in total),
- political instability in the producing countries (76.8%)
- and major environmental disasters in the oil industry (69.2%).

Despite the fact that improved technologies and attention to environmental issues are changing the structure of demand for primary energy resources, oil, and gas, along with coal, will remain the main sources of energy in the period until 2035.

The personnel market of the oil and gas industry has been experiencing a paradoxical state for several years. On the HeadHunter resource, the resumes of those who want to work in this industry are 10 times higher than the number of vacancies. At the same time, the personnel services of oil and gas companies say that there are not enough specialized personnel.

Retired oil workers should be replaced by young employees who have the knowledge of their predecessors and are confident in modern technologies. The main internal problem in the industry remains insufficient staffing.

Experts have identified more than a hundred specialties with declining competencies over the past three years. A decrease in competence is observed among specialists in Geology and geological exploration, field development engineers, operators of technological and production installations, and others.

To solve the problems of training new personnel, enterprises need to organize training centers in production, create an attractive, comfortable work environment (clean and comfortable production), and actively develop individual training programs/ scenarios for each employee.

GLOBAL INTEGRATION OF THE INDUSTRY BY MODEL "SMART" WELL AND "DIGITAL" FIELD.

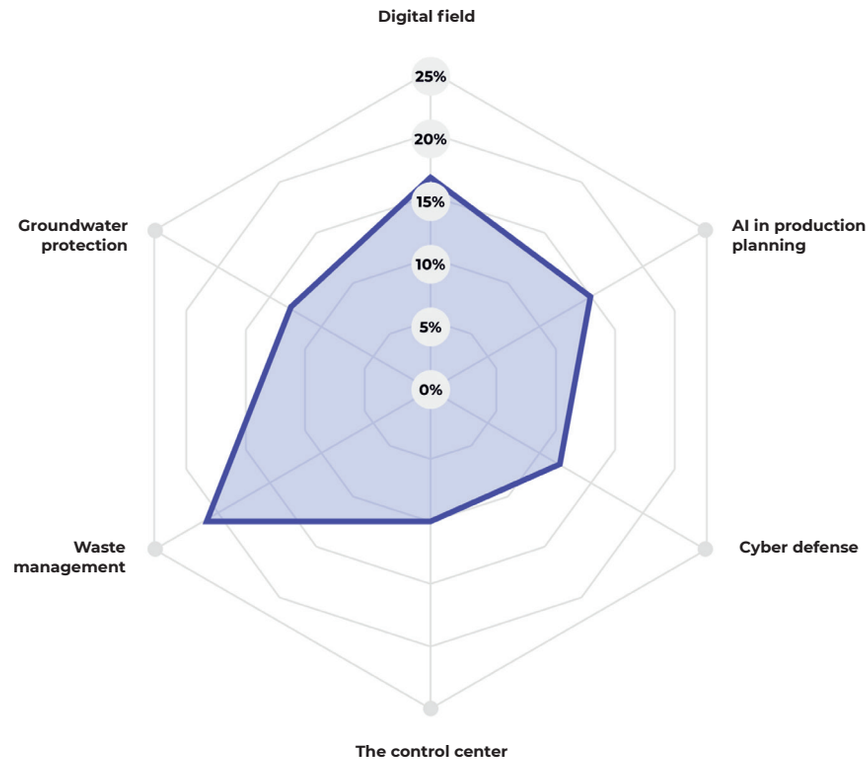
Expertsattribute the future of the industry primarily to the introduction of new technologies for exploration and production (90.4%), based on digitalization, big data collection and Analytics (87%).

The "smart" well operates independently in the mode set by the technological model of the ground infrastructure, and is able to independently adapt to changing conditions. A digital duplicate of the well is created in the control center, which records the specified parameters of the object (pressure, temperature, gas content) and allows the operator to control the well from a distance. You can increase the number of well or pipeline parameters to tens and set the per - second frequency of data collection. The benefit of process automation when monitoring remote objects, management personnel can see what is happening on the site at any time, react to an emergency situation, and predict how the results will change.[2]

Domestic experts are confident that "smart" wells (20.1% of estimates), sensor devices/ smart sensors (19.2%) and real - time Eco monitoring (12.5%) will be implemented in the near future and will become the basis of unmanned operation technologies.

Figure 3.3.

Current directions for future development.



The introduction of digitalization will bring a comprehensive benefit in the development of the oil and gas industry. There will be a "digital" field – a supercomputer constantly updated geological and hydrodynamic model of the field.

The key elements of the digital field are:

- touch devices, intelligent devices,
- drones for surveillance,
- integrated operational management center,
- the provision of oilfield services in real time,
- 3D printing of spare parts,
- utilization of wastes.

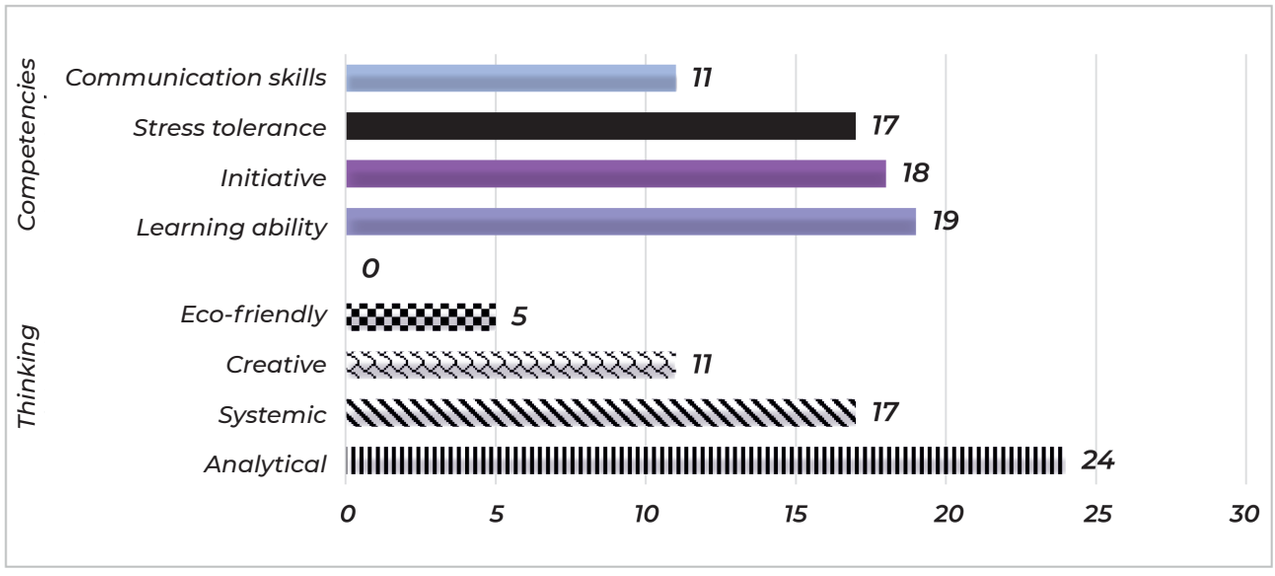
In the future, the oil and gas industry will not only be "smarter", but also "cleaner". The capabilities of artificial intelligence and digital technologies will be used to organize production in such a way that resources will be used more economically, waste will be disposed of better, and monitoring of groundwater protection and protection of valuable data will be carried out in a continuous digital mode. The experts ' opinions on the relevance of each direction as a percentage of the entire expert group are shown in figure 3.

[2] *Rostelecom and LUKOIL have launched the first smart wells in the Perm region, https://www.kommersant.ru/doc/3925621*

SYSTEM ANALYTICS AS THE BASIS OF FUTURE THINKING AND LEARNING ABILITY AS THE MAIN COMPETENCE.

More than a third of the professions in the oil and gas industry will be replaced by robotic or cyber-physical systems by 2025.[3] very soon, there will be specialties that use artificial intelligence in production and management processes. What knowledge and skills will be required of future professionals? Industry experts tried to answer this question (figure 4).

Figure 3.4.
Competencies and thinking skills in future professions (% of expert responses).



[3] *http://neftegaz.press/forecast / the oil and Gas industry requires robotics and quantizers.*

For the oil and gas industry, the development of analytical thinking with the use of tools of modern computing and design technologies is of particular importance. Analytical thinking implies a thorough analysis of various data, helps to identify the cause and effect, and quickly find the best solution in each situation. Every fourth expert believes that analytical thinking is the main ability of future specialists.

Analytical thinking is completed by system thinking and helps to see the practical application of the analysis data, to implement the optimal solution found. These are the skills needed to operate smart wells and digitally manage fields in the future. The demand for data analysts will increase by an average of 12% annually.

You can develop your analytical and system thinking skills and master new technologies only through continuous training.

Experts believe that the ability to learn and the initiative to acquire new knowledge are the main competencies for those who want to work in the non - oil and gas sector in the future. Stress tolerance is also important, because the work of an oilman remains difficult and responsible.

There are always a lot of people of different nationalities involved in the work of the drilling rig, with their own rules and expectations. A good oilman must be able to work in a team, communicate, build a dialogue, and look for common solutions.

GLOBAL INTEGRATION OF THE INDUSTRY BY MODEL "SMART" WELL AND "DIGITAL" FIELD.

The The world economic forum has released a report on the future of the labor market in the near future.

AI has already begun to affect our employment: today, computers account for 29% of work operations, and by 2025, they will replace people for 52% of operations. This will significantly change the labor market.

By 2022, the world will lose 75 million obsolete jobs, and 133 million new jobs of the future will be created to replace them.[4]

The global oil and gas industry employ more than five million people. The Republic's oil and gas production enterprises employ just over seventy-one thousand people.[5]

The labor market in the oil and gas industry is changing rapidly and dramatically.

[4] *https://www.weforum.org/reports/the-future-of-jobs-report-2018 future jobs Report 2018*
[5] *http://www.neftegaz.kz/analitik-articles/sravnitelnyij-analiz-oplatyi-truda-v-neftegazovoj-otrasli - kazaxstana.html*

Destroying the demand for certain types of activities, the technological progress created the et it to others. Large-scale digitalization of the oil service industry has already created a shortage of personnel with oil service education and experience working with digital systems.
Our experts noted that in the next decade, data analysis will become the basis for many professions — both in production and in management in the industry. Complex modular maintenance of complex technical systems and the ability to implement their programming, such competencies will be needed by a future engineer of multi-functional robotic complexes in the oil and gas industry and his colleague-an engineer of intelligent dispatching systems, telemetry, diagnostics in the oil and gas industry.

The oil companies of the future need not only excellently engineers with a level of almost cosmic training, but also talented managers who can lead mixed teams consisting of robots, field "digital workers" and remote performers.

Figure 3.5.
Competencies for working with new technologies.

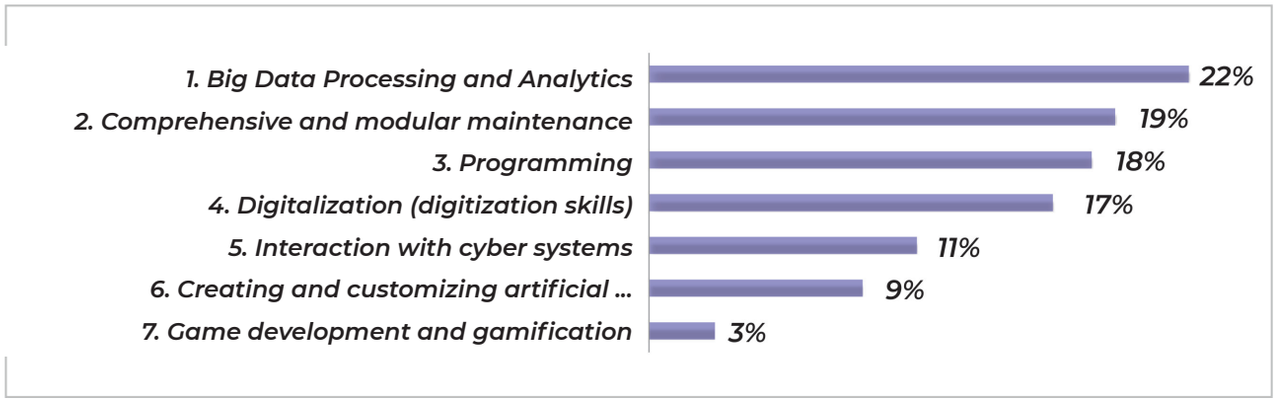


Figure 3.6.

Competencies for solving new management tasks.

Kazakhstan experts identified management competencies for solving new problems (figure 6). The implementation of large-scale projects for the construction of oil and gas facilities on land and in water, in various climatic zones and in the most difficult conditions, has increased the importance of project management.

Experienced design and construction managers are in demand, as well as employees involved in project management in various disciplines: design engineers, technologists, and specialists in planning and cost control.

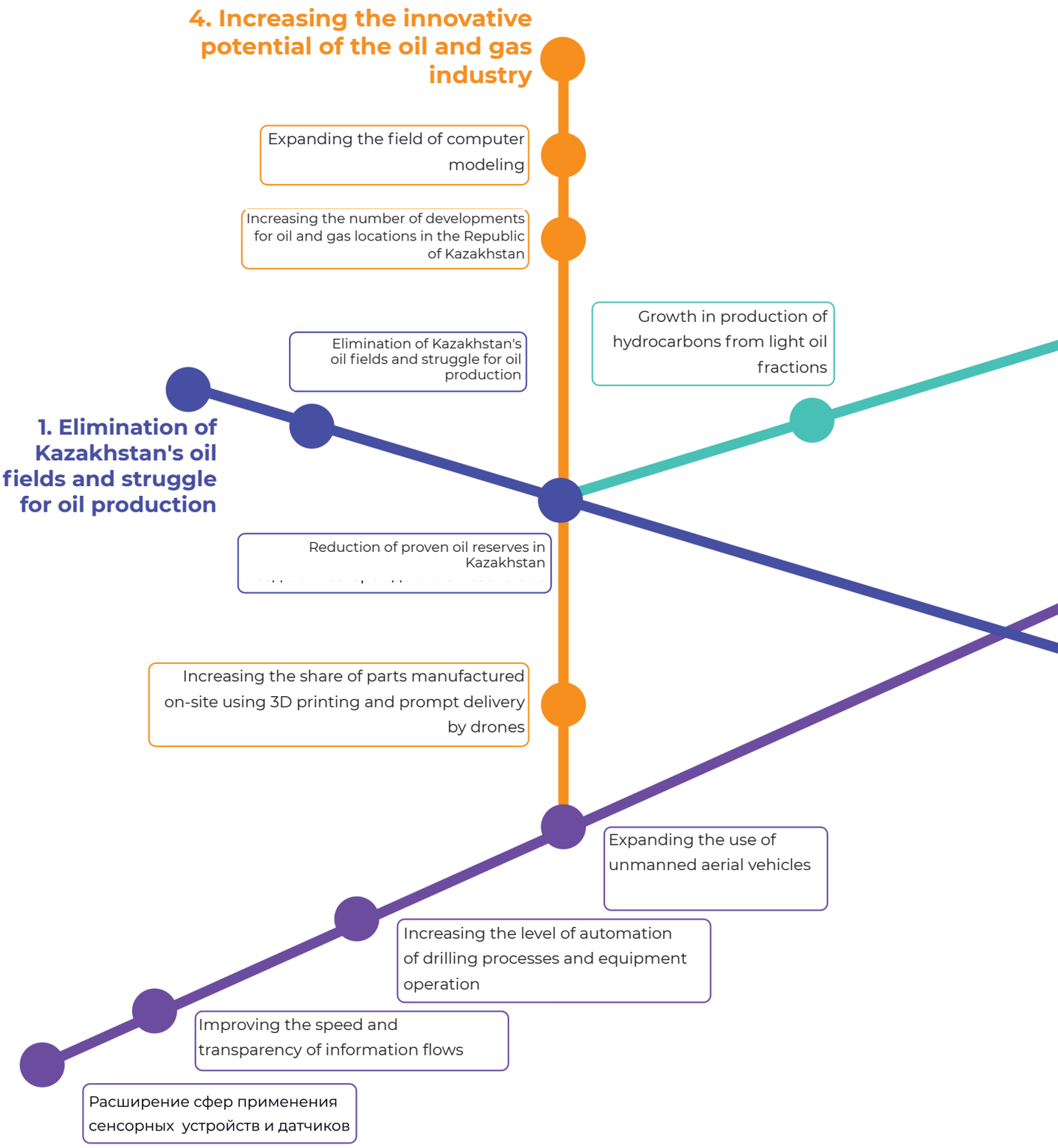
Most professions in the oil and gas industry arise at the border of various spheres of production activity and require the possession of a set of competencies noted by experts. Inter-functional interaction and flexible planning are also marked as priority management competencies.

The new environment increases the complexity of management work, and managers must be able to coordinate the activities of various teams and projects-tov. In each business model and specific production chain of the oil and gas industry, most professions will become integrated. Employees will perform several roles simultaneously, and managers will coordinate the interaction of humans, nature, and artificial intelligence.

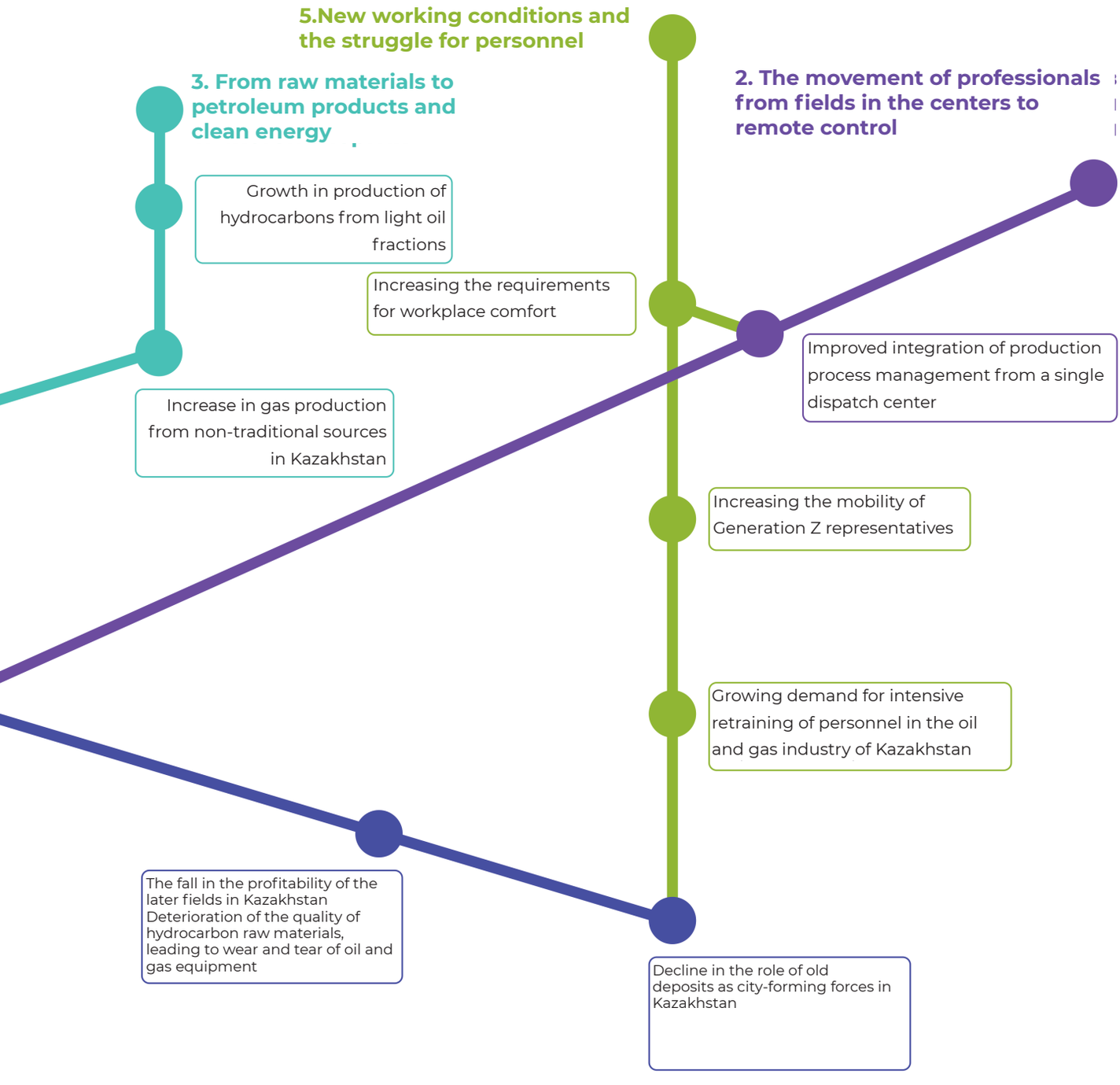
TRENDS THAT SHAPE THE FUTURE OF THE OIL AND GAS INDUSTRY OF KAZAKHSTAN

4.

MAP OF TRENDS
IN THE OIL AND GAS INDUSTRY OF THE REPUB



BLIC OF KAZAKHSTAN



4.1.
OBSOLESCENCE OF KAZAKHSTAN DEPOSITS AND THE STRUGGLE FOR OIL RECOVERY

TREND
"THE FALL IN THE PROFITABILITY OF THE LATE FIELDS IN KAZAKHSTAN"

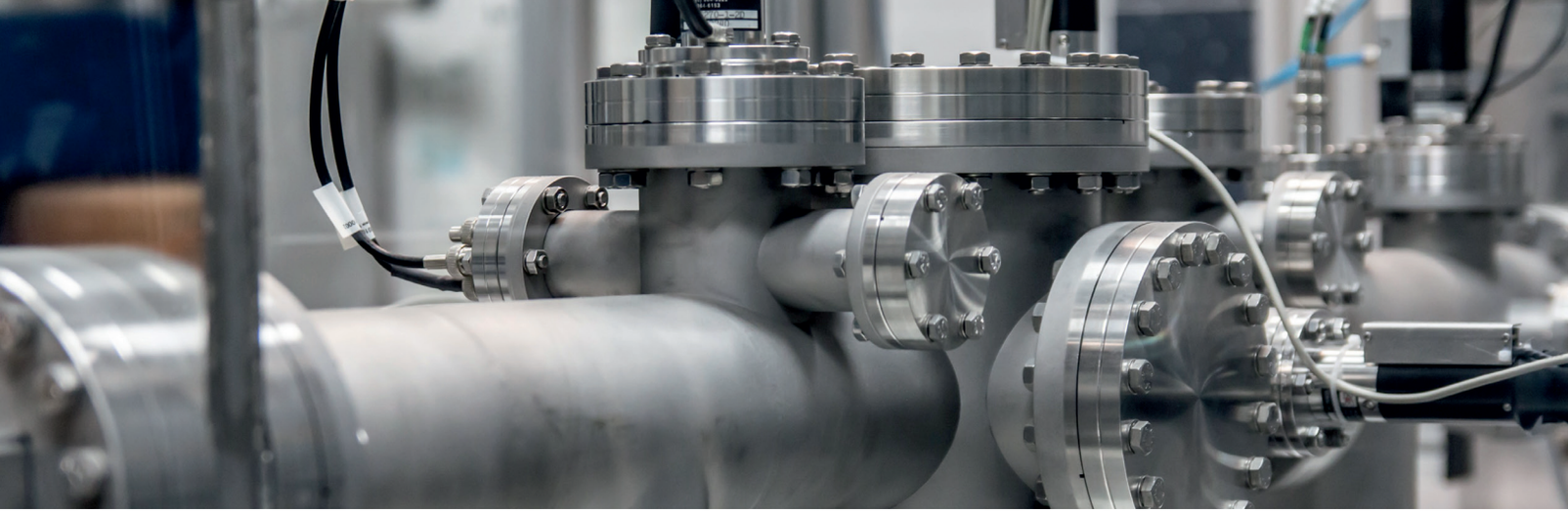
The years of big profits are coming to an end. The profitability of late deposits is gradually falling. More than half of the fields in Kazakhstan are Mature, i.e., they have passed through the "plateau" of production and are in the stage of decline, while the profitability of production is close to zero. Accordingly, the rate of production and production rates will be reduced. Main the way to increase profitability is to increase the oil recovery rate. Third-generation oil extraction technologies are already being used in the world, i.e., increasing extraction through injection of technical gases and drilling fluids into wells. In addition, the optimization of mechanized production, selection and adaptation of oil production technologies should be carried out.

2 TREND "REDUCTION OF PROVEN OIL RESERVES IN KAZAKHSTAN"

Although the discovery of new deposits does not help to increase the profitability of Mature fields, it does help to compensate for lower revenues from Mature fields with higher revenues from new fields. Proven reserves are being reduced without regular exploration. There is almost no replenishment of reserves in Kazakhstan. If the rate of production is maintained, the proven reserves will last for approximately 30-35 years. The moratorium on the exploration of new fields has been lifted, but this is not a one-step process, he said requires a long time and large capital additions. The use of new technologies for exploration and evaluation of reserves plays an important role. It is almost impossible to detect new reserves on known territories using old technologies. Therefore, it is necessary either to search for new territories that have not been explored before, or to use new tools to detect deposits near the data source. The first option increases costs, while the second option also requires high costs, as well as technology transfer and adaptation.

3 TREND "DETERIORATION OF THE QUALITY OF HYDROCARBON RAW MATERIALS, LEADING TO WEAR AND TEAR OF OIL AND GAS EQUIPMENT"

The obsolescence of deposits leads not only to a drop in revenues, but also to other negative consequences. The quality of oil is reduced in these fields, which leads to increased corrosion wear of oil and gas equipment. In oil entering the refinery, there are increased unfavorable indicators: the total acid number, in particular, caused by the content of naphthenic acids, the presence of hydrogen chloride, mercaptans, and reagents used in oil transportation. Periodic decrease in the quality of raw materials is very unfavorable. All this leads to leaks from tanks, fires, downtime associated with equipment repairs.



The solution to the problem of corrosion wear is a strategy for improving the safety of equipment, based on the use of non-destructive testing tools to identify the stages of corrosion and the types of the most corrosive raw materials. After identifying the problem points, a set of anti - corrosion measures are selected, first of all, the use of anti-corrosion materials.

Reducing the use of carbon steel in favor of stainless steel makes it possible to increase the survivability of equipment exposed to naphthenic acids. The flow rate and pipeline configuration also affect corrosion. High speed, reducing the diameter of activates the molecules of naphthenic acids.

4 TREND
"THE DECLINE OF THE ROLE OF OLD PLACE-BIRTHS AS CITY-FORMING FORCES IN KAZAKHSTAN"

Since Soviet times, part of the deposits played a city-forming role. With the fall in the profitability of deposits, it will be necessary to transform the economy of these cities in order to maintain employment.

On the other hand, traditional working conditions in enterprises no longer suit young people, representatives of generations Y and Z. in part, the decline in the role is offset by high salaries in the oil and gas sector, but you need to prepare for the problem in advance. It is more appropriate to develop small businesses and social initiatives. To maintain infrastructure, it is advisable to develop public - private partnership mechanisms.

4.2.
FROM RAW MATERIALS TO PETROLEUM PRODUCTS AND CLEAN ENERGY.

The decline in oil revenues caused by the global fall in prices and the fall in the profitability of Mature fields forces the oil and gas industry in Kazakhstan to look for ways to increase revenues. One of these methods is to increase the depth of oil and gas processing and search for alternative sources of raw materials.

5 TREND
"GROWTH IN PRODUCTION OF HYDROCARBONS FROM LIGHT FRACTIONS OIL, IN PARTICULAR PROPANE, FOR THE SYNTHESIS OF POLYMERS".

The gas industry in Kazakhstan is diversifying. Instead of producing and exporting crude oil, production of other petroleum products is increasing, including from alternative sources. The range of production increases from oil, in particular propane, polymers, etc.

6 TREND
INCREASE IN GAS PRODUCTION FROM NON-TRADITIONAL SOURCES

More and more volumes of gas are extracted from non-traditional sources, and the volume of gas condensate is growing. The use of non-traditional sources of hydrocarbons and the expansion of the range of products produced from them requires a global logistics transformation of logistics routes.

7 TREND
"THE GROWING DEMAND FOR TECHNICAL GAS, PRIMARILY HYDROGEN"

Technical gases are used in various industrial sectors. These include ordinary air, carbon dioxide, acetylene, helium, hydrogen, and others. Their scope is wide.

They operate industrial equipment, industrial and hot water boilers. Technical gases such as nitrogen and hydrogen are also used in the production and processing of hydrocarbons.

4.3.
INCREASING THE INNOVATIVE POTENTIAL OF THE OIL AND GAS INDUSTRY

Increasing the profitability of mature deposits directly depends on the technological development of production processes. Progress does not stand still, the use of new technologies by developed countries reduces the cost of their production, which makes them more competitive on the world market. Kazakhstan's oil and gas industry also increases its innovation component.

8 TREND
"INCREASING THE NUMBER OF DOMESTIC AND FOREIGN COMPANIES FOREIGN DEVELOPMENTS FOR OIL AND GAS FIELDS OF THE REPUBLIC OF KAZAKHSTAN"

Kazakhstan's science has recently created a base of practical research and development specifically, for domestic fields. A large number of foreign technologies are adapted to local conditions. All this creates good prerequisites for improving the efficiency of oil recovery and profitability of fields. At the same time, experts noted the practical difficulties faced by both domestic scientists and managers of Kazakh oil companies. Due to the lack of infrastructure and imperfect legal regulation in the field of commercialization and implementation of

developments, scientists are experiencing difficulties in finding a base for implementation, commercialization, of their developments. Enterprise managers, in turn, do not know where to look for work for their enterprises.

9 TREND "EXPANDING THE FIELD OF COMPUTER MODELING"

Computer modeling of objects (reservoirs and other natural objects, industrial objects, and equipment), business processes, well conditions and production processes is being implemented in the non - oil and gas industry. This trend is embodied in the following solutions: gigacellular modeling: a high-precision reservoir simulator; three-dimensional modeling of wells and fields, modeling of the near-well zone of the reservoir, modeling of business processes in fields, and so on.

10 TREND "INCREASING THE SHARE OF LOCALLY MANUFACTURED SPARE PARTS USING 3D PRINTING AND PROMPT DELIVERY BY DRONES"

The engineers have a message appears on the display on your smart mobile device. The 3D printing operator processes data to create three-dimensional files, and then prints spare parts and tools. Existing technologies already allow printing parts made of nylon material with a tolerance of 50 microns. Ready-made spare parts copters from warehouses to wells.

3D printing is also used for designing objects under construction. A similar project was implemented by the National oil company in the United Arab Emirates.

4.4.
THE SHIFT OF SPECIALISTS FROM THE FIELDS TO REMOTE CONTROL CENTERS

The main vector of innovative development of the non - oil and gas industry is digitalization of processes and Autonomous operation of equipment. Tens of thousands of sensors will transmit all information about the progress of production processes to control centers. Information will be processed by software algorithms, and decisions will be transmitted to Autonomous machines back to the fields.

11 TREND "STRENGTHENING THE INTEGRATION OF PRODUCTION PROCESS MANAGEMENT"

Thenumber of decision-making points for health management is reduced and it will be reduced to an Integrated operational control center (ICEC), which will be similar to the control room in the airport, managing the sequence of landings and take - offs of aircraft. The concept of building a hierarchical control system for the oil and gas complex includes four levels of control: the first, instrumental, level – the use of fiber-optic sensors, sensors for continuous data collection of underground, underwater and surface equipment, wells in the main technological processes; second, information level – analysis of a large - mA geologic information (Big Data); the third, operational level – the application of systems of management of processes of oil and gas production type of SCADA, MES type systems for smart grids, smart transport systems, water management

and the fourth management level – integrated of intelligent information systems like ERP to the operational and strategic management of oil and gas com - Plex in General. Changes in the oil and gas industry lead to the creation of search and exploration and drilling management centers, development, operation, preparation, transportation, processing, and marketing of real - time oil, gas, and oil products. In every major oil and gas company, the number of development management centers in the RRV is growing rapidly. In BP, for example, their number has reached 10 and they control up to 42% of all hydrocarbon production.

12 TREND "EXPANDING THE USE OF UNMANNED AERIAL VEHICLES APPARATUS'"

Unmanned aerial vehicles monitor the execution of oil and gas production workflows: perform critical site inspections, geospatial and aerial mapping, security and surveillance, and monitor progress:

- Compared to traditional methods, drones can provide automation to speed up the data collection process with additional speed and accuracy during routine risky industrial inspections.
- Drones can be equipped with a variety of payloads and sensors, depending on the mission requirements, or intended goals. High-quality and complex control data can be obtained from critical and operational assets using, among other things, visual, thermal and lidar sensors, and then analyzed and optimized to provide intelligent data and predictive data to interested parties. Unmanned aerial vehicles are also used to deliver spare parts from warehouses directly to the fields.
- As an example, Aerodyne, a global provider of integrated managed solutions based on unmanned aerial vehicles, has completed more than 45,000 non-pilot flights and verified more than 201,500 critical assets and major projects with a total development cost of $ 80 billion.

13 TREND "INCREASING THE AUTONOMY OF THE INDUSTRIAL SECTOR EQUIPMENTS"

With the advent of electricity, the equipment becomes more and more Autonomous, i.e., the person working on it cannot directly operate buttons, pedals, and levers, but transmit certain algorithms of actions. Also, the equipment has an increasing variability of response to different situations, learns to recognize different production situations, choose the desired algorithm of action, and even build these algorithms independently.

- Now the autonomy is increased even more due to the integration of remote industrial devices with each other. The phenomenon was called the industrial Internet of things (IoT).
- Thanks to the integration of devices: sensors for collecting information from industrial facilities, platforms for Analytics and data processing, and control equipment among themselves, it is possible to quickly respond to changes in the production process and make corrective decisions, while being at a distance from the object.
- The industrial Internet of things for the oil and gas industry is implemented in the following solutions. Oil and gas platforms of the industrial Internet of things equipped with sensors, actuators, sensors, and data transmission channels. Systems for intelligent monitoring of the object state. Tracking the health of machines and mechanisms. Monitoring of hazardous areas and production results.

14 TREND
"RAISING THE LEVEL AUTONOMY OF THE DRILLING PROCESS"

Robotic drilling systems. Autonomous systems that perform drilling without human intervention. By 2025-2035, the transition to fully automated and unmanned technologies in new offshore oil and gas fields is expected.

15 TREND
"EXPANDING THE SCOPE OF APPLICATION OF TOUCH DEVICES AND SENSORS"

The devices help to detect abnormal changes in temperature, pressure, etc. on drilling rigs, wells, etc. So, the first generation of smart wells contains about 100 downhole sensors and transmits data volume of about 106 megabytes of data per year. The second generation of smart wells already contains more than 10,000 well sensors, which are located vertically at a distance of 1 cm from each other and record all pipe stresses, temperature, and pressure. The second-generation smart well will allow monitoring and controlling the development of reserves throughout the entire life cycle of the oil and gas field. Second-generation smart wells generate about 109 gigabytes of data per year. Third-generation smart wells contain orders of 100,000 downhole sensors and transmit about 1,012 terabytes of data per year.

16 TREND
"ACCELERATION OF INFORMATION FLOW"

Data collection, analysis, and management teams are performed in real time.

For 2015, this is quarterly, for 2025 – monthly, for 2035 – weekly, for 2045 - daily data latency .

The data transfer rate is also increasing. For example, the data transfer rate for first - generation smart locations was usually 10 Gbit / s. The construction of bottom antenna systems will require even higher data transfer speeds.

It is expected that the volume of transmitted information will continue to grow to extremely large volumes. This will require the use of systems with a higher data transfer rate – 40 and possibly 100 Gbit / s.

17 TREND
"INCREASING TRANSPARENCY OF INFORMATION FLOWS"

At present, the consumer is no longer a constant in the process of creating a product.

The product is now created with their direct participation. The consumer is a co-author, tester, and source- feedback com. Business consumers and suppliers also want to have information about the state of the supply chain, the stage, the readiness of the ordered product, etc.

In this regard, transparency of information flows is increasingly in demand in the world.

The leader in this trend is IT companies, but this trend is gradually gaining strength in other sectors of the economy, including the oil and gas industry.

Transparency of information flows has formed into two sub-trends:

- ***Blockchain.*** TThe creation of the blockchain allowed the National oil company in the United Arab Emirates to get an idea of the entire group about the number of hydrocarbons and large financial transactions associated with them, which makes it possible to increase the efficiency of accounting. In addition, individual operator companies, as well as other companies that have a stake or interest in them, can base their decisions on immutable information that they can trust.
- Currently, ***the application is focused on a certain part of the company's supply chain,*** which, taking into account the daily production of about 3.1 million tons. Barrels per day, is large. IBM tracks onshore production operations to refineries or gas processing plants, and then to the export terminal. Each participant in the supply chain provides data about the exchanged amounts, which are recorded in the book.
- Tracking, managing, and executing these transactions and exchanges was a long, time - consuming process with telephone calls, emails, verification, and approvals. Not only is the process now much more efficient and optimized, ***but the blockchain can be visualized in such a way that the group gets a holistic view of the relationships.*** Individual companies and operators get their own perspective - for example, they see how the numbers entering and exiting their company are on their way to the next stage of the process.
- ***Cloud computing.***

The cloud platform provides access to information to all interested parties. This helps to avoid duplication of documents and control the status of their execution. Canadian company EPFC Corp introduced Oracle Aconex cloud services in February 2017.

- If necessary, not only individuals within the organization, but also inter - organizational project teams can have access to information.
- ***The structure of Aconex is "neutral",*** which means that each organization has its own safe space for internal cooperation, as well as for simple interaction within the project with external organizations. It is also an open system, and data can be linked to other systems via import / export or an application programming interface (API) that supports a single comprehensive view of the entire project.

4.5.
NEW WORKING CONDITIONS AND THE STRUGGLE FOR PERSONNEL

The upcoming changes in the industry, despite the development of automated technologies, are not possible without qualified specialists. On the one hand, the new requirements of the technological order require new methods of preparation. On the other hand, the new generation has specific requirements that are not limited to high salaries. The globalization of the world increases the mobility of young people, which forces businesses to compete for local staff.

18 TREND "GROWING DEMAND FOR INTENSIVE STAFF RETRAINING IN THE OIL AND GAS INDUSTRY OF KAZAKHSTAN"

Technological and social changes in the country have created requirements for the qualification profile of an employee in the oil and gas industry. Growing demand for personnel retraining in the gas industry of Kazakhstan (equipment repair and maintenance, remote management and maintenance, IT skills, data analysis and processing, polypropylene production technology). The oil and gas industry in Kazakhstan are increasing the depth of oil refining and, accordingly, the requirements for knowledge of the technology of production of oil products are increasing. Global automation of the economy leads to the production of equipment that is controlled remotely without human intervention.

Digitalization allows you to use unprecedented amounts of data for organization and production.

For oil and gas industry workers, there are new tasks that were not solved before, which require new skills and competencies.

Increasing the share of software-controlled equipment requires operators to know the basics of programming and other IT skills for configuring and managing equipment.

In the oil and gas industry of Kazakhstan, there is a growing demand for workers who speak Russian and English.

Equipment purchased by enterprises in most cases has operating manuals written in English and Russian. Young workers who replace the older generation do not have sufficient command of these languages and cannot always read and understand the instructions.

19 TREND "INCREASING THE GENERATION Z MOBILITY"

Citizens born after 1998 are more mobile than representatives of previous generations. Not being able to purchase their own housing, they begin to take advantage of the absence of a link to a single place of residence.

In other words, the lack of real estate makes these people more mobile. Accordingly, social values are beginning to change: the opportunity to see the world and try yourself in different fields of activity is becoming more and more appreciated. Increases mobility as well as the development of remote professions. Now you can work from the comfort of your home and, consequently, choose your place of residence wherever you want (provided that you have enough money for this).

For the oil and gas industry of Kazakhstan, this trend will appear in 5-7 years. To date, the mobility of citizens has not yet increased-juice's. While there is an influence of the older generation, which has the "where I was born, where I came in handy" attitude, in part, representatives of generation Z in Kazakhstan do not speak enough English and are not sufficiently loaded into the world information space and do not know many options for choosing a place of residence in other countries, in part, high wages in the oil and gas sector are holding back these trends.

20 TREND "INCREASING REQUIREMENTS TO THE COMFORT OF THE WORKPLACE"

The development of communication tools and digital technologies leads to the fact that the line between work and personal space is gradually blurred. This is reflected in the requests of the new generation of employees. They stop accepting work as a place where a person spends 8 hours, then returns home and continues to live a private life there. For them, work is part of life. Consequently, they want to see elements of their daily life at work.

The first is the desire to improve General working conditions. Progressive companies, primarily in the field of high technologies, create design rooms for employees with working places, relaxation rooms, etc.

After them, the working environment and industrial enterprises begin to improve. An example of this is the CHTPZ group of companies .

Another requirement of the new generation of representatives is their involvement in the information environment. Life is gradually moving into a global information network. Communication no longer looks like gatherings in the kitchen, but like communication in a social network, so the presence of a social network with interesting content in the enterprise in the next 10-15 years may be an important factor in choosing this enterprise as a workplace.

The third factor of a comfortable working environment is a flexible work schedule. New citizens want to manage their own working time on their own.

For example, Dell plans to switch 50% of its employees worldwide to flexible working hours by 2020. Intel, Volkswagen, and Apple provide employees with a variety of work modes, from which they can choose the most appropriate one: floating start and end times, working from home, a "compressed work week" (4 days, but 10 hours each), and the ability to allocate a pre - set number of working hours at their discretion.

For the oil and gas industry of Kazakhstan, this trend will not be relevant in the future 5-7 years, however, every year it will become more and more relevant. The danger increases social tension in a number of oil-bearing regions of Kazakhstan, which can develop into demands not only to give people jobs and provide a certain level of wages, but also to provide enterprises with clubs for interests, organized leisure, comfortable conditions in domestic premises and shift camps.

WHAT IS THE FUTURE OF KAZAKHSTAN'S OIL AND GAS INDUSTRY?

5.

WHAT IS THE FUTURE OF KAZAKHSTAN'S OIL AND GAS INDUSTRY?

The era of light oil revenues, i.e., revenues from oil extracted from proven high - yield Skua gins, is over. If earlier the oil sector of the economy of the Republic of Kazakhstan was the main engine of export development and its share in the state budget reached 44%[1] , then in the future its role will be it will decrease. There are fewer explored fields with high profitability every year. Therefore, the future of the Kazakh oil and gas industry will be built around solving the problems of natural decline in the economic efficiency of fields and wells.

The future of the oil and gas industry is seen as such by experts...

[1] *https://forbes.kz/process/energetics/44_gosudarstvennogo_byudjeta_kazahstana_formiruet_neftegazovyiy_sektor/*

5.1.
HIGH OIL RECOVERY AND "SMART" DEPOSITS.

Much attention is paid to methods of increasing oil recovery through the use of the following methods: reverse gas injection, steam injection, IREX micro-biological technology, etc. Much attention is paid to methods of increasing oil returns through the use of methods: reverse gas injection, steam injection, iREX microbiological technology, etc.

Research and production enterprises have been established that develop and produce components for enhanced oil recovery through liquefaction and gentle oil recovery. By 2030, the quality of produced oil will significantly decrease and its aggressive properties will increase. Therefore, a new direction in chemistry and materials science will be developed-the research of methods of anti-corrosion protection and the creation of new synthetic materials to increase the corrosion resistance of oil and gas equipment. Specialized service companies that perform periodic "upgrade" of the worker will be distributed by applying an anti-corrosion coating to the working surfaces of the equipment.

The growth of the population of cities and increasing environmental requirements in cities has led to the active use of gas as a fuel.

HBO-POWERED CARS AND ELECTRIC CARS WILL CHANGE THE PICTURE OF TRANSPORT IN THE CITY.

The system of fuel infrastructure in cities will change: gas and electric filling stations will replace gas stations. This will allow large cities to maintain a low level of

pollution from exhaust gases, and completely reorient the product line of oil processing plants in Pavlodar, Atyrau and Shymkent from the production of fuel for cars to new types of oil products: Euro - 10, aviation kerosene and other products.

According to experts, there will be a shortage of crude oil production in the world until 2050, even with factories already under construction around the world.

Realizing that the sale of crude oil significantly reduces the real financial income of the industry, Kazakhstan will build a chain of enterprises for the processing of oil, gas, and sulfur.

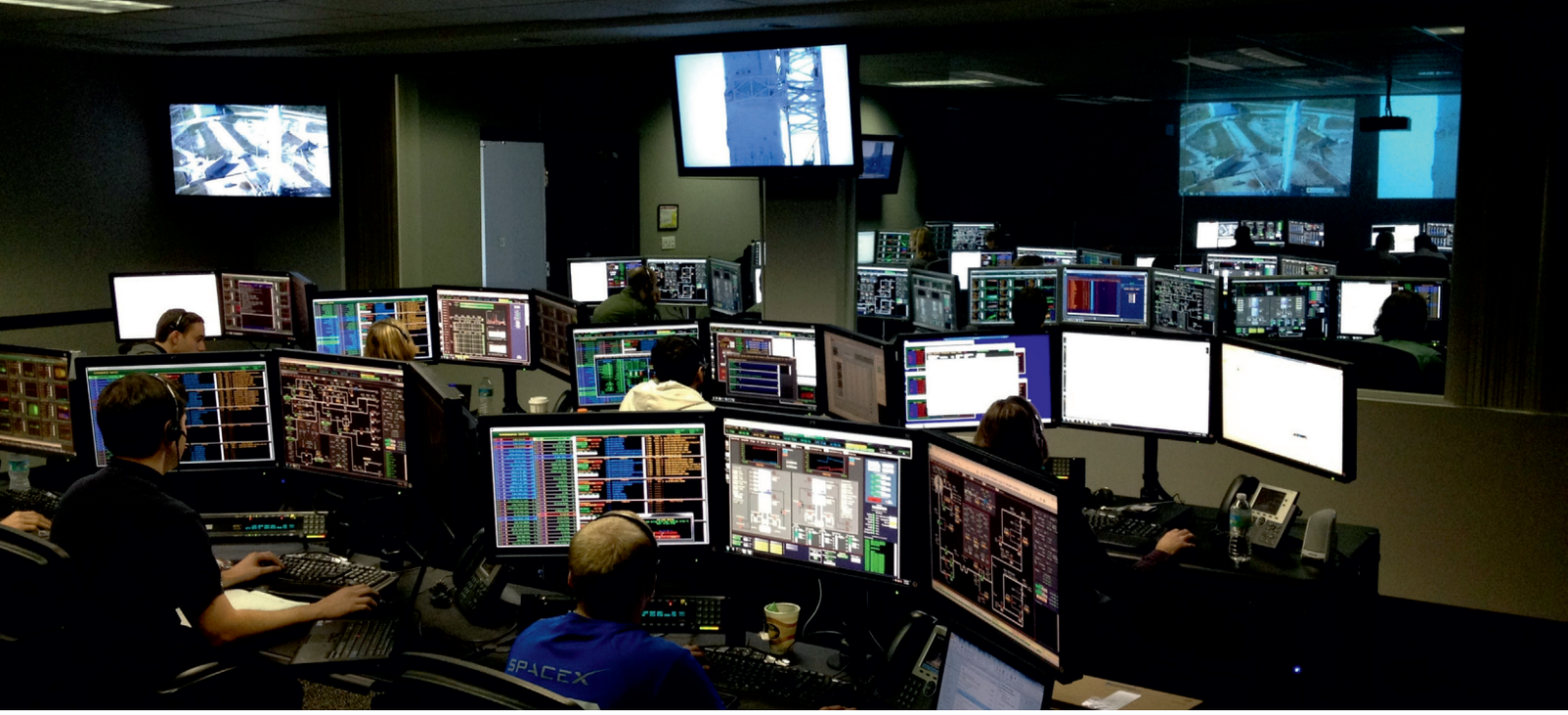
Based on the achievements of petrochemistry, the leading enterprises of Atyrau and Taraz will conduct a full complex processing of the extracted oil, regardless of the high-quality spread and the presence of impurities and inclusions: extraction of rare earth metals and other chemical elements, production of bitumen, polypropylene, and other semi - finished products for the production of consumer goods.

The emerging oil refining industry opens up great opportunities for specialists in chemical technology of the new generation: nano-chemistry, computer chemistry, technology innovators. The main characteristic of the future is a deserted production, where the process of pumping and storing oil and gas is fully automated and robotic. There are no locksmiths, crawlers, shift supervisors, or other low - level personnel. Monitoring of the work surf- the project is conducted by a universal Manager of the pipeline section, who has the competencies of a software engineer, big data analyst, and Petrochemist. Its main task is to monitor and evaluate instrument readings and update the software in a timely manner, correspond to the planned pumping process and, if necessary, adjust the planned programs.

Digital technologies will play an important role in the development of oil production and maintaining the level of oil recovery. They penetrate all the processes of the oil and gas industry: from drone-based exploration and digital information processing, to "smart" and unpopulated fields.

SMART EQUIPMENT HAS BECOME THE NORM.

Each oil worker will have a high level of digital literacy. A large number of sensors placed on drilling equipment, oil pumping stations, and transportation pipelines will transmit large amounts of data for subsequent processing and creating digital duplicates of locations.
3D modeling of reservoirs and adoption of efficient solutions based on operational models will allow efficient oil production and support efficient oil recovery.
Due to digital control of working methods, a high discipline of sparing oil recovery rates will be achieved.



All this will lead to the creation of modern dispatch centers for managing the entire chain of oil production and transportation processes.

Given the high speed of technology development in the IT sphere, the issue of continuous professional development and development of new IT tools will be solved with the help of digital coaching-a specialist who "pumps" the skills of University managers and service engineers (possibly other specialists) in a remote mode /in a virtual training center. Moreover, employees are not limited in the choice of specialists from a specific training center, they can choose any world specialist in the virtual training center, depending on the level of their own training.

The main construction of Kazakhstan's pipeline network will be completed by 2030 and gas will be available in every corner of Kazakhstan. The pipeline sphere will be switched to remote monitoring of transport systems – the integrity of the oil and gas pipeline transport systems will be ensured by drone flights, telemechanics, and dynamic monitoring of pressure sensors.

In the event of a fire, the system will automatically determine the geographical coordinates and call fire extinguisher drones from nearby pumping stations.

FIRE-EXTINGUISHING DRONES TRANSPORT FLAME-EXTINGUISHING SUBSTANCES THAT CAN EXTINGUISH OR LOCALIZE A FIRE AFTER THEY ARE DUMPED INTO THE FIRE SOURCE.

For effective operation of drones and other sensors, a digital oil service engineer must regularly perform preventive inspection, service maintenance, programming, reliability determination, and replacement of failed drones and sensors.

5.2.
A CLUSTER OF SERVICE COMPANIES AND HIGH SERVICE STANDARDS

The work of oil fields and oil processing enterprises is a single work of tens of thousands of workers and engineers who debug and operate a large number of complex and "smart" equipment.

Oil production centers will become a catalyst for the development of service and repair enterprises and enterprises that outsource specific types of work. On their basis, a new generation of service enterprises will be created, integrated with oil companies on the basis of "digital" platforms-SERVICE 2.0. Service companies will implement 4PL concepts of logistics and supply of goods and materials, as well as use digital doubles for diagnostics and repair of equipment.

All service enterprises are combined into a single service cluster with a management center. The managing service center will become an advanced competence center for service companies,

attracting leading practices in the field of production and technological services.

The main task of the management center is to ensure high standardization of service processes at industry enterprises, which will require training of new specialists in the field of studying and adapting new technologies for the service cluster company.

SERVICE CLUSTERS WILL STOP THE PRACTICE OF "CAROUSEL" OF SERVICE COMPANIES IN FAVOR OF THE PRACTICE OF STRATEGIC PARTNERSHIP BETWEEN NON-OIL AND GAS COMPANIES AND SERVICE ENTERPRISES.

Clusters are organized on the principles of free economic zones (without changing the law on public procurement, it is possible to create the necessary conditions for proper operation of fields).
A separate area of new challenges in the oil and gas industry is the development of service support for technological and business processes.

Management in the TRANS industry is being formed and will work in the flexible design methodology (Agile) mode. Despite the fact that the cycle of design and development of oil fields is estimated for decades-40-50 years, specialists in the field of making quick and efficient decisions are in great demand.

Within oil and service companies, the leading role will be played by specialists who ensure high efficiency and adaptation of business processes of enterprises under the pressure of constant changes in the market and fundamental transformations of the industry:

- Continuous improvement specialist (Specialist - continuous improvement),
- Data transformation specialist (workflow optimization specialist),
- Innovative technologist, etc.

5.3.
R&D CENTERS AS A NEW FORMAT FOR PROCESSES ACCELERATION.

Kazakhstan has accumulated extensive experience in extracting oil from great depths and the associated experience in adapting foreign developments to local conditions. R&D centers will become a new form for the development of innovation in the industry by 2030.

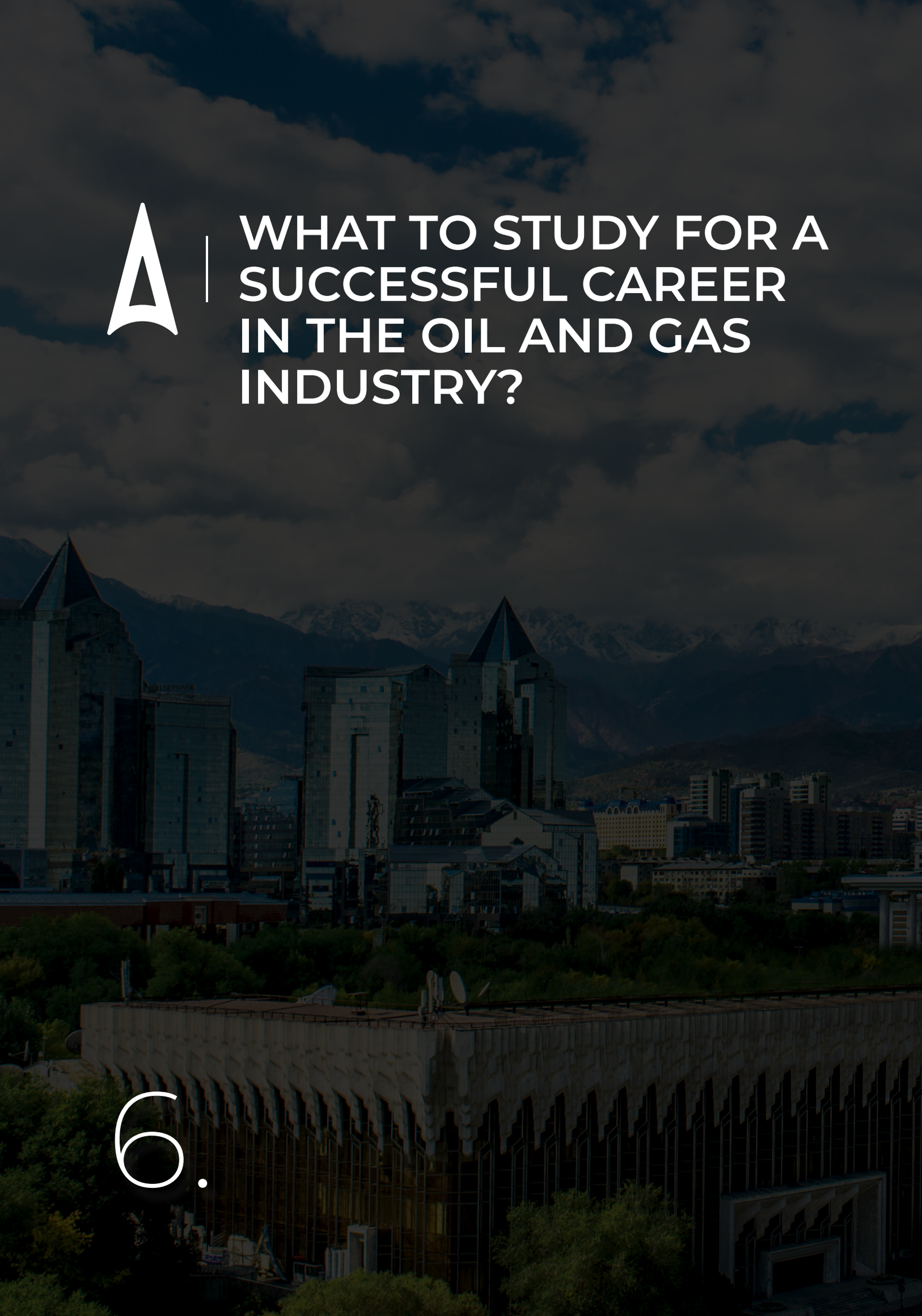
The process of organizing centers is simple, flexible, and intuitive. The main idea is the mutual benefit of all participants:

- a large number of participants Finance research, and the results of innovation are then openly distributed to all interested participants;
- several businesses that have a similar problem invest their money in research and then use the results;
- individual specialists can also make a contribution with their intellectual abilities and use the results obtained.

R&D centers will provide scientists with direct access to enterprises. This will allow scientists to develop unique specific technologies for enhanced oil recovery, smart and unmanned fields based on the characteristics of each location and well. The increase in the number of Kazakh developments and their introduction into production will significantly transform the non-oil and gas industry in Kazakhstan, making it less cumbersome, more flexible, and diversified.
Two other important components of the oil and gas industry are being developed on the basis of R&D centers: small petrochemicals, digital coaching, and personnel training.
Small petrochemicals are developing around the processing of coal into fuel, petrochemicals, as well as electricity and heat generation, mainly in the Central regions of Kazakhstan. They will make specialists in the field of chemistry, petrochemical technologies, Metalworking, as well as specialists in the field of project management with a long-life cycle in demand. This development of environmentally friendly technologies in oil and gas chemistry will be possible thanks to simple and clear rules for venture investment in "oil and gas startups" and R & d, as well as creating conditions for digital security for users.

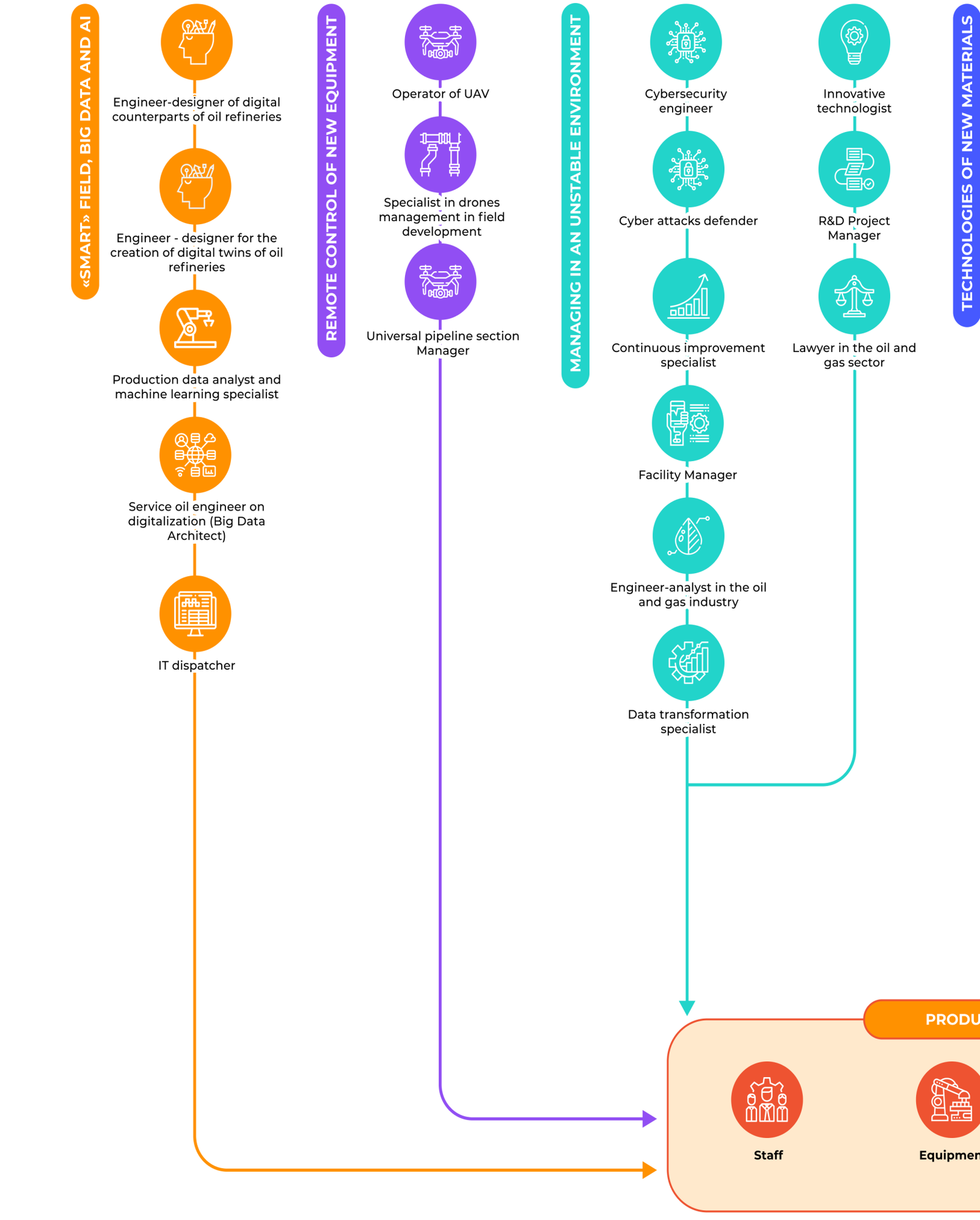
A high level of cybersecurity in the industry will be ensured, inter alia, due to the effective-actively working investigators in the cyber-crime and tightening and wrinkle - increase the liability for cyber - crimes.

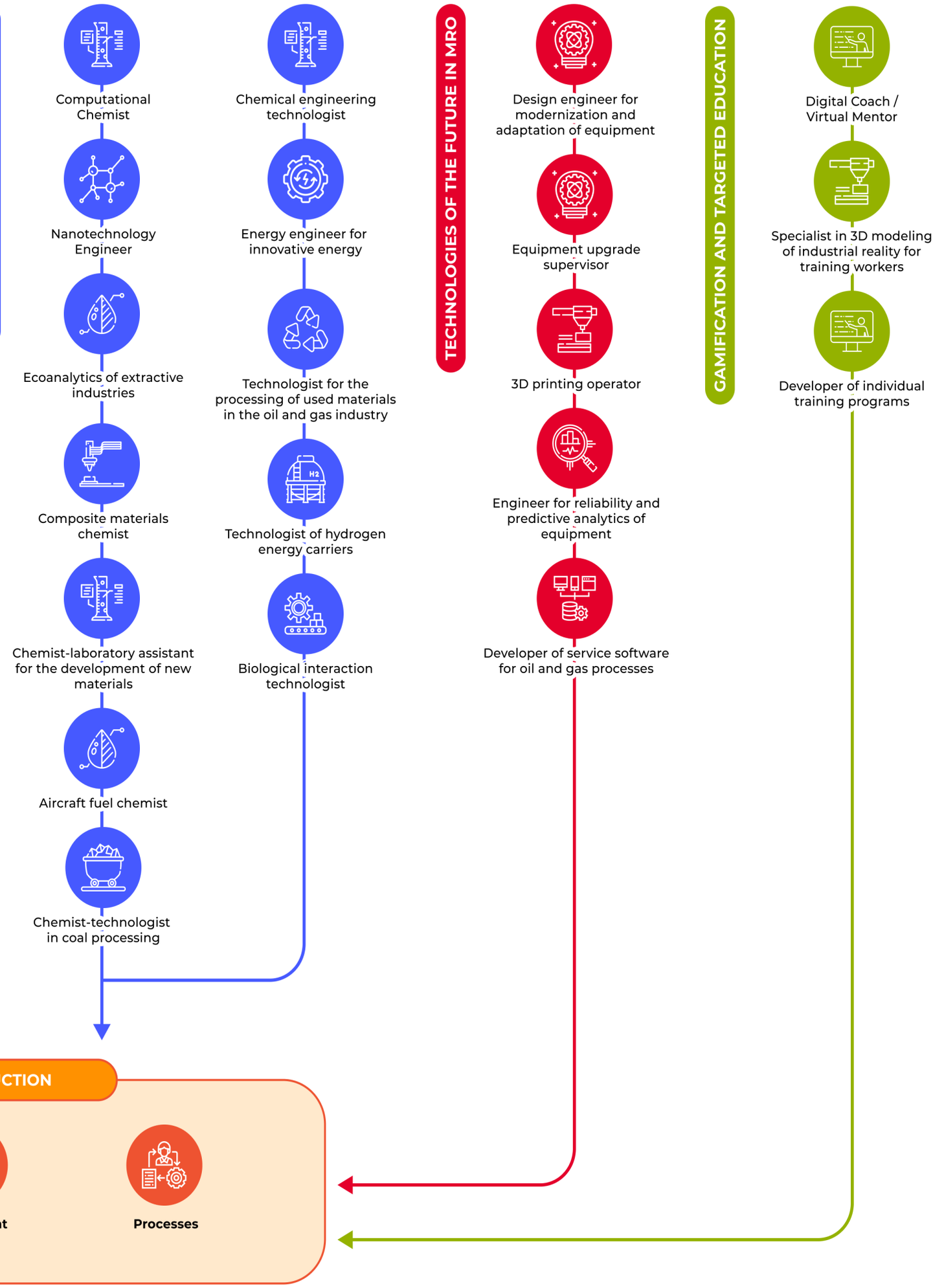
In partnership with R&D centers, enterprises will be able to create modern training and digital coaching centers. R&D centers will become an integrator that connects enterprises and their training centers with Universities, colleges, and research centers based on digital platforms.
3D visualization, gamification, and individual development programs for students and current employees of enterprises will be widely used for training and training of cadres. In parallel, both short - term training modules and long - term training programs from 5 to 10 years will be launched to train project managers who will gain and systematize unique production experience and thereby contribute to the development of the knowledge base of enterprises, R&D centers, and educational institutions.



WHAT TO STUDY FOR A SUCCESSFUL CAREER IN THE OIL AND GAS INDUSTRY?

6.


«SMART» FIELD, BIG DATA AND AI
Engineer-designer of digital counterparts of oil refineries
Engineer - designer for the creation of digital twins of oil refineries
Production data analyst and machine learning specialist
Service oil engineer on digitalization (Big Data Architect)
IT dispatcher
REMOTE CONTROL OF NEW EQUIPMENT
Operator of UAV
Specialist in drones management in field development
Universal pipeline section Manager
MANAGING IN AN UNSTABLE ENVIRONMENT
Cybersecurity engineer
Cyber attacks defender
Continuous improvement specialist
Facility Manager
Engineer-analyst in the oil and gas industry
Data transformation specialist
Innovative technologist
R&D Project Manager
Lawyer in the oil and gas sector
TECHNOLOGIES OF NEW MATERIALS
PRODU
Staff
Equipmen


Computational Chemist
Nanotechnology Engineer
Ecoanalytics of extractive industries
Composite materials chemist
Chemist-laboratory assistant for the development of new materials
Aircraft fuel chemist
Chemist-technologist in coal processing
Chemical engineering technologist
Energy engineer for innovative energy
Technologist for the processing of used materials in the oil and gas industry
Technologist of hydrogen energy carriers
Biological interaction technologist
TECHNOLOGIES OF THE FUTURE IN MRO
Design engineer for modernization and adaptation of equipment
Equipment upgrade supervisor
3D printing operator
Engineer for reliability and predictive analytics of equipment
Developer of service software for oil and gas processes
GAMIFICATION AND TARGETED EDUCATION
Digital Coach / Virtual Mentor
Specialist in 3D modeling of industrial reality for training workers
Developer of individual training programs
CTION
Processes

NEW PROFESSIONS IN THE OIL AND GAS INDUSTRY

6.1

1. SMART FIELD, BIG DATA AND AI

► 1.1

ENGINEER-DESIGNER
FOR CREATION DIGITAL TWINS OF OIL REFINERIES

HORIZON *of appearance* ► 2030

NOVELTY *of the profession*

- Creating digital models of existing fields.

KEY *competences*

- Systems thinking (ability to identify complex systems and work with them, including system engineering).
- Programming/ robotics/ artificial intelligence.
- Cross-industry communication skills (understanding technologies, processes, and the market situation in various related and non-adjacent industries).
- Ability to manage projects and processes.

- The development of digitalization, a large amount of data collected and an increase in the power of computers made it possible to create a virtual model (double) of a real field. The digital double makes it possible to simulate various changes in a real field: the movement of layers, changes in temperature, pressure, soil composition, and other parameters, and to correct the technological process, bringing it to the optimal parameters.

TRENDS

- Expanding the scope of computer modeling.
- Strengthening of the integration process control mining.
- Acceleration of information flows.

SUPERPROFESSIONAL *skills and competencies*

- Creating digital doubles have been discovered in deposits.
- Modeling of physical processes occurring in reservoirs.
- Modeling of possible changes in geological and geophysical processes.
- Transmitting information about the digital model for further processing and decision-making.

► 1.2

ENGINEER-DESIGNER
OF DIGITAL COUNTERPARTS OF OIL REFINERIES

HORIZON
of appearance ► 2030

NOVELTY
of the profession

- Creating digital duplicates of industries and enterprises.

KEY
competences

- Modeling the content of production and technological processes.
- Modeling of possible changes in processes and their consequences.
- Transmitting information about the digital model for further processing and decision-making.

- The development of digitalization, a large amount of data collected and an increase in the power of computers made it possible to create a virtual model (double) of a real enterprise. The digital model makes it possible to model various technological and business processes. Modeling allows you to predict the appearance of problems in the management of the enterprise, the appearance of defective products and the occurrence of accidents.

TRENDS

- Expanding the scope of computer modeling.
- Expanding the scope of sensor devices and sensors.
- Acceleration of information flows.

SUPERPROFESSIONAL
skills and competencies

- Systems thinking (ability to identify complex systems and work with them, including system engineering).
- Programming/ robotics/ artificial intelligence.
- Cross-industry communication skills (understanding technologies, processes, and the market situation in various related and non-adjacent industries).
- Ability to manage projects and processes.
- Performs new tasks: creating digital models of existing oil refineries.

► 1.3

PRODUCTION DATA ANALYST
AND MACHINE LEARNING SPECIALIST

HORIZON
of appearance ► 2025

NOVELTY
of the profession

- Completing new tasks: developing machine learning algorithms.

KEY
competences

- Collect and analyze large data sets for all production parameters.
- Determination of the data array of the past and present state of the production system.
- Identification of trends for future development and implementation of optimal production algorithms.

- Even now, some of the management decisions can be transferred to artificial intelligence, but even the most advanced technology needs to be prepared to solve important problems. The task of a machine learning specialist is to develop algorithms that the machine can use to make a decision. Machine learning is a continuous process of improving the algorithm of actions, identifying new cause-and-effect relationships and dependencies in production.
- The machine learning specialist must determine the complexity and importance of the problem, develop a solution procedure, and determine what data and volume are needed to solve the production problem.

TRENDS

- Expanding the scope of sensor devices and sensors.
- Expanding the scope of computer modeling.

SUPERPROFESSIONAL
skills and competencies

- Systems thinking (ability to identify complex systems and work with them, including system engineering).
- Programming/ robotics/ artificial intelligence.
- Work in conditions of uncertainty.
- Client orientation.

► 1.4

SERVICE OIL ENGINEER
ON DIGITALIZATION (BIG DATA ARCHITECT)

HORIZON *of appearance* ► 2025

NOVELTY *of the profession*

- Self-determination of parameters for monitoring and controlling production processes, location, and number of control points for collecting information.

KEY *competences*

- Diagnostics of tasks for optimizing production processes.
- Identify objects, systems, and units of equipment for digitization.
- Ensuring that the sensors work for reading readings.
- Recognition of information and preparation of data transmission for analysis.

- Process management in the oil and gas fields of the future is based on the analysis of large production data. Collecting and processing very large data in the modern sense (hundreds of terabytes) and very different data is the task of specialists of the future. The task is complicated by the fact that data is received at different speeds, and the response to incoming signals is required at different time intervals: sometimes within days, sometimes almost instantly. The big data architect will be responsible for collecting and processing a large amount of complex structured data.

TRENDS

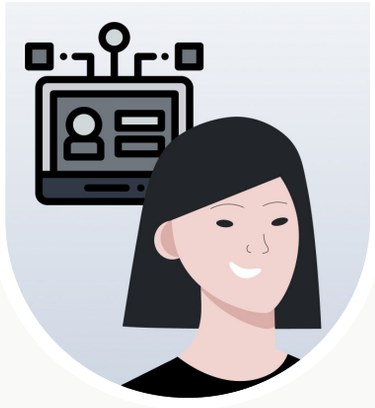
- Expanding the scope of sensor devices and sensors.
- Expanding the scope of computer modeling.
- Acceleration of information flows.

SUPERPROFESSIONAL *skills and competencies*

- Systems thinking (ability to identify complex systems and work with them. Including system engineering).
- Programming/ robotics/ artificial intelligence.
- Work in conditions of uncertainty.
- Ability to manage projects and processes.

► 1.5

IT DISPATCHER (MANAGER)



HORIZON *of appearance* ► 2025

NOVELTY *of the profession*

- Perform new tasks: remote dispatching based on software.

KEY *competences*

- Monitoring of production data.
- Coordination of work and execution of dispatching devices and mechanisms.
- Defining and setting tasks for operators of robotic equipment.
- Control of remote equipment operation parameters.
- Making operational decisions.

- Production enterprises of the future, including oil and gas production and processing of petroleum products, will massively use unmanned vehicles and equipment operating independently. The autonomy of equipment and production processes requires coordination and dispatching to ensure synchronization of work, high - level dispatching is required. These tasks will be performed by the IT manager.

TRENDS

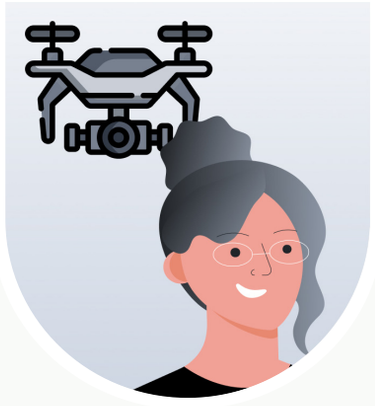
- Increase the autonomy of industrial equipment.
- Increase the level of automation of drilling processes.

SUPERPROFESSIONAL *skills and competencies*

- Systems thinking (ability to identify complex systems and work with them, including system engineering).
- Programming/ robotics/ artificial intelligence.

2. REMOTE CONTROL OF NEW EQUIPMENT

► 2.1



OPERATOR OF UAV
(UNMANNED AERIAL VEHICLES)

HORIZON
of appearance ► 2022

NOVELTY
of the profession

- Control of a new type of equipment: unmanned aerial vehicles.

KEY
competences

- Development of flight schedules based on production needs.
- Development of routes of flights and their translation into software code for the UAV.
- Monitoring of flight progress.
- Collection, initial processing and transmission of data obtained during overflights for analysis.
- Monitoring of malfunctions, failures, and failures during flights.
- Coordination of the work of those employees on the maintenance of the UAV.

- Today, perform a number of tasks in production: they deliver spare parts and materials, and monitor production processes. In the future, the use of drones will expand. The devices will help you perform offline work operations and much more. An operator of unmanned aerial vehicles will replace the workers at the site or when servicing pipeline sections.

TRENDS

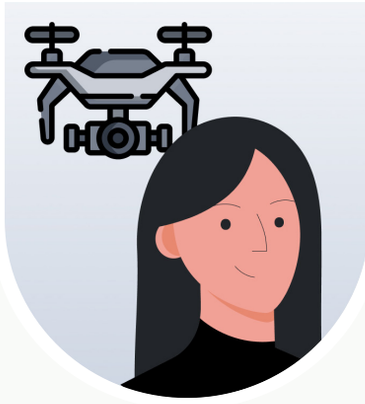
- Increase the level of automation of drilling processes.
- Expanding the use of unmanned aerial vehicles.

SUPERPROFESSIONAL
skills and competencies

- Systems thinking (ability to identify complex systems and work with them, including system engineering).
- Programming/ robotics/ artificial intelligence.
- Cross-industry communication skills (understanding technologies, processes, and the market situation in various related and non-adjacent industries).

► 2.2

SPECIALIST
IN DRONES MANAGEMENT IN FIELD DEVELOPMENT (GEOLOGY, GEODESY, SURVEYING)



HORIZON
of appearance

► 2022

NOVELTY
of the profession

- Control of a new type of equipment: unmanned aerial vehicles.

KEY
competences

- Monitoring of the condition of the pipes in the transport system and remote leak detection.
- Transmitting signals about leaks and malfunctions to the service Department.
- Identifying the recipient information about the state of the layers.

- Unmanned aerial vehicles will be widely used in the oil and gas fields in the near future. This will make it possible to increase the efficiency of a number of operations: to monitor pipelines, detect leaks and quickly eliminate other malfunctions. Specialists in drone management will be replaced by workers in dangerous and difficult areas, such as surveyors or surveyors.

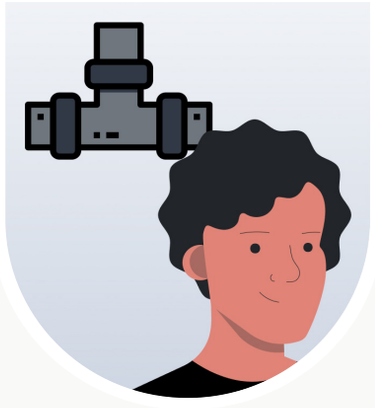
TRENDS

- Expanding the use of unmanned aerial vehicles.

SUPERPROFESSIONAL
skills and competencies

- Systems thinking (ability to identify complex systems and work with them. Including system engineering).
- Programming/ robotics/ artificial intelligence.
- Cross-industry communication skills (understanding technologies, processes, and the market situation in various related and non-adjacent industries).

▶ 2.3



UNIVERSAL PIPELINE SECTION MANAGER

HORIZON *of appearance* ▶ 2030

NOVELTY *of the profession*

- The use of new tools in the solution of tasks: monitoring of the technological process with the use of the software.

KEY *competences*

- Analysis of incoming data to assess the state of technological processes.
- Adjustment of the technological process by adjusting programs and teams.

- Digitalization of processes on pipelines, the use of unmanned vehicles and Autonomous machines allows you to reduce the management apparatus. Data on the state of equipment and pipelines, information on the progress of technological processes are transmitted remotely by telemetry devices. Remote control capabilities allow a single specialist to perform the work of monitoring an entire site. The profession of a universal pipe and wire section Manager allows you to improve the efficiency and quality of management decisions.

TRENDS

- Strengthening of the integration process control mining.
- Increase the autonomy of industrial equipment.

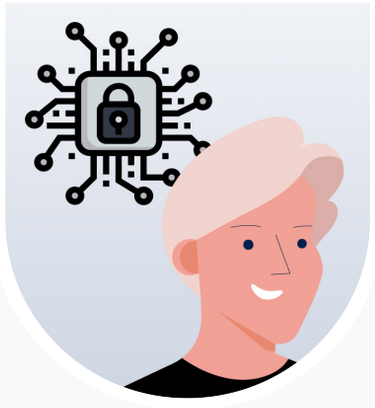
SUPERPROFESSIONAL *skills and competencies*

- Systems thinking (ability to identify complex systems and work with them, including system engineering).
- Programming/ robotics/ artificial intelligence.
- Cross-industry communication skills (understanding technologies, processes, and the market situation in various related and non-adjacent industries).
- Ability to manage projects and processes.

3. MANAGING IN AN UNSTABLE ENVIRONMENT

▶ 3.1

CYBERSECURITY ENGINEER



HORIZON *of appearance* ▶ 2030

NOVELTY *of the profession*

- Addressing new challenges: fighting cybercrime, protecting against threats, and preventing the risks and losses of cyber-crimes.

KEY *competences*

- Identification of risks and threats of committing a cyber-crime against the enterprise.
- Establishing the fact of cybercrime and assessing the level of damage.
- Preparation of comprehensive indictments and evidentiary facts and materials.

- The development of Internet technologies also leads to an increase in crimes committed in local and global networks. To protect the manufacture against damage specialist of appropriate qualifications and with the appropriate skills. To counter cybercriminals, it is necessary to establish the fact of a violation, collect evidence, and prepare data for law enforcement agencies.

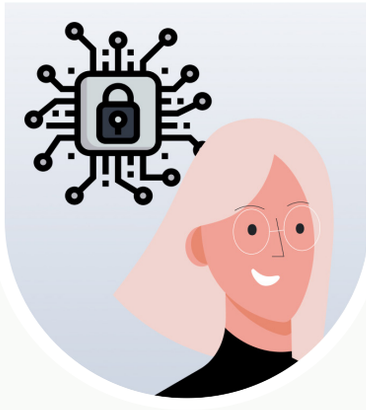
TRENDS

- Acceleration of information flows.
- Increase the transparency of information flows.

SUPERPROFESSIONAL *skills and competencies*

- Systems thinking (ability to identify complex systems and work with them, including system engineering).
- Programming/ robotics/ artificial intelligence.
- Cross-industry communication skills (understanding technologies, processes, and the market situation in various related and non-adjacent industries).
- Work in conditions of uncertainty.

▶ 3.2



CYBER ATTACKS DEFENDER

HORIZON *of appearance* ▶ 2025

NOVELTY *of the profession*

- Solving new tasks: protection from cyber-attacks.

KEY *competences*

- Development of cyber-protection measures.
- Network monitor.
- If cyber-attacks are detected, take protection measures, and decide whether to transmit information to law enforcement agencies.

- The development of Internet technologies leads to an increase in crimes committed in local and global networks. The more information about a company is online, and the more processes and equipment are managed remotely, the greater the damage that can be caused by unauthorized access, whether unintentionally or maliciously. The relevance of protecting networks from unsanctioned access is becoming more and more relevant every year. Security solutions for companies require specialists with higher qualifications than attackers.

TRENDS

- Acceleration of information flows.
- Increase the transparency of information flows.

SUPERPROFESSIONAL *skills and competencies*

- Systems thinking (ability to identify complex systems and work with them, including system engineering).
- Programming/ robotics/ artificial intelligence.
- Cross-industry communication skills (understanding technologies, processes, and the market situation in various related and non-adjacent industries).
- Work in conditions of uncertainty.

► 3.3

CONTINUOUS IMPROVEMENT SPECIALIST

HORIZON *of appearance* ► 2025

NOVELTY *of the profession*

- The allocation of existing tasks in the private sector: improving the efficiency of processes as a separate task.

KEY *competences*

- Monitoring and analysis of service, logistics and management processes.
- Identify bottlenecks: stages that can be improved or eliminated completely from production technology, management, and service processes.
- Develop action plans to speed up the implementation of processes, improve the quality of performance, and reduce costs.
- Coordinate and monitor the implementation of plans.
- Analyze the process that has already been improved and develop measures to improve it further.

- The experience of Japanese companies in the mid-20th century has shown that the Kaizen philosophy, which is based on continuous improvement of production efficiency, can become a competitive advantage. This practice applies to enterprises in other countries. In the oil and gas industry, taking into account the fall in oil production rents, reducing production costs is becoming increasingly important. The improvement will reduce the cost of production, with virtually no additional investment.

TRENDS

- Increase in the number of domestic and foreign developments for the oil and gas fields of the Republic of Kazakhstan.
- Drop in profitability of Mature fields in Kazakhstan " first leave unchanged.

SUPERPROFESSIONAL *skills and competencies*

- Systems thinking (ability to identify complex systems and work with them, including system engineering).
- Lean production.
- Cross-industry communication skills (understanding technologies, processes, and the market situation in various related and non-adjacent industries).
- Ability to manage projects and processes.

▶ 3.4

FACILITY MANAGER

HORIZON *of appearance* ▶ 2025

NOVELTY *of the profession*

- Separating existing tasks into a separate area: managing infrastructure objects in the enterprise.

TRENDS

- Falling profitability of Mature fields in Kazakhstan.

SUPERPROFESSIONAL *skills and competencies*

- Environmental thinking.
- Lean production.
- Ability to manage projects and processes.

- The production infrastructure provided by real estate objects requires constant maintenance and updating. Taking into account the growing demands and comfort of the workplace on the part of a new generation of employees, increasing requirements for energy efficiency of buildings and structures, the growing cost of construction requires a professional approach to building management. Specialists with appropriate qualifications will be trained to solve these tasks.

KEY *competences*

- Managing a production infra-structure with multiple processes.
- Search and control contracts and service providers for functions such as catering, cleaning, Parking, security, and technology.
- Advising companies on measures to improve the efficiency and profitability of the facility.
- Ensuring proper maintenance of major facilities and preventive maintenance.
- Budget management.
- Ensuring that objects comply with regulatory requirements and state regulations.
- Planning for the future by predicting the future needs and requirements of the facility.
- Control of any repairs, re-equipment, and construction projects.
- Preparation of maintenance reports.

► 3.5

ENGINEER-ANALYST
IN THE OIL AND GAS INDUSTRY

- The era of easy cheap oil is ending. Easy-to-recover oil reserves are being depleted. In order to increase the oil output of Mature fields, new technologies and applied scientific research are required. An oil and gas industry analyst are required to have a General knowledge of technologies for improving oil recovery and adapt existing technologies and developments to a specific field.

HORIZON *of appearance*

► 2030

NOVELTY *of the profession*

- Solving problems using a new tool: software for working with big data.

TRENDS

- Falling profitability of Mature fields in Kazakhstan.

SUPERPROFESSIONAL *skills and competencies*

- Environmental thinking.
- Lean production.

KEY *competences*

- Knowledge in the relevant field of NGOs (oil and gas, oil refining and petrochemical industry).
- Knowledge of oil and gas production, operation, and processing technologies.
- Analysis and application of knowledge in a specific area to improve production efficiency and solve specific problems.
- Collect information for estimating oil and gas reserves from third-party engineering firms and engineering staff of clients and potential clients
- Processing the collected information in various place-of-birth development programs.
- Creating and maintaining data files for oil and gas economic development programs, including creating new databases, configuring databases provided by the client and a third party.
- Launch the necessary specialized design programs.

▶ 3.6

DATA TRANSFORMATION SPECIALIST

HORIZON *of appearance* ▶ 2030

KEY *competences*

- Getting tasks for optimizing production processes.
- Identifying bottlenecks: steps that can be improved or eliminated completely.
- Development of business plans for process improvement, which should result in faster process execution, improved quality of execution, and reduced costs.
- Coordination and control of the implementation of measures.

- Reduced oil recovery from Mature oil fields and lower global oil prices are forcing oil and gas companies to look for internal reserves to reduce production costs. One of the solutions is to improve technological and business processes at mining and oil refining enterprises. Process improvement is a separate function.

TRENDS

- The fall in the profitability of Mature fields in Kazakhstan.

NOVELTY *of the profession*

- Separating existing tasks into a separate area: improving the efficiency of processes as a separate task.

SUPERPROFESSIONAL *skills and competencies*

- Cross-industry communication skills (understanding technologies, processes, and the market situation in various related and non-adjacent industries).
- Lean production.
- Ability to manage projects and processes.
- Ability to work in conditions of uncertainty.

► 3.7

INNOVATIVE TECHNOLOGIST

HORIZON
of appearance ► 2030

KEY
competences

- Monitoring of the latest research, innovations, and developments in the field of oil refining and production of petroleum products.
- Development of a project to improve the technological processes of oil refining and production of petroleum products based on the results of scientific research.
- Preparation of a justification for the effectiveness of implementation of the proposed improvements.
- Participate in the process of selecting a supplier of new equipment and/or improving the existing one.
- Participation in commissioning.

- In the context of reduced demand for oil as a raw material for automobile fuel, the relevance of local production of refined petroleum products is growing for countries exporting crude oil and primary processing products. It is necessary to turn the surplus of extracted oil into a product, since this allows not only to use the surplus of extracted oil, but also to increase profitability by selling products of higher processing.

TRENDS

- The fall in the profitability of the later fields in Kazakhstan.
- Deterioration of the quality of hydrocarbon raw materials, which leads to wear and tear of oil and gas equipment.

NOVELTY
of the profession

- The allocation of available tasks in a separate sphere: development of projects for enhanced oil recovery.

SUPERPROFESSIONAL
skills and competencies

- Client orientation.
- Ecological thinking.
- Ability to manage projects and processes.

▶ 3.8

R&D PROJECT MANAGER

HORIZON *of appearance* ▶ 2030

KEY *competences*

- Identify priority areas for research.
- Conducting negotiations with enterprises on conducting research and testing on their basis and implementing developments.
- Determining the parameters of the final result of the work.
- Coordination of research and development processes.
- Interaction with the customer in the development process.
- Monitoring the implementation of developments by the customer.
- Participate in the preparation of reports on the effectiveness of implementation. Protecting reports to the customer.

- In Kazakhstan, there is a situation where local Universities and research laboratories have accumulated a significant amount of research and development that is suitable for domestic fields and oil refineries. On the other hand, enterprises in Kazakhstan are in need of adaptable developments that increase the efficiency of production and processing processes. The reason for this, according to experts, the fact that scientific institutions do not have the skills to promote their own scientific research. In addition, in Kazakhstan, the infrastructure for commercializing scientific developments does not work effectively: enterprises that are ready to purchase patents cannot find them. To overcome this situation, it is advisable to organize R&D centers for effective mediation between production and science.

TRENDS

- Increase in the number of domestic developments for oil and gas fields of the Republic of Kazakhstan.
- The fall in the profitability of the later fields in Kazakhstan.

NOVELTY *of the profession*

- Combining tasks and separating them into a separate field: integrating research and development with oil and gas enterprises.

SUPERPROFESSIONAL *skills and competencies*

- Cross-industry communication skills (understanding technologies, processes, and the market situation in various related and non-adjacent industries).
- Lean production.
- Ability to manage projects and processes.
- Ability to work conditions determinacy.

▶ 3.9

LAWYER
IN THE OIL AND GAS SECTOR

▶ Many legal aspects in the field of oil and gas production (for example, in contracts for drilling, sale and transportation of oil and gas) are unique and require basic knowledge of the oil and gas industry. A lawyer needs such knowledge to prepare provisions on the responsibility of the parties, etc. an in-Depth study of the legislation on subsoil use is also required for lawyers, otherwise young professionals have to urgently gain knowledge of the industry (Geology, Geophysics, drilling) for the first 3-5 years.

HORIZON *of appearance*

▶ 2025

KEY *competences*

- Knowledge of the basics of oil and gas production technology.
- Knowledge of legislation in the field of subsurface use.
- Knowledge of the specifics of drafting contracts in the field of oil and gas production.
- Knowledge of the basics of international law.

TRENDS

▶ Growing demand for intensive retraining in the oil and gas industry in Kazakhstan.

NOVELTY *of the profession*

▶ Specialized knowledge in oil and gas legislation, combining it with basic knowledge of oil and gas production technology.

SUPERPROFESSIONAL *skills and competencies*

- Multilingualism and multiculturalism.
- Client orientation.

4. TECHNOLOGIES OF NEW MATERIALS

► 4.1

COMPUTATIONAL CHEMIST

HORIZON *of appearance* ► 2025

NOVELTY *of the profession*

- Solving existing problems with new methods: performing physical and chemical experiments using software.

KEY *competences*

- Using mathematical algorithms, statistics, and large databases to integrate chemical theory and modeling with experimental data.
- Creating models and simulations of physical processes.
- Use statistics and data analysis methods to extract useful information from large data sets. in Kazakhstan.
- Increase in the number of domestic and foreign developments for oil and gas fields in the Republic of Kazakhstan.

- Using computer models speeds up chemical experiments that can take months to complete in real time. In addition, computer simulations do not require expensive reagents. In contrast to the experiment, the computer model shows variable results obtained when changing one or more parameters of the experiment.

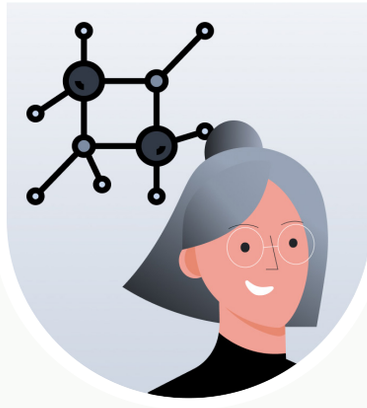
TRENDS

- The fall in the profitability of the later deposits

SUPERPROFESSIONAL *skills and competencies*

- Systems thinking (ability to identify and work with complex systems, including systems engineering).

► 4.2



NANOTECHNOLOGY ENGINEER

Nanotechnology opens up new opportunities both in the field of oil refining and in the production of materials for oil and gas equipment. The scope of such materials is very wide. To develop new materials and study their properties, conduct experiments, qualified specialists in this field are required.

HORIZON *of appearance*

► 2035

KEY *competences*

- Getting tasks for expanding the possibilities of developing traditional and non-water gas resources, as well as for improving the process of drilling and extracting oil and gas, making it easier to separate oil and gas in the reservoir, and improving the environmental friendliness of oil and gas production processes.
- Conducting experiments with nanomaterials.
- Development of materials that increase the efficiency of oil and gas production.
- Conduct field performance monitoring.
- Improvement of materials.

NOVELTY *of the profession*

- New tasks: implementation of nanotechnology.

TRENDS

- The fall in the profitability of the later fields in Kazakhstan.
- Increase in the number of domestic and foreign developments for the oil and gas fields of the Republic of Kazakhstan..
- Deterioration of the quality of hydrocarbon raw materials, which leads to wear and tear of oil and gas equipment.

SUPERPROFESSIONAL *skills and competencies*

- Systems thinking (ability to identify complex systems and work with them, including system engineering).
- Ability to manage projects and processes.
- Skills of artistic creation.

▶ 4.3

ECOANALYST
OF EXTRACTIVE INDUSTRIES

HORIZON
of appearance ▶ 2025

KEY
competences

- Analysis of environmental threats.
- Develop measures to reduce harmful effects on the environment.
- Participate in the preparation of a feasibility study for emission reduction projects.
- Implementation of emission monitoring, preparation of recommendations for improvement.

- Growing environmental requirements for industry are forcing industrial enterprises, including the oil and gas sector, to invest heavily in environmental monitoring and protection. In order to reduce the emission of harmful substances and minimize environmental benefits, it is necessary to analyze and develop measures to protect the environment.

NOVELTY
of the profession

- Implementation of new tasks: proactive reduction of emissions of harmful substances without reference to legal requirements.

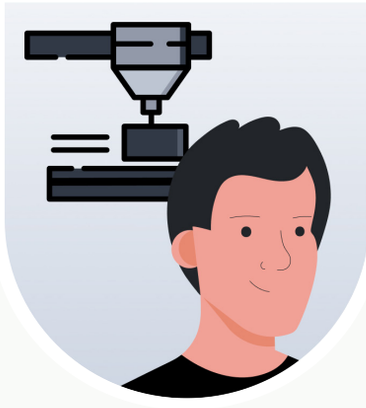
TRENDS

- Increase in the number of domestic developments for the oil and gas fields of the Republic of Kazakhstan.

SUPERPROFESSIONAL
skills and competencies

- Systems thinking (ability to identify complex systems and work with them, including system engineering).
- Ecological thinking.
- Ability to manage projects and processes.

▶ 4.4



COMPOSITE MATERIALS CHEMIST

▶ Composite materials are created from different materials that are connected but not mixed with each other. Composite materials allow you to get new properties and improved performance. Composite materials are still becoming widespread, so specialists will be needed to develop materials and study their properties.

HORIZON *of appearance*

▶ 2030

KEY *competences*

- Development of technology for the production of consumer goods.
- Adaptation of existing technologies for Kazakhstani enterprises.

NOVELTY *of the profession*

▶ Development of new materials (for Kazakhstan practice): composite material.

TRENDS

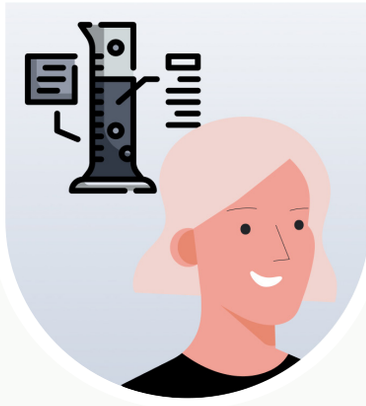
- Increase in the number of domestic developments for the oil and gas fields of the Republic of Kazakhstan.
- Deterioration of the quality of hydrocarbon raw materials, which leads to wear and tear of oil and gas equipment.

SUPERPROFESSIONAL *skills and competencies*

- Client orientation.
- Ecological thinking.
- Artistic skills.

▶ 4.5

CHEMIST-LABORATORY ASSISTANT
FOR THE DEVELOPMENT OF NEW MATERIALS



▶ The development of technologies in the field of materials production opens up broad prospects for improving the efficiency and safety of equipment. To do this , the specialist will need to identify the tasks that need to be solved, conduct research and experiments.

HORIZON *of appearance* ▶ 2030

KEY *competencess*

- Monitoring the development of new materials suitable for use in the oil and gas industry.
- Conducting research on materials used in the oil and gas industry, identifying parameters that require improvement.
- Use of software for data entry and processing.
- Analysis of new materials potentially applicable in industry.
- Preparation of conclusions on the feasibility of applying new materials.

NOVELTY *of the profession*

▶ Development of new materials (for Kazakhstan practice).

TRENDS

- The fall in the profitability of Mature fields in Kazakhstan.
- Increase in the number of domestic developments for the oil and gas fields of the Republic of Kazakhstan.
- The growth of production of hydrocarbons from light fractions of oil, in particular propane for the synthesis of polymers.

SUPERPROFESSIONAL *skills and competencies*

- Client orientation.
- Artistic skills

▶ 4.6

AIRCRAFT FUEL CHEMIST

HORIZON *of appearance* ▶ 2030

KEY *competences*

- Adaptation of fuel manufacturing technologies for reusable aircraft and spacecraft.

- The reduction in the need for fuel for cars due to the development of electric transport forces Kazakhstan's oil and gas companies to look for new niches for the production of products from the extracted oil. One of the promising areas for Kazakhstan is the production of fuel for aircraft and spacecraft of multiple use.

NOVELTY *of the profession*

- Development of new materials (for Kazakhstan practice).

TRENDS

- The fall in the profitability of Mature fields in Kazakhstan.
- Increasing the number of domestic developments for the oil and gas fields of the Republic of Kazakhstan.

SUPERPROFESSIONAL *skills and competencies*

- Client orientation.
- Ecological thinking.

► 4.7

CHEMIST-TECHNOLOGIST
IN COAL PROCESSING

The development of electric transport and alternative energy, as well as the decline in crude oil prices, forces Kazakh oil companies to look for new niches for their products. One of the most promising niches is the production of semi-finished products for the further production of consumer goods. In addition to oil, a promising raw material is coal, whose reserves in Kazakhstan are significant. The specialist will be engaged in processing coal into rubber, poly-sawn, rubber, and plastics.

HORIZON *of appearance* ► 2025

KEY *competences*

- Monitoring of existing technologies for the production of data materials from coal.
- Definition of the parameters of coal in Kazakhstan.
- Approval of final product parameters.
- Development/adaptation of existing technologies for existing coal parameters.
- Control and correction of the manufacturing process.

NOVELTY *of the profession*

- Development of new materials: rubber, polypropylene, rubber, plastics (a new profession for Kazakhstan practice).

TRENDS

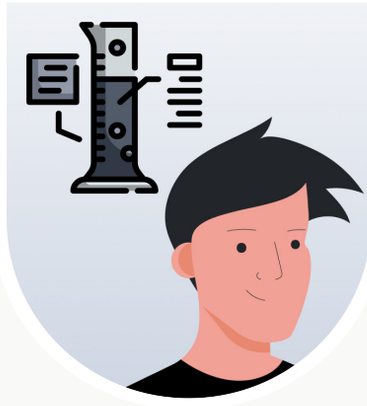
- The fall in the profitability of Mature fields in Kazakhstan.
- Increase in the number of domestic developments for the oil and gas fields of the Republic of Kazakhstan.
- Increased production of hydrocarbons from light oil fractions, in particular Pro-pan, for polymer synthesis.

SUPERPROFESSIONAL *skills and competencies*

- Client orientation.
- Ecological thinking.

▶ 4.8

CHEMICAL ENGINEERING TECHNOLOGIST



HORIZON
of appearance ▶ 2030

KEY
competences

- Knowledge of modern oil and gas processing technologies.
- Knowledge of the principles and fundamentals of chemical engineering.
- The ownership of the design principles of the chemical industry.
- Knowledge of the basics of design and construction of chemical plants.
- Knowledge of the structure and operation of chemical production equipment

- Modern technological development opens up prospects for the production of various materials from oil and gas. This direction is relevant for Kazakhstan due to the reduction in demand for fuel and energy from Russia, as well as the General decline in oil prices

NOVELTY
of the profession

- Solving new challenges: developing technologies for the production of new materials from oil and gas.

TRENDS

- The fall in the profitability of Mature fields in Kazakhstan.
- Increase in the number of domestic and foreign developments for the oil and gas fields of the Republic of Kazakhstan.
- The growth of production of hydrocarbons from light fractions of oil, in particular propane for the synthesis of polymers.

SUPERPROFESSIONAL
skills and competencies

- Client orientation.
- Ecological thinking.
- Cross-industry communication skills (understanding technologies, processes, and the market situation in various related and non-adjacent industries).

▶ 4.9

ENERGY ENGINEER
FOR INNOVATIVE ENERGY (GENERATION OF VARIOUS TYPES OF ENERGY)

HORIZON *of appearance* ▶ 2030

KEY *competences*

- Maintenance of installations for receiving various types of energy received from pipelines and renewable energy sources.
- Its distribution to the needs of the pipeline and to the public energy supply network.
- Conducting research to find new ways to generate energy.

- The list of alternative sources of energy generation is gradually expanding. Stricter environmental requirements force us to seek to save energy consumption and use alternative sources to meet local energy needs. One of the sources may be the oil pipeline itself. The kinetic energy of oil products transmitted through the pipeline can become a source of generating small amounts of electricity.

NOVELTY *of the profession*

- Solving new problems: getting energy from non-traditional sources.

TRENDS

- Increase in the number of domestic developments for the oil and gas fields of the Republic of Kazakhstan.

SUPERPROFESSIONAL *skills and competencies*

- Cross-industry communication skills (understanding technologies, processes, and the market situation in various related and non-adjacent industries)
- Lean production.
- Environmental thinking.
- Customer-oriented

▶ 4.10

TECHNOLOGIST
FOR THE PROCESSING OF USED MATERIALS IN THE OIL AND GAS INDUSTRY

HORIZON
of appearance ▶ 2030

KEY
competences

- Compilation and updating of databases on waste and secondary materials of the oil and gas industry.
- Conduct research and monitor existing technologies for recycling waste and secondary resources.
- Develop processing technology for your company.
- Market monitoring to identify the need for certain products.
- Participation in the calculation of the economic justification for the start of the processing process. Coordination with the management of the launch of a specific production.
- Participate in the selection of equipment for processing.
- Control and correction of the technological process of waste and secondary materials processing.

- The oil and gas industry produce a large amount of waste and intermediate refined products that are not used in the future. With stricter environmental regulations, waste storage and disposal are becoming more expensive. When using technological developments, waste and secondary products can be processed and additional income can be extracted from this. The specialist will deal with the processing of materials previously used in industry, as well as various types of organic and inorganic waste, the number of which is growing in Kazakhstan every year.

NOVELTY
of the profession

- Separation of existing tasks into a separate block, partial solution of new tasks: production of useful products from waste and secondary raw materials.

TRENDS

- Increase in the number of domestic developments for the oil and gas fields of the Republic of Kazakhstan.

SUPERPROFESSIONAL
skills and competencies

- Client orientation.
- Ecological thinking.
- Cross-industry communication skills (understanding technologies, processes, and the market situation in various related and non-adjacent industries).
- Ability to manage projects and processes.

▶ 4.11

TECHNOLOGIST
OF HYDROGEN ENERGY CARRIERS

HORIZON
of appearance ▶ 2035

NOVELTY
of the professions

- Working with new materials: hydrogen as an energy carrier and energy accumulator.

KEY
competences

- Development of hydrogen production technologies.
- Development of technologies for using hydrogen as an energy carrier. (production of fuel for engines and power plants).

- The development of alternative energy creates a significant problem: the need to accumulate excess energy and use it during the period when alternative energy generators cannot produce (windless, dark, etc.). one of the most promising technologies is the use of hydrogen as an energy carrier. The technology for producing hydrogen is currently energy-efficient. The development of cheap hydrogen production technology will give a significant incentive to the development of alternative energy.

TRENDS

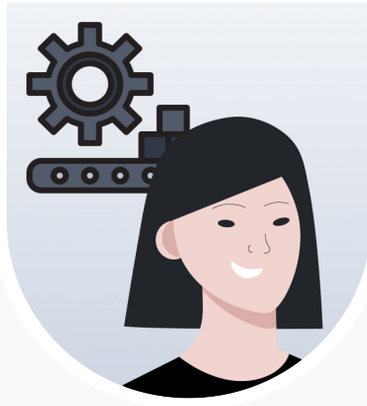
- Increase in the number of domestic developments for the oil and gas fields of the Republic of Kazakhstan.
- Growing demand for technical gas, primarily red hydrogen.

SUPERPROFESSIONAL
skills and competencies

- Working in an uncertain environment.
- Ecological thinking.

▶ 4.12

BIOLOGICAL INTERACTION TECHNOLOGIST



HORIZON
of appearance

▶ 2030

NOVELTY
of the profession

- Solving existing problems with new methods: sludge disposal using bacteria.

KEY
competences

- Conducting research: identifying the right bacteria.
- Collecting and multiplying bacteria.
- Adaptation of bacteria to local conditions.
- Selection and improvement of bacterial characteristics.
- Preparation of preparations containing bacteria.

- Once popular methods of injecting harmful waste back into the soil or incineration are gradually becoming a thing of the past. They are replaced by more advanced methods from the point of view of environmental safety. In particular, the technology of biological destruction or, more simply, the destruction of oil sludge by bacteria is becoming more and more popular. This method is safer in comparison with existing methods of utilization. These specialists collect, propagate such bacteria, and spread them over the contaminated area.

TRENDS

- Increase in the number of domestic developments for the oil and gas fields of the Republic of Kazakhstan.

SUPERPROFESSIONAL
skills and competencies

- Ecological thinking.
- Ability to manage projects and processes.

5. TECHNOLOGIES OF THE FUTURE IN MRO

► 5.1

DESIGN ENGINEER
FOR MODERNIZATION AND ADAPTATION OF EQUIPMENT

HORIZON
of appearance ► 2025

NOVELTY
of the profession

- Separate existing tasks into a separate block, partially solve new tasks: modernization and adaptation of equipment.

KEY
competences

- Adapt existing and new equipment for better compatibility.
- Modernization and improvement of existing equipment, increasing its productivity, reliability, and availability.

- Digitalization and remote equipment management are currently spreading in enterprises. The equipment of previous generations cannot be digitized. Remote management is also extremely difficult. However, a radical upgrade of equipment at oil refineries is not possible due to its high cost. In order to manage production in accordance with the new technological order, it will require the work of specialists who are able to adapt outdated equipment for the installation of sensors, telemetry systems and remote manipulators.

TRENDS

- Increase the autonomy of industrial equipment.
- Increase the level of automation of drilling processes.
- Expanding the scope of sensor devices and sensors.

SUPERPROFESSIONAL
skills and competencies

- Lean production.
- Client orientation.
- Ability to manage projects and processes.

► 5.2

EQUIPMENT UPGRADE SUPERVISOR

HORIZON
of appearance

► 2025

KEY
competences

- Analyzing the parameters of specific pieces of equipment.
- Identify critical parameters that require modernization.
- Coordination of the final parameters of modernization.
- Development of modernization projects for certain types of equipment.
- Participate in the development of the economic justification for modernization.
- Control of the modernization process.
- Monitoring of the final parameters of the equipment after modernization.

- Upgrading outdated equipment to meet the needs of the fourth technological order requires monitoring and maintenance. The identification of parameters that require modernization, sensor installation points requires an individual approach. To ensure high - quality modernization, control and maintenance will be required.

NOVELTY
of the profession

- Allocation of existing tasks in a separate block, partial solution of new tasks: modernization and adaptation of equipment.

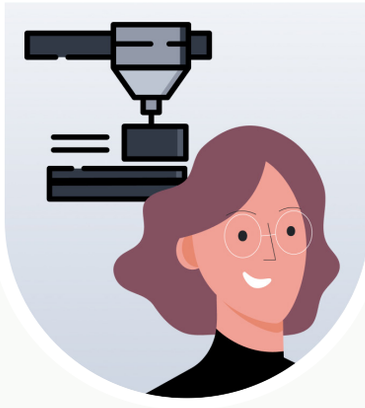
TRENDS

- Increase the autonomy of industrial equipment.
- Increase the level of automation of drilling processes.
- Expanding the scope of sensor devices and sensors.

SUPERPROFESSIONAL
skills and competencies

- Lean production.
- Working in an uncertain environment.
- Ability to manage projects and processes.

► 5.3



3D PRINTING OPERATOR

► 3D printing is one of the most promising areas of spare parts manufacturing. 3D printing devices require operators to know programming, mechanics, and engineering skills.

HORIZON *of appearance* ► 2025

KEY *competences*

- Translating drawings into a three-dimensional model.
- Translating a three-dimensional model into program code for 3D devices.
- Programming of devices for 3D printing.
- Selection of materials for 3d printing.
- Final processing of printed products.
- Maintenance of 3d printed devices.
- Production of parts that the factory is not able to produce on its own.

NOVELTY *of the profession*

► Work on new equipment: 3D printing devices.

TRENDS

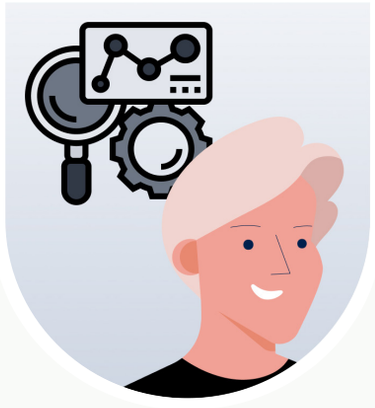
► Increase the share of parts manufactured on-site using 3D printing and prompt delivery by drones.

SUPERPROFESSIONAL *skills and competencies*

- Programming/ robotics/ artificial intelligence.
- Skills of artistic creation

► 5.4

ENGINEER
FOR RELIABILITY AND PREDICTIVE ANALYTICS OF EQUIPMENT



HORIZON
of appearance

► 2025

KEY
competences

- Development of diagnostic processes.
- Formation of teams for the implementation of diagnostics.
- Performing hardware diagnostics.
- Development of methods for stationary and mobile diagnostics.
- Design of diagnostic complexes.
- Implement data migration processes in SAP.
- Development of measures to increase the time intervals.

- The concept of planned preventive repairs is being replaced by the concept of predictive diagnostics in enterprises. Its essence is to carry out repairs not on the basis of a certain amount of engine hours or mileage, but on the basis of a forecast of when a particular part or node will fail. Predictive diagnostics specialists will have to solve new problems of analyzing and forecasting failures.

NOVELTY
of the profession

- Perform new tasks: predictive hardware diagnostics.

TRENDS

- Increase in the number of domestic and foreign developments for the oil and gas fields of the Republic of Kazakhstan.
- Increase the autonomy of industrial equipment.

SUPERPROFESSIONAL
skills and competencies

- Programming/ Robotics/ Artificial intelligence.
- Work in conditions of uncertainty.

► 5.5

DEVELOPER

OF SERVICE SOFTWARE FOR OIL AND GAS PROCESSES

HORIZON
of appearance ► 2025

KEY
competences

- Working with the customer to understand optimization tasks.
- Formalized description of technological and business processes in the enterprise.
- Writing software in a consistent programming language.
- Software implementation monitoring and Troubleshooting.

- digitalization and automation of oil production and refining processes requires various software for managing equipment, technological and business processes. existing software also requires separate modules to adapt to the needs of a particular enterprise.

NOVELTY
of the profession

- perform new tasks: develop specialized software.

TRENDS

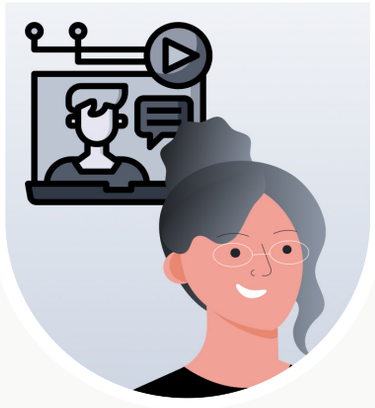
- Expanding the scope of computer modeling.
- Strengthening of the integration process control mining.

SUPERPROFESSIONAL
skills and competencies

- Programming/ robotics/ artificial intelligence.
- Work in conditions of uncertainty.
- Client orientation.
- Systems thinking (ability to identify complex systems and work with them, including system engineering).

6. GAMIFICATION AND TARGETED EDUCATION

► 6.1



DIGITAL COACH / VIRTUAL MENTOR

HORIZON *of appearance* ► 2025

NOVELTY *of the profession*

- Solving problems in a new way: improving skills by activating the cognitive processes of the student.

KEY *competences*

- in remote mode / in a virtual training center, improve the skills of universal management and service engineers (possibly other specialists).

- Transformation of the technological structure requires continuous improvement of employees ' qualifications. In addition to the classroom organization of classes, a remote form will also be used, including with the involvement of artificial intelligence systems. Coaching is a well-known field of study, but it is still not widely used in industrial enterprises. Coaching is useful primarily for managers, since they already have certain competencies, but may have difficulty activating their internal potential to achieve goals.

TRENDS

- Increasing demand for intensive retraining of personnel in the oil and gas industry of Kazakhstan (new skills for current training).

SUPERPROFESSIONAL *skills and competencies*

- Cross-industry communication skills (understanding technologies, processes, and the market situation in various related and non-adjacent industries).
- Client orientation.
- Working with people.
- Multilingualism and multiculturalism.

▶ 6.2

SPECIALIST
IN 3D MODELING OF INDUSTRIAL REALITY FOR TRAINING WORKERS

HORIZON
of appearance

▶ 2025

NOVELTY
of the profession

- Solving problems in a new way: creating 3D models.

KEY
competences

- Convert individual workflows to 3D format.
- Modeling and creating 3D models of various scenarios for the development of a particular workflow, depending on various external influences on the process.
- Develop scenarios for individual and group learning processes.

- recreating real processes in the virtual world, the real work of the equipment, the device of its individual nodes and mechanisms significantly increases the effectiveness of training. Virtual models allow not only completely. to reflect the structure of the object, but also to simulate the consequences of a particular decision, a particular intervention in its work. when a worker is trained in such a system, he goes to production, really imagining the device of the equipment with which he needs to work, clearly imagining what can happen if improper intervention.

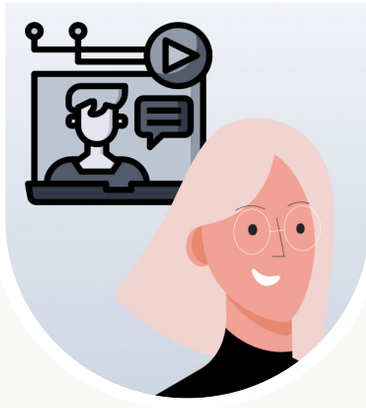
TRENDS

- Expanding the scope of computer modeling.

SUPERPROFESSIONAL
skills and competencies

- Systems thinking (ability to identify complex systems and work with them, including system engineering).
- Programming/ robotics/ artificial intelligence.
- Skills of artistic creation.
- Working with people.

▶ 6.3



DEVELOPER
OF INDIVIDUAL TRAINING PROGRAMS

HORIZON
of appearance

▶ 2025

KEY
competences

- Diagnostics of the student's cognitive abilities.
- Identification of cognitive interests, individual motivation structure.
- Identification of existing competencies in certain areas.
- Develop individualized learning plans based on existing competencies.
- Development of individualized motivation programs based on the motivation structure of students.

- Rapid changes in technology in the industry require rapid training and retraining. It is not possible to speed up learning by reducing the study time, because the curriculum is becoming more complex. A promising direction is the maximum individualization of educational programs, taking into account basic training, cognitive abilities, personality type and motivation structure. The development of such programs makes it possible to reduce the non-productive training time, thereby increasing its effectiveness.

NOVELTY
of the profession

- The solution of problems in a new way: individualization of training programs.

TRENDS

- Growing demand for intensive retraining of personnel in the oil and gas industry of Kazakhstan (new skills for current training).

SUPERPROFESSIONAL
skills and competencies

- Systems thinking (ability to identify complex systems and work with them, including system engineering).
- Multilingualism and multiculturalism.
- Skills of artistic creation.
- Working with people.

TRANSFORMING PROFESSIONS IN THE OIL AND GAS INDUSTRY

6.2.


2

2025

01

ENGINEER BY SPECIALIZATIONS 2.0

ENGINEER BY SPECIALIZATION (DRILLING, TECHNOLOGY, TRANSPORTATION)

- Deals with the organization and control of production and technological processes. Conducts research and project development, develops, and fills out technical documentation. Manages subordinate employees.

TRIGGER

- Skills.

DIFFERENCE

- Knowledge and skills of flexible planning (Agile, SCRUM),
- Project management,
- Quick-fix skills (solving problems)

2025

02

WELDER 2.0

WELDER

- Working professionals engaged in the welding of metals. The most common is electric arc welding, when the metal is melted by an electric arc and gas welding, which melts the metal with a flame of a mixture of oxygen and fuel

TRIGGER

- Physical movement.
- Manual welding

DIFFERENCE

- Skills in remote control of robot welders or automatic welding machines.

2025

03

CRANE DRIVER

CRANE DRIVER 2.0

- Specialist of the working profession, managing the movement of the crane, lifting, and moving cargo during loading and unloading, construction and installation. Assembly and other similar works.

TRIGGER

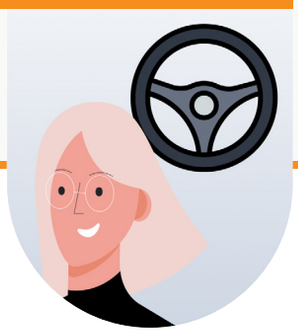
- Control the crane in real mode.

DIFFERENCE

- Remote control

2025

04



TRUCK DRIVER

THE TRUCK DRIVER 2.0

- A specialist of the working profession, who manages the movement of the forklift and all the mechanisms and devices installed there. Performs loading and unloading operations, moving cargo.

TRIGGER

- a Control of the forklift in real mode.

DIFFERENCE

- Remote control

2027

05

OPERATOR OF TECHNOLOGICAL INSTALLATIONS

REMOTE OPERATOR

- Highly qualified specialist who controls the technological process: parameters of raw materials, finished products, compliance with technical conditions according to instrument readings and analysis results. Monitors the operation of equipment, prevents malfunctions, deviations from the technological process.

TRIGGER

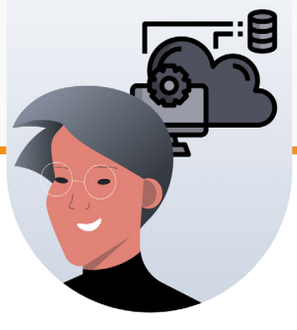
- Operating equipment

DIFFERENCE

- Software configuration, earlier fault detection

2030

06



CHEMIST

IT TECHNOLOGIST, DATABASE ANALYST

- A specialist with higher education who studies the chemical properties of materials. Participates in the development of processes for the synthesis of new materials, production lines

TRIGGER

- Skills

DIFFERENCE

- Knowledge and skills of analytical chemistry

2030

07

CHEMICAL ENGINEER, SPECIALTY "CHEMICAL TECHNOLOGY OF ORGANIC SUBSTANCES"

CHEMICAL ENGINEER ***WITH A NARROW SPECIALIZATION***

TRIGGER

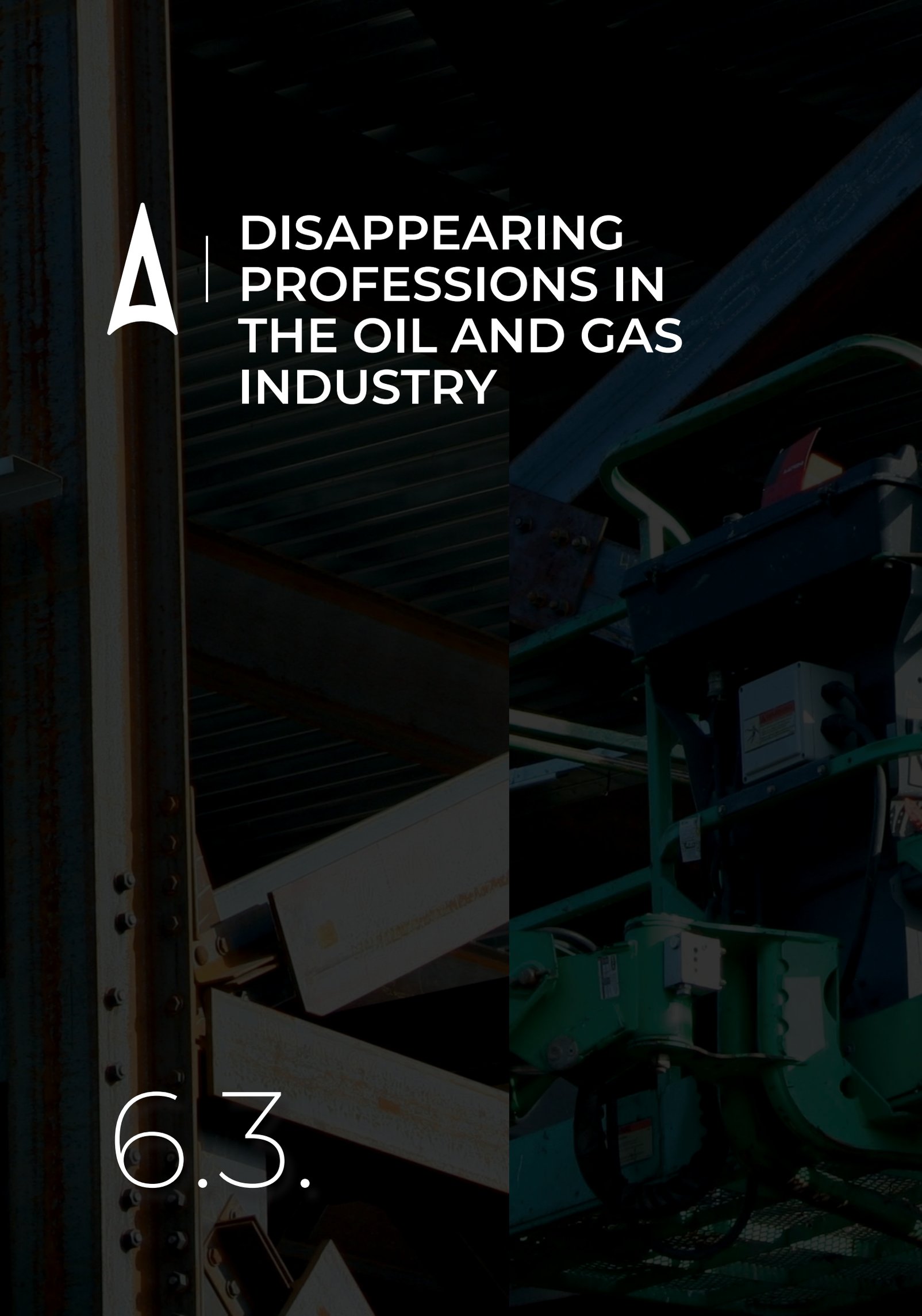
- Related knowledge and skills

- ***Polymerizer***
- ***Specialist in fine organic synthesis***
- ***The production technology of polymeric materials***
- ***Specialist in the development of polymer coatings***
- ***Technologist for the production of surfactants***
- ***Petrochemical engineer, etc.***

- Specialist with higher education who organizes and manages technological processes for the production of organic materials. Develops technological processes and participates in equipment design. Participates in the design of products made of organic materials.

DIFFERENCE

- Advanced knowledge and skills in these areas



DISAPPEARING PROFESSIONS IN THE OIL AND GAS INDUSTRY

6.3.

2027-2030

1

SHIFT MANAGER

- Data on the progress of the process will be collected automatically. It will also be automatically regulated

2030

2

PRODUCTION OPERATOR

- Automation of mining processes using robots and unmanned vehicles.

2025-2030

3

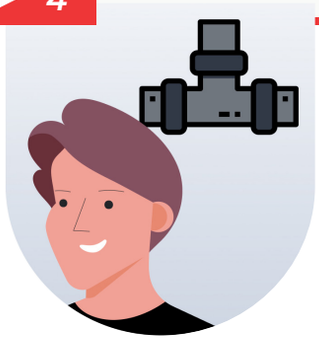
WORKERS
PERFORMING ROUTINE OPERATIONS

- Automation of routine operations.

2025-2027

4

LINEAR PIPELINE CRAWLER



- The pipelines will be inspected by monitoring drones. sensors will be installed on the pipeline sections to signal the location of the leak.

2025

5

ACCOUNTANT

- Accounting of equipment, materials, etc. will be carried out automatically.

2025-2027

6

SAMPLER

- Sampling will be automated, and automatic raw material control systems will be installed.

2025-2027

7

SURVEYOR

- Survey work will be performed by unmanned aerial vehicles.

2025

8

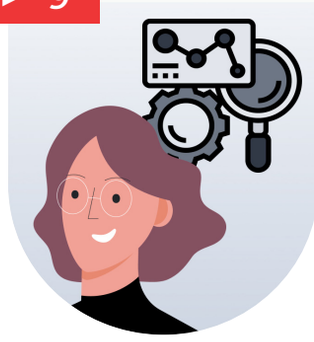
GLASSBLOWER
(PRODUCTION OF LABORATORY UTENSILS)

- The availability of ready-made laboratory utensils makes its production unprofitable. The need for laboratory utensils is reduced due to the introduction of analytical chemistry.

2025

9

VIBRATION DIAGNOSTICS ENGINEER



- Digitalization of equipment is developing. from the sensors installed on various elements of the equipment, information is received, which is processed using software. Such diagnostics are performed faster and more reliably than a vibration diagnostics engineer.

2025-2027

10

FIELD OPERATORS WORKING
WITH MEASURING INSTRUMENTS

- the Expansion of the use of telemetry: remote data transmission makes it unnecessary for operators to take instrument readings.

▶ 2027

▶ 11

CLEANER
OF PRODUCTION LEAKS

- Switch to clean production (leaks will be excluded).

▶ 2025

▶ 12

TIMEKEEPER

- Automatic recording of arrival and departure from work by electronic passes, software that automatically keeps track of working hours makes the work of a timekeeper unnecessary.

▶ 13

DOCUMENT MANAGEMENT SPECIALISTS*

- Introduction of electronic document management.

**The population is expected to decrease, but not completely disappear.*

COMPETENCIES OF THE FUTURE

7.

7.1.
FOUR LITERACIES OF THE FUTURE

The path to the competencies of the future lies through the abyss of mastering new types of literacy. The modern adult will have to greatly expand the set of literacies that he owns.

NOW ALMOST EVERY ADULT HAS THE FOLLOWING CAPABILITY:

1. The ability to read and write.
2. Knowledge of accounts (arithmetic, simple statistics).
3. User digital literacy (ability to type, understanding of Windows, ability to work in the main editors).
4. Technical certificate of interaction with the world of modern things: smartphones, household electrical appliances.
5. Scientific picture of the world.

How will literacy help the future specialist in professional activities?
In order to master the skill of playing a musical instrument, you will need to master musical literacy:

- treble clef and bass clef, location of notes on a stave,
- denoting dynamic shades and tempos,
- alterations and more.

Without learning this letter, you will eventually be able to remember the sequence of keystrokes or pick up a melody by ear and play a simple piece. But you will not be able to perform complex works and classical music culture will not be available for you. Professional formation as a Muse-Kant without musical notation will be impossible.

HISTORIES THERE ARE EXAMPLES MASS DEVELOPMENT OF LITERACY BY SOCIETY

For example, the industrialization of the USSR required new specialists in the field of working with machinery and equipment. The country massively needed future professions of that time: engineers, technologists, mechanics-repairmen, mechanics-drivers, while the majority of the population of the country were illiterate and illiterate peasants.

To train such specialists of the future from the peasants, the country needed to conduct two programs to eliminate illiteracy: educational programs-mass training in reading and writing, and the development of engineering literacy. Between 1919 and 1927, the literacy program covered about 10 million adults and 7.5 million children. And in 1933-1937, only in the registered schools of the educational program, more than 20 million negroes and about 20 million illiterates were already engaged. Only after the creation of basic literacy, the country was able to start training specialists for the complex professions of that time. For the emergence of a class of operators-machinists, as well as repairmen of new equipment, it was necessary to teach engineering literacy – reading drawings, the basics of technical mechanics, as well as knowledge about the details of machines and equipment. Without solving the problem of literacy, it is impossible to train specialists with high competencies.[7]

The next generation has experienced the development of user digital literacy – we all we learned to type on the keyboard, we learned to work with Windows, with text and image editors. Having mastered these skills, clerks, journal designers, and accountants were able to master new competencies using the capabilities of computer technology in their professions.

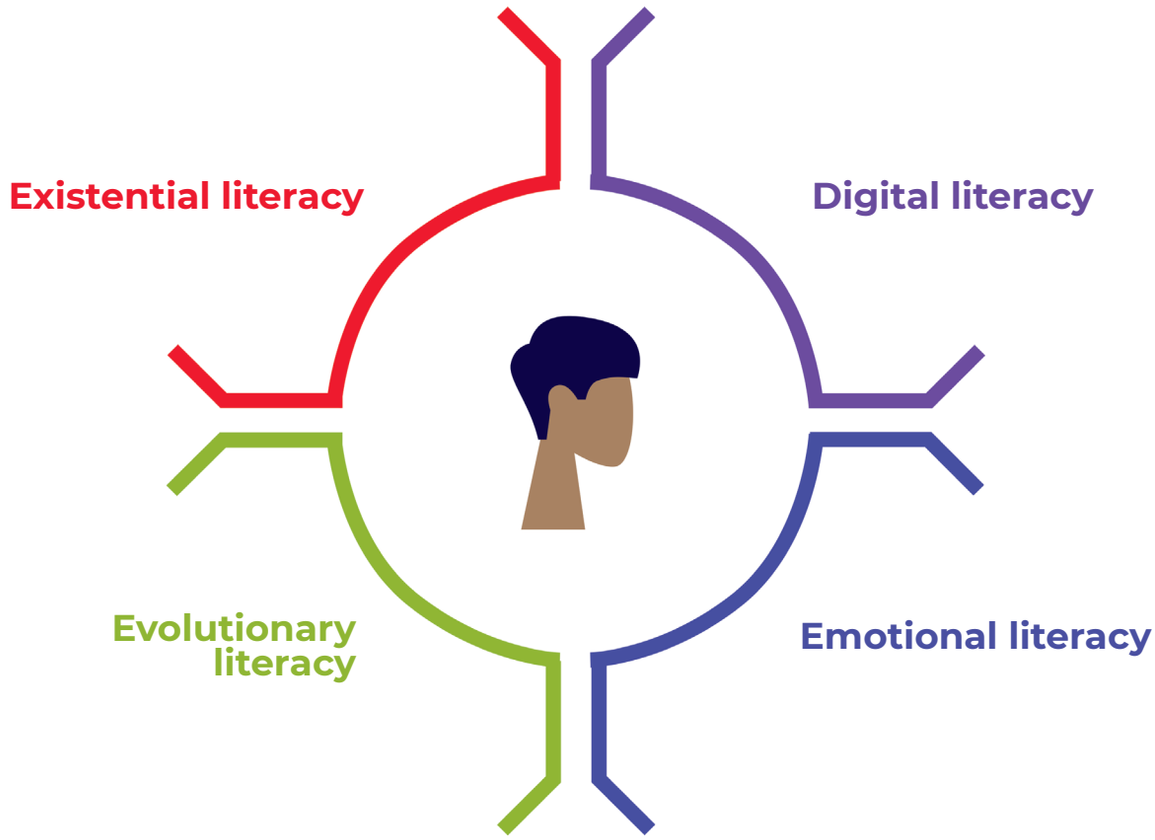
Now these basic skills of user literacy are already mandatory for modern professions.

Having completed the historical examples of the importance of learning literacy for the transition to the future, let's clearly formulate what we will consider the literacy of our near future.

Literacy is the basic primary skills that allow you to create a platform for understanding and entering into solving new problems with new tools.

[7] *Decree of the Council of people's Commissars of the RSFSR on the elimination of illiteracy. According to it, the entire population of Soviet Russia aged 8 to 50 years, who could not read and write, was obliged to learn to read and write in their native language or Russian at will.*

N THE NEXT 10 YEARS, WE PREDICT WHAT WILL IT TAKE TO MASTER NEW TYPES OF LITERACY:



DIGITAL LITERACY

In the digital world, when information is considered the second oil, every modern specialist must have digital literacy. Digital literacy will be in demand both in professional life and in everyday life. Accordingly, there is a basic and professional digital literacy.

Basic digital literacy includes the ability to use computers and smart backgrounds, use the most common programs, be able to search for information on the Internet, and know the basic rules for protecting financial transactions and personal data from intruders. A number of routine household operations are gradually moving into the digital world: conducting electronic correspondence, shopping online, paying bills and receiving public services online – as well as elements of basic digital literacy. Professional digital literacy is the ability to use digital devices and software in professional activities. the list of devices and programs is wide, because the specifics of the activity are different everywhere. The most widespread skills of working in 1: C, ERP and CRM systems, automated process management systems.

An ability to transform data into digital form, use of digital products for coordination and planning of work, preservation of ideas, preparation of joint projects, etc., these are elements of digital literacy.

EMOTIONAL LITERACY

Emotional literacy – the ability to understand and productively Express emotions, have a sense of empathy. Emotional literacy at the exceeds personal and professional effectiveness and efficiency in the interaction within the teams.

To maintain stable performance without slumps, you need to be able to recognize and understand the emotions that are born during the day, neutralize them and manage the rest. It is important not only to control, but also to show emotions productively. negative emotions can be expressed by swearing, breaking the distance, and you can correctly express your dissatisfaction without harming others and improving relations with colleagues at work. organizations of the future are more likely to align points of view, cooperate and cooperate than to be administratively subordinate. The effectiveness of collaboration largely depends on the emotional compatibility of team members. this requires being able to understand the feelings and emotions of others, empathize with others, and be able to eliminate the emotional damage that regularly occurs when working together, accumulates, and reduces effectiveness.

EVOLUTIONARY LITERACY

Organizations of the future will significantly increase employee autonomy. It will be necessary to understand and determine what to do. Therefore, the specialist will need evolutionary literacy.

Evolutionary literacy is the ability to understand and fulfill personal, group, and corporate goals (guidelines, intentions). Understanding the basics of life and career planning in a world of constant change. An equal desire for vertical and horizontal career growth in organizations of the future. Willingness to combine the professional sphere and personal life and find a healthy compromise between them. A wide area of personal responsibility in the work. This literacy is the basis for leadership, goal setting, group management, and so on.

EXISTENTIAL LITERACY

In the future, obsolescence of ideas, knowledge, products, goods, and services will occur over the course of months or weeks. Companies and products can lose customers, become unnecessary, and go bankrupt in a short period of time.

A specialist of the future will be required to design and offer a new product or business model based on the existing achievements of enterprises.

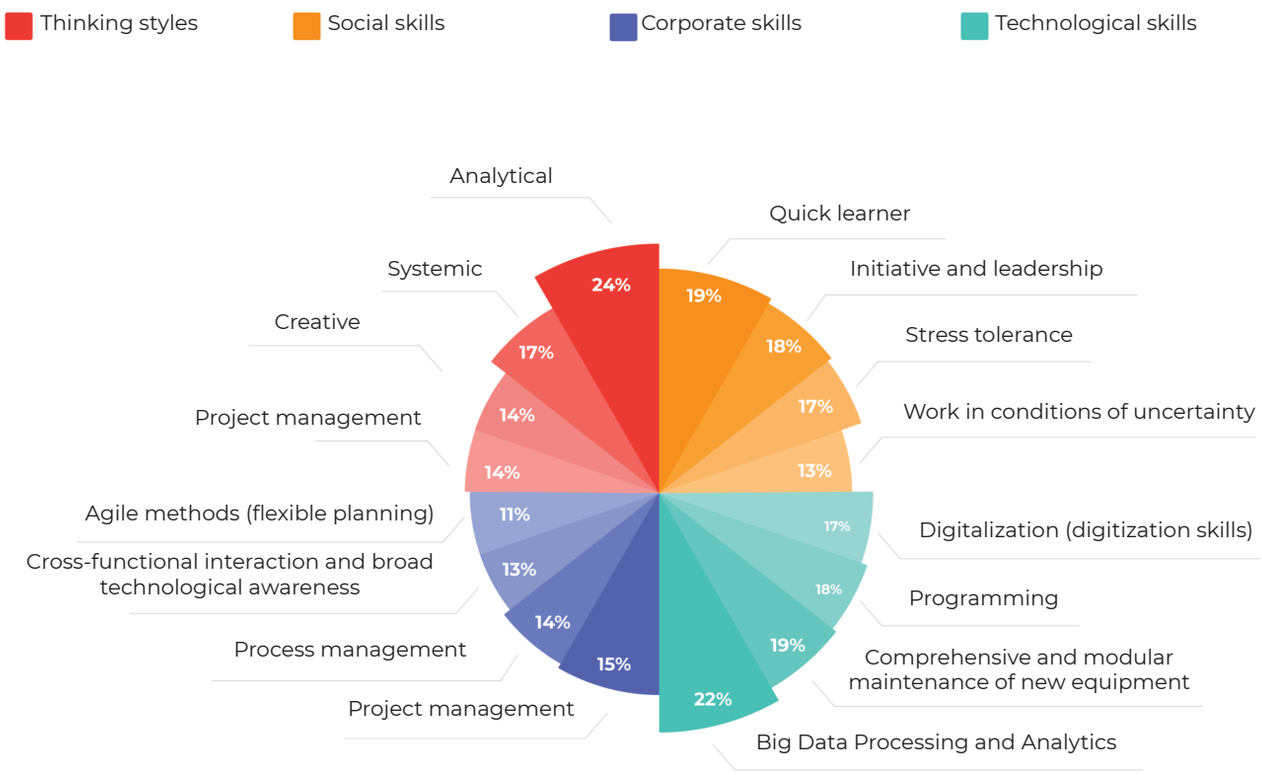
By defining the uniqueness and purpose of a specialist, Department, company, and product, future specialists will be able to build effective ecosystems.

To continue operating when the meaning of a company's existence seemed lost, you need to have existential literacy: the ability to find the uniqueness, purpose of a person, group, social groups, companies in a complex and changing world, as well as to build an eco - system around it to strengthen and develop it.

The ability to consciously connect and correctly use different forms and styles of thinking to unlock the potential and realize the purpose of a person, organization, or system.

7.2.
SKILLS OF THE FUTURE SPECIALIST

So, we have a list of professions that are likely to appear in 5-10 years. Let's find out what skills you need to master a new profession and build a successful career in the oil and gas industry. Leading experts of the oil and gas industry of Kazakhstan expressed their opinion on what skills will be the basis of career growth.



The first thing you need to know in order to become a popular specialist in the future, you will need to have more than just professional skills. With sufficient conservatism in the oil and gas industry, the demand for over-professional skills increases.

The reason for this is a new generation of oil recovery technologies, accelerated digitalization of processes, and the growing need for processing big data and developing solutions based on it.

Employers want to hire specialists who are able to adapt quickly, master themselves, and use modern planning and organization tools.

Second, the model of education will change: complexity will become the main feature of the future. Everyone will have to adapt to new forms of education.

The model of education that we are used to is called industrial, and was developed by the German school in the XIX century.

This model is characterized by the conveyor "school-College-University - high school".

DISTINGUISHING FEATURES OF THE OLD MODEL:

1. Getting an education in youth.
2. One education for life.
3. Long-term training in the received specialty from three to five years, depending on the level of education.
4. Fundamental nature Korea training.
5. After receiving the education, the quality increase is optional, it is not necessary. Exceptions are established by law.
6. The training System is implemented in the educational institution.

The new model of education has not yet been formed, and different authors describe it in different ways.

DISTINCTIVE FEATURE THE NEW MODEL WILL BE:

1. Continuous education of mixed age groups:

   a. it will become the norm to acquire a new profession in adulthood;
   b. new teaching methods will be created that take into account the age characteristics of students: memory loss, a higher level of responsiveness and perseverance.
2. The appearance of various educational programs in terms of duration, from ultra - short (10-15 hours) to ultra - long.
3. Globalization of the educational space:
4. Regional residents will have more access to quality education. Moving to the capital or highly developed countries will no longer be a unique opportunity to get a specific education, for example, in biology, astrophysics, etc. there will be more equal opportunities.
5. The emergence of educational ecosystems and unified thematic educational platforms in the country (unified medical, engineering, and other platforms that unite classical Universities).

   Within the framework of the project

"Atlas of new professions and competencies in Kazakhstan", skills were grouped into 4 large blocks:

1. ***Popular thinking styles.***
2. ***Social skills.***
3. ***Technical skills.***
4. ***Corporate skills.***

1 THINKING SKILLS

Experts agree that an increasing number of processes and functions will be performed by robots and artificial intelligence. By 2030-2040 in performing typical tasks, the person will lose to the machine. How do we win the competition? Thinking is one of the few areas where machines have not yet penetrated. Critical, creative, systematic, and other styles of thinking are available only to human and will remain his monopoly for the foreseeable future. Even today, specialists of the future should purposefully develop in itself, thinking styles and techniques. Only in this case will we be able to gain a foothold in the future with machines and make them assistants that collect data for us and perform simple functions for us and those that are easy to algorithmize.

2 SOCIAL SKILLS

The specialist of the future does not need to be able to work with machines, he needs to be able to manage and interact with other people. With the development of technology, the demand for building a trusting network of communication to meet emotional needs will increase more and more. Social networks, new production networks, and temporary project teams will require specialists to negotiate and cooperate, present, moderate, and facilitate the work of groups. These skills will become a separate vector of training and self-improvement of the future specialist.

3 TECHNOLOGICAL SKILLS

In the middle of the last century, computer specialists considered, by the beginning of the XXI century, computers-intellectual literacy will become as necessary to a person as the ability to read and write. We see that their predictions have come true. digitalization gives a person a volume of information thousands of times greater than it was at the beginning of the century. A large amount of poorly structured data is called big data. This data contains information on the basis of which the Manager will be able to make more informed and more objective decisions. The volume of information is growing every year, but without processing, this information is useless. therefore, there will be a demand for specialists who can identify data collection points and tools, structure and analyze them, and provide structured information to the manager for decision-making.

4 CORPORATE SKILLS

The core of industrial companies of the XX century was the factory and I Corporation. These are large organizations that are able to unite a large number of specialists and organize mass production. According to experts, the core of business in the XXI century will be digital platforms.

On the horizon of 10-15 years, we will see a synthesis of organizational models of the XX and XXI centuries. Modern corporations are clumsy and overly hierarchical. If an employee wants to make a proposal, it will take a long time to go through the stages of approval, changes to existing regulations, inertia, and overcome resistance to changes. The lower the employee is in the corporate hierarchy, the more difficult it is to pass these procedures.

What kind of skills will be required to win the competition from cars? The most important thinking styles for building a career in oil and gas companies in the future will be analytical thinking, system thinking, creative thinking, and project thinking.

Analytical and systems thinking leads by a significant margin.

Experts note that this is due to the growing uncertainty and the expansion of the list of complex tasks. In the future, their number will only grow. Analytical and systems thinking helps to organize a large amount of incoming data and make decisions in conditions of their lack. Those who use these skills see the cause-and-effect relationships of the development of events both in production and in the industry, identify the priority of tasks. Analytical and system-based thinking skills will be required, because professions that focus only on working with large volumes of data collected in production are beginning to develop. for example, an analyst of production data, a specialist in collecting information, etc.

CREATIVE THINKING

thinking that allows you to look at the situation in a new way and find a non-standard solution. Creative thinking is primarily a large variation in the use of thinking tools. The modern world is changing rapidly and we are faced with situations where it is impossible to find a ready-made solution using standard algorithms and rules.

Using creativity, you can create a fundamentally new product, solve the problem in a fundamentally different way. At the same time, we use imagination, look for new connections, establish new patterns between events and phenomena, look for new ways of using familiar things, new responses to old situations and phenomena.

A creative person can completely abandon previous experience and knowledge and thus find a non-standard solution. At the same time, the effectiveness of this approach can significantly exceed the decision made on the basis of familiar algorithms.

PROJECT THINKING

– this is the representation of work tasks in the form of projects, i.e., the ability to determine the stages of achieving goals, find ways to solve them, determine the necessary resources and necessary performers.

Project thinking is required in various fields of activity: from management to IT product development, from the implementation of an automatic management system at the enterprise to the implementation of a corporate strategy.

Enterprises are gradually moving away from the routine management method and moving to the project type of management.

Among social skills, experts predict the demand for rapid learning, initiative and leadership, stress resistance, and the ability to work in conditions of uncertainty.

FAST LEARNABILITY/ UNLEARNING

Knowledge is rapidly becoming obsolete. in order to master new knowledge, it is necessary to develop the ability to learn quickly.

A specialist needs not only to learn quickly, but also to learn quickly, giving up irrelevant knowledge, skills, and beliefs. If ten years ago IT was necessary for managers and employees of the IT sector to quickly learn, now it is becoming mandatory for employees of other industries, and the oil and gas industry is no exception.

INITIATIVE AND LEADERSHIP

experts consider the most important skills for a specialist of the future. gradually, the structure of organizations becomes less hierarchical, more horizontal. there are fewer formal leaders and an increasing role for informal leaders who do not have nominal power. proactive employees are higher because the companies of the future need to respond more quickly to changing conditions, without waiting for a command from above.

Initiative and leadership are in demand in all areas, from teams working around mining sites to the top level of management.

STRESS RESISTANCE

Unfortunately, rapid changes in the technological order and the growing level of uncertainty increases the level of stress both at work and in everyday life. In order to be successful, you need to be able to cope with stress: to identify stress factors in time, to determine which of them are controlled and manageable, and which are not, to know and apply methods of dealing with stress.

WORKING IN AN UNCERTAIN ENVIRONMENT

a relatively young skill. If in the middle of the last century the amount of data needed for decision-making was relatively small, and conditions remained stable, now the amount of data is growing rapidly, conditions can change in real time. This also requires a different approach to decision-making. If earlier it was believed that in order to make a decision, it was necessary to collect as much initial information as possible, now it is impossible to do so.

Now it is more important to determine the minimum sufficient amount of necessary information, to be able to allocate and reallocate resources, to respond in time to emerging changes. The skills will be in demand among developers of computer models of field operations, project managers, etc.

Among the corporate skills, it will be important for the employee of the future to establish and maintain cross - functional interaction, as well as to have at least basic project and process management skills, to use a flexible approach to task execution planning (Agile planning), to interact at the cross - functional level, for example, drillers and financiers.

PROJECT MANAGEMENT

As already mentioned, project management is gaining popularity because changes occur too quickly, and the traditional functional structure of enterprises does not have time to respond to them.

The project manager must solve problems of a high degree of novelty and complexity, in conditions of budget constraints, deadlines, while ensuring the quality of work. In contrast to the traditional highly hierarchical structures, temporary project teams are formed, which are disbanded after the completion of the project. Enterprises of the oil and gas industry of Kazakhstan need technological improvement, as technologies do not stand still. First of all, this applies to methods of increasing oil recovery and implementing big data processing methods and improving technological and business processes.

PROCESS MANAGEMENT

A business process in any company is a sequence actions to perform a typical task. In order to effectively manage processes, you need to be able to distinguish the process from the routine of employees ' activities and describe it graphically and schematically, preferably using one of the formal methods of description. It is important to see how the stages of the process are related to each other, what is the sequence of actions, who is responsible for the implementation. As a result, we get a visual representation of the process. When we have a visual description, we can start optimizing. The main indicator is to find how to do the same thing, but faster, easier, with less involvement of employees. At first glance, it seems that the process is optimally designed: every action is necessary, every performer is in his place. Practice shows that each process can be optimized, sometimes even at times.

SKILLS OF CROSS-FUNCTIONAL INTERACTION

will be required for those who work at the intersection of different fields of activity, for example, laboratory assistants and specialists of the main production, engineers, and financiers, etc. these skills will be in demand for continuing education specialists, facility managers, R&D project manager, etc.

AGILE

It is a flexible system of development techniques and processes that has begun to be applied in the IT field. The main postulates of which are that you need to focus on the needs of customers, understand which approach can best meet them, plan the execution of work in short segments, at the end of each segment to create a finished product, even in a greatly reduced version, and quickly adjust tasks based on feedback. Specialists who possess such skills will be in demand when implementing new large-scale projects of the company. for example, the introduction of automated process management systems,

digitalization of work processes and equipment, etc.
Challenges have not been solved at the enterprise, the result of which is difficult to describe in concrete properties, a high level of uncertainty of tasks – the main reasons of using Agile planning.

Technological skills of the future-the ability to work with computer systems, with digital devices, programming skills, working with big data and the ability to perform modular maintenance of modern equipment.

BIG DATA SKILLS

They will be in demand primarily from big data analysts, developers of digital models of enterprises and locations.

COMPREHENSIVE AND MODULAR SERVICE

equipment is replaced by maintenance with the replacement of individual parts due to the fact that modern equipment becomes more complex. A separate area of MRO service is the modernization of old equipment and the combination of equipment of different generations in one technological line.

PROGRAMMING

previously used by software developers. In the future, these skills will be required for operators of technological equipment, repair service personnel to configure equipment, adapt to the technological process, and eliminate defects. Software-controlled equipment is distributed, which also requires programming. Programming will be required for such professions of the future as: service engineer-oilman, IT dispatcher, engineer-analyst in NGOs, etc.

DIGITALIZATION

Modern equipment and modern technological processes are digitalized: they remotely transmit data on the process progress to a distance, correct drilling, oil, and gas production, interpreting data coming from multi - numerical sensors from deposits and wells, pipeline sections.

The emergence of such professions as a service engineer - oilman on digitalization, an innovative technologist, a specialist in computational chemistry is predicted, that is, specialists who are able to work with digital systems, perform or optimize work processes, interact with consumers and customers, or develop and maintain them.

7.3.
PROFESSIONAL COMPETENCES OF THE FUTURE

With the change in the technological order, the emergence and transformation of professions, the requirements for the competencies of new employees will inevitably change. What are competencies?

Competencies are a set of skills, knowledge, and personality traits that enable a specialist to do his job well. So, for a good teacher, empathy, patience, and attentiveness are important. For an officer – leadership qualities. For an accountant it means perseverance, accuracy, and scrupulousness.

Please note that competencies do not make a person a specialist, but they greatly simplify the performance of their duties for a specialist and increase their value.

Competencies of the future – a set of competencies, the possession of which will make it possible to

become more popular in the labor market in 5-10 years. recently, there has even been a trend: to master not a profession, but competencies. All professions are based on a number of competencies that will form the basis of professional skills in the near future.

BASIC COMPETENCIES IN THE PRESENTED ATLAS, THE FOLLOWING ARE SELECTED:

1. Lean manufacturing.
2. Multiculturalism and multilanguage.
3. Work with people.
4. Programming, artificial intelligence, robotics.
5. System thinking.
6. Eco-friendly thinking.
7. Skills of artistic creativity.
8. Interbranch communication.
9. The focus on customers.

1 LEAN MANUFACTURING

Lean manufacturing is an enterprise management concept based on the constant search, reduction, or elimination of losses. Losses are those actions, processes or operations that consume resources (human, temporary, material, etc.), but do not add value to the final or intermediate consumer.

Lean manufacturing changes the approach to managing the efficiency of an enterprise from extensive (working more and faster) to intensive (working more efficiently, i.e., doing only what is necessary and not doing what you can do without). Specialists with thrift competencies will be able to improve the efficiency of departments or businesses as a whole without attracting large investments.

The relevance of lean management methods is increasing, because traditional management methods have already reached their peak, further business development will increasingly focus on intensive development and lean improvement methods.

2 MULTICULTURALISM AND MULTILINGUALISM

Multiculturalism is the preservation and development in a particular community (state or enterprise) of the cultural characteristics of the people living there. Multiculturalism and multilingualism in the enterprise involves not only taking into account national or religious cultures, but also cultural thinking, psychotypes, communications and individual characteristics.

The modern world is becoming global at a rapid pace. Even now, a company that employs specialists who were born or live-in different parts of the world is no exception. The policy of multiculturalism and multilingualism sets the vector of interaction between people who are different from each other: not to conflict, but to recognize each other.

The changes taking place today pose new challenges that have never been seen before. It is generally recognized that the most effective solutions are born at the intersection of different areas of knowledge, approaches, and cultures. The most effective teams include people with different features of thinking, psychology, and distribution of roles in the team. Multicultural teams will be able to find effective unusual solutions and even solve problems that are still unsolved.

3 WORK WITH PEOPLE

Working with people is the ability to maximize the potential of the team and each of its members to achieve the goals of the organization.

Despite mass robotics and automation, the decisive role in the economy of the future is assigned to man and his creative abilities.

This is especially evident in IT companies. Companies have approximately the same computers and know the same programming languages, although to varying degrees, but some companies become successful, and others close after six months. As a rule, the key to success lies in the effective work of teams.

The relevance increases with the increase in the share of millennials in working groups. these people are more appreciative of the individual approach.

EFFECTIVELY UNLOCKING THE POTENTIAL OF EACH EMPLOYEE CAN CREATE A DECISIVE COMPETITIVE ADVANTAGE FOR THE ENTERPRISES OF THE FUTURE.

4 PROGRAMMING, ROBOTICS, ARTIFICIAL INTELLIGENCE

This area includes various skills related to the development and configuration of artificial intelligence systems, setting up and configuring robots, developing programs for managing production processes and individual machines.

Automation and robotics are rapidly penetrating all areas, including manufacturing.

It is expected that in 15-20 years, machines will replace humans in most routine operations that do not require creative skills. Therefore, the need for specialists with these skills will grow in all industries.

It is these specialists who will have to ensure the mass arrival of machines in all sectors of the economy.

AUTOMATION OF PRODUCTION WILL ELIMINATE THE HUMAN FACTOR AND INCREASE PRODUCTIVITY WHERE THERE ARE ROUTINE OPERATIONS THAT DO NOT REQUIRE SPECIAL TRAINING AND CREATIVE SKILLS.

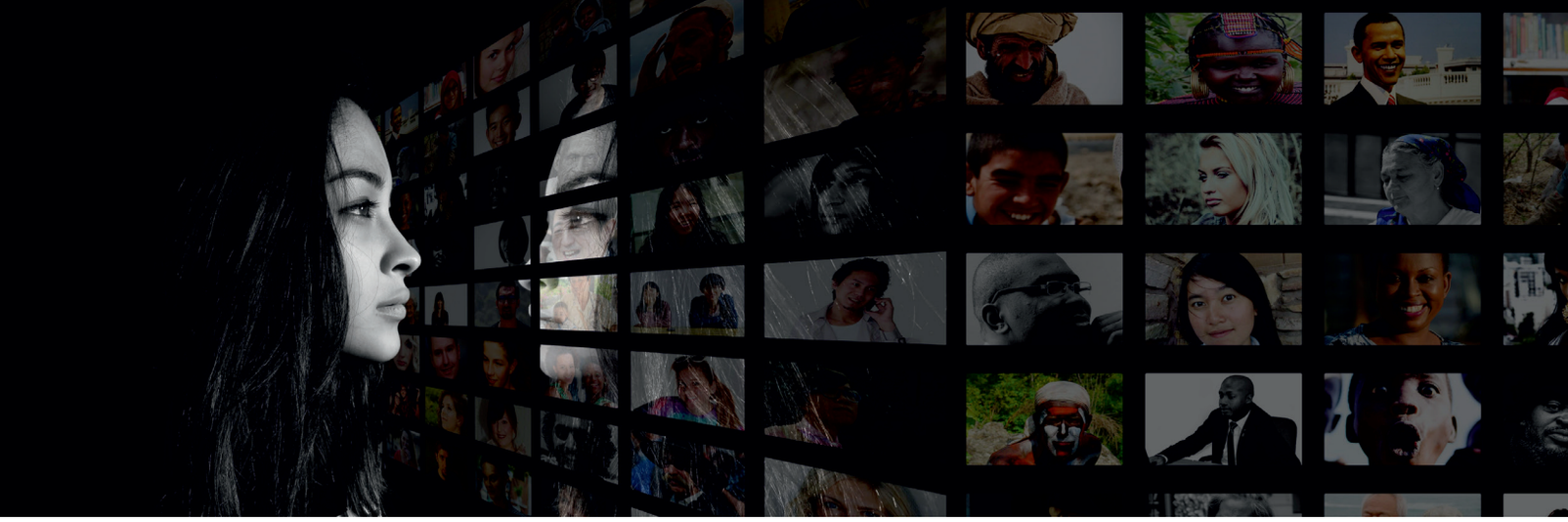
Specialists will be required not in the main production, but in the service sector and settings of machines, robots, and systems that make algorithmic decisions.

5 SYSTEM THINKING

The ability of a specialist to combine (generalize) particular facts into a general picture, to build hierarchical levels for understanding various situations (economic, political, business) and making long - term decisions. An important quality is an understanding of how a change in one element will later affect other elements.

The importance of systemic thinking increases due to the acceleration of changes in life, the need to learn new professions, as well as the increasing interpenetration of various spheres into each other (social networks, economics, politics, production, etc.).

Specialists with the skills of systems thinking will be able to solve such tasks as making strong long-term decisions in the context of rapid changes in the economy, diagnose large technical and social systems, make decisions about eliminating the root causes that hinder development, and this skill will also ensure the integration of various project teams into a single working organism.



6 ENVIRONMENTAL THINKING

Environmental thinking is focused on achieving harmony between business and the environment Wednesday. Already, the business cycle is developing from creation to product disposal, not just its sale and consumption. Environmental thinking places the highest priority on health and sustainable development. the importance of ecological thinking increases due to the fact that the development of industry has reached its limit and all further models of sustainable growth of society, economy and business should be built on the basis of mutual interests with nature, the ecosystem, its maintenance, and development. Specialists with environmental thinking skills will be able to solve such tasks as: careful attitude to resources, achieving zero emission of harmful substances into the environment, waste processing and use of secondary resources.

7 SKILLS ARTISTIC CREATIVITY

Skills of artistic creation, the ability to express feelings and emotions in figurative forms, the ability to create their own artistic images, the presence of a developed aesthetic taste. In the future, robots and machines will replace humans in many areas. The only sphere that is not yet available to machines is the sphere of creativity. Specialists with creative skills will gain an advantage in almost all areas of business. The emerging trend of personification and individualization of goods and services will continue to develop and the day is not far off when all goods and services will become as personalized as possible.

Accordingly, the demand for new creative forms of advertising and marketing that take into account the individual characteristics of the consumer will increase.

8 CROSS-INDUSTRY COMMUNICATION

Cross-industry communication consists in understanding technologies, processes, and the market situation in different adjacent and non - adjacent industries cross - functional and cross-disciplinary interaction.

More and more advanced products are created at the junction of different industries and specialists need the ability to understand several areas of knowledge at the same time. This competence allows you to learn faster, take the best from different areas, and through such mutual enrichment, ensure development within your field.

Specialists with such competence can create unexpected, unique, and breakthrough solutions.

9 CUSTOMER ORIENTATION

Customer orientation is understood as the ability to work with the needs of the consumer, the ability of the company and employees to determine the wishes of customers in a timely manner in order to satisfy them with their products or services with maximum benefit. This competence has become critical for the success of companies, competition for the consumer is constantly growing, and all employers want to see customer-oriented employees.

In the second half of the 20th century, the concept of an internal customer appeared, i.e., an intermediate consumer located further along the production chain within one company. Possession of this competence allows you to accurately understand the client's request and offer the most suitable solution for him, as well as to build the process of production and service more rationally, excluding from it the stages that are not important for the client.

WHERE TO STUDY NEW PROFESSIONS IN KAZAKHSTAN

8.


ЕВРАЗИЙСКИЙ
НАЦИОНАЛЬНЫЙ
УНИВЕРСИТЕТ
имени
Л.Н.Гумилева
Я верю в нашу молодежь.
Уверен, ваши знания, ваша энергия и
ваш труд будут работать на построение
сильного и процветающего Казахстана.

WHERE TO STUDY NEW PROFESSIONS IN KAZAKHSTAN?

Now that you have decided which profession to choose, you need to decide where this profession can be obtained. Where to learn a profession that does not yet train specialists?

There is no answer to this question yet, but we have developed a map of the localization of professions, which you can use when choosing an educational institution.

The educational institutions indicated in this map have the greatest potential to open training

in new professions on their basis when they appear in the register of specialties of the Republic of Kazakhstan.

It should be noted that in order to develop the training of specialists in new professions, universities should have mixed competencies.

Basically, these are competencies in 4 blocks:

1. . In the branch specialization-oil and gas business, geology, and exploration of mineral deposits;
2. In the field of IT - information technologies, programming, computing equipment, etc.;
3. In the field of mechanical engineering and work with equipment-technological machines and equipment, radio engineering, electronics, and telecommunications, etc.;
4. In the field of management-management and economics.

In total, 21 universities have been allocated that have industry competence-they can conduct training in the main specialty-non-oil and gas business, as well as such specialties as geology and exploration of deposits of the desired ones. Also, in the table of universities, other faculties and departments are highlighted, which show the presence of competence in other blocks of competence out of 4 necessary ones.

Below you can see Table No1-a list of universities in the Republic of Kazakhstan that have the potential to localize training in new professions in the oil and gas industry.

Also, after the table of universities, you can study the no2 table. localization of new professions in the oil and gas industry in universities of the republic of Kazakhstan. The second table shows the professions and which faculties or departments that, using their scientific and practical base, can potentially develop training of specialists in the medium term.

Table 1.

Rating of universities for localization of new professions in the oil and gas industry of the Republic of Kazakhstan*

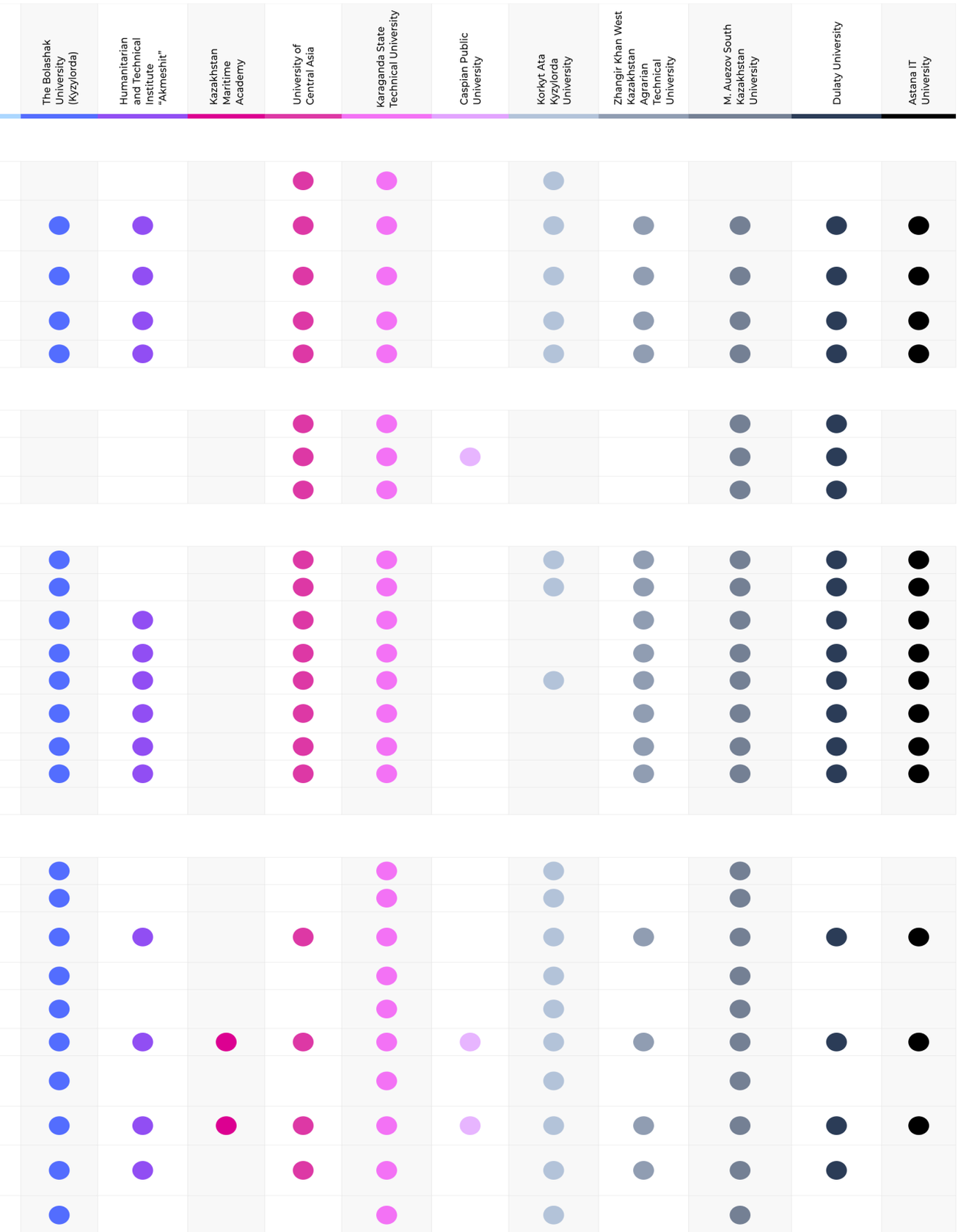
	Higher educational	Ranking	Count new professions
1	Atyrau University of Oil and Gas	3.60	35
2	West Kazakhstan Innovation and Technology University	3.35	19
3	Kazakh-British Technical University	3.28	32
4	S. Baishev Aktobe University	3.22	13
5	Atyrau Engineering and Humanitarian Institute	3.17	18
6	Satbayev University	3.16	28
7	Caspian State University of Technologies and Engineering	3.14	21
8	Zhubanov University	3.135	19
9	Toraighyrov University	3.11	26

**Source of the rating of universities - NCE " Atameken»*

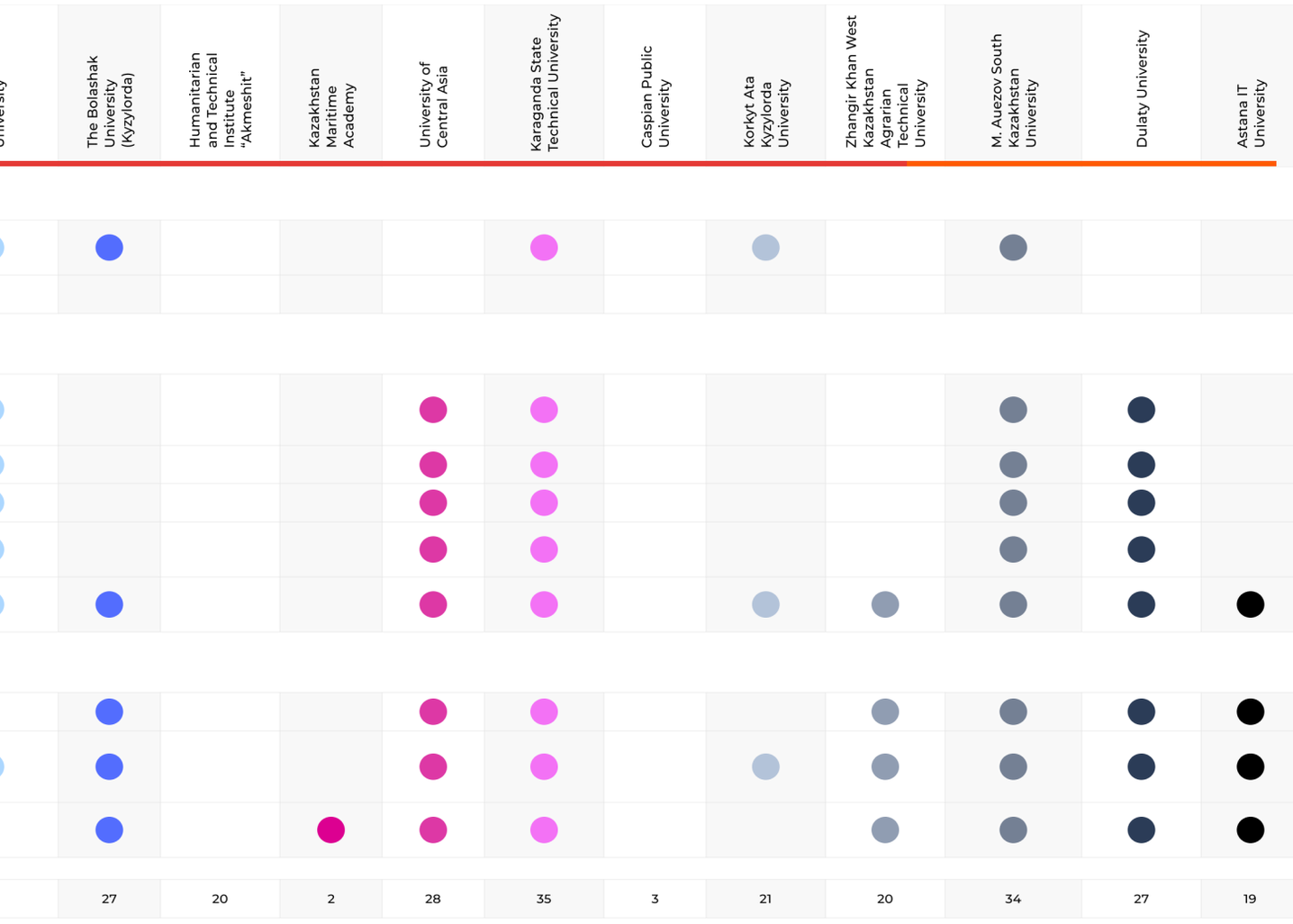
	Higher educational	Ranking	Count new professions
10	The Bolashak University (Kyzylorda)	3.10	27
11	Humanitarian and Technical Institute “Akmeshit”	3.07	20
12	Kazakhstan Maritime Academy	3.04	2
13	University of Central Asia	3.02	28
14	Karaganda State Technical University	2.87	35
15	Caspian Public University	2.812	3
16	Korkyt Ata Kyzylorda University	2.806	21
17	Zhangir Khan West Kazakhstan Agrarian Technical University	2.79	20
18	M. Auezov South Kazakhstan University	2.65	34
19	Dulaty University	2.56	27
20	Astana IT University	1.13	19

TABLE 2
LOCALIZATION MAP OF NEW PROFESSIONS IN UNIVERSITIES OF KAZAKHSTAN

№	Name of the profession	Atyrau University of Oil and Gas	West Kazakhstan Innovation and Technology University	Kazakh-British Technical University	S. Baishev Aktobe University	Atyrau Engineering and Humanitarian Institute	Satbayev University	Caspian State University of Technologies and Engineering	Zhubanov University	Toraighyrov University
Direction "smart" field, big data and artificial intelligence										
01	Engineer-designer for creating digital twins of deposits	●		●	●		●	●		
02	Engineer-designer for the creation of digital twins of oil refineries	●	●	●	●	●	●	●	●	●
03	Production data Analyst and Mechanical Engineering training specialist	●	●	●	●	●	●	●	●	●
04	Service oil engineer on digitalization (big data architect)	●	●	●	●	●	●	●	●	●
05	IT dispatcher	●	●	●	●	●	●	●	●	●
Direction of "remote control the new technology"										
01	The operator of the UAV	●		●		●	●			●
02	Specialist in drone control on the development location	●		●		●	●			
03	Universal pipeline section manager	●		●		●	●			●
Direction "management in conditions of instability"										
01	Cybersecurity engineer	●		●	●	●	●		●	●
02	Defender against cyber attacks	●		●	●	●	●		●	●
03	Continuous improvement specialist	●	●	●				●	●	
04	Facilities Manager	●	●	●				●	●	
05	Engineer-analyst in IT	●	●	●	●	●	●	●	●	●
06	Business/working process transformation specialist	●	●	●				●	●	
07	Innovative technologist	●	●	●				●	●	
08	R&D Project Manager	●	●	●				●	●	
09	Lawyer in the oil and gas sector		●	●						●
Direction "Technologies of new materials"										
01	Computational chemist	●	●	●			●			●
02	Nanotechnology engineer	●	●	●			●	●		●
03	Ecoanalytics in the extractive industries (managing the reduction of harmful effects)	●	●		●		●	●	●	●
04	Composite Materials Chemist	●	●	●			●	●		●
05	Chemist-laboratory assistant for the development of new materials	●	●	●			●	●		●
06	Aircraft Fuel Chemist	●	●	●	●	●	●	●		●
07	Technologist for the production of rubber, polypropylene, rubber and plastic from coal	●	●	●			●	●		●
08	Chemical engineering technologist	●	●	●	●	●	●	●	●	●
09	Energy engineer for the generation of various types of energy (collect energy)	●	●				●	●	●	●
10	Recycling-technologist of the oil and gas industry	●	●				●	●		●


The Bolashak University (Kyzylorda)
Humanitarian and Technical Institute "Akmeshit"
Kazakhstan Maritime Academy
University of Central Asia
Karaganda State Technical University
Caspian Public University
Korkyt Ata Kyzylorda University
Zhangir Khan West Kazakhstan Agrarian Technical University
M. Auezov South Kazakhstan University
Dulaty University
Astana IT University

№	Name of the profession	Atyrau University of Oil and Gas	West Kazakhstan Innovation and Technology University	Kazakh-British Technical University	S. Baishev Aktobe University	Atyrau Engineering and Humanitarian Institute	Satbayev University	Caspian State University of Technologies and Engineering	Zhubanov University	Toraighyrov University
Direction "Technologies of new materials"										
11	Technologist of hydrogen energy carriers	●	●	●			●	●		●
12	Biological interaction technologist		●	●			●		●	
Direction "Technologist of the future in MRO"										
01	Design engineer for modernization and adaptation of equipment	●		●		●	●			●
02	Equipment upgrade supervisor	●		●		●	●			●
03	3D printing operator	●		●		●	●			●
04	Engineer for reliability and predictive analytics of equipment	●		●		●	●			●
05	Developer of oil and gas process service software	●		●	●	●	●		●	●
Direction "Gamification and targeted education"										
01	Digital coach / virtual mentor	●		●					●	
02	Specialist in 3D modeling of industrial reality for training workers	●		●	●	●	●		●	●
03	Developer of individual training programs	●		●					●	
	Total:	35	23	34	13	18	29	21	20	27


The Bolashak University (Kyzylorda)
Humanitarian and Technical Institute "Akmeshit"
Kazakhstan Maritime Academy
University of Central Asia
Karaganda State Technical University
Caspian Public University
Korkyt Ata Kyzylorda University
Zhangir Khan West Kazakhstan Agrarian Technical University
M. Auezov South Kazakhstan University
Dulaty University
Astana IT University
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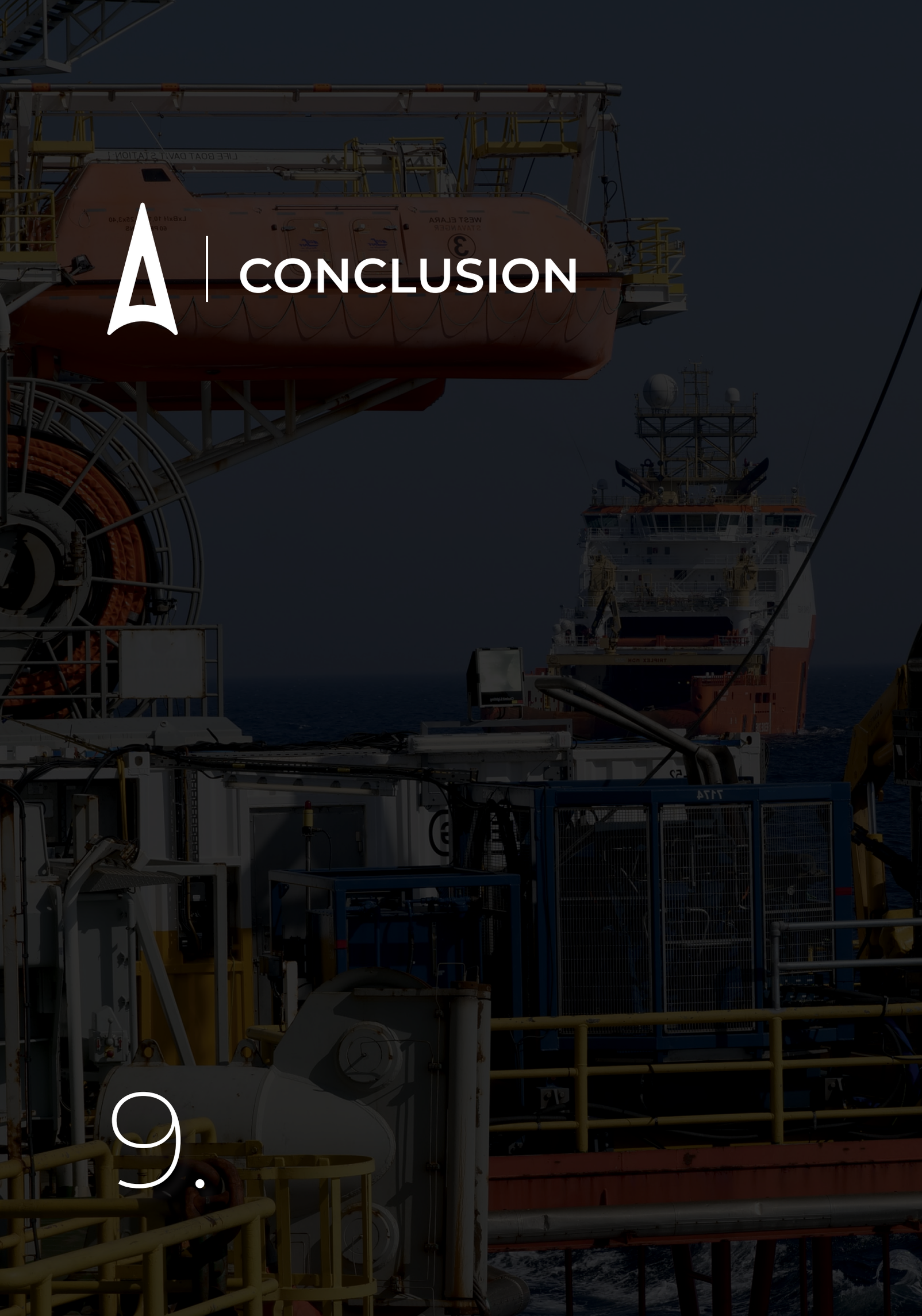

CONCLUSION

9.


LIFE BOAT DAVIT STATION
WEST ELARA
STAVANGER
3
LxBxH 10,16x3,25x3,40
60 PERSONS
TRIPLEX MDH
7174

CONCLUSION

The oil and gas industry around the world are undergoing a transition to radically new working conditions. In the context of a decline in the development of the world economy, the oil market is subject to strong fluctuations and the profitability of production changes sharply.

In recent decades, environmental pressure on the oil and gas industry has increased. Alternative energy and electric vehicles are being developed, which displace oil from its traditional market-fuel. This requires oil and gas companies to increase the level of oil recovery and the efficiency of labor. Many oil and gas companies create divisions that explore the possibilities of alternative energy. According to experts ' forecasts, a scenario is possible in which oil and gas companies are gradually transformed into large producers of electricity based on solar and wind energy.

The atlas of new professions and competencies of the oil and gas industry of the Republic of Kazakhstan combined the assessments and positions of leading industry experts in Kazakhstan and allowed to prepare a list of new professions in the industry for the period 2030-2035.

Industry experts highlight the- There are several major trends that are changing the oil and gas industry. First, the industry is actively integrating into the new digital economy: remote management methods are being created, implemented by-telemetry and telemechanics are used. Fewer and fewer specialists will remain in the fields and more and more of them will be concentrated in remote control centers. Secondly, oil companies are trying to make production more friendly in relation to natural resources. Companies are developing new fields and types of resources, looking for new technological solutions, including automated and robotic exploration systems, remote methods of oil production and management. Equipment is being created that reduces emissions and allows the rational use of resources. Environmental requirements for mining and environmental protection during transportation of minerals are increasing. Third, more and more attention are paid to methods of increasing oil recovery through the use of methods: reverse gas injection, steam injection, irex microbiological technology, etc. In addition to the development of specialists in the oil and gas sector, specialists will be required to develop the production and scientific infrastructure of the oil and gas industry. Experts suggest actively developing new organizational forms in the industry: R&D centers and regional service centers. Oil production centers will become a catalyst for the development of service and repair enterprises and outsourcing of narrowly focused types of work.

On their basis, a new generation of service enterprises will be created, integrated with oil-producing companies on the basis of "digital" platforms, a new direction in chemistry and materials science will be developed – the study of anti - corrosion protection methods and the creation of new synthetic materials to increase the corrosion resistance of oil and gas equipment. Specialized service companies will provide innovation of working equipment and anti-corrosion protection of equipment.

Gas-Powered vehicles and electric cars will change the picture of transport in the city, gas stations and electric filling stations will replace gas stations. Oil refineries are reorienting their product line from the production of fuel for cars to new types of petroleum products: Euro-10, aviation kerosene and other products.

Digital technologies will support all the processes of the oil and gas industry: from drone-based exploration and digital information processing, to "smart" and unpopulated fields. Remote control technologies, field modeling, “smart” sensors, large data processing and the construction of digital twins will be introduced.

All this will be possible thanks to new specialists with knowledge in the field of technologies of the oil and gas industry and IT. based on the results of the survey of experts and after discussion at the foresight session, industry experts developed and proposed new professions that will appear on the labor market in the oil and gas industry in the next 10-15 years. 35 new professions are proposed, which are grouped into 6 groups, because they solve similar problems. it should be noted that every oilman will have a high level of digital literacy.

Oil processing opens up great opportunities for specialists of chemical technologists of a new generation: nano-chemistry, computer chemistry, technologists-innovators. the competencies of new specialists in the field of investment, acceleration of innovation, standardization, and management of enterprises in the context of rapid changes will be required the foresight methodology used in the development of the atlas of new professions made it possible to determine the year of the expected appearance of professions and educational institutions (university or college) in which, according to industry experts, their training may begin in the near future. orientation to new professions should go without losing the quality of training of existing specialists.

PRESENTED "THE ATLAS OF NEW PROFESSIONS AND COMPETENCES" ALLOWS YOU TO START WORK ON CREATING A LABOUR MARKET FOR FUTURE OIL AND GAS INDUSTRY, WHICH IS AS FOLLOWS::

- ***FUTURE OIL WORKERS CAN CHOOSE A PROFESSION AND DETERMINE THE SKILLS NEEDED FOR THE JOB;***
- ***EDUCATIONAL INSTITUTIONS RECEIVE A BASE FOR PREPARING NEW PROGRAMS AND PLANNING THE DEVELOPMENT OF THEIR OWN ORGANIZATION;***
- ***OIL AND GAS COMPANIES GET THE OPPORTUNITY TO CARRY OUT TRANSFORMATIONS TAKING INTO ACCOUNT THE PROJECTED NEW PROFESSIONS AND COMPETENCIES.***

THE PROJECT TEAM

10.

ARG Group

PROJECT RESEARCH TEAM

** The composition of the research team that performed work within the framework of the project "Atlas of new professions and competencies of the oil and gas industry of the Republic of Kazakhstan"*

1. Metzik O. I.	Project Manager
2. Petrenko E. S.	Deputy head of project
3. Sudakov D.	International expert (1)
4. Pritvorova T.P.	International expert (2)
5. Dyakov A.V.	International expert (3)
6. Vechkinzova E. A.	International expert (4)
7. Tattibekov S. M.	International expert (5)
8. Tokanov A. B.	International expert (6)
9. Baymurzin A. M.	International expert (7)
10. Kim V. M.	Junior expert (1)
11. Adaev B. M.	Junior expert (2)
12. Talycin A. V.	Junior expert (3)
13. Baymagambetov A. A.	Junior expert (4)
14. Sabitov A.	Junior expert (5)
15. . Ybrai M. A.	Junior expert (6)
16. Sagatov Y. T.	Analyst
17. Rakhmet A. A.	Analyst

A LIST OF INDUSTRY EXPERTS ATTENDED THE FORESIGHT SESSION THE OIL AND GAS INDUSTRY OF KAZAKHSTAN

11.

TEAM
OF INDUSTRY EXPERTS OF THE ATLAS OF OIL AND GAS INDUSTRY

**List of industry experts who took an active part in the development of the Atlas of new professions and competencies of the oil and gas industry of the Republic of Kazakhstan.*

1. Bayramov Emil
2. Hazlett Randy
3. Moraru Mircea
4. AbezhanovElaman
5. Adilov Asan
6. Ajdarova Saule
7. Akkajsieva Ajzada
8. Akchulakov Bolat
9. Amanbaj Chalak
10. Amangaleev Serik
11. Askar Munara
12. Aubekerova Gulsagiya
13. Ahmetov Nurken
14. Ahmurzina Lyazzat
15. Ahymbaeva Bibinur
16. Ashikova Almagul'
17. BajgutdenovaZhanar
18. Bajmaganbetova Gul'mira
19. Bakenova Zarina
20. Bakytkyzy Gakku
21. Bekniyazov Yermek
22. Beysenova Zauresh
23. Bisenkulov Rizuan
24. Dajrov Zhasulan
25. Dollin Dauren
26. Eleusinov Marat

27. Zaksylykov Bauyrzhan
28. Zhanet Dinara
29. Zhilkishiev Malik
30. Iskakova Altynhan
31. Kaliev Sultan
32. Kamesheva Saltanat
33. Karasaj Zharkyn
34. Karashev Talgat
35. Karimov Satzhan
36. Kenzhegalieva Akbobek
37. Keshubaev Galiausat
38. Klimov Pavel
39. Kojshigariev Sisembe
40. Koptleev Ermek
41. Kuatov Marat
42. Kuatov Ruslan
43. Kuzembaeva Karlygash
44. Kul'batyrov Karshyga
45. Kuralhanov Darhan
46. Kazembekova Laura
47. Kusainova Ajman
48. Musenova Gul'zhan
49. Magauov Aset
50. Matikov Bekzat
51. Mendibaj Ykylas
52. Meraliev Saduohas
53. Mordovec Marina
54. Mukashkereeva Zhanargul'
55. Munbaev Murat
56. Murzagaliev Shakirzhan
57. Najzabaeva Raushan
58. Nugmanov YAkub
59. Nurgalieva ZHanar
60. Nygmetov Erkin
61. Orazova Gulzhan
62. Pyhanova Klara
63. Rabaj Yaromir
64. Rahmetov Zhanibek
65. 65.Rusnak Vladislav
66. Russaeva Ajnur
67. Sadigulova Ajgul'
68. Sargaliev Gaziz
69. Sveshnikov Andrej
70. Sergeevs YAkobs
71. Soltybekov Dastan
72. Sultanov Bauken
73. Syzdykov Askar
74. Syzdykov Murat
75. Tashimov Diyas
76. Telekusov Oryngali
77. Toksambaev Ordaly
78. Tret'yakova Yuliya
79. Turlan Medina
80. Turligalieva Ajgul'
81. Ujsimbaeva Gul'zhan
82. Ufimceva Ekaterina
83. Shajmerdenov Temirlan
84. Shakulikova Gul'zada
85. Sheraliev Mejrzhan

INDUSTRY EXPERTS REPRESENTED THE FOLLOWING COMPANIES

- APEC PetroTechnic Higher College
- Association "KAZENERGY"
- Atyrau Oil and Gas University
- Atyrau Polytechnic College
- Baker Hughes Company
- Chevron
- Edil-Oral.kz LLP
- Embamunaigas
- Engineering Company "KazGiproNefteTrans"
- Karachaganak Petroleum Operating BV
- Kazakh-British Technical University
- Kazakhstan Petrochemical Industries Inc. LLP
- Kazpetrol group
- KazTransGas JSC
- Kazakh Institute of Oil and Gas JSC
- KazTransOil
- KMG Engineering LLP
- KMG International N.V.
- Ministry of Energy of the Republic of Kazakhstan
- NC KazMunayGas JSC

- NCOC North Caspian Operating Company
- NMSC Kazmortransflot“ LLP
- Ozenmunaygaz
- Pavlodar Petrochemical Plant LLP
- Petrocouncil.kz
- PetroRetail
- PSA LLP
- Public Association "Kazakhstan Society of Petroleum Geologists"
- ROO "Union of veterans of the oil and gas complex»
- Satbayev University
- School of Mining and Geosciences - Nazarbayev University
- Shell Kazakhstan Development BV
- Tengizchevroil LLP

THE PROJECT PARTNERS:

МИНИСТЕРСТВО ЭНЕРГЕТИКИ
РЕСПУБЛИКИ КАЗАХСТАН

KAZENERGY

ERG

BTS·Education

ARG Group