

Escaping the Perfect Storm

Digitalization of Oil and Gas Production Asset as a Way Out of the ‘Perfect Storm’

What Steps Can Be Taken Now?

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The situation in which Russian oil and gas companies have been since spring 2020 can be defined as a ‘perfect storm’. The ‘perfect storm’ means a situation that has occurred due to a combination of unfavorable factors, when their total negative effect significantly increases. The situation on the oil market today cannot even be compared with any other period; the current sharp drop in demand for products did not take place even in 2008. While the experts predict market stabilization by the second half of 2020 – early 2021, the enterprises are trying to find the answer to the same question: how to stay afloat, maintain liquidity and withstand the onslaught of the new challenges and risks. The issue of production optimization has been in the air for a long time and now it is time for most companies to deal with it. And first and foremost, to work with the existing uncertainties, misunderstandings and bottlenecks in production processes, which are getting more and more costly every day.

Getting Ready for the Storm

The impact of the crisis is felt by many. But even the crisis does not harm the business as much as incomplete or not accurate understanding of production situation. How do the existing processes interact, what is their efficiency? Economic ‘storms’ are inevitable, but they are easier for those who have had an up-to-date picture of what is happening in advance and have used the appropriate tools allowing to quickly select the optimal modes for reservoir development, operation of wells, gathering systems and technological trains.

At the ITPS Group of Companies, we have been actively worked over 15 years at the oil and gas market, including in the world’s major fields, and have many times observed how once unprofitable enterprises achieved impressive business effects , starting with an objective assessment of available resources and a clear understanding of the current and target condition. All this can be done now, by quickly taking control of the situation, so as not to be held hostage by the circumstances in the future, but to be able to choose technologies and management methods for further development.

Based on our practical experience, we have identified the first priority steps that can significantly help a business, and what’s most important – quickly. They are: correct setting of tasks, consolidation of production data in a unified information environment and provision of effective management of key processes based on a modern digital platform. The expected effect can be manifested in an increase in productivity indicators by 5-15% and a significant cost reduction. The first results can be achieved in less than two months.

The Helping Hand

Historically, the key effects from the use of precise digital tools and techniques based on mathematical analysis, artificial intelligence and modern control algorithms were most obvious in the oil industry. It is a multifaceted and complex industry in which accuracy and correct interpretation of production data is a prerequisite for the economic success of an asset. Digitalization provides the oil and gas company unique competitive advantages, and the crisis that happened all of a sudden, proved that once again. The companies that have started building a new business model now feel much more confident, as they have

no blind spots and they can work with changes and risks. It goes without saying, that when the crisis is over, they will be even more ahead of competitors.

It is clear the Digital Field cannot be built in two months. The implementation of comprehensive digitalization roadmaps takes months and years of meticulous work and requires considerable investment. But this does not mean that the required performance parameters cannot be achieved in simpler ways. In order to ensure quick wins, it is necessary to correctly identify the areas for optimization, where the implementation of digital solutions can have a noticeable effect. Therefore, it is better to start with the so-called express survey of fields and production assets. This usually takes little time, but helps to understand exactly what steps the enterprise needs to take.

The survey allows solving many important production issues at once: get rid of the blind spots, outline the target results (including the percentage of reduction in capital and operating costs) that the company wants to achieve, set up plans for obtaining specific effects. But most importantly, the survey makes it possible to assess the state of existing systems and processes, identify key drivers for increasing efficiency and create a methodological basis for future transformations. The gathered information is used to define all further actions on consolidating production data, implementing monitoring, analytics and forecasting technologies, and creating the sources of accurate and reliable information. Further, an oil and gas producing asset can increase efficiency by making prompt management decisions based on accurate calculations performed via integrated model (IM).

Digital Twin

Practical evidence indicates that the use of integrated modeling technology offers significant economic effect at all stages of field development. Usually, the development of an IM of an oil and gas production asset takes place through several stages:

- development and creation of component models (deposit, well, reservoir, ground infrastructure) based on various specialized software products such as: Roxar, Schlumberger, Petroleum Experts, Rock Flow Dynamics, AVIST Oil & Gas, etc.;
- putting together a single integrated model;
- model adaptation and setup.

The ready-made solution will allow reproducing the current state of the asset and work through various scenarios for getting to the target condition. The ITPS portfolio includes a number of strategic projects in this area which include the development of Russia's largest integrated production model at the Yuzhno-Yagunskoye oil and gas field, covering more than 1,700 wells, as well as projects implemented at smaller assets.

The model can help to calculate the potentials of each asset separately and understand how the implementation of certain production operations will affect the entire system as a whole; both short and long-term. With its help, it is possible to evaluate wells operation, select optimal production regimes, reduce shortages, plan activities and thereby optimize operation of assets and start getting benefits from almost the first day of implementation.

The effect of modeling is especially noticeable at the fields with hard-to-recover reserves and specific conditions, for example, at gas-lift wells. At such facilities, it is often difficult to define optimal operation regimes and, therefore production plans. IM becomes a source of precise data for calculations, on the basis of which further asset management is performed.

In this case, all factors that directly or indirectly affect production efficiency are taken into account: reservoir performance, surface facilities operation regimes, pipeline throughput, etc. With proper use and constant provision of high-quality field data, the integrated model will become the main tool for getting forecasts for various scenarios, assessment of technological and economic efficiency of production solutions and monitoring of their implementation.

Operational Necessity

It is obvious that the implementation of IM at an oil and gas sector enterprise demands high labor costs, creating new infrastructure components, and training personnel to work with the solution. In order for the model to stay up-to-date, it is necessary to integrate it with production information systems, launch new business processes to update it and optimize production, transform production management approaches into integrated operations based on predictive models and real-time data.

We have developed a technology allowing to do this as quickly as possible. The idea is to use proprietary technologies to accelerate the development of models and automate production optimization processes based on models using the AVIST Oil & Gas platform provided as part of the service model (SaaS). In addition, the technical capabilities and competencies of the ITPS Group of Companies make it possible to quickly hook up the remote infrastructure facilities to the solution through wireless secure communication channels with round-the-clock availability, to ensure continuous monitoring of production parameters and, based on them, to ensure intelligent control of operation regimes of wells and technological lines based on AI algorithms. Equally important, most of the work on setting up the system (up to 95%) can be performed remotely.

Why is it better to use this solution to manage IM? The answer to the question lies in the history of its development. In 2014, while working at one of the foreign assets, ITPS experts faced some specific challenges. First of all, the process of updating integrated model with actual data is rather time consuming. Secondly, after the organizational structure optimization, the workload on personnel increased significantly. The licensed software limited the number of specialists working simultaneously. While one person was updating the model (this process took several days), no one else could perform calculations and review the results. What's more, the software interface was complex, and it was rather expensive to train staff working with it.

It should be noted, that specialized modeling software does not always offer visualization of calculation results in the form the user needs. It can also be problematic to combine information from different sources. In a word, at that time it was necessary to find a practical solution that would not only solve the problem of working with IM, but also take into account all the challenges mentioned above. In this regard, it was decided to develop a tool that was loyal to diverse production data coming from different sources, and multivendor software.

Today, the platform, which has been constantly evolving over the past six years, represents the embodiment of the ITPS's practical experience in the field of non-stop production. The solution provides direct uploading of production data from source systems into integrated model without distortion, bypassing intermediate steps. The upload happens automatically and requires the user's attention only for control. The measurements coming from wells go through validation. Typically, the validation process is based on mathematical principles; a value is recognized as corresponding to the specified standards if it falls within the range of specified values. The use of integrated model makes it possible to evaluate the measurements from the point of view of physics and to validate not one parameter, but a set of parameters at once.

The system can manage field installations, and monitor events. There is a model for improving business processes, and mechanisms for processing large arrays of data with the help of artificial intelligence. All this allows operating well stock quickly, efficiently and remotely.

Fighting the Perfect Storm

Digital control of industrial processes has many simple everyday analogies. The simplest example is a standard transmission of a car. You control the speed of the car, and in order to go faster or slower, you need to perform a set of sequential precise actions, which you do automatically. The clutch must be released smoothly: if you do it incorrectly – the engine dies. And there is also automatic transmission,

setting the required speed automatically, being the most optimal and economical choice at the moment. You can forget about the clutch pedal (there is no clutch pedal), and your car drives at the right speed all by itself and does not burn fuel in traffic jams in vain. It is not economical to drive standard transmission in the city; even conventionalists had to admit it eventually.

Digitalization is not only technologies and specific products; it is also the process of making consistent and carefully planned changes to the organizational structure of the company, including digital tools and their functions in production processes. Having this principle as a basis, you can continue to:

- make accurate calculations based on reliable data;
- try different operation regimes of wells and production lines;
- implement various models of business processes developed and tested by specialists of the leading oil companies;
- make forecasts, perform predictive management of the infrastructure condition;
- implement integrated plans combining the actions of various departments into a single manageable mechanism;
- automatically work with the choke model based on the integrated model calculations, perform calculations and analysis of potentials in 24/7 mode.

An integrated approach solves the problem of functional sink holes. We are talking about a situation when various departments are focused only on their own tasks, as a result of which there occur contradictions in plans with other and conflicts of activities. It is necessary to form multidisciplinary teams working in a single information environment with unified and correctly interpreted initial data. What's important, the unified operation of specialists in various areas provides team result and strengthens the moral environment in the company.

The steps described above will be enough to mobilize the resources of the company, use them as efficiently as possible and go through the perfect storm safely. No one knows how long it will be. The oil crisis of 1973 took six years. The current crisis is more diverse, it includes many industries. Its impact on some areas of economy immediately affects the other. When self-isolation is going to be over, the negative economic effect caused by it will remain for some time by inertia. During this period, we must work efficiently, we shall be setting priorities and allocating resources properly.