

# Prospects of supervising service development as the tool of input quality control

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**Abstract.** Supervising provides a foothold in the Russian Federation domestic market of oilfield services. Despite the rapid growth of supervising services market, there is still a definite demand in developing this domain. The authors consider the implementation of supervising in Russian oil and gas industry sector, as well as the possible execution paths of its improvement and development.

## 1. Introduction

Supervising has proved its efficiency in the oil and gas industry sector. It is obvious that the incoming quality monitoring of oil and gas well construction and repair activities has positively affected the performance of different service organizations. Therefore, one of the main trends in supervising development is transferring positive experience and its further implementation as a basic tool of incoming quality monitoring of contracting in other activity spheres and industry sectors. The authors suggest transferring existing successful supervising experience into the following spheres: core drilling in geological solid mineral exploration, design and construction of water supply wells, engineering surveys, implementing environmental plans. Legal gaps, lack of legal norms and regulations in the Russian Federation Standard Laws reveal the awkwardness and diversity of contract relation conditions, which, in its turn, in most cases results hindering difficulties and uncertainty in the organization of supervising service within the Russian Federation. This leads to the need in redeveloping existing legal regulatory to create a supervising market.

## 2. Research Methods

The research methods include the following: (1) method of abstraction, which involves the abstraction of the supervising service demand level on market in the Russian Federation oil and gas industry sector. The authors assume that supervising services are in demand on the Russian Federation oil and gas industry service market. (2) method of analogy, i.e. the authors project the main economic supervising mechanisms into various industries.

## 3. Introducing supervising into other activity spheres and production industries

Oil-gas well construction, design and construction of water supply wells, core drilling in geological solid mineral exploration and engineering surveys involve complex industrial process. The specific feature is that the basic technological operations are carried out under the conditions of final result uncertainty. This stipulates an extremely wide variety of working conditions and probabilistic nature of the factors due to the lack of reliable information on geological-mining and technical production conditions. The first production operation results could be accurate, however, further work performance may be distorted. Under the conditions of uncertainty, these issues could be solved by introducing supervising, as the basic tool of technical and technological quality monitoring of work performance. Thus, conceptual



similarity of the presented activity domains associated with the oil and gas well construction and repair embraces the fact that the production process itself could lack final result uncertainty and, this in itself, reveals the fact these processes are volatile indicating that operations accuracy production technology will be of fundamental importance and will be the main consolidating factor in the issues of implementing supervising into the other activity domains.

The set methods and goals in the water well construction, prospecting works in core drilling for solid minerals, as well as functional requirements in engineering survey are similar in content. In this case, there exist all the necessary prerequisites for introducing accumulated supervising experience in the oil and gas industry sector. This could be an effective management and monitoring tool. Supervising services are not regulated by the existing Civil Laws, and the provision of such services is based on the basic principle of contract freedom, which makes supervising more adaptive to any activity in compliance with the needs and desires of this or that customer. The supervisor provides external monitoring, while the motivated supervision involves honest execution of one's obligations through fines and penalties established by the contract relations and charged for performance non-identified shortcomings and defects of the contractor [1,2].

Supervising services are more essential when the supervisor is present throughout the work performance in order to monitor the process quality, and it is less effective if it involves only single one-time supervisory control. In this case, it is more difficult for the supervisor to "focus" the operation results on the object under supervision. For example, a serious challenge could be the reliability assessment of sample recovery values, the main indicator of geological information of subsurface structure during core drilling. This information could be cases of fraud and falsification of the core material. As drilling crew workers are focused only on the implementation of planned targets, i.e. core sample recovery at any price, the core material could be falsified in the following cases [3]:

- 1) slurry up-filling from the sump to the drilled core— slurry is composed not only of drilled out material from current footage, but also from borehole wall fragments over its entire length (the most frequent case);
- 2) adding core from the drilled wells into the core of the current footage;
- 3) falsification of coal or ore core- boring cylinders from matching materials on lathe machine.

Involving a supervisor in water well construction is obvious during the experimental pumping. This operation should also be carried out in compliance with the industrial standards, which state that the total duration of the pumping should be 1-2 days on each reduction after establishing permanent dynamic level for a given production rate. The duration of such an operation could be up to 3 months. Although this operation is characterized by a high automation level, still there are some cases of well test result falsification of the performing organization itself [4].

Without proper monitoring of engineering survey, the specialists relying on previous materials or indirect evidence could not be able to perform the necessary studies fully. For example, they can increase the distance between actual mine workings, which, in its turn, could lead to inevitable missing or mistaken contouring areas and further development of hazard geological processes. Other possible factors could be decrease of true vertical parametric well depth, gapping and/or no soil samples, inadequate identification of the engineering-geological elements and ground water level and etc. Contractors often use such approaches, especially if they have extensive prospecting experience and simultaneously try to adjust the findings on its face. In this case, the customer could receive unrepresentative or falsified survey results, which would certainly affect further performance on site [5].

In all above - mentioned cases of work performance result falsification the main task of the supervisor would be to improve the quality of the representative results. This would embrace an exclusively applied monitoring of any technology in accordance with the technical specifications and internal regulations of the customer during work performance. For example, a solid core bar is extracted from the core barrel during continuous fracture free solid rock drilling, which is composed of mineral grains embracing similar hardness and abrasion properties. In this case, reduction could be governed by such geological and technical factors as abrasion of ends and the diameter of combined core fragments during the rotation in the receiving core barrel, loose soil and sand rocks, ultra-soft and soluble minerals, dispersing fine particles in dense silty rocks, alternating thin layers of hard and soft rocks, sharp transition zones from solid rocks in soft formations. There could also be a feasible core output reduction up to 0% during karst massif drilling in case of cavities and voids or high ice content in soil (at room temperature soil volume "dries out" sometimes up to 60-70%). For each factor causing core destruction and further output reduction, the following drilling technologies were developed: decreasing rotation; shorter runs; dry run

(without drilling mud); applying double coring shells (inside a non-rotating tube); "salt" dense drilling muds at drilling, sealant packing of inner pipe and etc. These factors, influencing standard core recovery should be examined by the supervisor, who should first analyze and then properly follow the core drilling process, eliminating any cause-effect technology violations during production and exploration activities, as well as analyzing the recovered core or confirming its absence.

The main condition for the water well construction is its location. The location must comply with sanitary regulations, and should not be located in flood, landslide areas, near highways and past cattle burial grounds. These conditions are fundamental excluding possible aquifer contamination. Faulty detection of such violations could lead to aquifer contamination, even if exploited aquifers have not been drilled. Bad annulus plugging, resulting in poor aquifer overlapping, is a serious violation of the water well construction technology. Failure in annulus isolation technology could result in water flow between developed and non- developed aquifers. This gradually erodes the soil and increases gaps between the casing and the formation [6].

Since contaminated water can enter the developed formation, degrading water quality. The supervisor during work performance, could register above -mentioned facts and give a preliminary conclusion on the technical condition of the object, its location and accurate maintenance water well construction technology. Supervisor could confirm the fact of fixed pipe connections and lack of pipe clearance. There are cases of well casing without fixing and application of infringing materials. Contractors restore previous lifting equipment, by using pipes, filters, defective materials contrary to sanitary regulations. These facts can not be identified as labeling and/or accompanying documents are falsified, which, in its turn, hinders possible identification. Applying anti-falsification incoming control, the supervisor could not only improve the quality of construction, but also significantly reduce the risk of accidents.

Engineering survey results are influenced not only by technological factors but also such factors on-site infrastructure, geographic (landscape, climate, tectonic) and geological. These factors are probabilistic and directly dependent on the object under the study. These factors not only influence the engineering survey quality, but also the cost of such work, namely, production cost increase during the survey. Engineering survey executives quite often try to hide the fact that further implementation is not practical, in order to increase funding by increasing work volume and convincing the customer that there is no other existing option. Supervisor analyzes the primary survey results and suggests relative changes in the planned work program. This results in proving economic justification of for the expenditure and policy for implementation of each program phase.

At present, quality control of solid mineral core drilling, engineering survey and water well construction are mainly performed by the customer. Public authority expertise and technical supervision have definite results, but are still ineffective as the production process remains in the shadows. Supervisory authorities conduct only one-time inspection control, which could only reflect the present on-site situation. In this case, it is the customer who is more interested in the quality of performed work. Currently, supervision and control organizations are established by the customers, such as Internal Oversight Services, but again they are inefficient [7,8]. Internal quality control inspector does not always work autonomously as he/she is also dependent on the authorities who are often focused on the implementation of specific targets. This results in the concealment of the facts, deviations and violations committed during work performance. Such control is ineffective, as the inspector is subjected to outside pressure which, in its turn, excludes possible objectivity in assessing the quality of both the results and production process. This fact defines a certain need for accurate quality evaluation of the work performance independent of external control. These functions could be performed by supervisors in the sphere of oil and gas well construction and repair. Supervisor is motivated and highly-responsible for his/her performance which could be the key quality factor in rendering supervising services. It should be noted that the supervisor's report has an evident value in legal disputes confirming or denying the correctness of actions, as well as the order and the quality of work implementation.

#### 4. Conclusion

It is obvious that introducing supervising into solid minerals core drilling, water well construction and engineering survey domains is effective which is defined by anti-falsification control of work performance results, as well as the supervision and control proper production technology execution. This would not only improve the production control quality, but also proper performance of one's responsibilities. It has been proved that the most promising aspect would be the fact of increasing the work performance quality results in different industrial sectors.

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