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2014 IOP Conf. Ser.: Earth Environ. Sci. 21 012048

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Development of well construction and workover supervising in Russian Federation

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Abstract. Despite long history of drilling supervising it still has a number of uncertainties. The period of rapid rise in supervising development at the beginning of the 90's changed in the 2000's. The necessity in the development of this sphere is obvious. The author describes the history of supervising, period of its market condition adaptation. The research also gives principles methods of supervising development and first steps for its position improvement.

1. Introduction

Annual spending of Russian petroleum enterprises associated with well construction and workover are on average from 30 to 50 %. But despite the enormous investments some of the constructed objects are still characterized as non-acceptable, as they require minor and capital repair already at the initial stage of operation. [1] Consistently, this leads to the increase in existing wells steady operation maintenance expenditures. Thus, improving the quality of site facilities construction is directly related to the future reserve balance and, as a consequence, results in increasing of enterprises profitability. The main proven tool to improve the quality of drilling at service market is supervising. Despite the long history of RF supervising services, it still needs the development, namely, in the increasing of its efficiency [2,3].

2. Research Method

Historical and logical method. The article studies the processes in chronological order starting with the period of supervising initiation and its step by step development in Russian Federation petroleum sphere.

Scientific abstraction method. The research is based on the destruction from the volume of petroleum engineering facilities during investigating period. Thus the dynamics of attraction and demand of supervising service in time is not taken into account. The authors consider supervising service of well construction and workover as a required one on Russian Federation petroleum service market.

System approach method. Supervising is studied from the point of its types. The research characterizes principle differences of supervising services presented on Russian Federation petroleum service market. The supervising service is researched in whole as a variety complex.

Induction and deduction method. Authors in their article give a number of facts revealing the true situation of petroleum supervising in Russian Federation. These facts can be considered as a ground for assuming the necessity of supervising sphere development.



Positive and normative analysis. Taking into account the concrete evidences, the authors present their viewpoint and give the objective estimation of well construction and workover supervising position on Russian Federation petroleum service market. Future of supervising service is attempted to be forecasted on the base of determinants influencing the development of the sphere.

3. Domestic Drilling Supervising Development

Need to improve the quality of well construction is a constant factor that led to the creation of drilling contractors market through reorganization of production enterprises. Since the early 90's, during the switchover to market economy, individual entities providing services in facilities construction for mining industry have been generating on Russian petroleum market. Growing competition forced drilling contractors to increase the quality of work that resulted in the considerable growth of collaborative engagement. Contract based cooperation developed relationships between entrepreneurs and stakeholders. In this case, the counterparties were focused on the quality of works done by the contractor.

Work organization experience in the conditions of early market relations was insufficient as well as theory and practice was not prepared for radical changes [4]. As the case may be, the need to improve the quality of oil and gas facilities construction accidentally formed the new market service – supervising. Thus, the main economic problem concerning the improvement of facilities construction quality as well as fundamentals of industrial activity organization was solved. From the perspective of market relations built on a contractual basis, supervising was focused on the effectiveness of customer-contractor system interaction.

In course of time supervising improved its position in the domestic petroleum service market, this is supported by a numbers of annual turnover - 18 billion US dollars [5], but in the Russian legislation there is still no such a concept. In accordance with the Civil Code of the Russian Federation, the customer is entitled to realize control and supervision over the progress and quality of work, compliance with execution deadlines and quality of materials provided by the contractor [6]. For realizing the above mentioned, the customer, without contractor's agreement, may enter into a contract with a definite engineer or specialized organization for provision of equal services. [7]

Industry standards also require the customer to ensure the construction of hazardous production facility to realize control in order to manage the compliance of works with project documentation requirements, technical regulations, results of engineering surveying and requirements of urban land development plan. [8] Lack of standard rules and regulations of legal service rendering for supervisor organization creates uncertainty. Thus, legislation predetermined formation of supervising in the form of technical and technological control, which involves such activities as supervision in monitoring and detecting of nonconformance to technical standards, industrial safety rules and other legal acts regulating the construction of facilities. Supervisor is collecting information about the construction and sends it to the customer in a timely manner. In this case the supervisor does not interfere in the construction works, his authority is limited, and all operational decisions are made by the customer. Basic obligations of the supervisor are clearly set in the agreement.

Starting from the 2000's through the conjuncture of fast developing market, supervising began to change and adapt to the growing needs of customers. Under these conditions a new kind of supervision services emerged – construction management. Apart from technical and technological construction supervision, these services include process control which is intended to improve the quality of work and to reduce cost. Thus, management implies control and estimation of volume and quality of contractor's work. In this case supervisor in addition to basic obligations of technical and technological control can provide the customer with the suggestions of how to improve organization and increase the efficiency of contractor's work, as well as to analyze the actual condition of the object, give suggestions and comments. The supervisor can also perform detailed analysis of working time and coordinate working schedule, at this the customer can make a claim on idleness. Representatives of the supervisor are involved in production meetings and working schedule

coordinating. It should be noted that this form of supervising significantly reduces customer's burden, as part of the issues is managed without customer's participation.

Principal differences between the above mentioned forms of supervising can lead to confusion and misunderstanding during signing of Service Agreement. Often customers are trying to shift some of the obligations, not specified by the Agreement, to supervisors. [9] Sometimes, during tendering for the provision of services, supervision over the facilities construction in accordance with technical specification is noted in the customer's tender. Technical specifications set special tender for providing of services which correspond to the construction management. All participants of the economic process has their own visions of supervising services.

An Agreement should be made in terms of the tender documentation, so tender documentation provided by the customer is essential, namely, the draft of the Agreement. The terms of the Agreement after tendering procedure could be changed only in case of re-tendering, accompanied by a temporary loss of the resource. In tenders customer places his own requirements which can often be vague. Duties of the Agreement executives may not be clearly specified. It should also be noted that Russia has an extensive supervising market, but the modern trend, in contrast to the trends of the 90's, has led to the situation when customers are mostly guided now by the price, not the quality of rendered services. In this case, there can emerge such organizations which will agree with the tender terms regardless the value of the contract. The contractor can bear a risk of obligations fulfillment. Thus, market competition displaces supervisors that are not price competitive, but can provide services of better quality.

4. Extensive Development of Drilling Supervising in the Russian Federation

The experience obtained in technical and technological well construction, before shifting of the enterprises to market relations, positively reflected in the development of supervising in the early 90's. It is priori known that at the initial stage of supervising development, specialists in well drilling and construction, namely, leading engineers of that time fulfilled supervisor's obligations. At present, in the wage-rate book there is still no such position as "Supervising Engineer", but it is obvious that drilling supervising engineer is a specialist who has experience in drilling. So the reserve of knowledge, skills, and specialists in this field was enough for 15 years. However, even nowadays there is a shortage of professionals.

The situation is critical as in 5 years the current generation of supervisors will retire, but there must be someone who should replace them. The problem is – where to find specialists of next generation and if they be able to provide services without quality loss. The whole complex of factors and problems led to necessity of finding extensive methods of supervising development. Lack of trained specialists resulted in rapid development of large number of training centers, specialists' competence development programs and various supervising courses. In May 30th, 2008, firstly in Russia at Gubkin Russian State University of Oil and Gas, drilling supervisors got the certificates in additional education training program "Specialist in Technological Supervision and Control of Wells Construction Process (Drilling Supervisor)". A specialist, who has just graduated from university, is sure not be able to meet all the requirements of the employer as well as to fulfill all the obligations. Method of self development during continuous learning process is the most effective despite the fact that this is costly and risky. It should be also noted that the company would rather invite a professional than spend money and time for young specialists' training.

5. Intensive Development of Drilling Supervising in the Russian Federation

At the initial stage of supervising development, before the 2000's, attracting of the external service was profitable for the customer from the economic point of view. Fines and penalties charged to the contractor for violations identified by supervisors covered the losses and justified the risks associated with construction. The general tendency has led to the fact that the system supervisor - contractor started to be intended for the cutting of losses and risk prevention both from supervisor and the contractor. Supervisors timely reacted to possible deviations and irregularities in construction

technology facilities, and the contractor coordinated all his works with the supervisor as a legal representative of the customer under the terms and conditions of the Agreement. Ultimately, the supervising organization got profit and contractor performed his obligations set by the Agreement.

Since 2003 the situation has stabilized, the amount of fines reduced and customers has no longer seen the supervising as an object of investments, which in future can cover the costs of engaging a third-party service through penalties to the contractor or the service organization, in accordance with the terms and conditions of the Agreement. Thus, in the course of time, the common viewpoint to the attracting of the supervisor for facilities construction has changed. Supervising started to be considered as an obligatory spending aimed at control of the contractor's actions. Even the contractors refused to undertake working responsibilities without a legal representative of the customer in the face of the supervisor. At the same time, companies were always trying to optimize works and reduce their costs. This fact led to the development of supervising. Overall dynamics led to increasing in supervisors' responsibility and gross in the number of objects under supervision. As a rule, to organize supervising services, Contractor provides Customer with engineers based on the scheme including two interchangeable experts per one object [10].

Well construction process is a continuous process, therefore, supervisor must be constantly present at the facility realizing his obligations, but supervisor cannot be present in two or more places at once. Construction facilities have different geographical location, often at a considerable distance from each other. Such a process of working organization could certainly reduce service quality. Supervisor is certain to be guided by the priority, complexity and risk of technological deviations when planning supervision of a definite object. It is preferable if for example conductor drilling is realized at one object it means that constant presence of supervisor is not urgently required, so supervisor can shift his attention to more complex object where round-trip operations are performed. But processes can be of casual character and here arises a need to look for more intensive methods of supervising development, exactly - methods to improve efficiency of supervising. One of such methods is the implementing of engineering construction management system (hereinafter ECMS) that allows remote monitoring of key parameters of production process in real time. ECMS does not exclude the presence of a field supervisor at the facility, on the contrary, the system aims at the logistics of field service optimization and data gathering.

Under the conditions of the large number of work execution on different objects, senior supervisor must constantly make decisions on the appropriate allocation of field supervisors on the objects. To organize the logistics of field supervisors, senior supervisor must have working schedule and operation data of technological parameters for each object. Key process parameters at well workover such as the weight on the hook, weight on the bit, wrench torque moment, manifold pressure, liquid level in tanks allows for measurement of weight electronic indicator "GIV-1-E" (producer - ZAO "Prompribor", Ekaterinburg) by exchanging information with the computer or other device. Such remote monitoring allows senior supervisor to see the current process at the object in real time and forecast the possible working aspects for the nearest future, which, in its turn allows the prediction of critical or hazardous industrial operations requiring the presence of the field supervisor.

At well construction the presence of supervisor is essential, so the logistics aspect in this context is not relevant. In this case, supervisor has a task to optimize the process. It is mostly seen during construction of wells at great depths (over 4,000 m) in complex geological environment, with complex technological schemes, where customers are ready to cooperate with design institutions concerning changes in the design documentation in order to reduce construction costs [11]. For drilling process monitoring it is recommended to implement a system of drilling parameters control such as "IS MSRV" (Producer - ZOA "AMT" St. Petersburg), "TM-KUB» (Producer OOO "Tomskneftegazinzheniring" Tomsk), Rigsense (Producer MD Totco / National Oilwell Varco, USA). This system monitors the following drilling parameters: the weight on the hook, winch speed, the drilling mud pressure in manifold, the number of pump strokes, rotor speed, wrench torque moment, mud level in each tank, drilling mud parameters, and concentration of combustible gases. Through

remote monitoring data can be transferred to the supervisor, who can change the drilling process and predict accidents basing on the data obtained,.

In addition to monitoring of the production parameters there exist an opportunity to install devices for recording manufacturing operations at the facility. Supervisor can not only perform the control over the machines and sensors but also manage the workers.

Besides, ECMS indirectly completes the task in gathering information that helps the supervisor in regular reporting. At rational organization of information flows of Customer and Supervisor internal divisions, complete and timely provision of all geological and technical information can be achieved. Information flows should be based on the source of communication control system parameters, the means of communication and means of information processing - application software on the results of which, strategic decisions are taken. So, operational control can be performed by all involved production units. Results of this control are: cost reduction and cost optimization for facility construction, time reduction for construction, longer service life of materials and equipment, intangible benefits implies productive cooperation with project organizations on a number of issues.

6. Conclusion

Supervising as a sphere of activity emerged spontaneously due to the market demand in the effective tool to improve the quality of drilling. In this case supervising should be enshrined in law. Issuing of normative legal documents will help to eliminate the uncertainty and create a common vision of providing Supervision services. Supervising period is characterized by its extensive growth in the 1990's, when supervising was considered as an investment project, where customer can benefit from penalties and claims assessed on supervisor or contractor and the stage of stagnation in the 2000's. The last stage of supervising is characterized by losses, personnel turnover, the growing of service companies' responsibility. So the main extensive method of supervising development under these circumstances can be regarded as a process of teaching and developing of expert staff in terms of best practices exchange with professionals. To the intensive methods the development of engineering constructions monitoring systems can be also referred. The experience obtained in the 1990's allows supervising to exist, but not to develop. So, only the combination of methods applied can give a start for the future of supervising.

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