

Management of pilot IT projects in the preparation of energy resources

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Abstract. The article examines high-risk objects in which it is necessary to monitor its state to prevent hazardous activities during the cycle of preparation of energy resources. The paper examines IT projects that help to if not prevent, then at least minimize the consequences of the negative impact of hazardous industries in process of preparation of energy resources. Due to the fact that currently, there are no uniform and specific requirements for the functionality of such information systems in public services, companies are implementing pilot projects for the implementation of the above tasks. All stages of the pilot project were formed and analyzed in detail. Based on the survey results, the requirements for the functional blocks of the information system were determined. The findings of the study were formed and presented for further use for the project management activities for the company in the oil and gas industry. Implementation of the project in pilot format is the most suitable option in the current conditions. This allows minimizing project risks associated with exceeding the deadlines, budget, as well as inconsistencies of current functionality with the needs of system users by ensuring the possibility of developing and testing the system in a short time and clarifying the future direction of IT solution refinement.

1 Introduction

One of the most significant problems that arises during the operation of hazardous production facilities in the oil and gas industry is the high probability of emergencies and industrial safety incidents. Accidents and technical incidents from time to time occur in the zone of location of such enterprises, and especially of pipelines transporting oil, which entail serious environmental pollution as the critical impact [1].

This problem did not appear today and there are already a large number of technologies that can, if not prevent, and then at least minimize the consequences of these incidents. At present, the so-called ecological directed automated control systems are used at the enterprises of the oil and gas industry.

Automated hazardous energy objects management systems have a clearly defined functional aspect, consisting in four stages:

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- identification of specific types of production activities that have or may have a negative impact on the environment;
- assessment of the nature of the impact of a hazardous production facility;
- determining the level of negative impact;
- assessment of the importance of certain environmental aspects, emergency of accidents for the enterprise itself.

Over the past years, the Russian Federal Service for Environmental, Technological and Nuclear Supervision (Rostekhnadzor), with the support of the companies of the fuel and energy complex, has been actively developing and planning to introduce a set of measures to improve the quality of security at hazardous production facilities of Russian energy companies. This set of measures includes the development of the draft Federal Law "On Amendments to the Federal Law" On the Industrial Safety of Hazardous Production Facilities "[2]. A direct consequence of these requirements is to secure the obligation to ensure continuous monitoring of the state of production facilities of hazard classes I and II. Requirements It is planned to organize the mandatory implementation of operational control information systems for the state of hazardous production facilities about all companies of the Fuel and Energy Complex. It is also necessary to organize a common information space between the industrial and environmental safety services of energy companies and the State services of Rostekhnadzor.

To accomplish the task, in 2017 a part of large companies of the fuel and energy complex (FEC) are included in the implementation of remote monitoring systems for hazardous production facilities (HIF). In addition, a number of pilot projects were initiated to test the operational control approach for the list of key GCOs. Taking into account the fact that currently there are no uniform and specific requirements for the functionality of such information systems in public services, the fuel and energy complex companies, through the implementation of pilot projects, solve a number of tasks:

- Contribute to the formation of requirements for the mandatory functionality of these information systems in other companies;
- Check the completeness of the equipment of HIFs with the sensors necessary for the implementation of operational monitoring of the state of objects;
- Testing the capacity and adequacy of infrastructure capacity to ensure the correct operation of the information complex.

Another important aspect is the possibility of developing and planning a project to ensure the information security of transmitting real-time data to subordinate state services. This is necessary because the possibility of online control should be provided for all interested parties - companies and government agencies for industrial safety.

This article describes one of such projects approbation of the implementation of the remote monitoring system of energy industrial safety of an oil producing enterprise. This project is planned to control large hazardous production facilities related to the development of hydrocarbon resources on the continental shelf. In oil-producing companies, particular attention is paid to such objects. These objects have a very high impact of incidents of industrial safety. The objectives of the project include:

- introduction of a system for remote monitoring of industrial safety at a high risk facility;
- assessment of the possibility of introducing a similar software system at other high-risk facilities of the company;
- the ability to assess and define mandatory requirements for monitoring the state of facilities for further inclusion at the level of government regulation.
- the ability to provide preventive measures to reduce the likelihood of incidents at the facility and assess the risk of such incidents.

2 Materials and Methods

The evaluation of the implementation of pilot projects is based on the definition of the concept of a pilot project. A pilot project is a non-durable and non-scale project designed to test the viability of a unique proposed solution to the problem [3]. The pilot project identifies potential factors that may affect the process and the result of the implementation of a full-fledged project for the implementation of an IT solution.

The approach of the pilot IT-project management for the implementation of the system of remote monitoring of industrial safety of objects, used in the performance of the presented work, is based on the methodology adopted in the energy company to manage the implementation of these kind of investment projects. This method is based on the project management methodology PMI PMBoK (Project Management Body of Knowledge), and adapted to the company's standards and procedures. PMBOK Guide is a set of knowledge on project management, containing the amount of professional knowledge to successfully achieve the goals in the implementation of projects in various fields. The purpose of the PMBOK Guide is to highlight the best practices part of the project management body of knowledge. The standard contains both widely used traditional practices, and recently appeared, but already proved as highly effective approaches to the solution of problems of management.

The process of implementation of it projects in the company consists of a sequence of stages shown in Fig. 1.

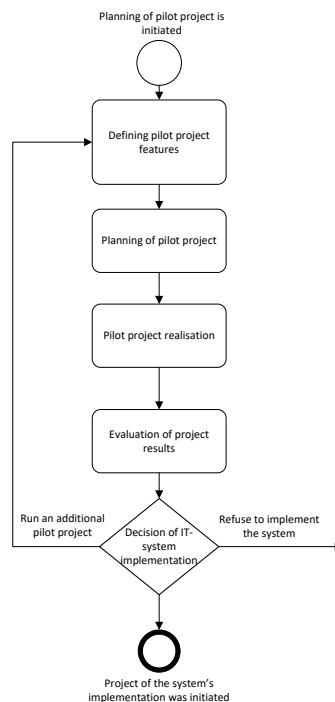


Fig. 1. The procedure for the overall implementation of the pilot project.

The pilot IT project is an effective solution for innovative and high-tech projects with a high degree of uncertainty of the result, ways to achieve it. It helps to simulate the main project, predict and more precisely plan its implementation.

In general, the pilot project has many characteristics of standard projects for the implementation or development of IT solutions. However, the pilot project has the following advantages:

- the ability to confirm the generated results at the stages of assessment and selection;
- determination of the real possibility of adaptation of the existing boxed IT solution or the use of a new technology to solve the problems of a business customer;
- deciding on the possibilities and feasibility of automating the business processes affected by the system, or determining the need for process optimization and other organizational changes;
- obtaining information that will help to more accurately plan the implementation stages of the implementation project;
- planning an approach to service support for this solution;

The failure of the pilot project allows you to avoid more significant failures in the future, since it does not require the acquisition of a large number of licenses and training a wide range of users.

The implementation of a pilot project may require the allocation of unplanned resources, the involvement of key personnel and the correction of plans and budget. In addition, pilot projects require special attention, since the main goal of the pilot project is to prepare for the application of new processes and new tools in real projects [4,5].

On average, the duration of the pilot projects is from 4 to 6 months. The timing variation depends on the preparedness of the project team for the implementation of the pilot project, the ability to attract users of the system at the training stage and pilot tests. In addition, the degree of qualification for the affected task of the involved employees from both the customer and the contractor (contracting organization) is important [6]. The criticality of the excerpts of the planned implementation period of pilot projects is high for management (they are interested in determining the results of projects) and for the project team on the part of the customer (they are interested in high-quality preparation of resources and planning the IT budget of the project) [7].

As part of managing the implementation of a pilot project, the main activities are planning for the implementation of key project results, a clear definition of goals, timelines and budget for the project [8]. Accordingly, the goal of the project is the introduction of a remote control and monitoring system for the hazardous production facility of the oil producing enterprise. Taking into account the high risk of an immediate entry into force of changes in legislation regulating work with hazardous production facilities, the implementation of a pilot project is scheduled for one year from the start [9]. Among the key project results are highlighted and implemented:

- conducting a survey of the subject area associated with this hazardous production facility - a survey of the business processes affected by the project, identifying stakeholders and target users of the IT solution, determining high-level requirements for the functionality of the information system and the current level of automation at the energy industrial facility;
- performing an examination of the current state of the infrastructure equipment and determining the need for completing the implementation of a targeted IT solution at the selected facility;
- conducting market research and selection of a packaged IT solution for the implementation of functional requirements for an IT system;
- implementation and adaptation of the selected solution for the particularities of the automated production facility;
- conducting pilot tests of the adapted information system in real production conditions;

- examination of the developed solution and determination of the volume of necessary modifications for further replication of the IC to other hazardous production facilities of the company.

The implementation of the pilot project began with detailed planning of the project as a whole, which is reflected in the format of the project management plan. Pilot project management plan includes [10]:

- objectives and expected results of the project: correspond to the goals at the planning stage (pre-project works);
- project limitations: the available temporary, cost and technical limitations of the project are formulated;
- roadmap: includes list and deadlines for project completion
- project risks: it is a critical point for a pilot project, a list of risks is generated with a description, prioritization and risk response measures;
- quality control plan: determines the list of activities at each stage with the formation of a matrix of quality control by the project team members;
- organizational structure of the project: description of the composition of the project team and the distribution of roles within the project;
- management of communications in the project; formalization of approaches to the interaction of project team members for the successful implementation of work;
- project risk management: describes the approach to dealing with risks in the process of project implementation [11];
- list of tasks of the pilot project: a complete list of the work performed at each stage of the pilot project with the definition of the duration and attracted resources is described.

In the course of the next stage of the pilot project - domain surveys, key users of the target IT system were identified. The key users are regional specialists to ensure and solve security problems at a hazardous production facility, employees of the unified energy industrial and environmental safety service of the company, who initiate measures to eliminate incidents and incidents of industrial safety, as well as experts from government services.

The survey also determined the requirements for the functional units of the information system [12]:

- ensuring the possibility of centralized monitoring of the process in real time, storing information about deviations of parameters from the normal operation of a hazardous production facility;
- automatic recognition of events potentially leading to the development of emergency situations at the time of their occurrence;
- presentation of information on the operational situation in the field of industrial safety, on the results of analytical processing in graphical form;
- implementation of accident risk assessment algorithms;
- automated generation and transfer of operational information on indicators of the state of industrial safety and formalized reports to subordinate state control services.

At the next project step, an assessment was made of the technical equipment and infrastructure of the automation object.

According to the results of this assessment were confirmed [13]:

- a sufficient level of equipment with telemetry systems,
- compliance with the bandwidth of information transmission channels with the requirements and power,
- availability of accumulated information on the operation of the production facility in databases for the formation in the system of an analytical tool of a statistical assessment of the risks of pre-emergency situations.

The next stage is to carry out market research of relevant IT solutions and search for developers to adapt the system. During this stage, the focus was on solutions from Russian vendors due to the specifics of the subject area and the requirements of the legislation on import substitution of foreign IT solutions [14]. As a result of the search, a solution was chosen from a company that implements solutions for ensuring online monitoring of the industrial safety process in other fuel and energy companies.

At the current stage of the project implementation, a regular intermediate control check of the adapted IT solution is carried out for compliance with the formed functional and technical requirements for the system, as well as testing the performance of this solution in actual production conditions as part of the pilot testing phase [15].

Thus, upon completion of this pilot project, a comprehensive assessment of the results of the pilot project is planned, determining the possibility of replicating the IT solution to other company facilities, determining the functional scope of the system, which is recommended to be included when implementing remote monitoring systems in other companies [16].

3 Results

The results of the work at the stages of the pilot project carried out a survey of the processes of preparation of energy resources in the company, defined the boundaries of the system, selected a standard solution for the implementation and adaptation to the processes of the company, started the stage of industrial testing of its solutions. Accordingly, an obtained by the authors the scientific result of the work is the development and adoption of IT-project management methodology the energetic company is used for managing pilot IT-projects that are not typical for realization process used in the company.

In the course of the work at the stages of the pilot project, a list of lessons learned was determined, which are recommended to be used in the process of testing the pilot solution:

- selection of a pilot automation facility should be a high-risk hazardous facility, the automation of control over which will allow to achieve an increase in the efficiency of the process;
- the pre-project stage should be highlighted as a mandatory stage, at which a detailed survey and justification of the pilot project should be carried out;
- confirmation by the business customer of the correctness of the calculation algorithms implemented in the system (for example, the risks of emergency situations);
- adaptation of the pilot solution to the current process in the company;
- approval of the minimum list of documentation for the development of a pilot decision from the start of the project, in which all design decisions are recorded and agreed by the authorized persons.

4 Discussion

The key challenge in the implementation of the described project initiation stage was a high degree of uncertainty and risks of the implementation of the information system implementation project, taking into account the limited experience of implementing remote monitoring systems for hazardous production facilities for preparing energy resources. Taking into account the highlighted problems, it was proposed to carry out a pilot project that would reduce the risk of the cost of a larger IT solution. The main results of the described work are:

- ability to make a balanced and reasonable decision on further scaling of the implemented IT monitoring solution to ensure control over other production facilities of the company;

- develop an approach for long-term start-up and management of high-risk investment it projects, not previously used in the company to manage projects for the implementation of information systems.

In continuation of the presented work, it is planned to work out the developed approach to the management of pilot it projects in other areas of the energy company's activities, as well as a detailed comparison of the proposed approach with the one applied to high-risk it projects in companies in other industries.

5 Conclusions

Thus, the findings obtained as a result of the work were formed and presented for further use for the activities of the project management of the company. Given the high degree of uncertainty in the requirements for an IT tool being developed from the point of view of one of the key stakeholders and users - government regulators - implementing the project in a pilot format is the most suitable option in the current conditions and allows minimizing project risks associated with overdue budget as well as inconsistencies of current functionality with the needs of users of the system due to the possibility of developing and testing the system in a short time and clarify the further direction of finalizing an IT solution.

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