Investment in the improvement of maintenance service efficiency of processing equipment of an industrial enterprise

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Abstract. The article considers the role of investments in the growth of profitability of large-scale production due to the high wear of processing equipment because of the long absence of major repairs. It evaluates the effectiveness of the organization of maintenance service of the processing equipment operated in the shop of a metallurgical plant. The cost of the services provided by a specialized organization is determined. The paper describes the procedure for the settlement of accounts and the conditions of acceptance of equipment after service in the current production conditions in the Far North. In the final part of the article the financial, organizational and economic results of the activities are presented.

1. Introduction
In the current economic situation, attracting the attention of investors is becoming increasingly difficult: national investment rating in crisis conditions is low, and at the federal level, national investors give the greatest preference to regions with the most developed infrastructure (Moscow and Moscow Region, St. Petersburg, Kaliningrad Region).

The priority sectors of investment are still mining and processing of minerals, metallurgy, construction, large-scale production, and innovations.

In the assessment of the effectiveness of an investment project, the degree of accuracy and reliability of financial information increases as its life cycle develops. At the initial stage of any project, it is advisable to carry out its rapid assessment [1-5]. It is especially important to assess the potential of investing at the stage of forming an idea and developing a preliminary technical and economic assessment (feasibility study) or business plan for a project. The expressed methods are based on the use of traditional cash flow discounting tools that are applied to eliminate economically inefficient projects from a large number of those considered by an investor, for example, in the case of a competitive tender or the implementation of a targeted program. Then an elementary comparative criterial evaluation of the indicators of the project under consideration, which are priority for the investor, is carried out. For deeper and more detailed analysis and development of a cash flow forecast for any project, both its author and investor can use investment design tools that simplify and speed up work, such as Prime Expert or Project Expert. If a project author is guided by information relating to forecasts in the investigated industry and can find the initial data applicable to the cost-recovery method, the preliminary financial calculation of the project will be fit to the requirements of an investor for discounted indicators [6-11].

It is worth noting that investment is the engine of small business development, large industrial enterprises and the national economy as a whole. Due to the fact that in the 1990s – 2000s, the
investments in the work of equipment of industrial enterprises were minimal, today there is a situation of reduced profitability of many industries. In turn, the investment in industrial enterprises can have a positive impact on the growth of their efficiency [6, 12-15]. Reducing unplanned downtime of equipment, production costs and improving the reliability of fixed assets of an industrial enterprise for a corps of engineering are among the most important tasks in production. In order to ensure the stable operation of the processing equipment of the workshop, the preparation of raw materials and the feed of the metallurgical plant, in 2010 the management decided to change the traditional system of maintenance service and repair of fixed production assets to the maintenance service of the equipment by the same specialized repair organization [1, 16-20].

2. Results and Discussion
To determine the starting point of the new relationship between a customer and a contractor, according to the expert data of the specialists of Norilsknickelremont enterprise, comprehensive activities were developed, within the framework of which the following works were performed during 2010:

- diagnostics of the actual state of the equipment;
- repair (restoration) of electric lighting of the workshop;
- repair (restoration) of process water supply systems for the winter period;
- repair (restoration) of the aspiration system;
- repair of accommodation premises;
- anticorrosive protection of metal structures of the building and equipment.

In addition, the motivation of service personnel is of no small importance [2, 21]. In this connection, certain changes were made to the regulation on the bonus payments for repairmen, which are presented in the table below.

Maintenance service includes a range of services for daily operation and maintenance, operational field adjustment, verification and calibration of measuring instruments, dosimetric monitoring of radiation sources that ensure reliable operation and technically good condition of the processing equipment of the workshop [3, 21-22].

The principle of mutual settlements between the contractor and the plant is as follows. The cost of services rendered is determined on the basis of the cost of the contractor service to ensure one hour of equipment operability and the cost of the contractor materials used in providing services at prices agreed with the plant [6].

### Table 1. Bonus payments for repairmen. Before and after changes in the regulation

| Before switching to the service | After switching to the service |
|-------------------------------|-------------------------------|
| Execution of the production program – 10 % | No emergency repairs due to fault of the site - 7% |
| Lack of claims - 10% | Compliance with the equipment maintenance and repair schedule - 8% |
| Utilization of planned estimates - 10% | Compliance with the requirements of the maintenance regulations - 8% |
| Safekeeping of property - 5% | Emergency shutdowns response activity - 5% |

The cost of services, subject to the maintenance time of the shop equipment in working condition in 2011, amounted to 122 million rubles excluding VAT. On the site for repair and maintenance of the raw materials preparation workshop, there were 106 people (6 engineers and 100 workers).

The actual fact that the equipment is in working condition is recorded in the register of the
time period for which the equipment, transferred for maintenance service is in working condition. The performance is referred to the state of fixed assets in which they can function in accordance with their purpose, with all their parameters being within the limits provided by the technical documentation.

The time for which the equipment is on standby is considered the time it is in good operating condition.

The time of excess maintenance of equipment carried out by the contractor fault is taken into account as the time when the equipment is inoperable.

The procedure for the calculation of the cost of maintenance services of fixed assets (the active part is equipment) is as follows:

- The contractor develops the list of equipment transferred to the maintenance service, and the plant approves it
- The service organization develops planned preventive repair schedules for the equipment, and the plant approves them
- The service organization develops costs for maintenance needs based on the actual condition of the equipment, including taking into account available results (reports) of the examinations of industrial safety (EIS) and approved by the PPR schedules, and the plant approves them.
- Based on the approved schedule, the service organization calculates the labor costs in labor hours required to fulfill the cost plan for repair and operational needs, taking into account the actual condition of the equipment.
- Based on the calculation of necessary labor costs, in labor hours, as well as on the basis of the approved schedule of PPR and the cost of one standard hour, the cost of the service of ensuring one hour of equipment operation is determined.
- The service organization prepares and submits for approval to the plant the following materials:
  a) the list of equipment transferred to the maintenance service;
  b) schedules of PPR equipment with the required labor costs in labor hours;
  c) the calculation of the cost of the equipment maintenance services (the cost of services of ensuring one hour of equipment operation).

The delivery-acceptance of services for maintenance of fixed assets is carried out monthly by authorized representatives of the plant with the drawing up of the corresponding act. The actual fact that the fixed assets (active part is equipment) are in working condition, which is accepted in the certificate of delivery and acceptance of work (services), is taken from the register of time spent by fixed assets (active part is equipment) transferred for maintenance service, in working condition [4]. To promptly replace failed equipment assemblies in the shop, an area was allocated for the organization of a preparatory production site by a service company (Figure 1).
Figure 1. Site of the assembly unit repair of equipment: 1 – rack stand for sheet metal; 2 – sharpening machine; 3 – workbench with vise; 4 – rack for assembling units; 5 – welding point; 6 – rack for restored units.

Over the period of maintenance service of the workshop equipment from 2011 to 2014, the number of contractors decreased to 94 people due to the increase in production efficiency and stable operation of the equipment (Figure 2).

Figure 3 shows the change in the cost of services rendered by the service organization for the period of 2011–2014 while maintaining stable operation of the main processing equipment of the shop of the metallurgical plant.

Figure 2. Change in the number of contractor’s personnel.  
Figure 3. Cost of service organization in 2011–2014.

As a result of the transition to maintenance service (Figure 4), the workflow during the processing of completed works decreased, the number of unplanned equipment stops decreased, the 24-hour duty of the operating personnel in the workshop was organized, with jointly developed measures to improve working conditions being implemented.
Figure 4. Workshop for preparation of raw materials of the metallurgical plant after the transition to the service maintenance of equipment.

3. Conclusion
From the point of view of financial results, the plant managed to reduce the shop maintenance expenses by the amount of the annual inflation component, while the service organization increased the level of wages of its employees by increasing production efficiency.

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