

1.13.13. RESOURCE-SAVING OPERATION OF HAZARDOUS ENTERPRISES BASED ON REAL-TIME CONDITION MONITORING

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The increase of labour productivity and an operational efficiency of production has a great importance in the economic crisis time because there are no reserves caused by a growth of prices for products and expansion of marketing outlets. The production efficiency is determined by profitability level as resumptive criterion of economic efficiency. In such conditions the organizational chart should be simplified and be formed along specific target fulfillment taking into consideration mobility of human resources, rise of level of self-control and standardization of processes. All that allows to accelerate the procedure of the mutual purposes adjustment in a chain of creation of values, since, only by disposing of the information about changes, management will be able to minimize situational losses of the company. Fundamental reasons of high expenses and losses are the bad observability, the straitened controllability and, as a result, low stability of production processes, that is stipulated for [1]: 1) the latent reason of origin and development of malfunctions in the equipment, and bad observability of real processes of degradation of the equipment during its life cycle; 2) difficulty of revealing of the latent errors of designing, installation and operation of technological plants and subjectivity in assessment of quality of units and their components during production, repair and in operation; 3) negative influence of “the human factor” together with inefficiency in control of actions of the staff on maintenance of working capacity of the equipment and conducting work-flow; 4) the low efficiency off-scheduled and the scheduled preventive maintenance. Real-Time Condition monitoring – observing over the process of change in a condition of the equipment for the purpose of warning staff about achievement of a limiting condition for the equipment on intervals of time indissolubly adjoining to each other during which the equipment condition essentially doesn't vary. The availability of interpretation “the reason (defect) – a consequence (parameter)” corresponds to condition monitoring, and absence of the interpretation is monitoring of parameters. Thus, the systems making only monitoring of parameters, requirement for such interpretation advances a high integrated error of those, do not ensure possibility to increase safety and operational efficiency of the equipment and production. On the contrary, monitoring systems of a condition of the equipment, having the installed an automatic expert system with almost zero error of diagnostics of a condition, are unique means of achievement of the purpose. Systems of complex monitoring COMPACS® are intended for maintenance safe resource-saving running of the equipment handling of dangerous industrial objects (DIO) by reception in real time of the operative information about last, current and predicted technical condition of equipment in DIO [2]. System COMPACS® realizes automatic planning of volumes and terms of the equipment repairing by formation lists of the equipment which is subject to planned and urgent repair with taking into consideration objective possibilities of existing repair infrastructure and current requirements of maintenance safety and stability of engineering procedure. Integration into the system COMPACS® majority of non-destructive testing methods allows to ensure complex condition monitoring of all equipment of the enterprise on a common hardware-software platform, that essentially reduces losses of the information and increases efficiency and objectivity of made decisions and actions on maintenance service and management of an equipment handling, and as ensures increase of safety and efficiency of operation by technological complexes as a whole, especially as

control under all processes, which are carried out within the framework of a control system safe recourse saving an equipment handling of technological complexes, is made by administration of the enterprise by means of diagnostic network Compacs®-Net in real time. In the aggregate with the problems, revealed from the analysis of safety in production, it is pointed out the presence of unmotivated factors, which price for refinery only on this plant, by the most conservative estimation, exceeds 155 thousand US dollars a year ($141 \text{ repair} \times \1100). It leads to a conclusion about necessity of updating system of motivation and the control at the enterprise, especially since the annual wages fund on the technological complex amounts less than 200 thousand US dollars. During first six months of equipment handling in the plant staff, being guided by system instructions, carried out equipment repair according to actual technical condition, on average repaired monthly 14 machines. There was increase in quantity of useful works in repair from 12 to 17 (Figure) since August 2005 till January 2006. It was conducted a maximum of useful repair work – 33 during the stop repair of the plant in December, 2005 – January, 2006. The analysis of databases of COMPACS shows that the basic quantity of useful repairs fall to the share of the repairs connected with bearings defects – 61%; 24 % of repairs are conducted because of defects in centering and balancing and 15% of repairs are connected with removal fastening defects. It allows to draw a conclusion about poor-quality repair of units (61%) and insufficient insistence of the staff from the plant at process of an acceptance of units, defects of installation on a technological item are 39% of repair. However the quantity of useful repairs had considerably decreased since February, that was connected with essential increase of labour efficiency on equipment maintenance service (a fig. 12). The quantity of works on maintenance service had increased with 30 to 59 from August, 2005 till January, 2006, that confirmed purposeful work of the staff in the plant at duly service of units according to instructions from the system COMPACS®. Monthly average level of maintenance service was stabilized and had averaged 57 works from February till July. As a result of increase in productivity of maintenance service almost twice, since January, it had occurred exponential reduction of repairs quantity to one in July, 2006, it means that the volume of repairs had decreased at bar of claim by

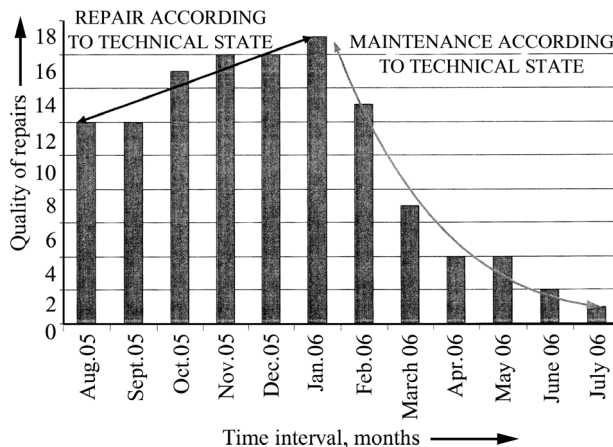


Fig. Useful repairs of units in the plant guided by system instructions

lapse of time with incidents and failures for 7 months in 17 times, that was essentially reflected in economy of a technological complex. Objectivity of estimations condition of production factors and tendencies of their interaction is ensured by stationary condition monitoring systems of the equipment with the integrated automatic expert system of support decision-making on the nearest urgent actions with the equipment are a principal basis of the new approach to the production management, basing on implementing of safe resource-saving business process for an equipment handling into system of industrial management. It allows to increase an operational production efficiency in connection with an exception of failures, increase the period of continuous work of technological complexes at simultaneous reduction of quantity and complexity of repairs. Condition monitoring of production factors in real time, ensuring almost zero error of diagnostics, makes objective knowledge duly and accessible for all levels of production management, so decisions – are adequate and constructive.

References:

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