

Model of Recovery Procedures System for Continuous Technological Processes

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Abstract. An expert system of recovery procedures for continuous technological processes has been developed. The organization of a flexible control system will significantly reduce losses during downtime of technological processes and improve the reputation of the enterprise. As practice shows, in the event of emergencies, losses from downtime of continuous technological processes that ensure the functioning of the enterprise can be several times higher than the cost of their failure. In order to minimize downtime we have created an expert system of recovery procedures of technological processes. The introduction of a flexible system of recovery procedures for technological processes of enterprises in conjunction with the basic requirements for the organization of continuity of technological processes and recovery after failures is recommended by standards such as ISO 17799, a set of standards ISO 9000, standard of the Bank of Russia STO BR IBBS-1.0, etc. it will significantly reduce the impact of emergency situations, minimize financial losses and improve the reputation of the enterprise. Moreover, it will help to place the right emphasis on vital indicators of technological processes for the enterprise, and the cost of creating and maintaining a flexible system can be considered as one of the necessary forms of guarantees of sustainable work. To create a flexible system of recovery procedures of technological processes, it is necessary to carry out such procedures as: identification and classification of technological processes, risk analysis.

1. Introduction

Technological process (TP), according to GOST R 12.3.047-98, is a part of the production process associated with actions aimed at changing the properties and (or) the state of substances and products circulating in the process. For example, the process of Assembly, disassembly (production process), or the provision of information services (information process).

During the design of a flexible system of recovery procedures for technological processes, an electronic sheet and a questionnaire for fixing equipment failures were developed, which allows them to be systematized and entered into the database for subsequent use in the system.

The main method of obtaining the necessary data for the identification of TP—expert, questionnaire survey of managers, rank and file and end users. Managers have a General picture of the functioning of the enterprise, ordinary service personnel can make adjustments to the performance of individual operations, and the survey of end users in turn will determine some external relations and process parameters [1].

2. Risk analysis

Analysis of information risks is an integral part of the plan for disaster recovery processes. There are several reasons for the failure of the technological process: natural, man-made, natural and man-made, as well as business, human. The last two types of interrupters have not received much attention before. But they include moving the company to another office, and the problems associated with the interaction with government agencies, and the lack of planning for the replacement of positions, and labor conflicts and other force majeure situations. Thus, the problem of ensuring the continuity of processes affects not only information technology, but also the entire production process as a whole [2].

3. Classification of technological processes

The classification of the identified technological processes is carried out according to two parameters: criticality and tolerance to downtime. Under the criticality of TP is understood the degree of importance of the resource for the information system, i.e. how much the implementation of the risk to the technological process will affect the functioning of the enterprise.

Four classes of technological processes are proposed (according to the classification of J. W. Toigo "Disaster Recovery Planning»):

Critical (Critical) – a process, the functionality of which can not be performed until you find identical resources that can be used instead of the lost. Critical processes cannot be replaced by manual methods under any circumstances. The tolerance to stop is very low and the cost of stopping is very high. Thus, for critical technological processes, the enterprise must take measures to have access to resources comparable to those normally used.

Vital(Vital) – technological processes whose functions cannot be performed manually or can be performed manually within a short period of time. They have a slightly higher tolerance for stopping and a slightly lower cost of downtime, provided that the features are restored within a certain time frame (usually four or five days). In technological processes, classified as vital, can be allowed a brief suspension of processing, but for the rapid restoration of the functioning of the technological process will require significant resources.

Sensitive (Sensitive) – technological processes can be provided with manual means for a long period of time, while the cost will not increase significantly. Sensitive technological processes, at the same time will require significant resources for operational recovery [3].

Non-critical (Noncritical) – technological processes can be interrupted for a long period of time, have a low or zero cost for the company, and will not require significant resources for operational recovery

Graphically, the dependence of the class of the process on the time and cost of downtime is shown in figure 1.

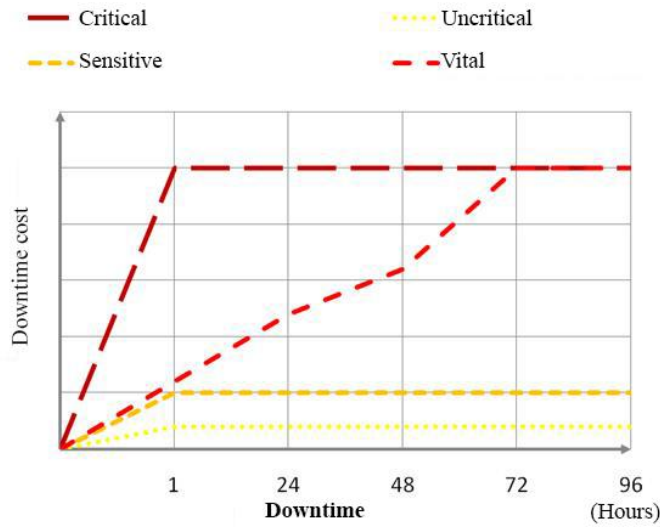


Figure 1. The dependence of the value of the loss of the object of the idle time of technological processes

4. Effective methods of obtaining information

The most effective methods of obtaining information, in our case, is to conduct a survey of end users of technological processes. Based on the identification carried out, the questions for the survey of users are formed very clearly. The wording of the question should be as follows: "What steps would the user take to perform the operation if the process resources were unavailable?". This formulation is necessary to reduce subjectivity in assessing the level of criticality of the process. The subjectivity of the assessment of the level of criticality of the technological process is usually manifested in the fact that the average user does not see the overall structure of the enterprise, in addition, most often the criticality of the process is estimated by the user based on the forces that he spends on maintaining this technological process, based on the "convenience" to perform their duties [4,5].

In connection with the expansion or curtailment of production, with the introduction of new technologies in the enterprise, new technological processes may arise, and existing ones may change their structure, resource base or be eliminated. Changes in continuous technological processes, in turn, lead to changes in the level of their criticality and tolerance. Accordingly, it is necessary to regularly update the technological processes [6].

After the classification, for each specific process should be carried out the following work:

- determination of key properties of information processed in the technological process;
- determination of the minimum idle time of the technological process;
- determination of the structure and resources of the technological process;
- the definition of the minimal composition of resources of the technological process;

First of all, the properties of information that must be stored, and what properties can be neglected in the operation of the process in emergency mode: (availability, integrity, confidentiality.)

The cost of stopping the technological process is determined on the basis of the actual cost of downtime, i.e. lost profits, wages of employees for the period of downtime, payment of overtime for employees when restoring the functioning of the technological process. You also need to take into account a possible decline in the reputation of the company.

After criticality and tolerance of the technological process it is necessary to determine the structure of the technological process - key nodes, direction and intensity of information flows, etc. it is also Necessary to determine on what resources the used hardware supporting the nodes of the technological process, maintenance personnel, links with other and external information flows [7].

5. Analysis of the resource base of technological processes

The criticality of the technological process extends to the supporting infrastructure. In most cases, it is necessary to identify infrastructure components, including power systems, air conditioning systems, communications (connections between the company premises and the location of the data provider or the Central office), and other resources necessary for the operation of the process. Without backups or manual controls, the loss of one subsystem may make it impossible to further restore the process.

In addition to basic infrastructure support, other components, including hardware, software, and networks, inherit their criticality based on the support they provide to a particular critical process.

A clear definition of the links of the process with resources and other technological processes will help to understand the sequence in which to carry out their recovery.

It is necessary to determine the minimum composition of resources necessary to maintain the emergency operation of the process and preserve the properties of the information processed in the process. It is necessary to take into account the possibility of recovery with a deficit of one and an excess of another resource. For example, it is possible to transfer part of the least critical technological processes to manual processing [8].

On the basis of the information provided, the recovery procedures of the technological process are determined. They should be very clearly spelled out the sequence of actions to restore the process, {it is desirable that all the main performers were understudies}. In addition, regular briefings and exercises should be conducted with the staff responsible for the restoration of the technological process. It is also necessary to run the system and on the basis of the results to make adjustments to the system and the definition of weak links.

6. Updating the flexible system of recovery procedures

Updating of the flexible system of recovery procedures for technological processes is carried out as changes are made to the technological process. To carry out these works, the most suitable cyclic model of Shewhart - Deming (PDCA Cycle), figure.2.

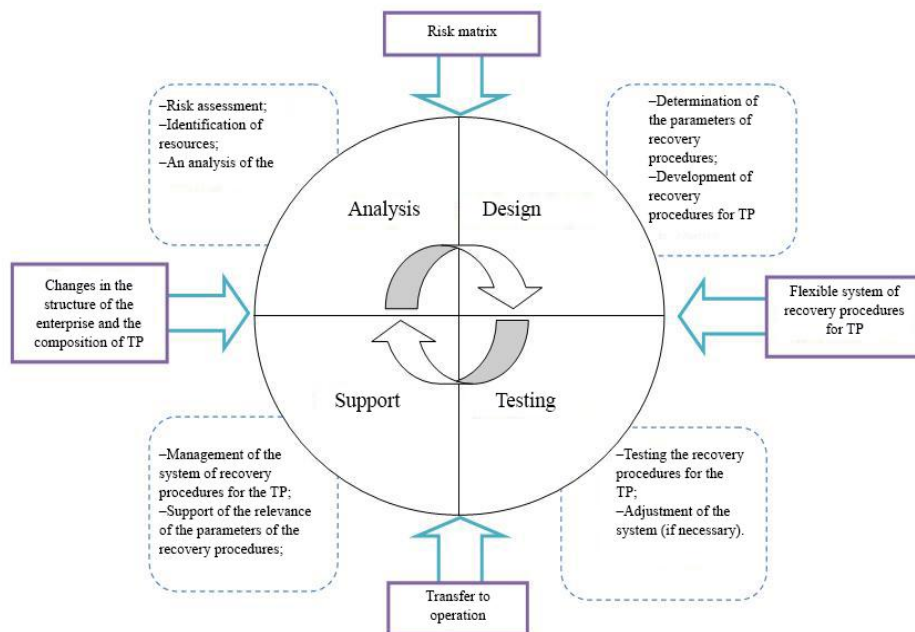


Figure 2. Shewhart – Deming model applied to the creation and maintenance of a flexible system of recovery procedures for technological processes.

The creation and subsequent maintenance of the expert system is a process that requires a lot of time and deep knowledge in the field of building secure systems [9,10].

It is possible to simplify the process of managing the expert system of recovery procedures of technological processes with the help of the developed algorithm presented in figure 3.

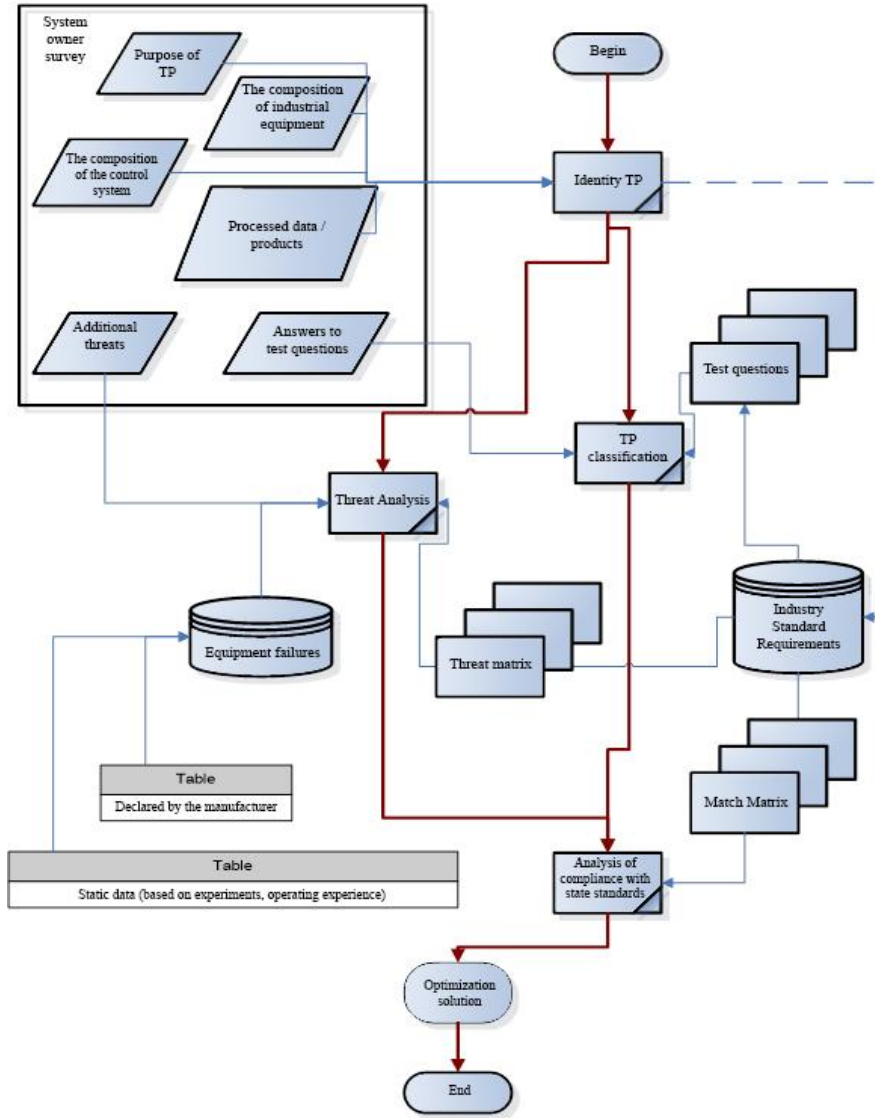


Figure 3. Algorithm of expert system of recovery procedures for technological processes.

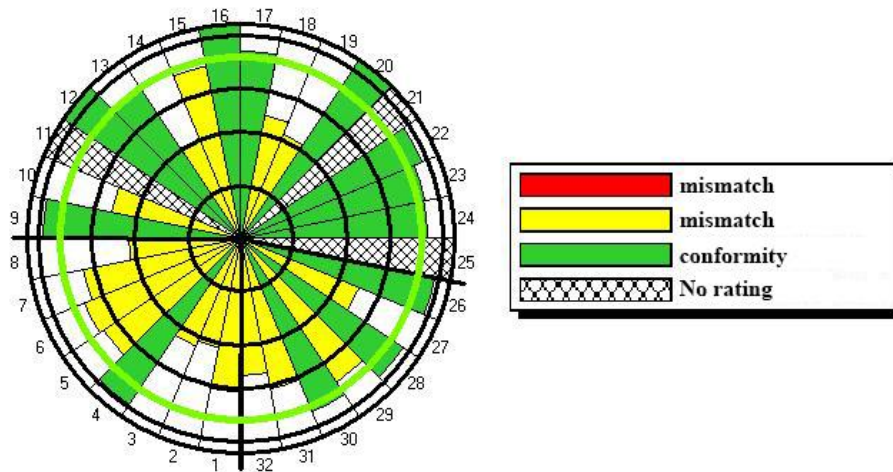


Figure 4. The results of the estimation of the group indicators.

An example of a graphical representation of the assessment of the functioning of the technological process is shown in figure 5. In this doughnut chart, the inner circles and sectors indicate levels of compliance with the Standards.

Conclusions

Thus, a universal algorithm of the expert system of recovery procedures of technological processes is developed. Both full and partial implementation of this algorithm is possible. The most demanding on time and knowledge in the field of standardization is the block of algorithm – classification of TP. Created and registered software, the implementation of which allows to assess the compliance of TP standard and industry requirements, greatly simplify and reduce the time the process of creating a flexible system of recovery procedures of continuous technological processes. As a result, it is possible to bring the compliance of individual TA and the whole enterprise to certain standards and forecast compliance in quantitative representation.

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