# MODELING OF TECHNOLOGICAL EQUIPMENT REPAIR SERVICES BAKERY USING PETRI NETS

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Uninterrupted work process equipment bakery company provides a continuous process of manufacturing products and as a result, coordinated operation of the enterprise as a whole. To prevent and minimize production downtime losses, which will result in the failure of at least one technological unit should consider the process of repairing bakery equipment support using simulation.

Repairs relationship to the process equipment include regulation mechanism, replacement of parts and components, restoration parts.

The current strategy of planned preventive maintenance repair service focuses on the prevalence operations to replace worn units. However, different terms of service similar parts and components reduce the effectiveness of the operation. Pryroblennya process that begins after the replacement of parts and components, leading to accelerated wear and redistribution of loads between the newly established and old parts. The result is not always clear, may cause a series of failures (especially in dull control) or reduce the life of details regarding the primary. Frequently unjustified replacement of parts lead to increased production costs, reducing time machines, increasing the risk of latent failures due to faulty installation. Increasing the time between replacements makes it possible to wear body parts and the need for further longer repair. Every replacement parts and assemblies must be justified and conducted technical state complex for effective recovery mechanism working condition.

Thus there is a pattern: the previously detected damage means less need for its elimination.

The process of maintenance of technical equipment (MOT) repair department bakeries is a complex technical process, which is influenced by random factors that complicate decision-making at the management level. One of the uses of simulation

for recording and analysis of random factors is the use of methodologies Petri nets. Existing approaches to decision making can solve fairly narrow range most tasks without calculation parameters that determine the effectiveness of the technical process, justifying the need for software modeling decision support.

Model technical process maintenance service repair department bakeries contains 18 positions and 9 conversions.

To set units include the following events:

P1 - chief mechanic job descriptions; P2 - a schedule of planned preventive repair; P3 - set repair crews; P4 - established bakery in TO; P5 - then the company that is in working order; P6 - MOT, which is in working order; P7 - MOT, which is in poor condition; P8 - is in need of major repairs; P9 - TO renovated; P10 - after small repairs; P11 -equipment average need repair; R12 - after replacement of components; P13 - necessary to replace the parts of stock; P14 - report carried out planned preventive maintenance; r15 - Purchase orders component maintenance; p16 - notification of the failure of equipment; r17 - then put to unplanned repair; R18 - report on unscheduled repairs.

To set transitions include the following:

t1 - formation of planning and schedule preventive maintenance work; t2 - MOT inspection; t3 - overhaul; t4 - holding small (recovery of parts, adjustment mechanisms) and medium (recovery accuracy, power and performance of equipment by replacing parts) repairs; t5 - replacement component maintenance; t6 - formation report carried out planned preventive maintenance; t7 - forming component purchase orders; t8 - review after reports of damage; t9 - formation report unscheduled repairs.

Submodel that includes transitions t2 - t7 simulates the process of planning and preventive repair works at while submodel conversion t8-t9 - the process of unplanned repairs after the discovery of emergency condition of the equipment.

**Research results.** To simplify the modeling and analysis of the conditions set apply specialized modeling package Petri nets - CPN Tools. After the model building process of the repair service of the process equipment in CPN Tools, the network is

in "human condition", it is not of box, that can run infinite number of times, and after the conversion markers returned to its original position.

The model corresponds to the real system, it reflects the structure and functional relationships modeled system.

The developed simulation model allows you to visualize and to verify the results of allocations received in the previous stages, allows the chief engineer quickly assess the impact of layout and structural factors of technologies and ancillary assets (the type and location of equipment, etc.) on the loading equipment and the formation of the Department schedules.

Simulation is used primarily for the following applications:

• the study of complex internal and external interactions of dynamic systems to optimize them. For this model to study the patterns of relationship variables, making changes to the model and observe their effect on the behavior of the system;

• to predict system behavior in the future on the basis of modeling of the system and its environment;

• training for purposes which can be of two types: individual training provider that manages some process or device, and training a group of people engaged in collective management of complex manufacturing or economic entity.

## Conclusions

With the developed model of process equipment repair process was performed classification of interactions repair and maintenance of machinery, installed and operated at bakeries.

Construct a simulation model of process equipment repair service bakery using Petri nets. This model allows a realistic assessment process of technical support equipment, resulting in increased reliability of equipment, reduced production downtime and enforced working schedules.

As the apparatus used Petri net modeling asmost formalization universal method of simulation models.