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Department «Technological equipment, mechanical engineering and standardization»

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from specialty «Mechanical Engineering»

Discipline RT 4319 «Repair technology»

Module AP 9 «Production automation»

LECTURE NOTES

Topic 1. Impact of repairment

Repairment costs, as defined by normal plant accounting procedures, are normally a major portion of the total operating costs in most plants. Traditional repairment costs (i.e., labor and material) in the United States have escalated at a tremendous rate over the past 10 years. In 1981, domestic plants spent more than $600 billion to maintain their critical plant systems. By 1991, the costs had increase to more than $800 billion, and they were projected to top $1.2 trillion by the year 2000. These evaluations indicate that on average, one third, or $250 billion, of all repairment dollars are wasted through ineffective repairment management methods. American industry cannot absorb the incredible level of inefficiency and hope to compete in the world market.

Because of the exorbitant nature of repairment costs, they represent the greatest potential short-term improvement. Delays, product rejects, scheduled repairment downtime, and traditional repairment costs – such as labor, overtime, and repair parts – are generally the major contributors to abnormal repairment costs within a plant.

The dominant reason for this ineffective management is the lack of factual data that quantify the actual need for repair or repairment of plant machinery, equipment, and systems. Repairment scheduling has been and in many instances still is predicated on statistical trend data or on the actual failure of plant equipment.

Until recently, middle and corporate level management have ignored the impact of the repairment operation on product quality, production costs, and more importantly on bottom-line profit. The general opinion has been ‘‘repairment is a necessary evil’’ or ‘‘nothing can be done to improve repairment costs.’’ Perhaps these were true statements 10 or 20 years ago. However, the developments of microprocessor or computer-based instrumentation that can be used to monitor the operating condition of plant equipment, machinery, and systems have provided the means to manage the repairment operation. They have provided the means to reduce or eliminate unnecessary repairs, prevent catastrophic machine failures, and reduce

the negative impact of the repairment operation on the profitability of manufacturing and production plants.

Industrial and process plants typically utilize two types of repairment management: run-to-failure, or preventive repairment.

The logic of run-to-failure management is simple and straightforward. When a machine breaks, fix it. This ‘‘if it ain’t broke, don’t fix it’’ method of maintaining plant machinery has been a major part of plant repairment operations since the first manufacturing plant was built, and on the surface sounds reasonable.

A plant using run-to-failure management does not spend any money on repairment until a machine or system fails to operate. Run-to-failure is a reactive management technique that waits for machine or equipment failure before any repairment action is taken. It is in truth a no-repairment approach of management. It is also the most expensive method of repairment management.

There are many definitions of preventive repairment, but all preventive repairment management programs are time driven. In other words, repairment tasks are based on elapsed time or hours of operation. Figure 1.1 illustrates an example of the statistical life of a machine-train. The mean time to failure (MTTF) or bathtub curve indicates that a new machine has a high probability of failure, because of installation problems, during the first few weeks of operation. After this initial period, the probability of failure is relatively low for an extended period of time. Following this normal machine life period, the probability of failure increases sharply with elapsed time. In preventive repairment management, machine repairs or rebuilds are scheduled on the basis of the MTTF statistic.