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LECTURE NOTES

Topic 6. Repairment engineering roles and responsibilities

The primary reason for establishing a repairment engineering function is to provide a systematic and coordinated approach to managing the reliability, maintainability, and life cycle costs of all assets throughout the entire facility. This function plays an important role in ensuring that industrial equipment and infrastructure operate safely, efficiently, and with minimum unplanned downtime. Its activities should not be limited to responding to equipment failures or organizing repair work. Instead, repairment engineering must focus on preventing failures, improving equipment performance, and extending the useful service life of industrial assets.

The main objective of repairment engineering is to establish an effective technical framework that supports the long-term performance of the facility. This requires the integration of engineering knowledge, maintenance practices, operational experience, and economic analysis. Therefore, the roles, responsibilities, and accountability of this function must be clearly defined and aligned with the overall business objectives of the organization.

An effective repairment engineering group should work closely with production, maintenance, operations, procurement, safety, and management departments. Such cooperation ensures that decisions regarding equipment maintenance, replacement, modernization, and repair are based on technical requirements as well as operational and financial considerations.

This fundamental requirement does not appear to be adequately reflected in the assigned roles and responsibilities of the Philip Morris group. The observed deficiencies indicate that the existing organizational structure and distribution of responsibilities do not fully support the main objectives of an effective repairment engineering function.

1. Limited scope of equipment under the responsibility of the repairment engineering group

One of the main deficiencies is that the scope of equipment included in the repairment engineering group's area of responsibility is limited primarily to production equipment. By definition, or as currently interpreted, this approach excludes a significant part of the facility's infrastructure and supporting systems.

Industrial facilities depend not only on production machinery but also on numerous auxiliary systems that ensure continuous and reliable operation. These include electrical power distribution networks, steam generation and distribution systems, compressed air installations, gas supply systems, water supply and treatment facilities, ventilation and air-conditioning systems, pumping stations, and other engineering infrastructure.

In addition, certain critical assets, such as overhead cranes, lifting equipment, material handling systems, and other auxiliary machinery, may also fall outside the responsibility of the repairment engineering group. However, failures of these systems can directly affect production continuity, personnel safety, product quality, and operating costs.

For example, a failure in the compressed air distribution system may stop several production lines simultaneously, even if all production machines are technically operational. Similarly, problems with electrical distribution or steam generation can affect the entire facility. Therefore, excluding these systems from the scope of repairment engineering creates gaps in technical responsibility and may lead to an inconsistent approach to reliability management.

To address this issue, the repairment engineering function should cover all significant physical assets within the facility, regardless of whether they are directly involved in the production process or provide supporting services. A comprehensive asset register should be established, identifying equipment ownership, technical condition, criticality, maintenance requirements, and expected service life.

2. Inconsistent understanding of the role of the repairment engineering function

Another important deficiency is the lack of a consistent understanding of the actual purpose and responsibilities of the repairment engineering function. In its

current configuration, 34 separate tasks or roles have been defined for this group. Although these activities may individually represent valid engineering responsibilities, their existence does not necessarily mean that the overall function is properly established.

A list of individual tasks is not sufficient to define the purpose of an engineering department. It is also necessary to establish clear priorities, identify expected outcomes, define areas of accountability, and explain how each activity contributes to the reliability and performance of the facility.

For example, activities such as preparing technical documentation, reviewing equipment specifications, participating in repair planning, analyzing equipment failures, and supporting procurement are important. However, these activities should be integrated into a common strategy rather than performed as independent administrative or technical tasks.

An effective repairment engineering function must take a proactive approach to equipment management. This means identifying potential problems before they result in equipment failure, evaluating the causes of recurring breakdowns, recommending engineering improvements, and supporting decisions regarding equipment replacement or modernization.

The group should also establish standardized engineering procedures and technical requirements to ensure consistency across different departments and production areas. Without such coordination, individual departments may adopt different maintenance practices, leading to duplicated work, inefficient resource allocation, and inconsistent equipment performance.

3. Main roles and responsibilities of an effective repairment engineering function

The role of an effective repairment engineering function is to provide the proactive leadership, technical direction, and engineering support required to achieve and sustain optimum reliability, maintainability, and life cycle cost performance of the facility's assets.

Its responsibilities should include several interconnected areas:

- Asset reliability management. Developing strategies to improve equipment reliability, identifying critical assets, monitoring failure trends, and reducing the frequency of unexpected breakdowns.

- Failure analysis and prevention. Investigating equipment failures, determining their root causes, identifying recurring problems, and recommending corrective and preventive engineering solutions.

- Maintainability improvement. Evaluating equipment design and accessibility to ensure that inspection, servicing, repair, and replacement activities can be performed efficiently and safely.

- Life cycle cost management. Assessing the total cost of equipment ownership, including acquisition, installation, operation, maintenance, repair, energy consumption, and eventual replacement.

- Engineering standards and specifications. Establishing technical requirements for equipment selection, installation, operation, maintenance, and modernization.

- Technical condition assessment. Organizing inspections, condition monitoring, and engineering evaluations to determine the actual condition of equipment and predict potential failures.

- Modernization and continuous improvement. Identifying opportunities to upgrade existing equipment, introduce improved technologies, and eliminate design weaknesses that negatively affect performance.

- Technical support and coordination. Providing engineering recommendations to maintenance, production, procurement, and facility management teams.

These responsibilities should be implemented through an integrated approach. For instance, when repeated failures occur in a production machine, the engineering group should not simply recommend another repair. It should investigate the underlying causes, assess whether the problem is related to equipment design, operating conditions, material selection, installation quality, or maintenance procedures, and develop a long-term solution.

4. Relationship between repairment engineering and other organizational functions

Repairment engineering cannot operate independently of other departments. Its effectiveness depends on the quality of communication and cooperation with the main functional groups within the facility.

The production department provides information about equipment operating conditions, production schedules, performance losses, and operational difficulties. The maintenance department supplies information about completed repairs, maintenance history, labor requirements, spare parts consumption, and recurring failures.

The procurement department supports the selection and acquisition of equipment, components, and spare parts in accordance with established engineering specifications. The safety department ensures that engineering recommendations and repair strategies comply with occupational health, environmental, and industrial safety requirements.

Facility management is responsible for establishing business priorities, allocating resources, and making strategic decisions based on technical and economic information provided by the engineering group.

For example, if a critical pump experiences repeated failures, the repairment engineering group should coordinate with operators to understand the operating conditions, with maintenance specialists to review repair history, and with procurement specialists to evaluate available replacement components. Based on this information, engineers can determine whether the pump requires redesign, improved maintenance procedures, or complete replacement.

Such cooperation helps ensure that technical decisions are not made in isolation and that all departments work toward common performance objectives.

5. Performance monitoring, accountability, and continuous improvement

An important responsibility of repairment engineering is to establish a system for evaluating equipment performance and measuring the effectiveness of implemented engineering solutions.

While repairment engineering cannot directly control the overall performance of the facility, it is responsible for providing facility and functional management with accurate and timely technical data. This information allows management to optimize maintenance and operational strategies, allocate resources effectively, and identify opportunities for continuous improvement.

The effectiveness of the function can be evaluated using a number of key performance indicators (KPIs), including:

- Mean Time Between Failures (MTBF), which measures the average operating time between equipment failures.

- Mean Time To Repair (MTTR), which indicates the average time required to restore equipment to operational condition.

- Equipment availability, which reflects the proportion of time that equipment is available for operation.

- Equipment reliability, which evaluates the ability of equipment to perform its required function without failure.

- Maintenance cost per unit of production, which helps assess the economic efficiency of maintenance activities.

- Percentage of unplanned maintenance, which indicates the extent to which maintenance activities are reactive rather than planned.

- Frequency of recurring failures, which helps identify unresolved technical problems.

These indicators should be regularly reviewed and used to evaluate the effectiveness of engineering strategies. For example, an increase in MTBF after equipment modernization may indicate that the implemented engineering solution has successfully improved reliability. A reduction in MTTR may demonstrate improvements in equipment accessibility, spare parts availability, or repair procedures.

In addition, engineering decisions should consider the entire life cycle of an asset rather than focusing exclusively on immediate repair costs. In some cases, replacing an old machine may require significant initial investment but can reduce energy consumption, maintenance expenses, production losses, and safety risks over the long term.

Continuous improvement should therefore be considered a permanent responsibility of the repairment engineering function. Lessons learned from equipment failures, maintenance activities, and modernization projects should be documented and incorporated into future engineering decisions.

6. Expected outcomes of an effective repairment engineering function

When the roles and responsibilities of repairment engineering are properly established, the organization can achieve several important results.

First, the reliability of production equipment and supporting infrastructure improves through systematic failure prevention and engineering optimization. Second, maintenance activities become more predictable, allowing the organization to reduce emergency repairs and unplanned production interruptions.

Third, the overall cost of asset ownership can be reduced through better equipment selection, improved maintenance strategies, and timely modernization decisions. Fourth, clearly defined technical responsibilities help eliminate gaps between departments and improve coordination throughout the facility.

Finally, a comprehensive engineering approach contributes to safer working conditions, more efficient use of resources, and improved long-term operational performance.

Conclusion

The repairment engineering function should be viewed as a strategic engineering resource rather than simply an administrative or technical support group responsible for a predefined list of activities. Its primary purpose is to ensure that all critical

facility assets achieve the required levels of reliability, maintainability, safety, and economic efficiency throughout their service life.

To achieve this objective, the function must have a clearly defined scope of responsibility covering both production equipment and supporting infrastructure. Its activities should be proactive, data-driven, and closely integrated with the work of maintenance, production, procurement, and management departments.

Ultimately, the success of repairment engineering depends not on the number of assigned tasks but on its ability to influence engineering decisions, prevent equipment failures, reduce life cycle costs, and support continuous improvement toward world-class facility performance.