

EFFECTIVE PREVENTIVE MAINTENANCE FOR SHIP UNLOADER BELT CONVEYORS

In port and industrial operations, ship unloader belt conveyors play a critical role in ensuring the continuous transfer of materials from vessels to storage areas or production facilities. As an essential part of the material handling system, the reliability of this equipment has a significant impact on overall operational productivity.

Continuous operation, heavy material loads, and exposure to dust, moisture, and harsh environmental conditions can increase the risk of component wear and equipment failure. Without an appropriate maintenance strategy, belt conveyor failures can lead to unplanned downtime, reduced unloading capacity, and increased operational costs. Therefore, implementing an effective Preventive Maintenance (PM) program is essential to maintaining the performance and reliability of ship unloader belt conveyors.

Key Components Requiring Preventive Maintenance

Preventive maintenance involves scheduled inspections and maintenance activities to identify potential issues before they develop into equipment failures. Several key components require particular attention, including:

1. **Conveyor Belt:** Inspecting the belt surface condition, wear, tears, splices, and potential belt misalignment that may disrupt material handling operations.
2. **Idlers and Rollers:** Ensuring that idlers and rollers rotate smoothly without bearing damage, excessive wear, or material buildup that could increase operational resistance.
3. **Pulleys and Bearings:** Inspecting pulley and bearing conditions, lubrication systems, and alignment to prevent excessive friction and component damage.
4. **Drive System and Gearbox:** Inspecting the motor, gearbox, coupling, and transmission system to ensure that driving power is transferred efficiently.
5. **Belt Cleaners and Scrapers:** Ensuring that belt cleaning systems function properly to minimize material carryback, which can cause material accumulation and damage to surrounding components.
6. **Safety Devices:** Ensuring that safety devices such as emergency stops, pull cord switches, belt sway switches, and speed switches function properly in accordance with operational safety standards.



Effective Preventive Maintenance Strategies

To ensure optimal ship unloader belt conveyor performance, preventive maintenance must be implemented consistently through well-planned maintenance activities. The following are five key practices that can be applied:

- **Scheduled Routine Inspection**

Conducting regular inspections of the conveyor belt, pulleys, idlers, bearings, gearbox, and other supporting components. These inspections aim to identify early signs of potential failure, such as abnormal noise, excessive vibration, increased temperature, and component wear before they develop into equipment failures.

- **Maintaining Belt Alignment**

Ensuring that the belt remains properly positioned along its designated path during operation. Belt misalignment can cause edge wear, damage to the conveyor structure, and material spillage along the conveyor route. Regular inspections of idler positioning, pulley alignment, and loading point conditions are necessary to minimize these risks.

- **Replacing Idlers Before They Seize**

Idlers showing signs of wear, bearing damage, or increasing rotational resistance must be addressed promptly. Replacing idlers before they become completely seized can prevent belt surface damage, excessive friction, and potentially more serious operational disruptions.

- **Controlling Material Carryback and Spillage**

Ensuring that belt cleaners and scrapers function properly to minimize material remaining on the belt surface after the discharge process. In addition, material spillage around transfer points and along the conveyor route must be cleaned regularly to prevent material accumulation that could interfere with component movement and increase the risk of equipment damage.

- **Recording and Analyzing Maintenance Data**

Documenting all inspection results, maintenance activities, component replacements, and abnormal findings during operation. This data should be analyzed regularly to identify failure patterns, evaluate failure frequency, and determine maintenance priorities. As a result, maintenance decisions can be made more effectively through a measurable and data-driven approach.

Consistently implementing these five activities can help reduce the risk of equipment failure, extend component service life, and improve the availability and reliability of ship unloader belt conveyors.

ADIKARI WISESA



Measuring Preventive Maintenance Effectiveness

The effectiveness of preventive maintenance is not measured solely by the number of maintenance activities completed, but also by improvements in equipment performance and reliability.
Several key performance indicators (KPIs) can be used, including:

- **Equipment Availability:** Measures the percentage of time equipment is available and ready for operation.
- **Mean Time Between Failures (MTBF):** Measures the average operating time between one equipment failure and the next.
- **Mean Time To Repair (MTTR):** Measures the average time required to complete equipment repairs.
- **Maintenance Compliance:** Measures the percentage of scheduled maintenance activities completed according to plan.
- **Unplanned Downtime:** Monitors the duration of operational interruptions caused by equipment failures or unexpected disruptions.

Regular evaluation of these indicators helps companies identify improvement opportunities and ensure that maintenance strategies are implemented effectively.

Building Operational Reliability Through Planned Maintenance

Preventive maintenance for ship unloader belt conveyors is not merely about conducting routine inspections and replacing components at scheduled intervals. More importantly, maintenance should be an integral part of an asset management strategy focused on reliability, safety, and operational efficiency.

Through proper maintenance planning, systematic inspections, equipment condition monitoring, and data-driven evaluations, potential failures can be minimized before they impact operations.

Adikari Wisesa Indonesia is committed to supporting industrial asset reliability through integrated Maintenance & Reliability solutions. With a structured and performance-oriented maintenance approach, Adikari supports the achievement of more reliable, efficient, and sustainable operations.