Shop Floor Breakdown- Consolidated Report

Impact date: August 4, 2023

Location: Norfolk VA

Breakdowns:
3 machine breakdowns occurred in the Assembly department between 10AM and 12PM.

Machines Impacted:
1. Automated Assembly Machine 1 - Belt failure
2. CNC Mill 1 - Electrical shortage
3. Robotic Welding Cell 1 - Software crash

Root Causes:
1. Assembly Machine 1: Premature belt wear due to misalignment
2. CNC Mill 1: Loose wiring connection inside control panel
3. Robotic Weld 1: Outdated software lacking protection for complex operations

Corrective Actions Taken:
1. Assembly Machine 1:
   - Belt replaced
   - Alignment adjusted
   - Increased inspection frequency
2. CNC Mill 1:
   - Electrical connection tightened
   - Full panel inspection scheduled
3. Robotic Weld 1:
   - Software updated
   - Added programming operation limits

Recovery Timeline:
All machines were restored to working order by 4PM.

Breakdown Details:
Three critical machines experienced failure between 10AM and 12PM on August 4th, 2023:

1. Automated Assembly Machine 1
   - Failure: Belt breakdown
   - Impact: Belt was worn and misaligned, causing accelerated degradation
   - Line Stoppage: 2 hours

2. Computer Numerical Control (CNC) Mill 1
  - Failure: Electrical shortage
  - Impact: Loose wiring connection inside control panel
  - Line Stoppage: 3 hours

3. Robotic Welding Cell 1
  - Failure: Software system crash
  - Impact: Outdated software lacked protections, failed during complex operation
  - Line Stoppage: 8 hours

In total, these three machines account for 65% of production capacity in the assembly line area. With all three machines down simultaneously between 10AM to 12PM, the assembly line was operating at 35% capacity for a period of 3 hours. This created substantial bottlenecks and work-in-progress inventory backlogs throughout the line.

The automated assembly machine and the CNC mill were restored to working order by 2PM and 3PM respectively on the same day. However, it took until 4PM for the robotic welding cell's software system to be updated and brought back online.

This approximately 6-hour period of reduced production capacity directly impacted 5 critical customer orders that were delayed by up to 1 week. It also incurred overtime labor expenses to catch up.

Analysis:
The three machine breakdowns that occurred on August 4th resulted in significant impacts to production capacity, delivery schedules, and expenses. The automated assembly machine, CNC mill, and robotic welding cell account for 65% of production capacity, so when all three machines experienced failure, it created bottlenecks and delays throughout the entire assembly process.

Upon conducting root cause analysis on each machine, it was determined that lack of preventative maintenance and outdated systems/software were major contributing factors. The automated assembly machine had not had its belt inspected for wear and tear in the last 4 months as stipulated in the maintenance schedule. The CNC mill had loose electrical wiring that was not detected during inspections. Finally, the robotic welding cell had outdated operating software that was not programmed to handle complex edge case operations.

The combination of these factors shows gaps in maintenance, quality control, and system software updates. By increasing the frequency of inspections, tightening the thresholds on what passes QC, and ensuring the latest software security patches and versions are installed, many of these machine failures could have been prevented.

Implementing improved preventative maintenance scheduling, establishing rapid response teams for when breakdowns do occur, and cross-training production workers are all recommendations that can help mitigate future losses related to machine downtimes.

In summary, failures in proper maintenance protocols, outdated systems, and lack of training/response mechanisms led to 65% production loss and 5 late customer deliveries. Corrective and preventative actions must be prioritized to avoid repeat breakdowns.

Business Impact:

The simultaneous breakdown of the three machines resulted in significant impacts to operations:

Production & Capacity:
- 65% overall capacity loss in assembly line area
- Severe bottlenecks created along entire assembly line
- Work-in-progress inventory pile-up

Delivery & Customers:
- 5 critical customer orders delayed by up to 1 week
- Missed delivery target for Folder Company order
- Additional expedited shipping costs incurred

Labor & Expenses:
- 47 hours overtime for assembly workers
- Overtime costs estimated at $8,400
- Revenue losses from delayed production estimated at $52,000

The customers that experienced order delays have been notified of the issues and updated delivery dates. However, the Folder Company order required expedited premium shipping to meet the delayed target, incurring additional logistics expenses.

The 65% capacity loss led to substantial backlogs, which then required nearly a week's worth of overtime across multiple shifts to catch up. This resulted in added labor costs.

In total, the breakdowns along the assembly line are estimated to have cost the company over $60,000 in expedited shipping fees, lost revenue, and overtime wages due to the issues not being detected sooner.

Corrective actions and Recommendations:
To prevent the breakdown issues from recurring, the following corrective actions have been established:

Preventative Maintenance

- Increase inspection frequency for critical components
- Tighten thresholds and standards for passing inspections
- Implement new belt alignment adjustment procedure

Software Systems
- Deploy software monitoring system to detect failures
- Mandate that all software must be updated to latest version

Training
- Cross-train assembly workers to spot issues
- Train rapid response team to address breakdowns

In addition to the actions above, an investigation will take place to understand why the preventative maintenance schedule was not properly carried out. The outdated software issue points to gaps in the IT change management process that will need to be addressed at a systemic level.

Implementing these steps will improve the monitoring, detection time, and restoration time for breakdowns by:

- Having more frequent inspections to detect problems sooner
- Equipping staff with better training to identify and respond to problems
- Keeping software updated to avoid failures from lack of patching

With robust corrective measures in place, the operational impacts and financial losses from machine breakdowns can be significantly reduced.