Maintenance Work Order Natural Language

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Aircraft Manufacturing Mission Critical Equipment

Composite Fabrication

Metal Fabrication

Drill & Fill Systems

Support Systems
Equipment Data Flow Architecture “Boeing Model”

Manufacturing Operations Management
- Data collections for OEE
- Historian
- Dashboards
- Legacy and New Equipment Plans

Process Control
- Product Quality Data Assessment
- Machine Capability assessment vs. Engineering Requirements
- As built vs. as Designed Digital Twin
- Performance to Plan

Total Productive Maintenance
- FMEA Integration
- System Interfaces
- Health Monitoring and Fault Detection
- CBM
- Reliability plan

Availability Performance Quality

Factory Floor
- PLC
- Machine Tool Data Agent
- Industrial PC & Standard Interface
- Sensors Data

Historian – Time Stamped Data

MOM

BEN

PLC

Historian

Data Tags & translation

T Web Server

 Apriso Dashboards

Production Application Integration

Maintenance Tickets
Improvements that can reduce maintenance costs:

- Standardized operator daily effort
- Control or eliminate reactive maintenance
- Planned maintenance to include all details and lessons learned
  - Good mechanics training
  - Develop machine and process FMEA and Failure Tree

- **Accuracy and reliability of machine and part data**
  - Detailed operator tie-ins
  - Standardized report format

Performance data for visibility and actions

- Machine control data
- Sensor data
- OEE: Accurate Downtime Client data
- Health Monitoring: Deep learning & AI
Issues with Non-Standard Work Order Tracking

• Repetitive issues can occur under different naming conventions
• Root cause is not investigated due to lack of documentation
• Absence of sufficient data for analytic studies
• Lack of information to track problems for a family of machines
• Lack of information to make machine design improvements
• Increased maintenance costs
• Increased support costs
Challenges with Natural Language Planning in Large manufacturing

- Significant number of different machines and work centers
- Differences in priorities at each geographic location
- Difficulties to agree on standardizations
- Lack of support to enforce standard terms to identify machine problems
- Data may not be shared across the different sites
- Technology is still new and the benefits will need to be explored further
- Need a unified plan and software tool
- Expertise are limited
- A formal plan needs to be put in place, funded, and aligned to the legacy systems

✓ Natural language standards and decision support will benefit large manufacturing firms
✓ System can build the foundation for improving the maintenance functions