IIoT, AI and the Digital Thread for Aerospace Manufacturing Optimization

GE Aviation MRAS Case Study

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About Plataine

IoT-based Optimization and Automation Software for Advanced Manufacturing

• A software intelligence layer over ERP, PLM and the shop-floor
• Our solutions leverage factory floor sensors and AI-based analytics providing real-time recommendations & decisions
• Unique data structure to manage the Digital Thread in the factory and across the supply chain
• Top-tier partners: GE Digital, McKinsey, AMRC (UK), CTC GmbH (Airbus)

Key Applications:
• Process Automation: Material, WIP & parts traceability
• Material Yield Optimization
• Tool Utilization Optimization
• Digital Thread & Part Traceability
• Supply Chain Collaboration

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The Problem we solve

- Current systems & processes are challenged to address growing production volumes & complexity, while under strict quality constraints.

- The Result:
  - Inflexible Production Plans
  - Lack of Visibility
  - High rework & waste
  - Reduced capacity
  - High Cost of Poor Quality (CoPQ)

- Expected benefit, driven by **economies of scale**
- Waste, driven by loss of **process control**

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Plataine’s IIoT Apps for Manufacturing Optimization

**Plataine Optimizers (Digital Assistants):**
- Context-aware, automatic actions & recommendations in real-time

**Plataine Analytics:**
- Digital-Thread, alerts, insights, learning

**Plataine Data Collection:**
- Range of data sources, protocols and methods of collection

**DIGITAL DATA CONTEXT**
- Shop-floor Sensors, Industrial IoT
- Customer Systems of Record
- Computers & Mobile Devices

**KNOWLEDGE**

**DECISIONS**

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About GE Aviation MRAS (Middle River Aircraft Systems)

- 870K sq. ft. facility located in Baltimore, MD

- Designs, develops and manufactures:
  - Nacelle and Thrust Reverser Systems
  - Complex Composite and Metallic Structures
  - Global Services and Support

- The specific program designs, builds and services composites nacelle systems for the CFM LEAP powered A320NEO

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MRAS Business Challenges (high-rate program)

• Lack of visibility over kits and tools led to inefficiencies and waste.
• Manual tracking of kits’ location, expiration date (bond by date) and exposure time resulted in late processing, quality issues, excessive lab testing, and in some cases disqualification and scrap.
• ‘Time-based’ tool maintenance (not ‘duty-cycle-based’), leading to quality issues: often found late in the process.
• Challenges projected to increase with rapid volume growth into 2018.
The Solution: Plataine’s Industrial IoT Software for Manufacturing Optimization

• Automate tracking of **work orders progress and assets’ location & condition** (Material, kits, parts, tools)
• Automatic management of **time-sensitive material & kits** (composites)
  – Expiration date & exposure time (bond by date)
  – **Real time alerts** to materials & resulting parts (inheritance)
• Automatic **tool cycle tracking & maintenance alerts** (from ‘time-based’ to ‘duty-cycle-based’)
• Create digital assets to obtain **100% part traceability** and the Digital Thread
• First **link into supply chain integration** (kits externally supplied by pre-tagged and tracked)
• Integration with MRAS Enterprise systems landscape

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Program Scope

• Hundreds of active materials & [multi-material] kits tracked at any given time (2000 archived kits to date)
• Approximately 100 tools are tracked at a given time
• Over 30 stations tracked:
  – 2 Freezers including kit staging area
  – 22 Layup stations
  – 9 Autoclaves including area outside of autoclaves
  – Teardown area
• Volume projected to grow as the program’s rate grows
Material & Asset Tracking
Work Orders Progress, Status & Location

- Freezer/Storage
- Cut & Kit
- Layup
- Autoclave

Outcomes:
- Increased throughput
- Improved ‘on-time delivery’ ratio

Site map displays kits and parts location and status
Bottlenecks and congestions

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Material Optimization
Optimized Management of Time-sensitive Materials

Complete automation
- 'In & out of freezer' times
- Expiration date & exposure time
- Material allocation suggestions

Outcome:
- Savings in raw material
- Reduced rework

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Tool Management
Optimize tool maintenance cycles

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RFID sensors serve as application enabler

Site Layout:
RFID Hardware & Devices at GE-MRAS
Digital Thread: from raw material to finished part, allowing full traceability and auditability

- Finished Product
- Assemblies
- Parts
- Kits
- Materials

- Full Digital Traceability
- Assets genealogy back to the raw material
- Quality analyses
- Audit ready data
Integrated Dashboards and Reports

• Spotfire Dashboards
  – Map actual part location on shop floor
  – Track Estimated Time Left (ETL)
  – Flag work orders past ETL thresholds
  – Provide order in which to pull kits from freezer based on expiration date

• Reports displayed on shop floor monitors and available via iPhones and iPads

• Real-time intelligence for real-time action

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Scaling Up Beyond The Factory Level - Complimenting GE’s Digital Thread Across the Supply Chain

- ERP/ PLM Integration
- Real-Time, Enterprise Wide tracking
- Plataine Optimization Solutions

- OEM Assembly Line
- Distribution Center
- Supplier 1
- Supplier 2
- Supplier 3
- Material Warehouse

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Deployment Methodology & Key Milestones

- June 2016: Proof-of-Concept (POC) Pilot, performed onsite
- August 2016: Onsite RFID Mapping
- Dec 2016: PO issued
- March 2017: Go Live UAT for Phase 1; Ramp up through May 1st
- June 2017: Phase 2 deployment

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Benefits and Outcomes

• Reduction of non-conformance, due to missed bond-by dates and over-aged material
  – Cost of processing kits, including lab testing
  – Impact on schedule due to parts held up by kits
  – Cost of potential part scrap
• Improved visibility - where parts are, color code of time left etc.
• Shifting maintenance of bond tools from ‘time-based’ to ‘duty-cycle-based’
• More efficient autoclave utilization – maximize parts per autoclave run
• 100% digital traceability, integrated with GE MRAS systems
Next Phases

• Expanding system scope for part tracking in downstream stations

• Continuous learning of data collected for more precise and relevant alerts & recommendations:
  - Composites shelf-life management and allocation based on historical process data and real-time production situation
  - Tool Maintenance Alerts based on historical process & quality data ensures optimal maintenance cycles (not too early, not too late)
Summary: Make Automation Your Top Priority

• **Collect** data in real-time that covers the entire manufacturing processes from:
  – Factory-floor sensors & machines
  – Enterprise systems (ERP, CAD/PLM, MES)
  – Digital devices

• **Analyze** data to get insights and alerts

• **Optimize** manufacturing using AI-based Digital Assistants that empower your staff
Thank You

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