RFID in Construction: Improving Productivity & Materials Management

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McDermott International, Inc
Introduction & Purpose

• Presenter: Michael Smith
  – Global Manager-Industrial Engineering
  – Pilot PM & Integrator

• Presentation Purpose:
  – RFID Construction Challenges
  – Lessons learned
Agenda

• About McDermott
• Productivity Initiative
  – Assessment
  – Solution Development
  – Solution Deployment
  – Results, Benefits / ROI
• Questions
About McDermott

• McDermott International, Inc
  – Founded in 1923; leading EPCI company focused on executing complex offshore oil and gas projects worldwide
  – Concept to commissioning services for upstream field developments, fixed and floating production facilities, pipelines and subsea systems
McDermott Worldwide Operations

- Operations in +20 countries with more than 13,500 employees

Resources:
- Marine Vessel Fleet
- Fabrication Facilities
- Engineering offices.
Construction Industry Institute:

- Complexity & variability contribute to reduced productivity
- Up to 90% Work is Non-Value-Added
  - Queuing, Material Handling & Internal Lead-Time largest components
- Labor inefficiencies range 5.4% - 56.8%

* Value-Added: Work that creates value
* Non-Value-Added: Required work & waste
Assessment Cycle

• Current Conditions:
  – Project startup data ~30% or less
  – For tracking efforts; ≥ 95% involve material status
  – 30%-40% of personnel time researching material status
  – Standalone systems; manual updates
  – In-house MMS; No MPS/MRP/MRPII/ERP

• Assessment Recommendation:
  – Pursue initiative to improve productivity
  – Utilize new technology; RFID, GPS, Barcode, Software
Assessment Cycle

• Focus:
  – Improve Planning, Scheduling, and Work Execution
  – Improve Materials Management
  – Integrate and eliminate manual standalone systems

• Approach
  – Prototype solution in “Real-World” environment
  – Limited duration & scope
  – Reflective of customer needs & requirements
  – Directed by diverse cross-functional project team
Solution Target Characteristics

• “Cradle-to-Grave” process coverage
• MES characteristics & functionality
• Scalable, adaptable, and configurable
• Combination of software, hardware, & process modifications
• Two Components; integrated but independent
  – Materials Management Module
  – Work Execution Module
Solution Development Cycle

I. Site & Process Selection
II. Process & Workflow Mapping
III. Identify Application Requirements
IV. Hardware & RFID Selection
V. System Field Testing
VI. Solution Deployment Testing
I. Site: Batam Fabrication Yard

• SE of Singapore coast
  – ~301 Acres
  – >7,000 Employees

• Weather
  – High humidity year-round
  – Temp: 72 °F - 95°F
II. Process & Work-Flow Mapping

Legend:
- Raw Material
- Raw Pipe
- After Fabrication
- After paint flow

CAB-1

Warehouse

Erection

CAB-2

Raw Pipe Storage

Shop A-Pilot Area
III. Application Requirements

- Identify update methods
- Manual entry & uploads
- Identify data & system deficiencies
  - Material ordering, status updates, location system & tracking
  - Develop system countermeasures
- Create, Integrate, Eliminate, & Automate

Data & Information Sources-Excel, Access, PDF
III. In-House Application-MDACCS

• Material Data Analysis & Control System
• Web-based interface
• Material Inquiry & Release
• Work processing & Reporting
• Label Release & Printing
  – Real-time via Wi-Fi
• Messaging & Notification
III. In-House Application-STATS

- Spool Tracking & Traceability System
- Independent mobile RFID tracking & inventory system
- Indoor/Outdoor data processing application
  - Transfers, Inventory, WIP Tracking, Spool Search and other
  - Integrated usage with Barcode, RFID, and GPS, and other data
III. In-House Application: MPATH

- Material Position & Tracking History
- Visualization tool for RFID/GPS data
- Integrated with MES
- Transaction History
- WIP Status
- Material & WIP Location
- Position & Path
- Create Erection Work Packs
IV. Hardware & RFID Criteria

• Ease of use; information conveyance
• Read range, repeatability & accuracy
• RFID/Tag attachment & visibility
• Resilient to in-process & field requirements
  – PWHT, Blast/Paint, Welding, etc.
  – Reaction to: Impact, heat, humidity, & material handling
• Cost effective
• GPS compatible
• Support intercompany usage
IV. Hardware Devices

UHF Readers

- Intermec 700/IP4
- Unitech RH767

BT GPS Receivers

- Datamax Printer MK II M4210 RFID Printer

Convergence Systems
IV. Location Grid System

• Devise yard partition system
  – 2.5 x 2.5 m
IV. Align Global & Grid Coordinates

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Location:
- McDermott Yard
- Block: N163
- Grid Location: 7A3.4

Handheld result:
- Actual standing point
- CAB Grid

RFID Journal Live! Tenth Annual Conference and Exhibition
Apr. 3-5, 2012 | Walt Disney World Swan and Dolphin Resort, Orlando, Fla.
IV. Hardware-Wi-Fi System

Shop A: Pipe Shop
IV. RFID Tags-Type & Format

- Passive & BAP UHF Gen2
- UHF Frequency 902-928 MHz
- Hard case, bolt-on, tie-wrap, adhesive, & hanging
V. Attachment Methods

- Tie-Wrap
- Hanging
- Adhesive
- Substrate
V. In-Process Fitness & Durability

- Post Weld Heat Treatment
- Blasting & Paint
- Impact/Collisions
- Exposure

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1st Blasting

2nd Blasting

[Table of data]
V. Field Fitness & Durability

- Heat, Humidity, Rain
- Impact & Collisions
- Chemical Exposure
V. Readability & Range Testing

- Antenna Orientation
- Tag Placement
- Field & Shop Readability
- Read Range
  - Unitech: 4.92 – 6.56 ft
  - CS101: 22.97–32.81 ft.
VI. Final Tag Selection

- Passive UHF
- Polyester Label Stock-4”x3”; RR Donnelley
- Alien Squiggle Inlay
- IIMAK SP330 Resin Ribbon
VI. Solution Deployment & Testing

- User training & documentation
  - Reference & User Manuals
- Workshops in English & Bahasa Indonesia
- Project Kick-Off Meeting
VI. Solution Deployment & Testing

Release Labels-MDACS

Print Label-DataMax

Bartender Software

RFID Label

Attach Label to Substrate or Tyvek Tag
VI. Solution Deployment & Testing

- Cutting
- Fitup & Welding
- Inspection
- Laydown Inventory
- Laydown Area
- Blast & Paint
- RFID Journal Live!

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Benefits and Improvements

• Capacity Planning and Flexible Scheduling Tool
• Integrated traceability with data integrity
  – Material, WIP & work status visibility
• Conditional attributes relationships control
• Improved productivity and reduced process cost
• Metal-friendly RFID tagging processing
  – Low piece-price per tag/substrate combo
• GPS location accuracy within 5-7 feet
• Estimated ROI < 6 months
• Reduced NVA by 22.6%
• Reduced Manual Processing by ~54.1%
• Reduced Processing Time by ~24.3%
• Reduced Internal Lead-Time by ~27.4%
• Improved Overall Process Productivity by ~7.2%
Current State & Next Steps

• Reviewing for full production implementation

• Partial controlled utilization in current projects
  – Tagged: +4,500 Spools
  – Life of Project: +17,500 Spools

• Expand into other work areas & applications
  – Welding Machines
  – Material Transport Wagons

• Future Investigation
  – Active Tag RTLS
  – Facility-Wide Wireless Mesh
Questions??
Thank You