Digital Manufacturing. Implemented.

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Agenda

- WHAT’S MOVED
  How the market has changed

- WHAT’S NEW
  What digital roads now enable

- WHAT’S DIFFERENT
  IMTS 2018 v IMTS 2020

- SO WHAT...
  Connecting with customers
What’s moved…from driver to enabler

EXPECTATIONS
Culture and behavior

BREADTH
Increased emphasis on produce lifecycles

DEPTH
Organizational capabilities

Critical Success Factors for Digital Manufacturing Implementation in the Context of Industry 4.0 (2017)
World Economic Forum: Digital Transformation of Industries (2016)
Market Changes

THE TECHNOLOGY LIFE CYCLE PATH

What’s new…MT + (new) Digital Roads

MT has been “digital manufacturing” for 30+ years
  • Not all “digitization” is intrinsically critical nor informationally useful
  • But context is extremely useful…
    • Begins to link tech investment to business cases
    • Expanding areas of ROI, increasing implementations…

Digital roads to information alley
  • Connectivity
  • Integration
  • Decentralization
  • Virtualization
Defining “smart”

**INTELLIGENCE**
- Know (and tell) about itself and environment

**CONNECTEDNESS**
- Devices, humans, systems, networks…

**SERVICE INTEGRATION**
- Product offering from intelligence + connectedness

**DATA-DRIVEN**
- Decisions based upon (and linked to) data
What’s different…IMTS 2018 to 2020

2020 Expectations
- Machines are inherently connected
- Data visibility and utilization are essential
- Differentiators: UI/UX, multi-level analytics (machine, cell, factory)
  - Ease of use, maintenance experience, installation/buy-off, MES/ERP integration, etc.

2020 Breadth & Depth
- Machine tools plus…parts…and…lifecycle
  - AM/3DP, metrology, design/simulation tools, inter-industry partnerships, smart products
- New roles in companies…
  - IoT Product Manager, Digital Factory Lead, Global Head of IoT, Data Scientist, IoT Engineer
Keys to convey tech capabilities

CONNECTIVITY
- Standards-based approach
- Time-series data
- System architecture

INTEGRATION
- Data management interoperability
- System automation
- SW configuration

DECENTRALIZATION
- Parsing levels and types of data
- Cybersecurity, traceability
- Collaborative tools

VIRTUALIZATION
- Model-based Enterprise (MBE)
- Simulation, digital thread
- Training tools (AR/VR)
Standards Harmonization
Standards Harmonization

“Which standard do I choose?”

“HOW DO I USE STANDARDS TO SATISFY MY BUSINESS REQUIREMENTS?”
Keys to convey ROI

- Where does your product fit in the supply chain?
- What data about your offering is needed for business analytics?
- What’s more critical...internal or external integration?
  - Given an economic perspective
- What does digitally “implemented” imply to your customers?
  - Readiness, reliability, consistency, etc.
  - Security, services-oriented, data-centric, etc.
Implementation Opportunities

Control and Sensor

Raw Data

Syntax

2018-07-01T08:12:24.3313

Structure

Semantic Data

Device
Linear X
Position: 196.54mm
Load: 12.43%
Rotary C
Rotary Velocity: 87.22 RPM
Controller
Execution: ACTIVE

Meaning

Data Enrichment (Patterns)

Information

Integration

IT & Cloud

Predictive
Prescriptive

Value $$$

Proprietary

V Mill 1
Lathe 1
Robot
CMM

Cell

Part 1
Part 2
Part 6
......

Batch

Execution: ACTIVE

Load[X]: 120%
Feedrate[Override]: 80%

Prescriptive Information

Data Enrichment (Patterns)

part XY32
–

Producing part AB56 at avg. SS of 2500 RPM

Producing unknown part

Producing part XY32 at avg. SS of 2160 RPM

CloudControl and Sensor

Bad

Good

Ecosystem

MES

ERP

PLM

CAx

Syntax

Structure

Semantic Data

Information

Integration

IT & Cloud

Cloud

Syntax

Structure

Semantic Data

Information

Integration

IT & Cloud

Cloud

Value $$$

Exhibiting in a Digital World