Ford Manufacturing
The Journey to Digital

Our Progress Toward an Intelligent and Completely Connected Manufacturing System

Mike Mikula
Chief Engineer
Advanced Manufacturing
Our Vision:

To become the world’s most trusted company delivering smart vehicles for a smart world.
# Ford Production System

**Best In The World Manufacturer**

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<tr>
<th>SOS</th>
<th>QOS</th>
<th>DOS</th>
<th>COS</th>
<th>POS</th>
<th>MOS</th>
<th>EOS</th>
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<tr>
<td>Simplified Lockout Policy</td>
<td>Standardized Quality Reports</td>
<td>Material JIT</td>
<td>Process Flexibility Enabler</td>
<td>Common Operator Interfaces</td>
<td>Standardized Constraint Management</td>
<td>Energy Management</td>
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<td>Complexity Management</td>
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<td>Faster Launch</td>
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**Principles of Manufacturing Do Not Change as a Result of Methods**
1990 – 2019 Manufacturing Mass to Lean Production

Global Controls Standards V1.0
Ford Production System
- Ford Production System Launched
- Powertrain Manufacturing Engineering (PTME) Centralized

Medium Volume Line MFG
- Medium Volume Assembly Systems
- Medium Volume Parallel Path CNC Machining Systems
- Use of Digital Tools for Engineering

Digital MFG Engineering
- Continued Development of the Flexible Production Systems for Engine, Transmission and Axles
- “U” Shaped Standard Machining Module Developed for Engines, Transmissions Components

High Volume MFG
- High Volume Assembly Systems
- Transfer Bar Machining Systems w/limited flexibility for Product Changeovers
- Zone Controls
- Basic Machine Monitoring Systems to drive Productivity & Quality

Flexible MFG System
- Assembly and Machining Systems Flexible to 2 Architectures
- Initiated Condition Monitoring in Machining Systems
- Standardized Bill of Process and Bill of Design

Global Controls Standards V2.0
- Global Deployment of Flexible Systems
- Zero Loss Launch
- Factory Information Systems
- Global Tooling Systems
- Distributed Control
- Global deployment of Machining Condition Monitoring

Evolution Toward a Digital System Started More Than a Decade Ago
Investment in Advanced Manufacturing

Acceleration is Required to Leverage Industry Advancements to Maintain Position as a World Class Manufacturer
Desired Outcomes

Transform Ford’s approach to manufacturing leveraging technologies that enable new capabilities and empower employees:

• Reimagine the value stream leveraging emerging and maturing technologies
• Explore the realization of new customer experiences
• Identify how to improve the employee experience and emerging roles
• Support Ford’s vision of being the world’s most trusted company
Factory of Tomorrow (FoT)
Integrated Business & Technology Strategy

Key Capabilities

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<tr>
<th>Demand Sensing</th>
<th>Dynamic Configuration</th>
<th>Mass Customization</th>
<th>AR Empowered Workforce</th>
<th>Modular Design</th>
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Key Technologies

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<th>AI/ML</th>
<th>Blockchain</th>
<th>3D Printing</th>
<th>Digital Twin</th>
<th>Mixed Reality</th>
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Key Enablers

| Next Gen Networking | Platform Enabled Rapid Solution Delivery | Edge, Enterprise & Cloud Capabilities | Data Lake, Advanced Analytics & Insights | Cyber Security |

Enabling Differentiated Customer Experiences
Technology Enablement

**Historical Strengths (Rear View)**
- Data-rich environment
- Strong OT/IT integration
- Mature and robust core systems
- Analytics driven insights
- Innovation, experimentation and pilots leveraging Next Gen technologies

**Future Opportunities (Forward Looking)**
- End to end connectivity, traceability and predictive capabilities
- Technology modernization
- Next generation infrastructure
- Broader leverage of existing data
- New technology-enabled business capabilities aligned with product roadmap
Global Factory Of Tomorrow

Factory Of **Tomorrow**, Brought To You **Today**