



PTC SMART CONNECTED MANUFACTURING STRATEGY AND SOLUTIONS

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VP, IoT Manufacturing Solutions

June 7th, 2016

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PTC PORTFOLIO AND THE MANUFACTURING JOURNEY



PARTNER ECOSYSTEM



AND MANY MORE

IoT SOLUTIONS

CAD | **PTC® Creo®**

PLM | **PTC® Windchill®**

ALM | **PTC Integrity™**

MFG | **PTC® Manufacturing**

SLM | **PTC® Servigistics®**

Transformation Journeys

Engineering

Manufacturing

Service

IoT PLATFORMS

Connect

Axeda



Analyze

ThingWorx

Create

ThingWorx

Experience

Vuforia™

transformation journeys

Understand
Advance
Outperform



Agile Engineering

Improve your time-to-market and mitigate risk by unifying your engineering disciplines and increasing their adaptability



Digital Engineering

Drive business results and continuous innovation by transforming your engineering practices and product designs



Manufacturing

Continuously improve your operational performance and flexibility through digital manufacturing, real-time intelligence and predictive analytics



Service

Generate unprecedented value for your customers and your organization by redefining the entire service model

A WAVE OF TRANSFORMATION IS COMING TO MANUFACTURING



Smart Manufacturing

Industrie 4.0

Made in China 2025

IN THE WORDS OF LEADING MANUFACTURERS



TUESDAY, June 7



(4:00 – 4:45 p.m.)



(5:00 – 5:45 p.m.)

WEDNESDAY, June 8

Solar Turbines

A Caterpillar Company

(10:45 – 11:45 a.m.)



(3:30 – 4:15 p.m.)



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THURSDAY, June 9

CNB

yacht builders

(9:30 – 10:15 a.m.)

Aerospace OEM

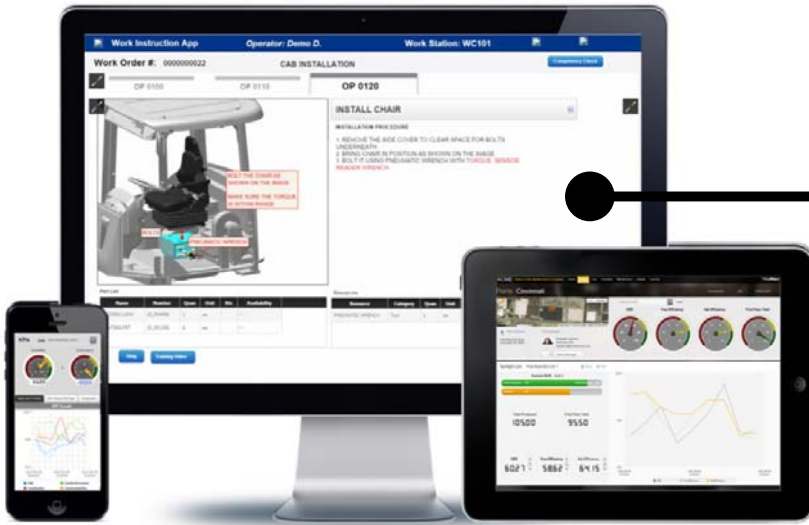
(10:30 – 11:15 a.m.)

#LIVWORX

* A subset of the IoT for Manufacturing sessions at LiveWorx

THE IOT MANUFACTURING OPPORTUNITY

Continuously improve your **operational performance** and **flexibility** through real-time intelligence, digital manufacturing, and predictive analytics



THREE STAGES OF TRANSFORMATION



Continuously improve your operational performance and flexibility through real-time intelligence, digital manufacturing, and predictive analytics

1. Understand

Make decisions quickly by connecting and unifying different sources and structures of internal and external data in real-time

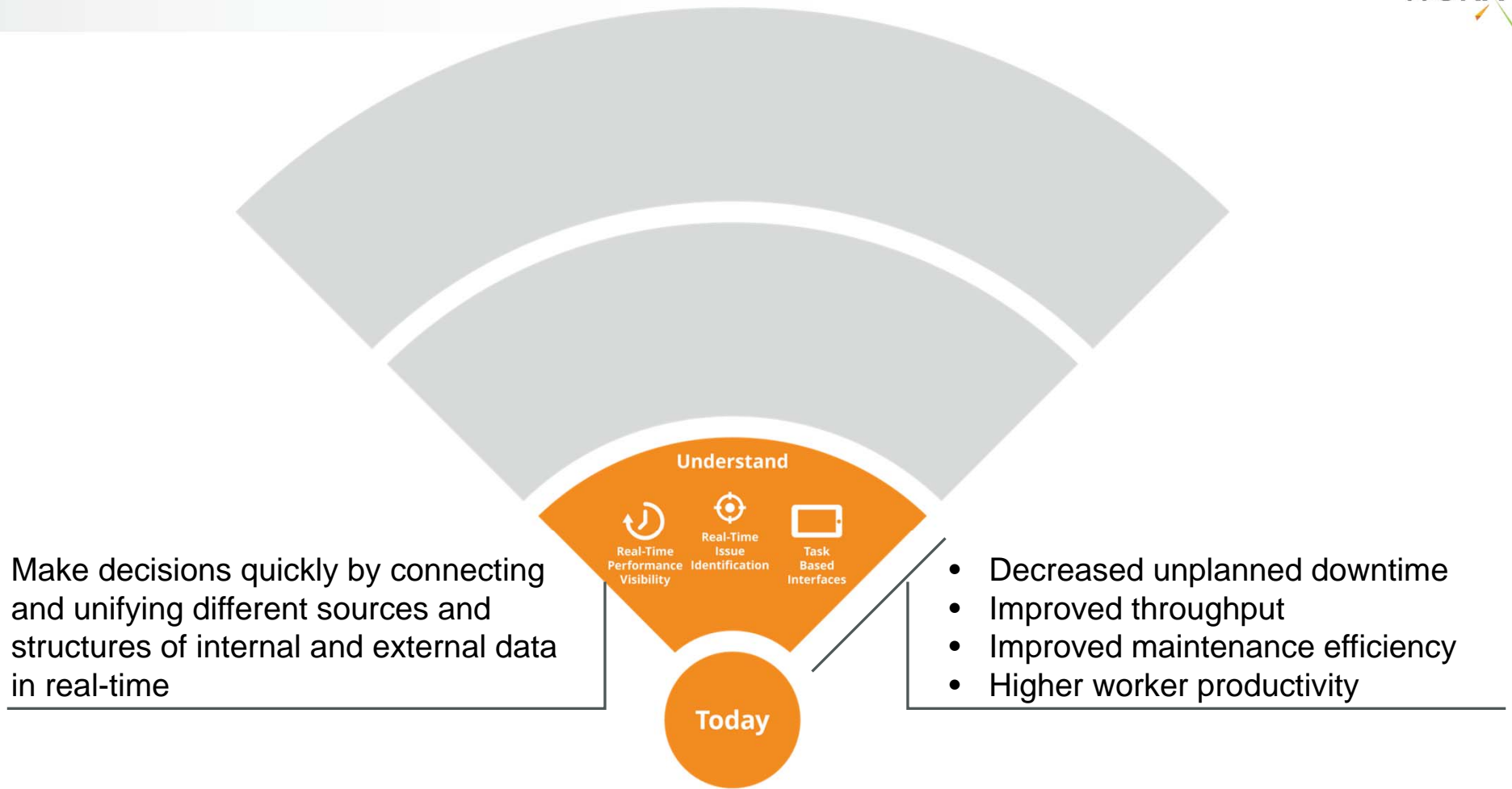
2. Advance

Streamline your operations and continuously innovate through predictive analytics, digital processes, and a guided workforce

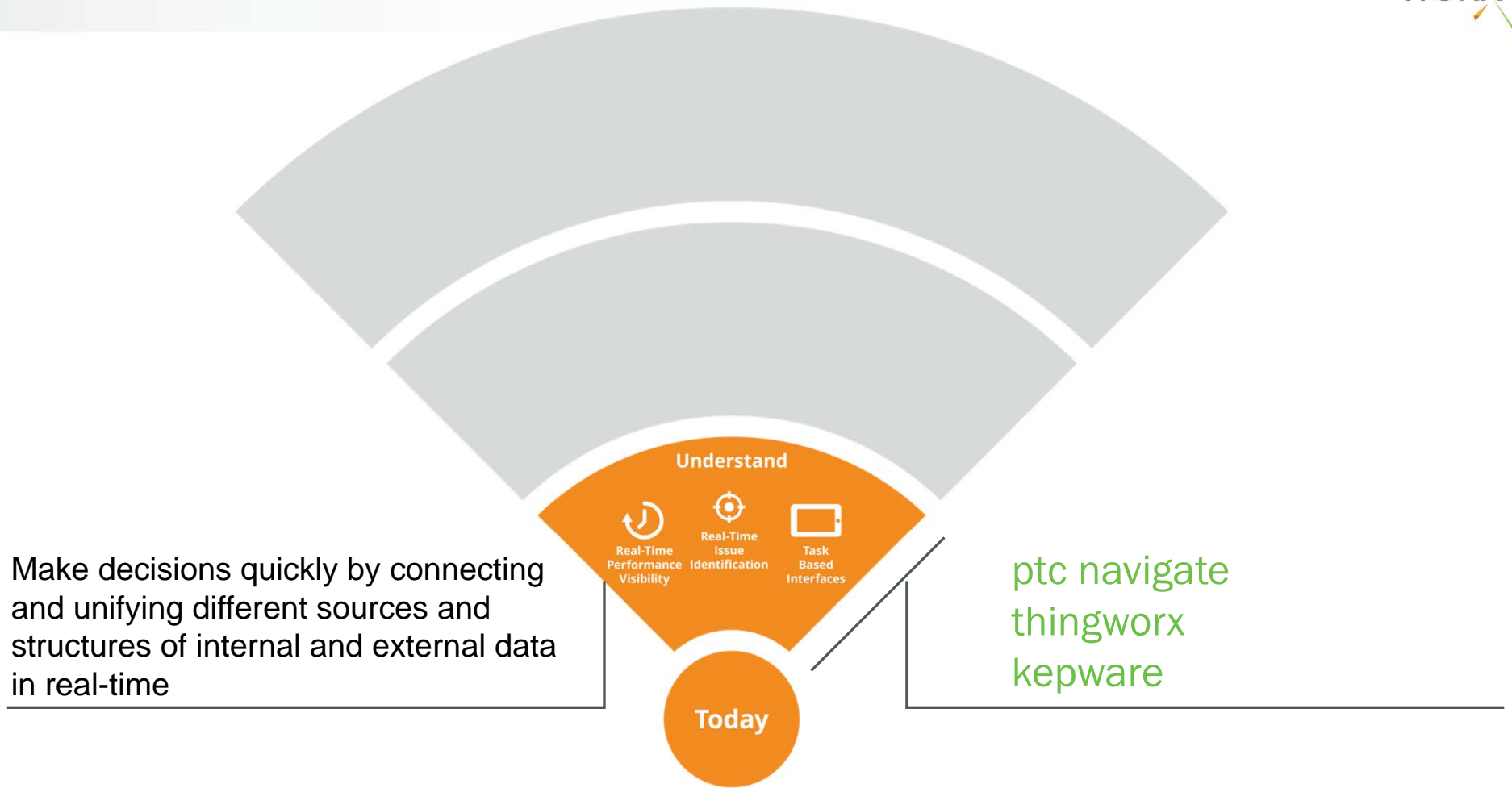
3. Outperform

Achieve optimal execution through continuous, closed-loop process improvement and adaptive operations

STAGE ONE: UNDERSTAND



STAGE ONE: UNDERSTAND



PTC NAVIGATE FOR INDUSTRIAL CONNECTIVITY



CAPABILITIES

- Instant connectivity to industrial assets
- Task based interface
- Real-time alerts
- Real-time performance visibility
- Ad-hoc trending to speed up root cause analysis
- Real-time reporting
- Plant level visibility



BENEFITS

Reduce operational risk

Improved quality

Higher asset availability

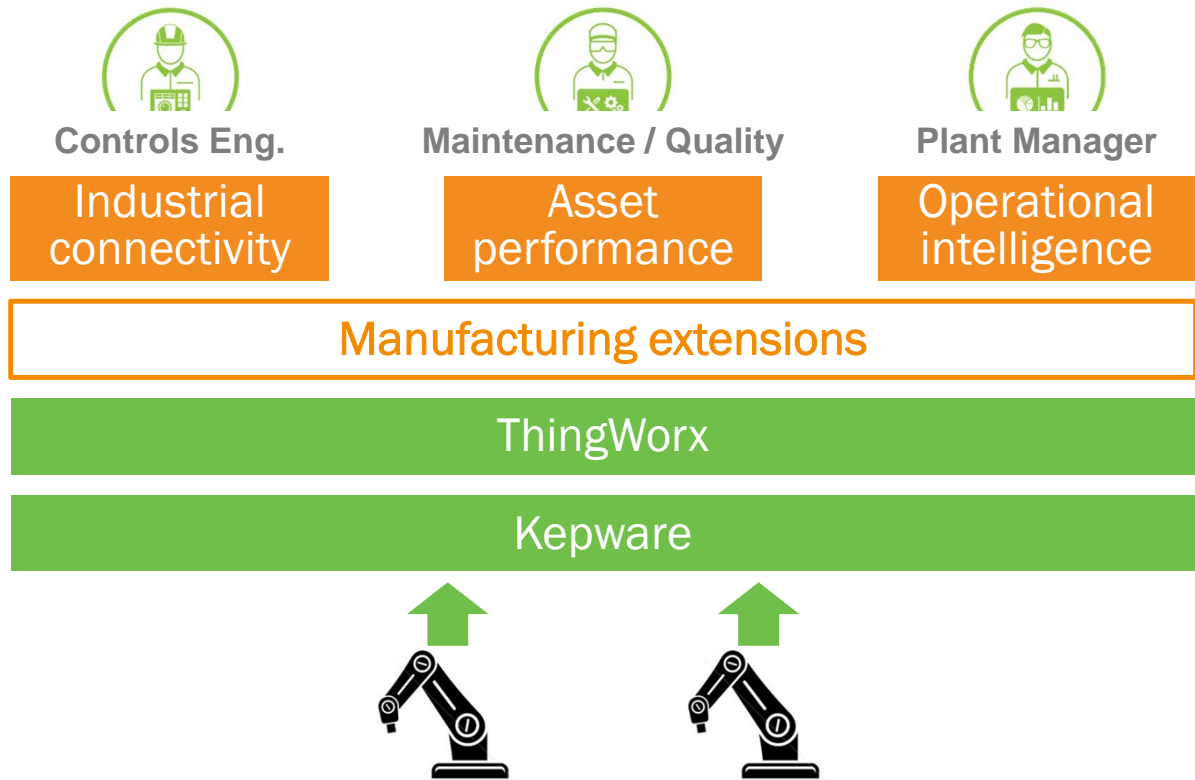
More reliable data collection

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GE TRANSPORTATION, GROVE CITY



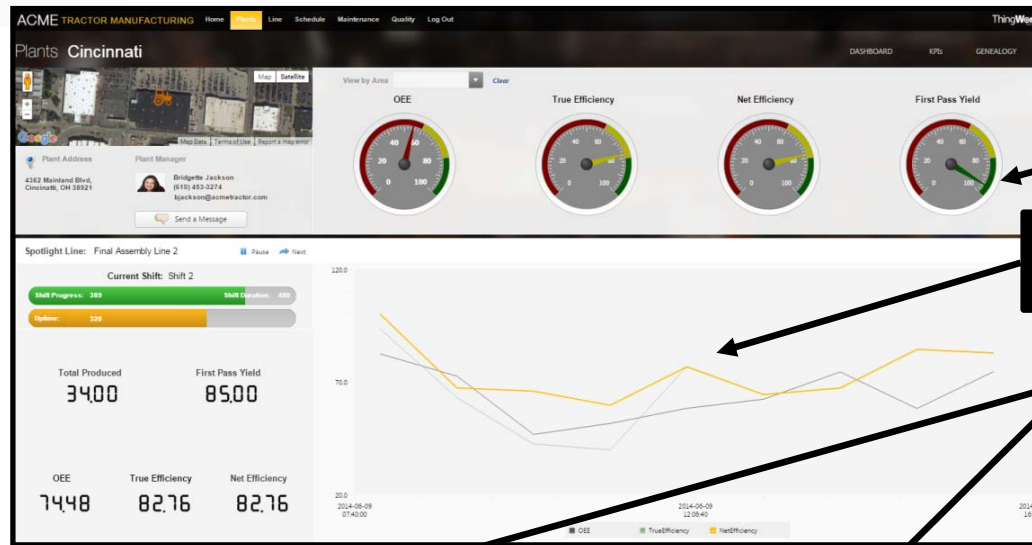
10 to 20% reduction in unplanned downtime

PTC NAVIGATE FOR OPERATIONAL INTELLIGENCE



CAPABILITIES

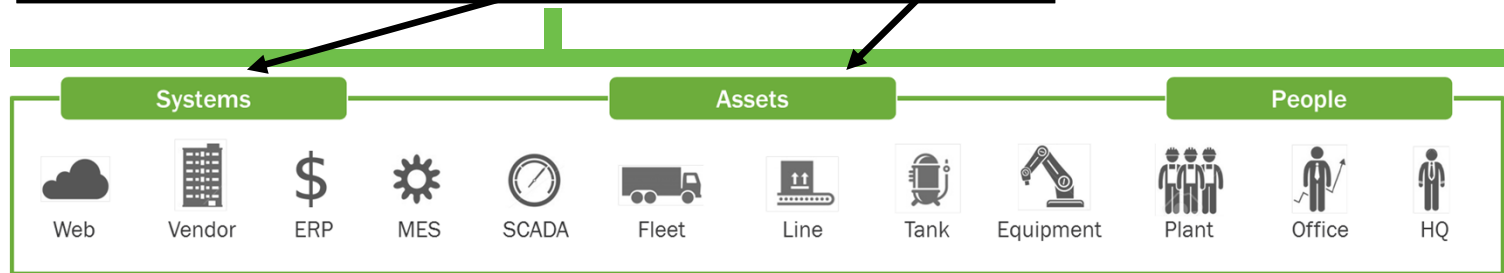
- Real-time connectivity to disparate factory assets and business systems,
- Unified visibility into performance and issues, for proactive problem solving
- Drill-down into root cause to eliminate non-productive downtime
- Role-based delivery for better and faster decision making



Normalized manufacturing KPIs

360° view into operations, including historical trending

Connectivity to equipment and systems



BENEFITS

Increased factory performance

Reduced downtime

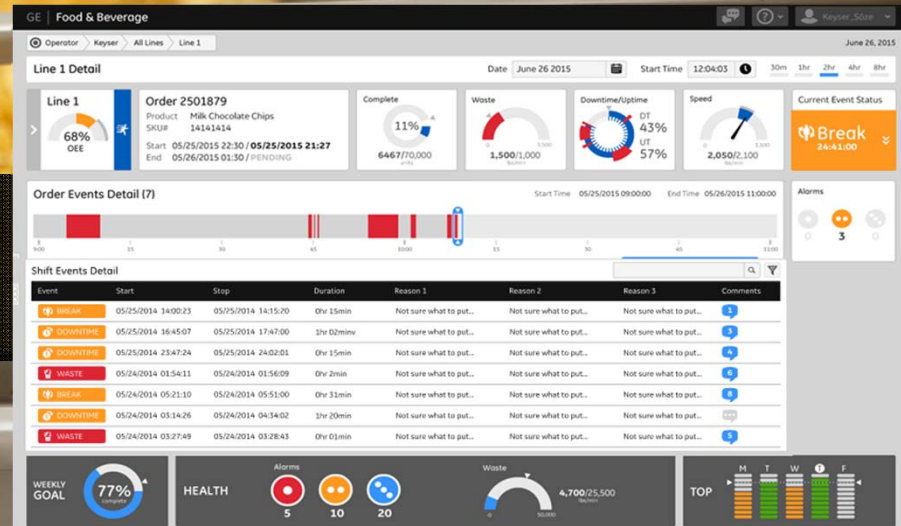
Improved quality

Increased flexibility

A GLOBAL FOOD LEADER INCREASES PRODUCTIVITY

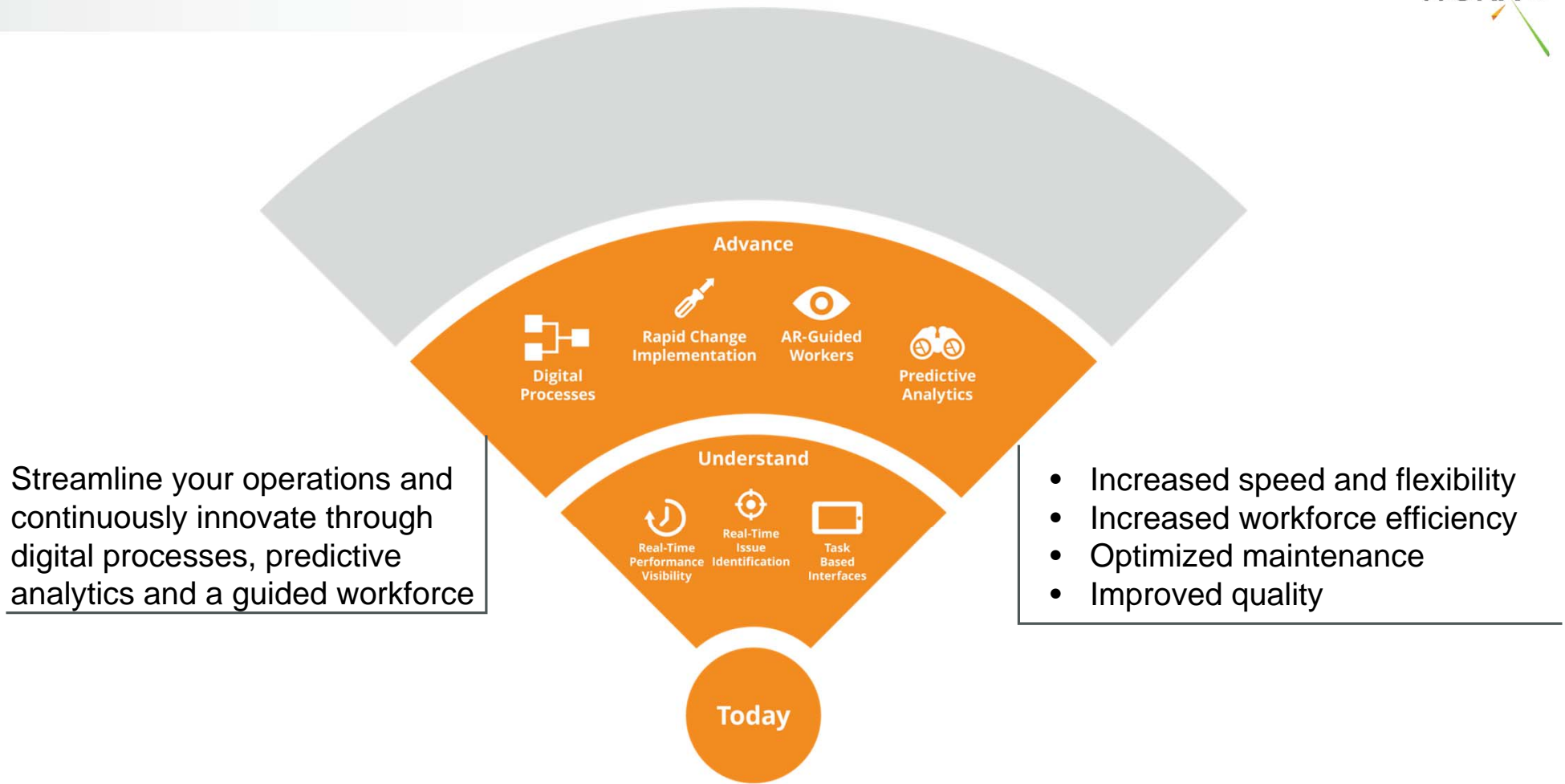


5 to 8% improvement in productivity

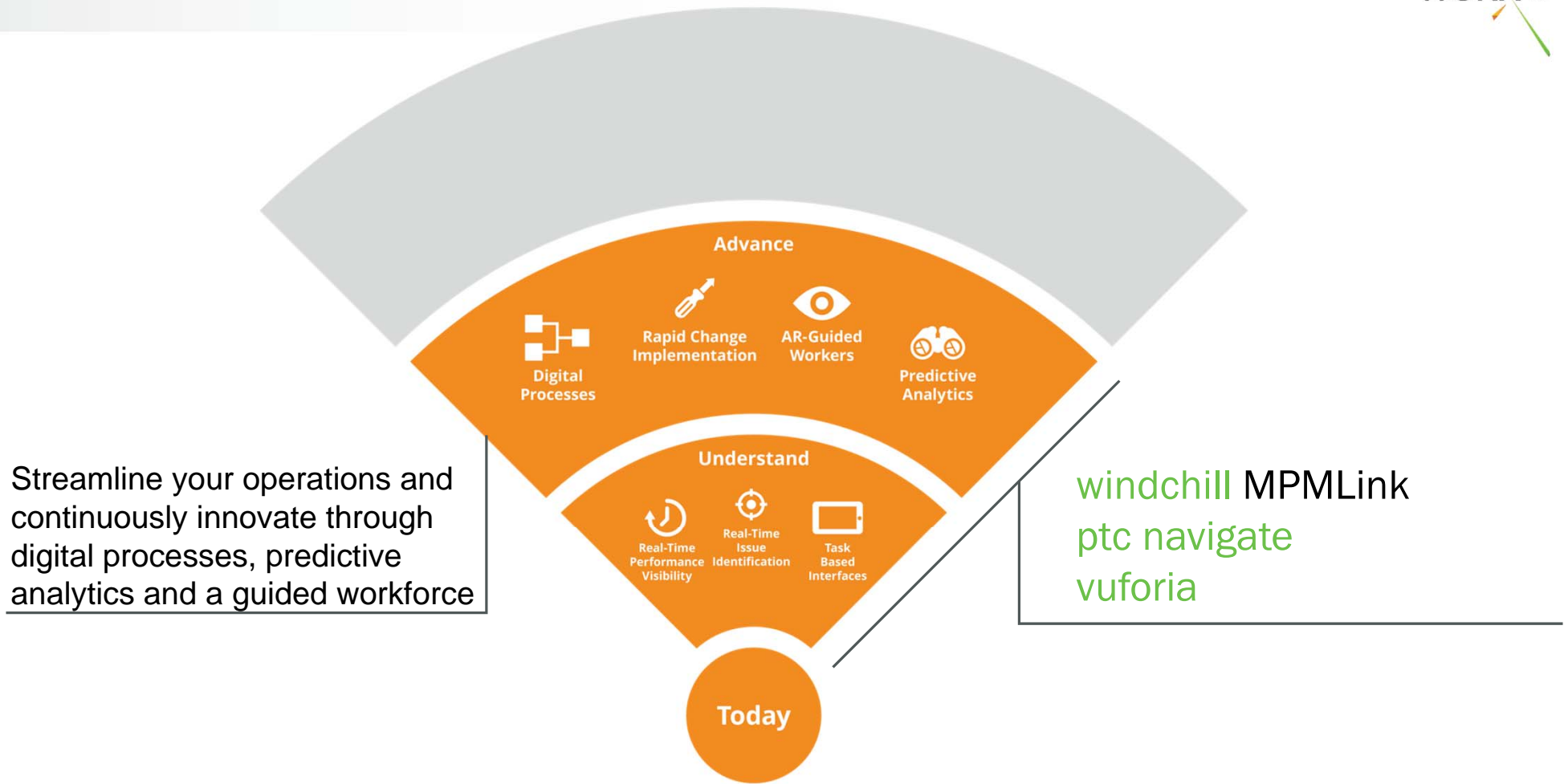


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STAGE TWO: ADVANCE



STAGE TWO: ADVANCE



PTC NAVIGATE FOR OPERATOR EFFICIENCY



CAPABILITIES

- One unified screen for the operator with contextual, order specific, information from all sources
- Bi-directional integrations
- 3D instructions
- Automated and manual data capture to build quality genealogy
- Support for smart tools
- Real-time quality check to error proof execution

People (operator):

- Single interface
- Role-based

Mfg systems (ERP/MES):

- Work orders
- Operations, parts, resources
- Competencies check
- Parts / resources availability
- Operation clocking

PLM / MPM / CAD:

- 2D / 3D
- Part and process plan details
- Standard operating procedures
- Augmented Reality

Quality / data capture:

- Traceability, genealogy
- Operator feedback

Industrial tools:

- Torque, angle, battery life, ...
- Position and orientation
- Program download (NC, CMM)



BENEFITS

Improved operator productivity

Improved quality

Higher value from existing systems

Higher IT flexibility

SMART, CONNECTED ASSEMBLY LINE FOR IMPROVED QUALITY



Leading aircraft manufacturer with €40 billion in revenue and 55,000 employees

#LIVEXORX

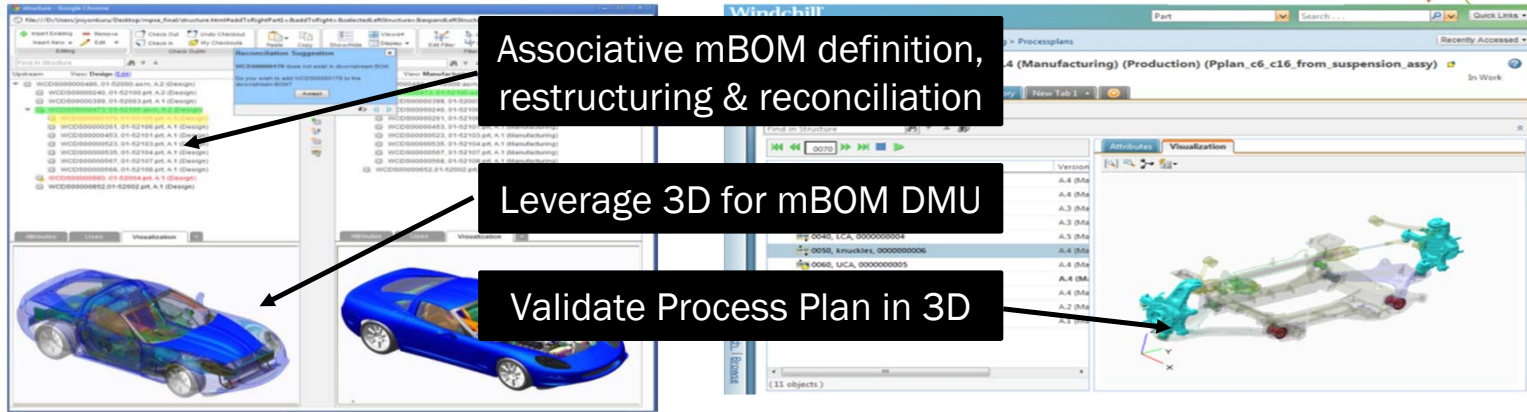
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WINDCHILL MPMLINK

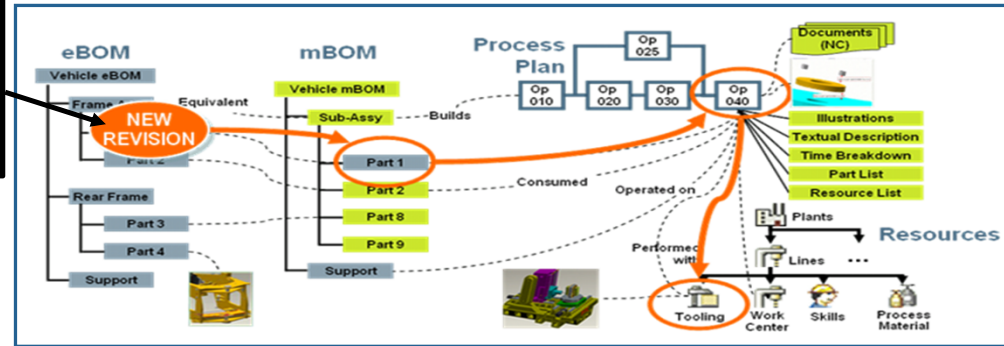


CAPABILITIES

- Manufacturing BOM Management
- Process Plan Management
- Manufacturing Change Management
- Integration to Operations
- Integral Work Instruction Management
- Control Characteristic Management



Mfg change control and propagation to mBOM, process plans, resources, instructions and documents



BENEFITS

Improved Eng. & Mfg. collaboration

Increased production quality and performance

Shorten time to production

Reduce development cost

CNB IMPROVES PRODUCT DEVELOPMENT AND MANUFACTURING PROCESSES WITH PTC SOLUTIONS



Founded in 1987, CNB is part of the Bénéteau group, a world leader in the construction of sailing yachts. With more than 40 prestigious yachts constructed, CNB has acquired an unfailing reputation for the quality of its construction and the finish of its boats.

“PTC has delivered a solution that is in line with the vision we have for improving our product development and manufacturing processes. We can now leverage the advanced capabilities of the newer releases of PLM and the PTC Manufacturing Process Management solution helps streamline our R&D and manufacturing processes.”

CNB



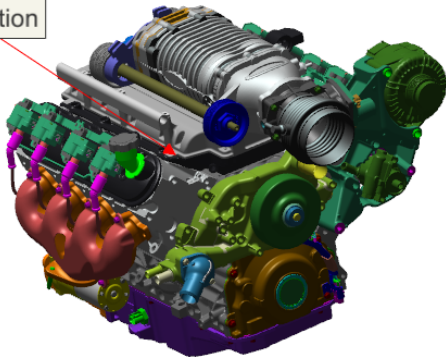
Club 100 Chirico - May 14, 2009 - Photo Nicolas Clain

WORK INSTRUCTIONS AUTHORIZING

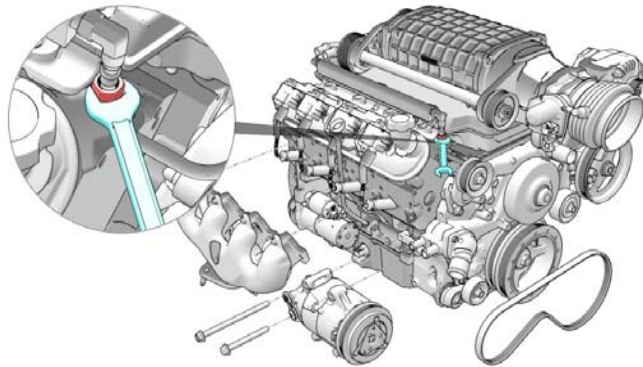


3D Annotations

Tight BOLT
per specification



3D Illustrations



Augmented Reality



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AUGMENTED REALITY GUIDED WORKERS



CAPABILITIES

- Guided, step-by-step instructions
- Contextual delivery of Work Instructions
- 3D and Augmented Reality delivery
- Real-time process and quality validation for error proof execution



BENEFITS

Improved operator productivity

Improved quality

Improved maintenance

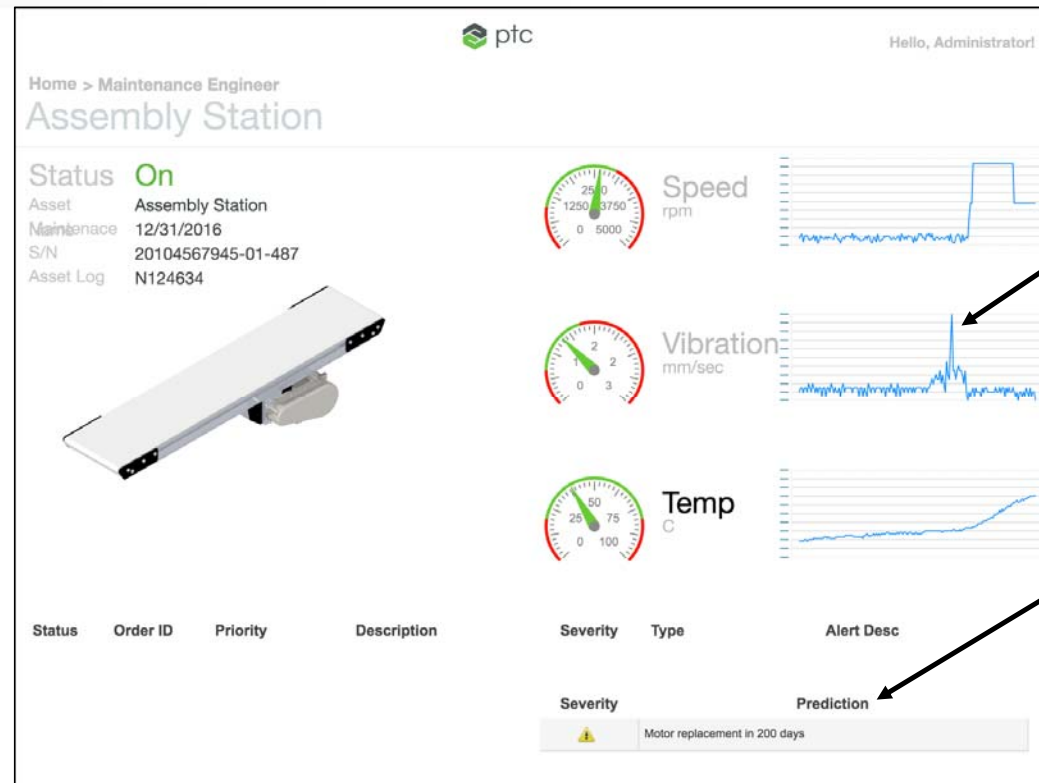
Improved training



PREDICTIVE ANALYTICS

CAPABILITIES

- Auto-detect normal state pattern
- Real-time anomaly detection
- Predict Outcomes
- Predictive Maintenance
- Predictive Quality



Anomaly Detection

Predictions

BENEFITS

Reduced downtime

Optimized maintenance planning & execution

Improved quality

Reduced scrap and rework

manufacturing journey

Continuously improve your operational performance and flexibility through digital manufacturing, real-time intelligence and predictive analytics.

How to get there

Combine engineering, manufacturing, quality and service data into a unified digital thread

Enable physical-digital closed-loop processes to constantly improve and adjust operations

Implement consistent KPIs and corporate-wide performance benchmarking to identify and implement best practices

Digitally design your manufacturing process and quality plans

Apply predictive analysis to machine health and quality processes

Employ intuitive, in-context 3D and augmented reality to guide workers

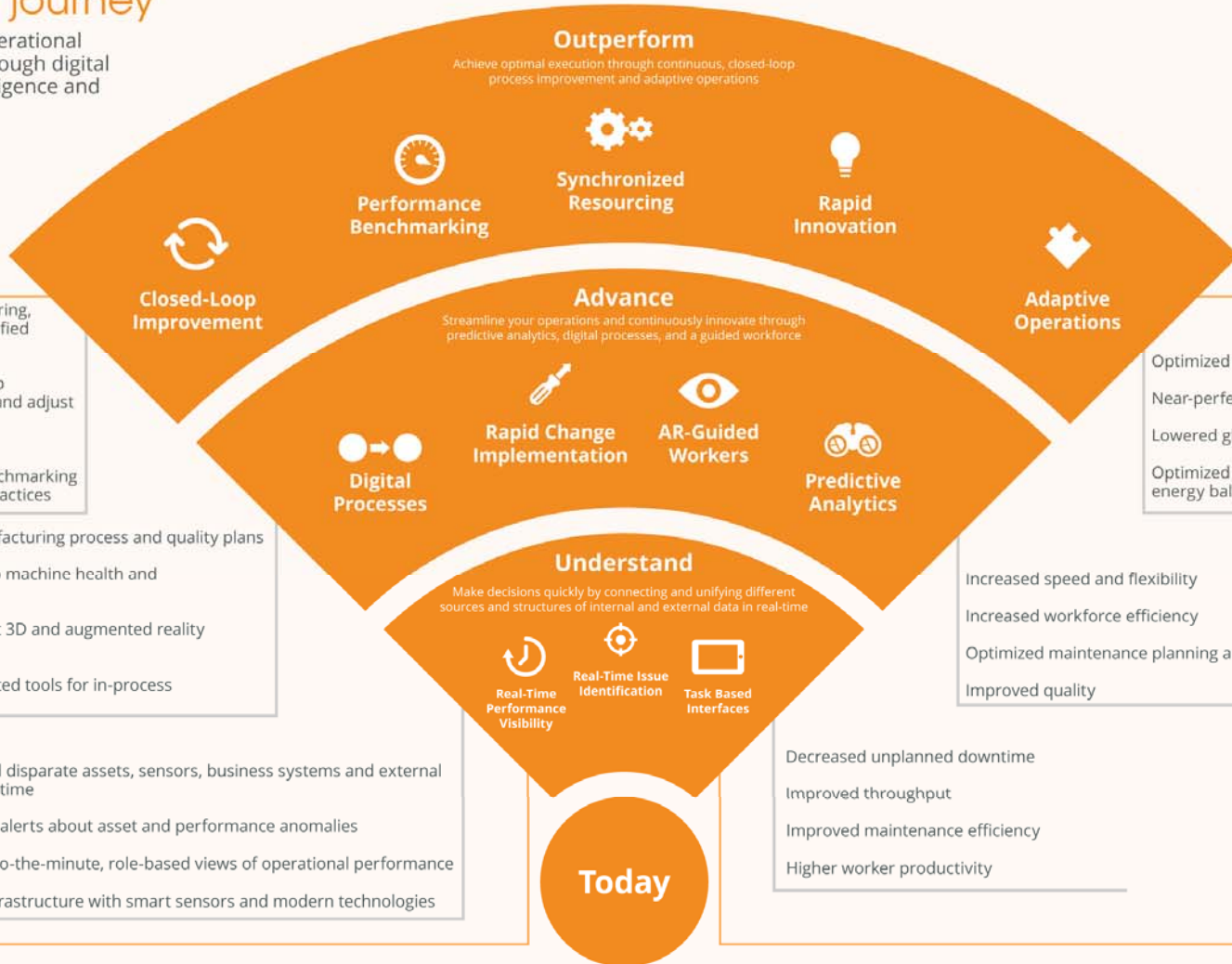
Incorporate smart, connected tools for in-process quality validation

Connect diverse and disparate assets, sensors, business systems and external data sources in real-time

Broadcast real-time alerts about asset and performance anomalies

Simplify data in up-to-the-minute, role-based views of operational performance

Enhance existing infrastructure with smart sensors and modern technologies



Closed-Loop Improvement

Performance Benchmarking

Synchronized Resourcing

Rapid Innovation

Adaptive Operations

Digital Processes

Rapid Change Implementation

AR-Guided Workers

Predictive Analytics

Real-Time Performance Visibility

Real-Time Issue Identification

Task Based Interfaces

Optimized enterprise-wide operations

Near-perfect quality

Lowered global manufacturing costs

Optimized production, maintenance, and energy balancing

Increased speed and flexibility

Increased workforce efficiency

Optimized maintenance planning and execution

Improved quality

Decreased unplanned downtime

Improved throughput

Improved maintenance efficiency

Higher worker productivity

MFG SOLUTIONS ROADMAP



Controls Engineer



Plant Manager



Maintenance



Quality



Operator



Process Planner
Maintenance Planner

AR Instructions Authoring and Delivery

Digital Twin

Predictive Maintenance

Predictive Quality

Industrial Connectivity

Operational Intelligence

Asset Performance

Operator Efficiency

Manufacturing extensions

3D Process Planning & Work Instructions

KepServerEX

A PTC Business

#LIVEWORX



Web



Vendor



ERP



MES



SCADA



Fleet

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A decorative graphic consisting of several colorful, elongated, triangular shapes pointing towards the center. The colors include blue, green, yellow, orange, pink, and purple. The shapes are arranged in a way that they appear to be converging on the 'X' in the main text.

LIVE WORX 16™

TAKE A FRESH LOOK AT THINGS

liveworx.com

