

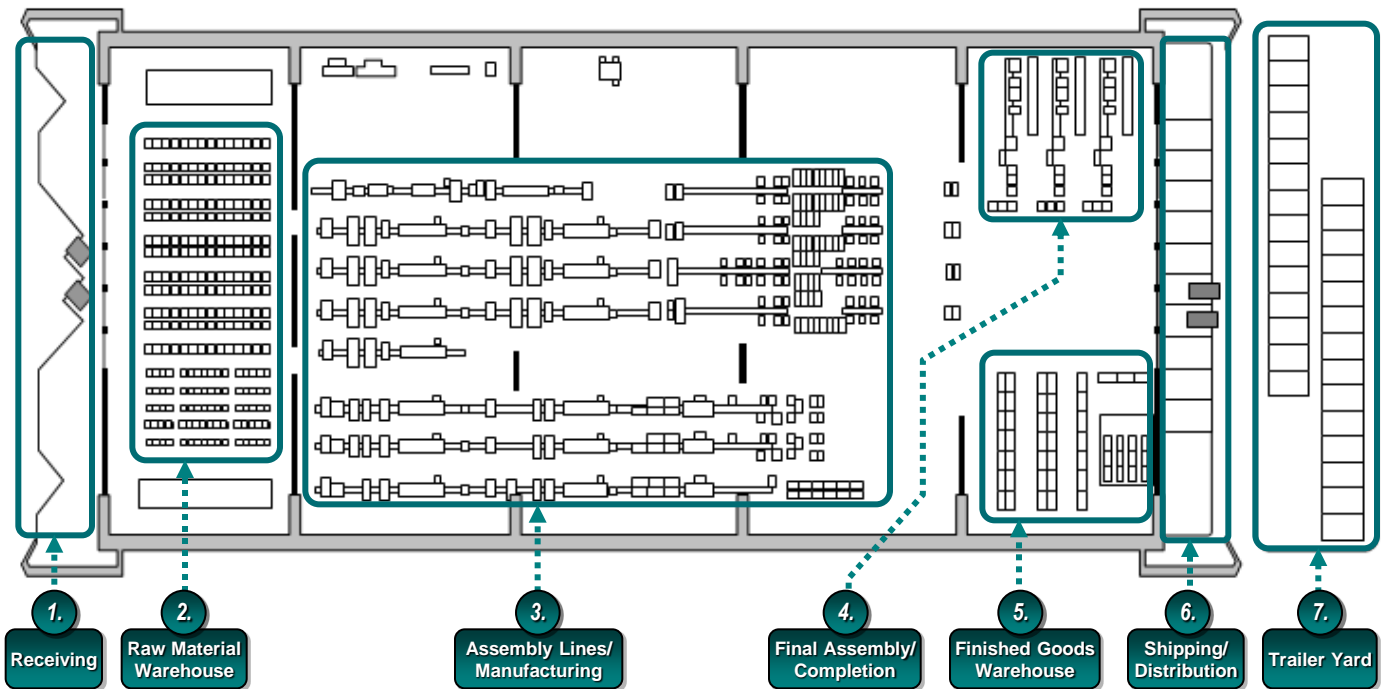
Real-time Visibility

Deploying RFID & RTLS in Manufacturing Operations



Delivering Real-time
Visibility to the
Enterprise

Real-time Manufacturing Visibility



Innovative Manufacturers continually look for ways to increase efficiency and eliminate waste. RFID and RTLS technology provide the necessary visibility and measurability to drive process improvement and cost savings.

Whether deployed at an enterprise level or within the four walls of a single facility, real-time visibility can increase operational efficiency while reducing inventory, labor, transportation and administrative costs. RFID-enabling a single facility can have an enterprise-wide impact. *Automating and error-proofing even a single business process can deliver a significant return on investment.*

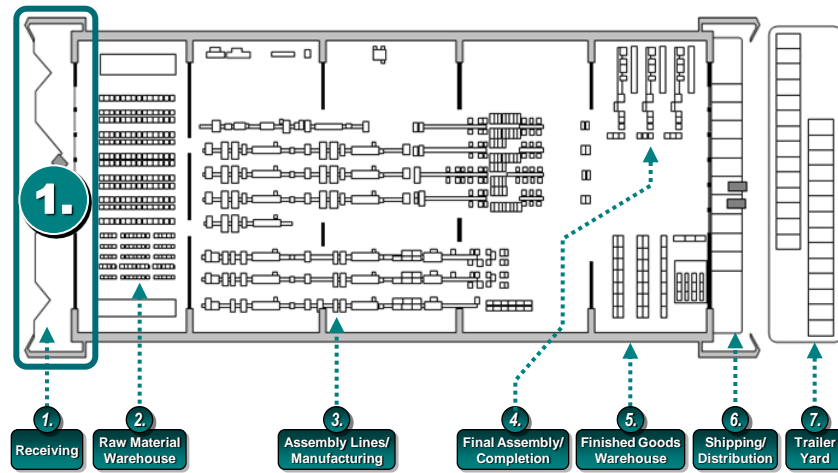
Process-specific projects often pay for themselves within 3-4 fiscal quarters, and are targeted in one or more of the following areas:

- Shipping
- Receiving
- Container Tracking
- Kanban Management
- Cycle Counting
- Tool Tracking
- Work-in-Process Tracking
- Order Tracking
- Audit & Inspection
- Yard Management

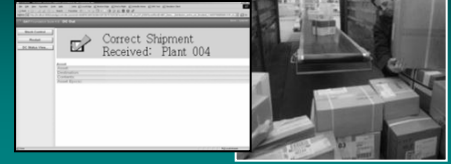
This guide illustrates specific areas where manufacturers can quickly and cost-effectively RFID and RTLS-enable their operations, using a single assembly facility as an example.

Note: Although RFID and RTLS are referred to specifically within this document, UWB, Wi-Fi, along with other Auto-ID and sensor technologies may be used interchangeably for real-time enabled applications.

1. RFID & RTLS Applications in Receiving



Receiving



RFID & RTLS Application

- Automate receipt & verification of incoming goods

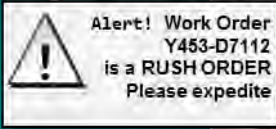
Web Services Integration Options for ERP & WMS Systems

- Compare received goods with content manifest or ASN
- Flag rush orders by comparing order number and special instructions
- Expedite rush orders
- Quarantine and track non-scheduled shipments

RFID & RTLS Value Add

- 100% automated tracking & reliable identification of shipments as they are received
- Significantly reduce error rates and costly correction processes
- Focus staff on exception handling vs. administrative paperwork

RTI (Returnable Transport Item) Tracking



RFID & RTLS Application

- Track reusable containers and contents from location to location

Web Services Integration Options for ERP & WMS Systems

- Pull parts manifest for each work order to track components
- Confirm final destination for each shipment & work order number
- Alert staff with a visual or audible alarm when a work order is received at the wrong location

RFID & RTLS Value Add

- Automate check-in/check-out processes
- Obtain real time status of work orders and components

Case Study:

RFID-enabled Tool Tracking

A Defense Contractor real-time enabled their CostPoint system with OAT software to track and improve the utilization of specialized tools and indirect materials across multiple manufacturing facilities.

With real-time visibility into tool usage and associated Work-in-Process status, tools can now be stored at point of use, minimizing transport delays. The company can also access up-to-the minute program status, enabling them to allocate resources more efficiently.

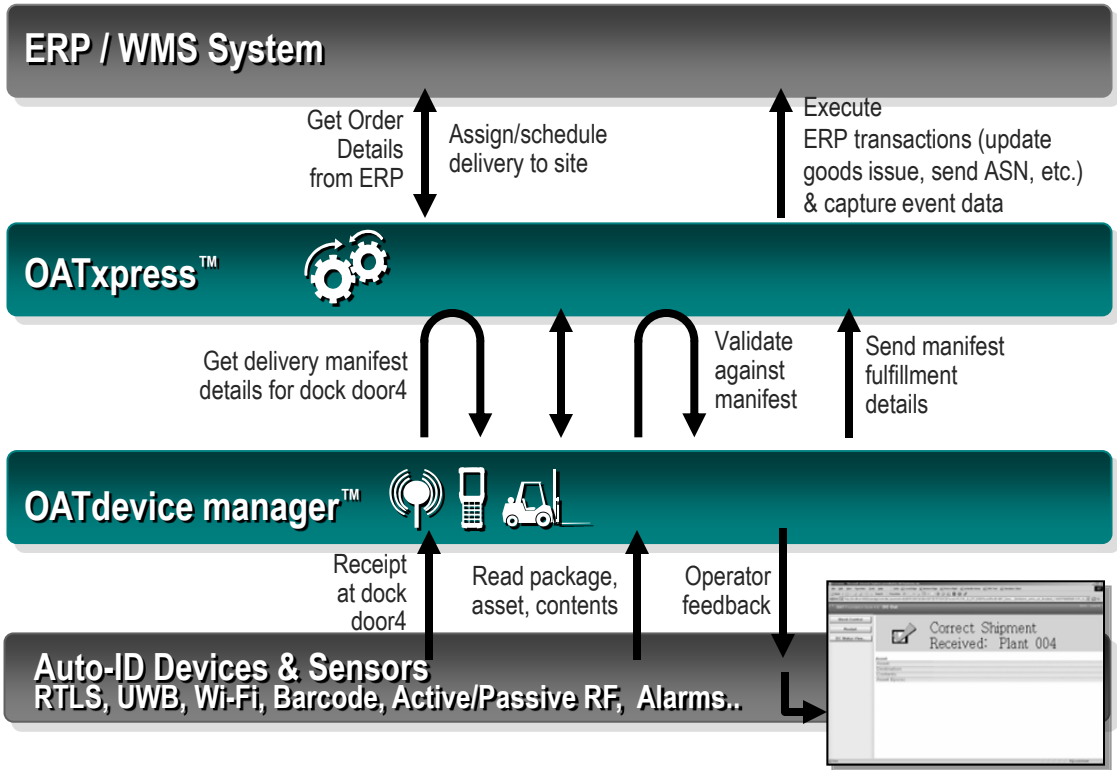
1. Receiving: Functional Process Flows

Receiving



Sample Process Flow

- Validating manifest details, ASN against physical shipments

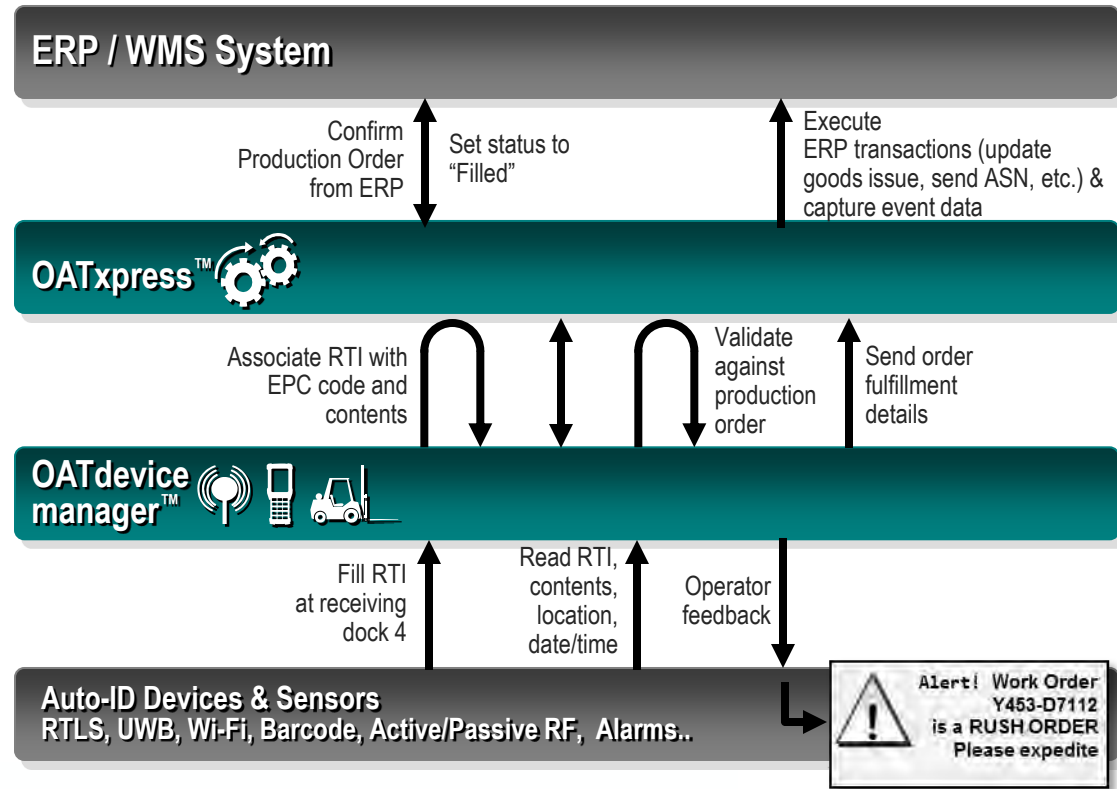


RTI (Returnable Transport Item) Tracking

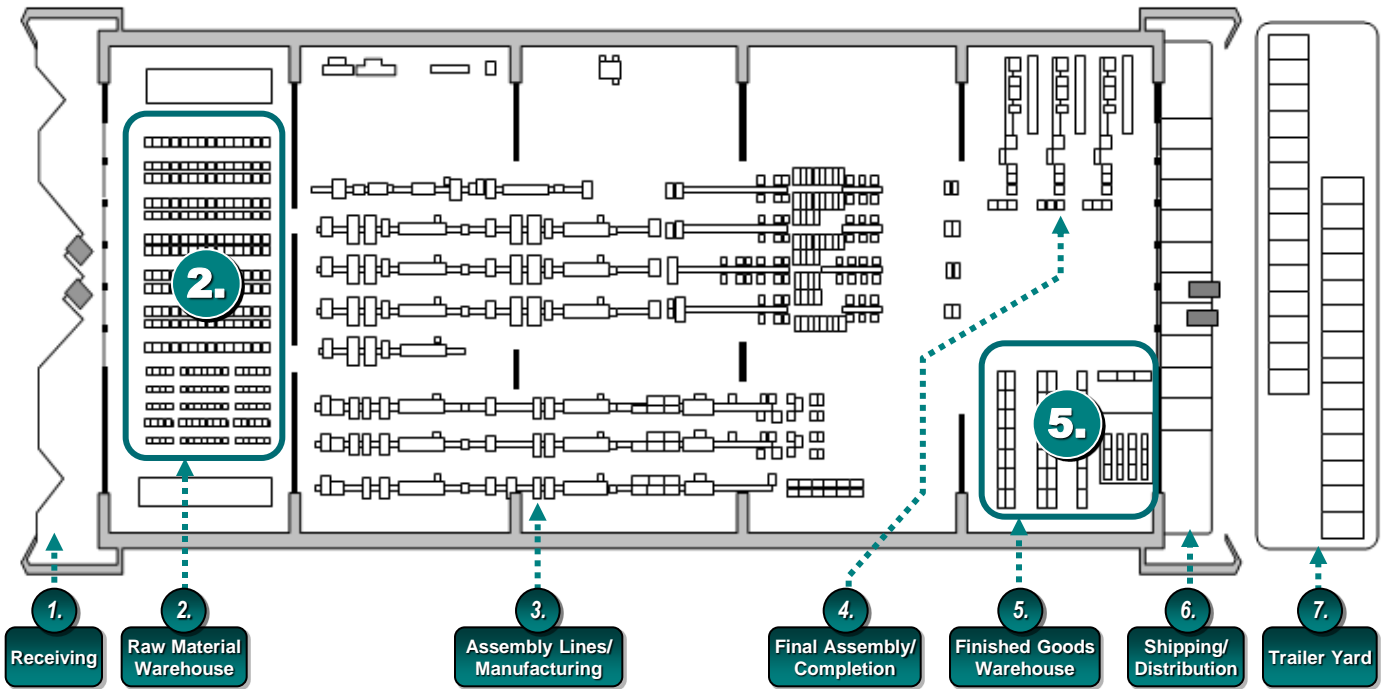


Sample Process Flow

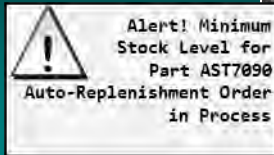
- Validating order & manifest details against physical containers and their contents



2. 5. RFID & RTLS Applications in Warehouses & Stores



Stock Taking/ Cycle Counting



RFID & RTLS Application:

- Automated stock taking and inventory updates

Web Services Integration Options for ERP & WMS Systems:

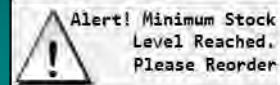
- Compare expected inventory with actual inventory
- Update inventory levels in enterprise systems and dashboards

RFID & RTLS Value Add:

- Faster, more frequent inventory counts, with no line-of-sight requirements
- More accurate item-level inventory

Kanban Management

Line-Side Replenishment



RFID & RTLS Application:

- Proactive inventory management and automatic replenishment

Web Services Integration Options for ERP & WMS Systems:

- Compare expected inventory with actual inventory
- Alert operator or automatically replenish when inventory levels are low

RFID & RTLS Value Add:

- More accurate inventory and replenishment
- Reduction in safety stock, labor costs
- Increased downstream productivity

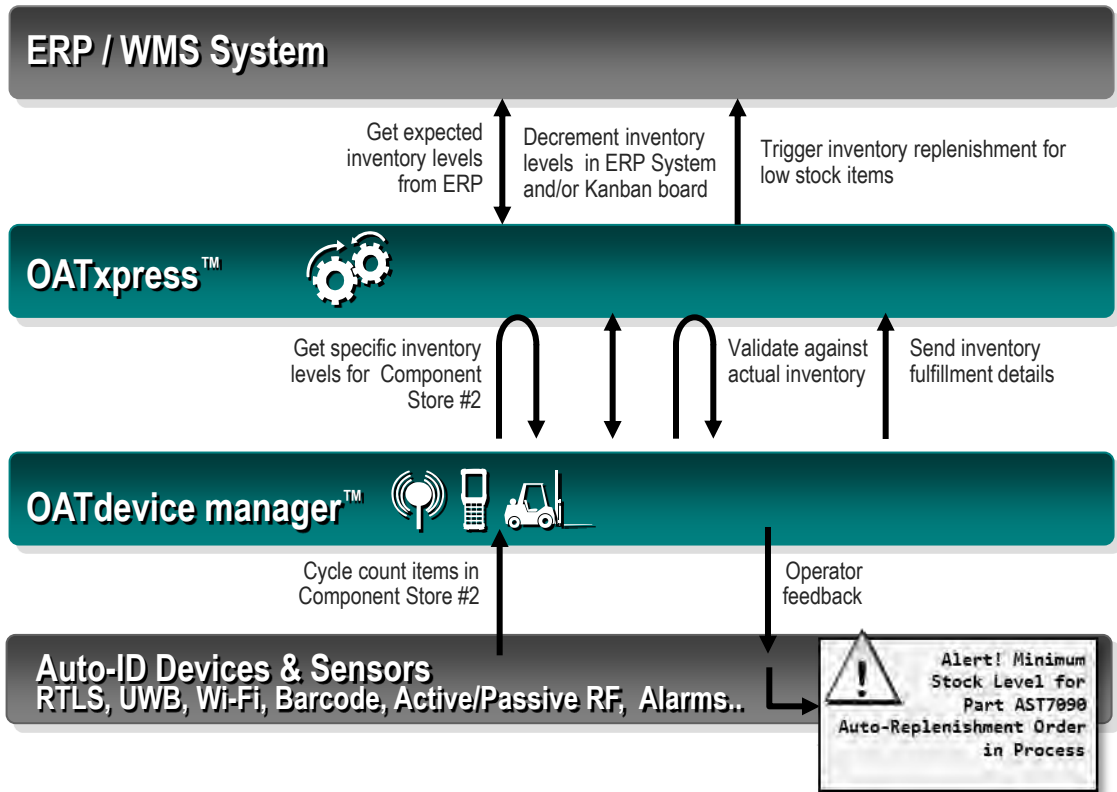
2. 5. Warehouses & Stores: Functional Process Flows

Stock-Taking Cycle Counting



Sample Process Flow

- Inventory Verification and Auto-Replenishment

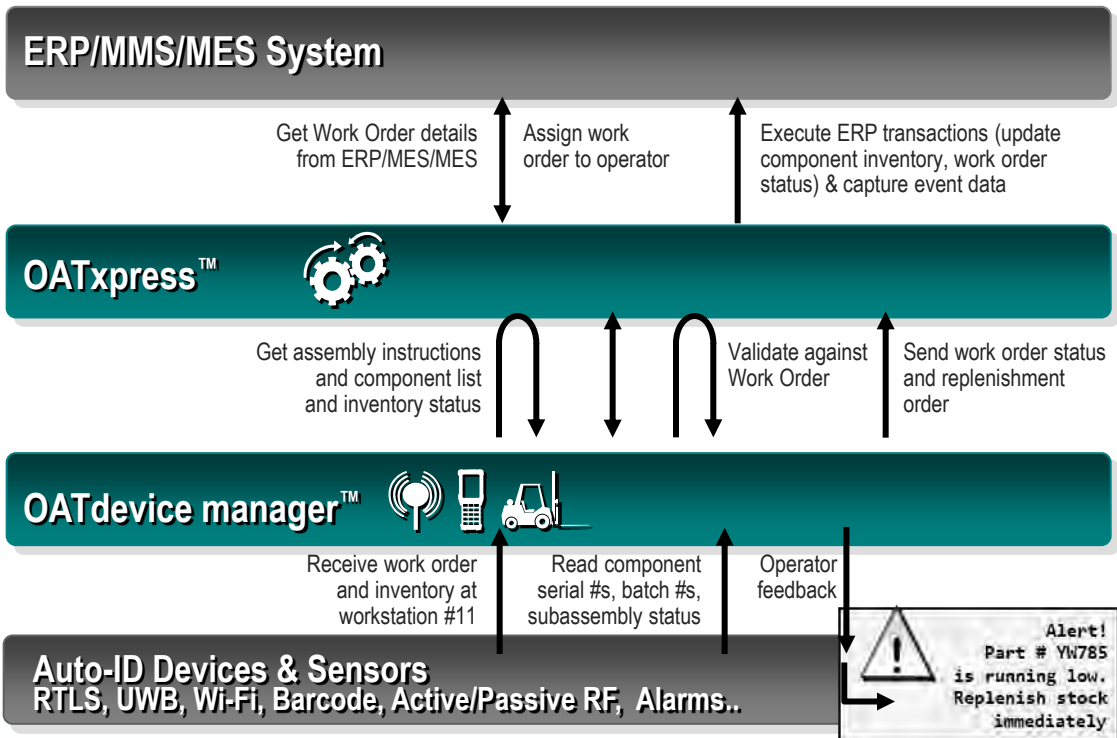


Kanban Mgmt. Line-Side Replenishment

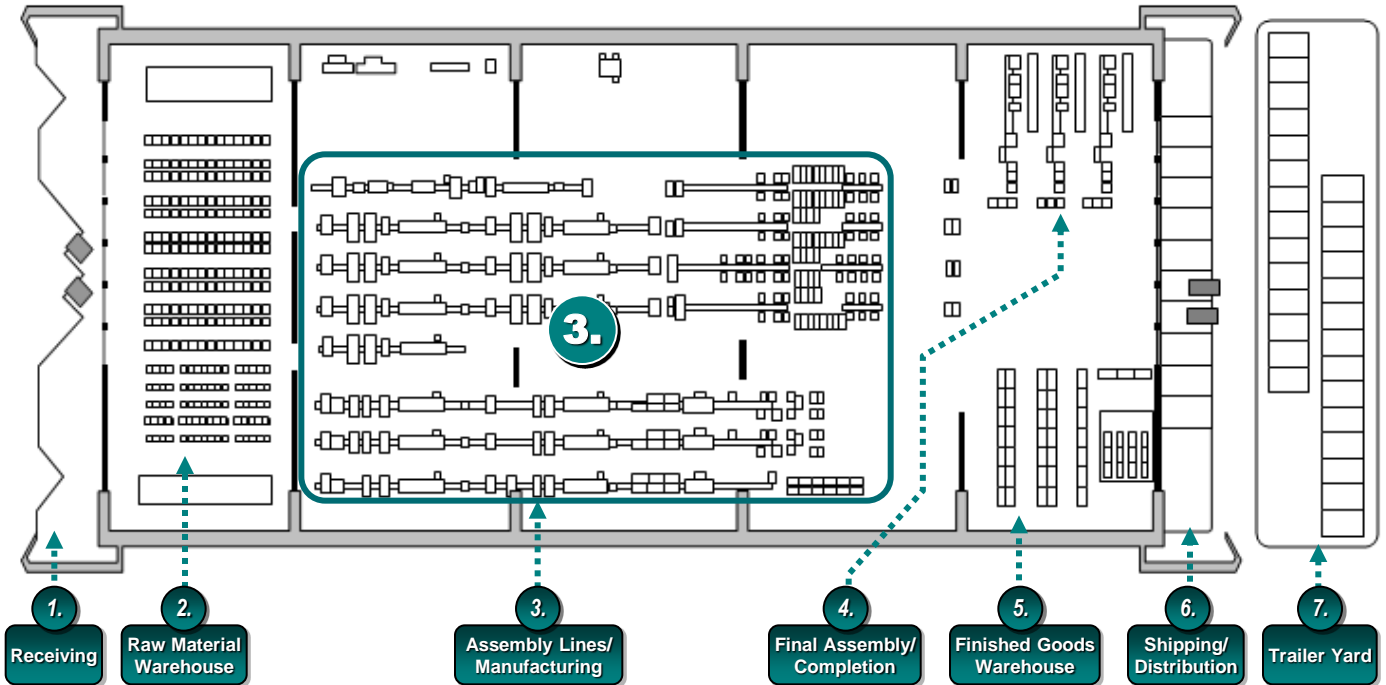


Sample Process Flow

- Verifying Component Inventory at Line-Side as Work Orders are assigned



3. RFID & RTLS Applications in Assembly



Work in Process Tracking



RFID & RTLS Application:

- Real-time tracking of manufacturing work orders, component parts and subassemblies

Web Services Integration Options for ERP, MES & WMS Systems:

- Update inventory levels when component parts are assigned to new work orders
- Alert operator or replenish part store when inventory levels fall below a pre-defined threshold

RFID & RTLS Value Add:

- 100% automated tracking and reliable identification of work orders through the manufacturing process
- Reduction in safety stock and costly reusable containers
- Help prevent missing orders and rework, increasing throughput
- Audit trail of components, batch numbers for finished products

Tool Tracking



RFID & RTLS Application:

- Real-time tracking of tools and specialized equipment

Web Services Integration Options for ERP, MES & WMS Systems:

- Verify and update tool location and maintenance records when tools are checked in and out

RFID & RTLS Value Add:

- Automated inventory management
- Reduction in tool spares
- Fewer lost tools, increasing manufacturing uptime
- Audit trail of tool usage and calibration simplifies compliance

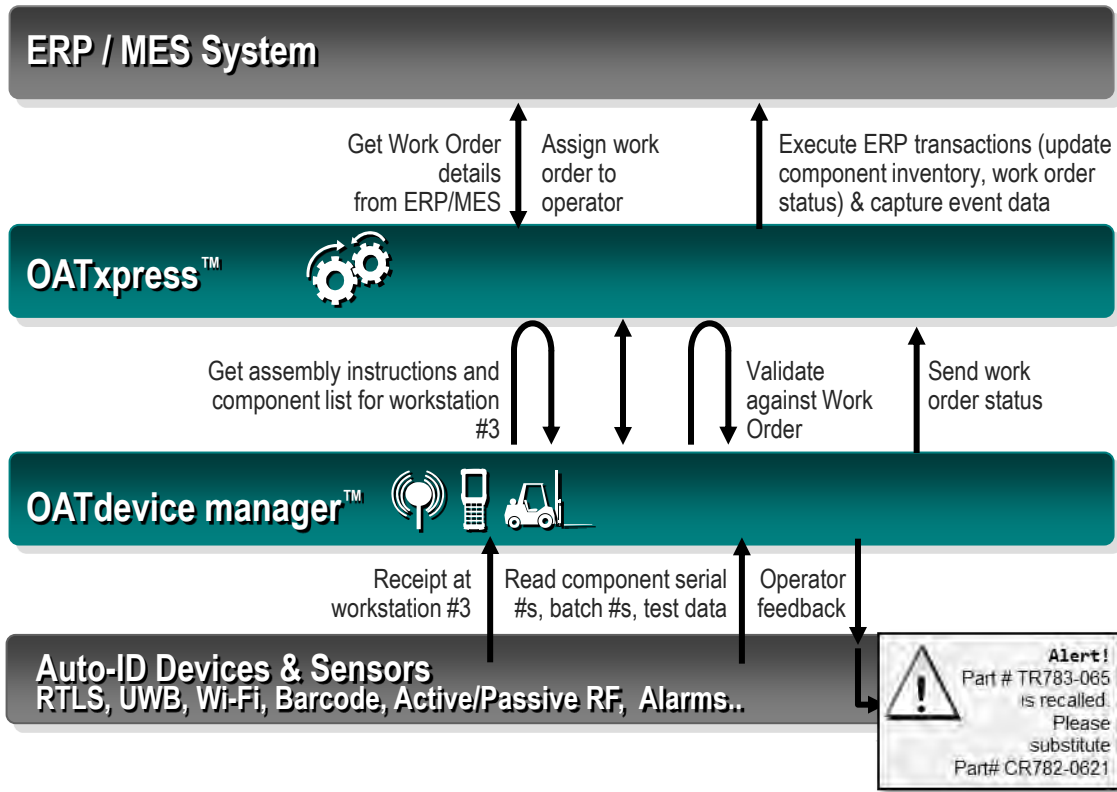
3. Assembly: Functional Process Flows

Work-in-Process Tracking



Sample Process Flow

- Verifying Components as they are Assigned to Work Orders

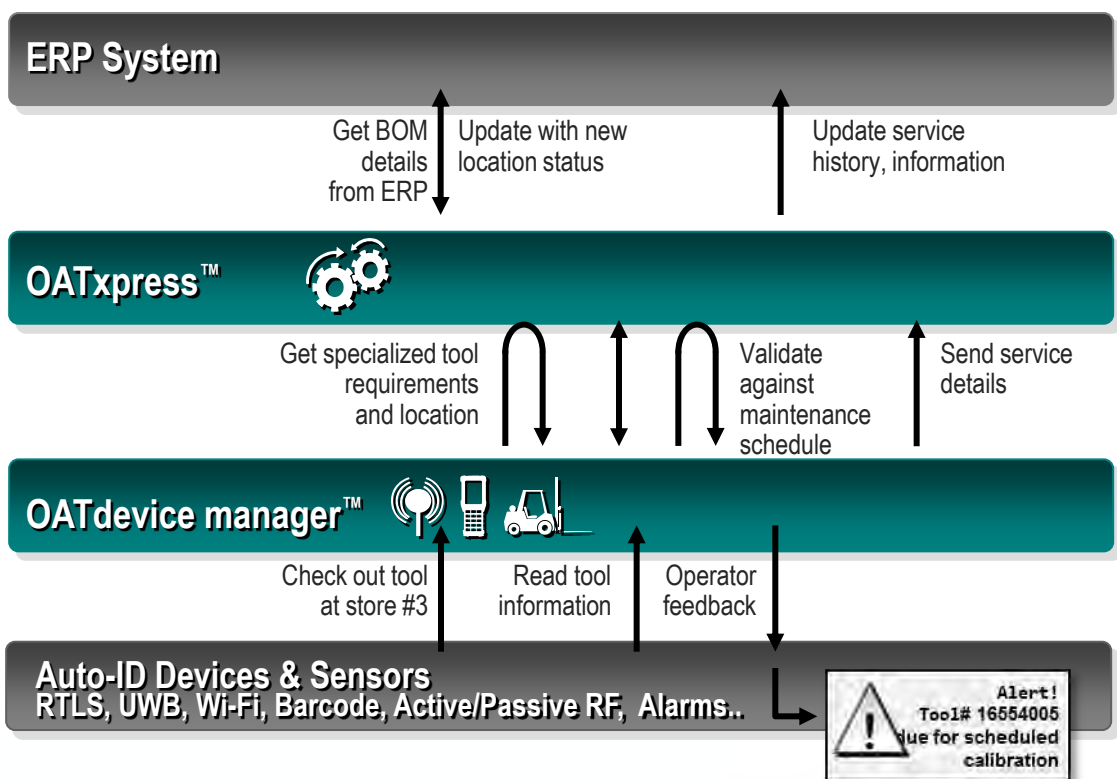


Tool Tracking

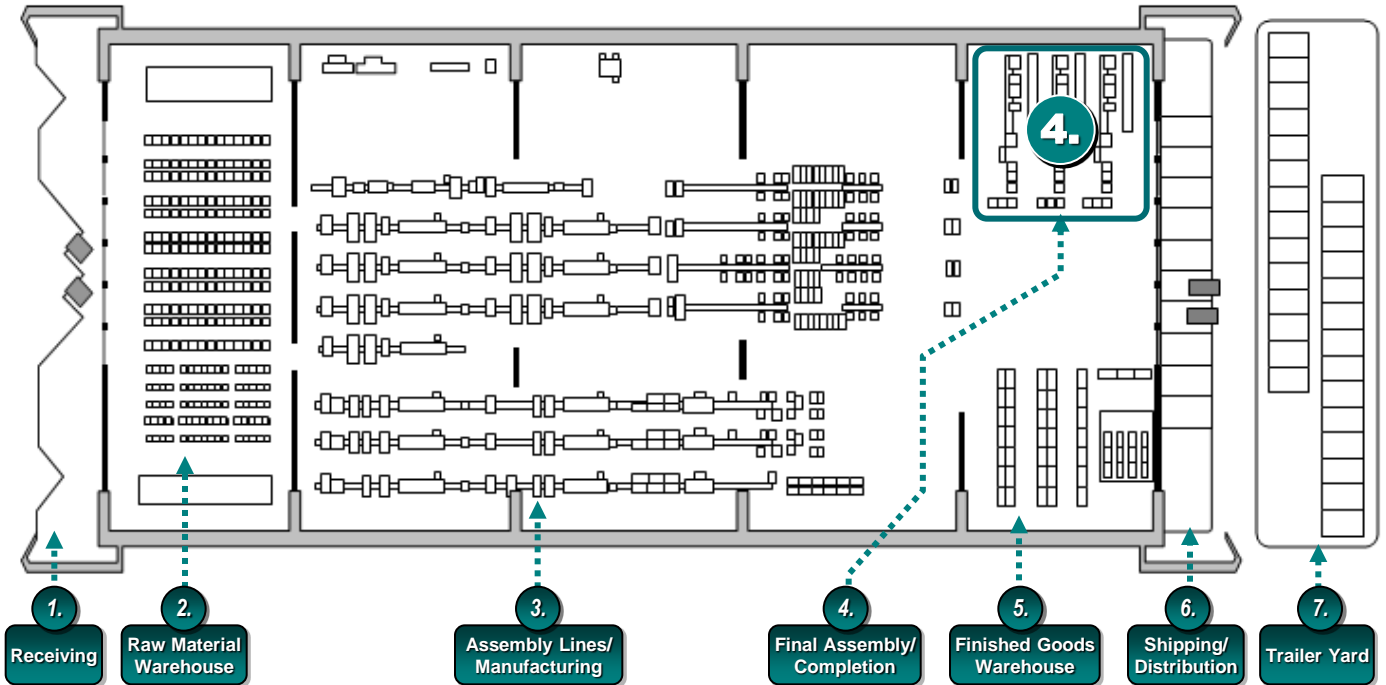


Sample Process Flow

- Manage tool stores and calibration schedule



4. RFID & RTLS Applications in Final Assembly / Completion



Audit & Inspection



RFID & RTLS Application:

- Real-time tracking of quality assurance activities and maintenance schedules

Web Services Integration Options for ERP Systems:

- Confirm required components are included in each finished product or custom order
- Alert staff if a specific component is missing, is near or past expiration date, or requires maintenance
- Verify and update maintenance records when products are serviced

RFID & RTLS Value Add:

- Faster final inspection process
- Fewer spare components required
- Audit trail simplifies compliance and reverse logistics

Order Tracking



RFID & RTLS Application:

- Track orders & their individual items from location to location

Web Services Integration Options for ERP & WMS Systems:

- Pull order details to track supplier, end customer, final destination & item numbers
- Alert staff with a visual or audible alarm when an order is received at the wrong location, or needs to be expedited

RFID & RTLS Value Add:

- Real-time order status
- Reduce manual labor in confirmation, verification & search activities

4. Final Assembly & Completion: Functional Process Flows

Audit & Regulation



Sample Process Flow

- Confirm required components are on board aircraft

ERP / Service & Asset Management System

Get aircraft manifest from ERP, Service & Maintenance

Assign/schedule inspection to site, aircraft, operator

Update inspection records and final assembly manifest

OATxpress™



Verify aircraft registration at inspection bay 1

Validate against manifest

Send manifest fulfillment details

OATdevice manager™

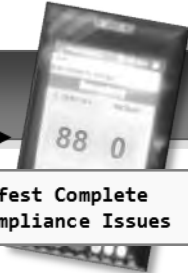


Start audit process at inspection bay 1

Scan aircraft contents, part #s, serial #s

Operator feedback

Auto-ID Devices & Sensors RTLS, UWB, Wi-Fi, Barcode, Active/Passive RF, Alarms..



- Manifest Complete
- 0 Compliance Issues

Order Tracking



Sample Process Flow

- Validate physical items against ASN & customer order to track supplier, end customer, final destination and item numbers

ERP / WMS System

Get ASN Details from WMS

Assign/schedule delivery to customer

OATxpress™



Get manifest details for Order Y453-D7112

Validate against manifest

OATdevice manager™



Receipt at staging area

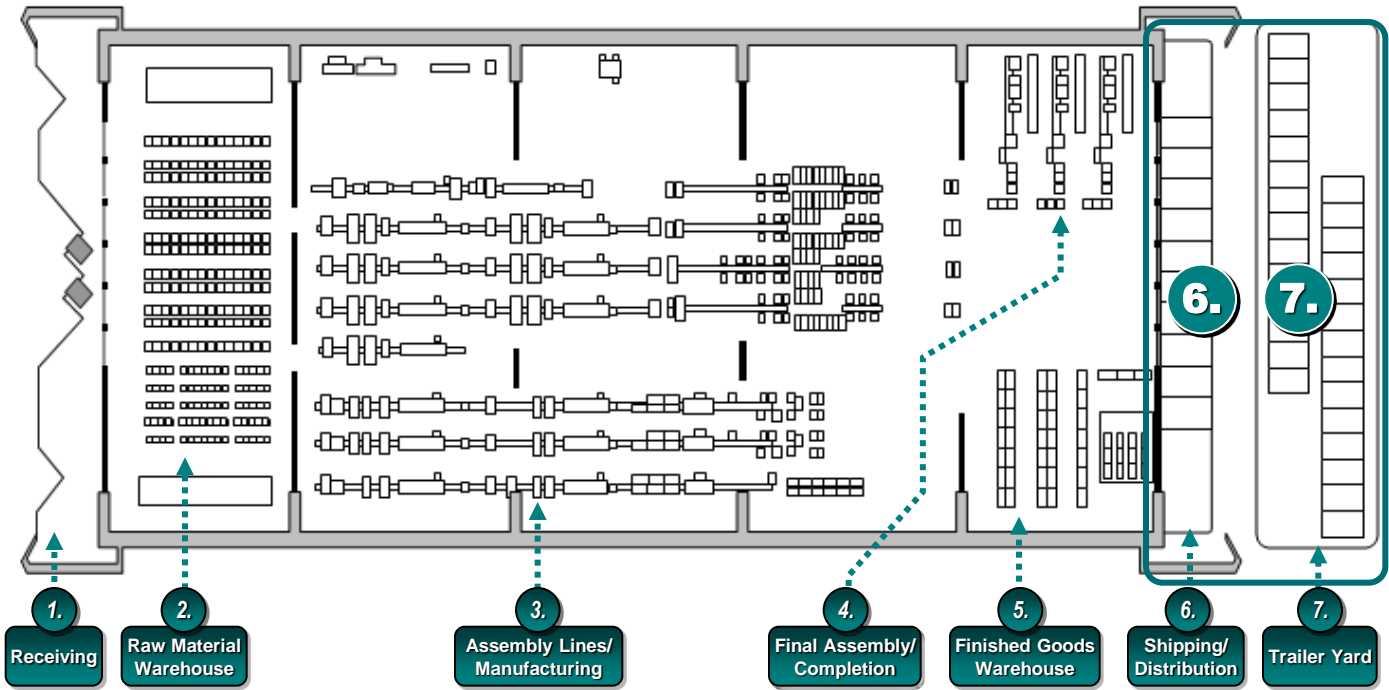
Read package, contents, customer, final destination

Operator feedback at Dock Door 5

Auto-ID Devices & Sensors RTLS, UWB, Wi-Fi, Barcode, Active/Passive RF, Alarms..



6. 7. RFID & RTLS Applications in Distribution, Yards



Shipping



RFID & RTLS Applications:

- Automate Advanced Shipping Notices (ASNs)
- Verify outgoing orders
- Automate tracking of delivery vehicles and associated orders

Web Services Integration Options for ERP & WMS Systems:

- Expedite rush orders
- Verify individual items with customer orders
- Verify final destination, carrier and dock door
- Flag rush orders by comparing order number & special instructions

RFID & RTLS Value Add:

- 100% automated tracking & reliable confirmation of orders as they are shipped
- Significantly reduce error rates and costly correction processes
- Focus staff on exception handling vs. administrative paperwork

Yard Management



RFID & RTLS Application:

- Automate tracking and identification of trailers and their contents as they arrive, exit or move within a laydown yard

Web Services Integration Options for ERP & WMS Systems:

- Compare trailer contents with manifests, ASNs and work orders
- Update inventory and place replenishment orders as needed

RFID & RTLS Value Add:

- Significantly reduce error rates, correction processes and 3rd party service costs
- Minimize driver and trailer detention time
- Minimize the need for extra trailers, safety stock and expedite costs

6. 7. Distribution, Yards : Functional Process Flows

Shipping



Sample Process Flow

- Verifying outgoing orders, validating Packages against ASN

ERP / WMS System

Get Order Details from ERP

Assign/schedule delivery to site

Execute ERP transactions (update goods issue, send ASN, etc.) & capture event data

OATxpress™



Get delivery manifest details for dock door4

Validate against manifest

Send manifest fulfillment details

OATdevice manager™



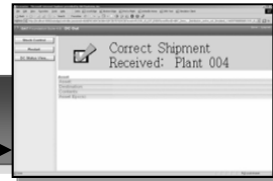
Final inspection at dock door4

Read package, asset, contents

Operator feedback

Auto-ID Devices & Sensors

RTLS, UWB, Wi-Fi, Barcode, Active/Passive RF, Alarms..



ERP / WMS / Service & Asset Management System

Get delivery schedule from ERP / WMS / Service & Asset Management

Assign finished goods to zone within laydown yard

Update yard management map

OATxpress™



Get location details for trailer

Validate against inventory/ location table

Send configuration details

OATdevice manager™



Receipt at laydown yard

Read product ID, trailer ID, location

Operator feedback

Auto-ID Devices & Sensors

RTLS, UWB, Wi-Fi, Barcode, Active/Passive RF, Alarms..



Pinpoint goods location in yard

Yard Management



Sample Process Flow

- Verifying Finished Goods Location and Maintenance during Check-In/ Check-Out Process



Deploying RFID in Manufacturing: Best Practices

1

Leverage your enterprise systems

Manufacturers make significant investments in ERP, WMS, MMS and MES systems. Enriching these systems with RFID & sensor data can dramatically reduce the time and cost of deployment.

2

Take advantage of real-time data

Don't just capture RFID information in a data warehouse. Take full advantage of real-time alerts and insights to reduce error rates and improve productivity.

3

Focus on cost reduction

Many manufacturers can realize significant savings in expedite, transportation, labor and inventory costs by RFID-enabling error-prone process areas such as Shipping & Receiving, Container Tracking and Yard Management.

4

Start with configurable packaged solutions

RFID packaged solutions are much faster to test and deploy, and can often be easily configured for your specific needs, without requiring custom development.

5

Make sure your initial project has room for growth


Select a proven Auto-ID application platform with broad device support and deployment flexibility, so that you can evolve and scale easily.

6

Begin with the end in mind

Don't lose sight of your business goals. Track and adjust your metrics along the way and plan for continuous improvement.

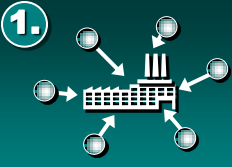



Leveraging Your Production Systems

	RFID & RTLS Integration Examples
Enterprise Resource Planning (ERP) Systems	<ul style="list-style-type: none"> • Verify physical components against bill of materials • Trigger inventory replenishment when low stock is detected
Manufacturing Execution Systems (MES)	<ul style="list-style-type: none"> • Track physical products at each stage of testing & assembly • Confirm that custom orders match manifest • Locate missing parts & equipment
Warehouse Management Systems (WMS)	<ul style="list-style-type: none"> • Verify manifest & destination for outgoing shipments • Prevent mis-shipments with visual/audible alarms • Track finished goods inventory
Service & Asset Management Systems	<ul style="list-style-type: none"> • Verify parts & equipment against service orders • Monitor installation & maintenance history • Locate recalled or expired service parts
Business Activity Monitoring (BAM) Dashboards	<ul style="list-style-type: none"> • Automatically update dashboards to reflect: <ul style="list-style-type: none"> – Physical inventory levels – Orders shipped – Manufacturing efficiency

ERP, MES, WMS, Service & Asset Management systems & business activity dashboards are the lifeblood of many manufacturing and services organizations.

RFID & RTLS-enabling these production systems incorporates real-time production and delivery status into day-to-day business metrics. This enables staff to uncover and address process errors before they impact production schedules, customer orders and downtime.

RFID & RTLS-enabling the Value Chain

	 1. Supply Chain	 2. Logistics & Distribution	 3. Manufacturing / Assembly Lines	 4. Maintenance & Reverse Logistics
Items to Track:	<ul style="list-style-type: none"> • Component Parts • Supplier • Batch Number • Due Date 	<ul style="list-style-type: none"> • Carrier • Order Number • Order Contents • Final Destination • Due Date 	<ul style="list-style-type: none"> • Work-in-Process • Tools and Equipment • Test Results • Custom Order Details 	<ul style="list-style-type: none"> • Service History • Replacement Parts • Part Expiration Date • Service Due Date
Processes to Enable:	Sourcing Shipping/ Receiving	Shipping/Receiving Yard Management Transportation	Shipping/Receiving Line-side Replenishment Assembly Asset Tracking Tool Tracking	Line-side Maintenance Reverse Logistics
Enterprise Systems to Enable	ERP MMS WMS	ERP WMS	ERP MMS MES WMS	Field Service Enterprise Asset Management
Infrastructure to Enable	Barcode, RFID, Contact Memory Buttons, Wi-Fi	Barcode, RFID, Wi-Fi, RTLS, GPS	Barcode, RFID, CMBs, Wi-Fi, PLCs, Stack Lights & other sensors	Barcode, RFID, CMBs, Wi-Fi, RTLS, GPS
Quantifying Value:	Increased Forecast Accuracy Reduced Safety Stock Reduced Expedite Costs	Streamlined Shipping Costs Increased Order Accuracy & Customer Satisfaction	Improved Product Quality, Fewer Returns Reduced Downtime Reduced Scrap & Rework Reduced Expedite Costs	Increased Time in Service Fewer Audits & Regulatory Fines Reduced Maintenance and Repair Costs

Beyond the four walls of each manufacturing facility, there are common operational challenges in supply chain, logistics and maintenance processes that can be addressed with real-time visibility.

By RFID & RTLS-enabling existing applications and implementing Auto-ID packaged solutions, Manufacturers can reduce deployment time and accelerate the return on their technology investment.

Case Study: RFID-enabled WIP Tracking and Warehousing

A Heavy Equipment Manufacturer RFID-enabled their SAP ERP system with OAT Software to automate the tracking of parts, indirect materials, subassemblies and finished goods through manufacturing and warehousing.

The company now has up-to-the minute visibility into Work-in-Process, materials inventory and finished goods. As a result, errors and rework have virtually been eliminated, while reducing labor and inventory costs.



About OATSystems

OATSystems has helped more than 100 companies take advantage of RFID & RTLS to streamline operations, enhance customer satisfaction and increase bottom line results. OAT is the recognized Auto-ID solution leader with software that empowers businesses to achieve a competitive advantage and ROI from RFID & RTLS. As a pioneer in the development of Auto-ID technology, OAT has been setting the standard in RFID for over half a decade and has provided RFID & RTLS-enabled solutions to leading companies such as Airbus, Chevron, Best Buy, Tesco, Kimberly-Clark, Cephalon, Shell and others.

Contact OATSystems today at www.oatsystems.com or 781-907-6100 and get ready to take control of your operations.

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