Creating a Smarter More Connected Manufacturing Plant

A MODULAR APPROACH TO DEVELOPING THE FACTORY OF 2020

ZEBRA

Introduction

Manufacturing 2020

The purpose of this guide is to provide examples and insight into how technology focused on Connected Visibility can help a manufacturing enterprise. Our term Manufacturing 2020 takes on two notions: perfect 2020 vision across your plant and the notion of deploying technology fit for the year 2020 and beyond.

In a demanding customer environment and as we strive for a lean, agile manufacturing plant capable of consistently producing products on cost, on plan and on specification, technology offers us the opportunity to speed up the pace of progress and transparency. By doing so we meet our customers' expectations on product and delivery and our stakeholders' expectations on profit.

This guide looks at manufacturing as a whole. It does not favour a market segment but we appreciate there are nuances driven by market segment and geography to name just two. The notion of creating a manufacturing business plan and then delivering it has, historically, been driven out of managing exceptions effectively, offsetting risk/cost and, in the last decade, harnessing the supply chain in its entirety. This last point is worthy of particular focus in delivering Manufacturing 2020.

Insights: Stage and Gate

A gate is a point for checking and auditing – for example, at the point of scanning a barcode. A stage is the area between gates. So improved visibility can be simply defined as the introduction of more gates. Now bring in Wi-Fi and RFID technology to supplement barcode, WLAN and the number of gates increases (thus reducing stages) as passive RFID would identify location based on last known pass through an unmanned gate. Active RFID gives you real-time locationing if required. Therefore the technology strategy is straightforward and scalable dependent upon the density of visibility you need for your operation.

RFID Increases the Visibility Without Manual Interventions
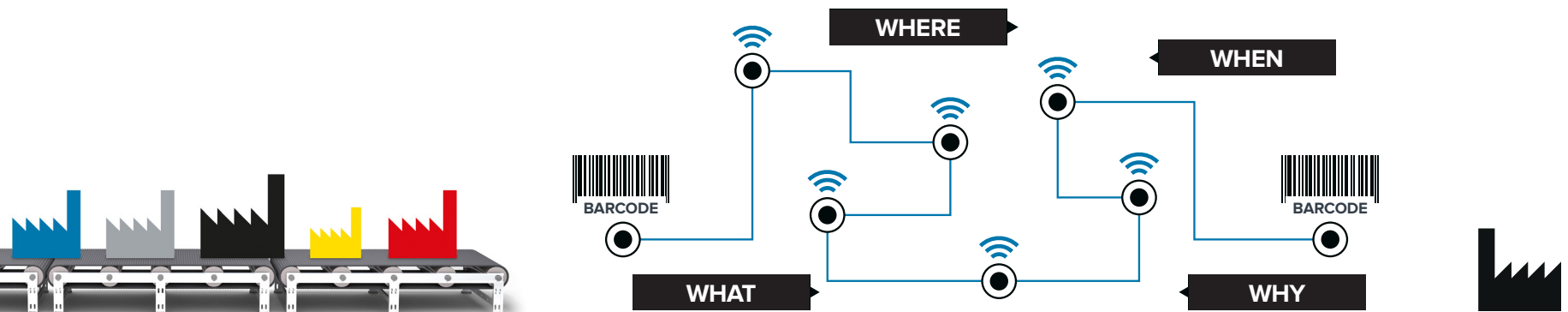
Insights: Standard Operating Procedures

Given the same number of components, how many different ways can you assemble them? Quality and Process engineering teams derive algorithms to determine the effectiveness of a design and manufacturing process on this basis. The solution is to adopt a design that can only (notionally) be assembled one way or to set out the assembly process as a set of instructions termed SOPs (Standard Operating Procedures).

These are usually documented and then updated as process improvements under tight version control. Moving from paper-based SOPs to digital SOPs on a mobile device, to a talking SOP in the operator's earpiece. And in the future augmented reality is coming. This makes staff skilling more manageable, the staff more agile and the ability to manage change less cumbersome or costly.
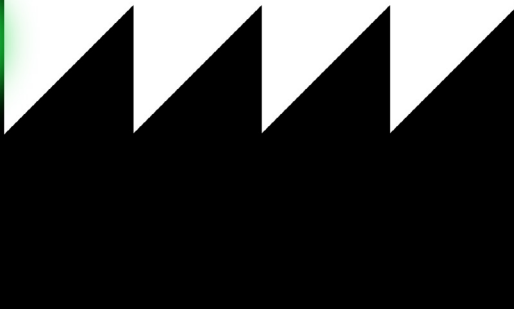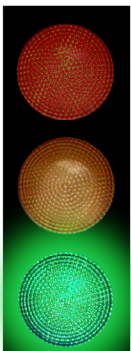
Insights: Where Are We Now?

A critical observation we have made is that manufacturers sometimes work in silos, developing their own capability then sending out mandates or SLAs for their supply chain to deliver to. So as the tier one manufacturing enterprise adopts automation and applies eKanban principles, for instance to its enterprise, the tier two and three sub assembly and component suppliers are playing catch up or baulking at the investment cost to keep pace.
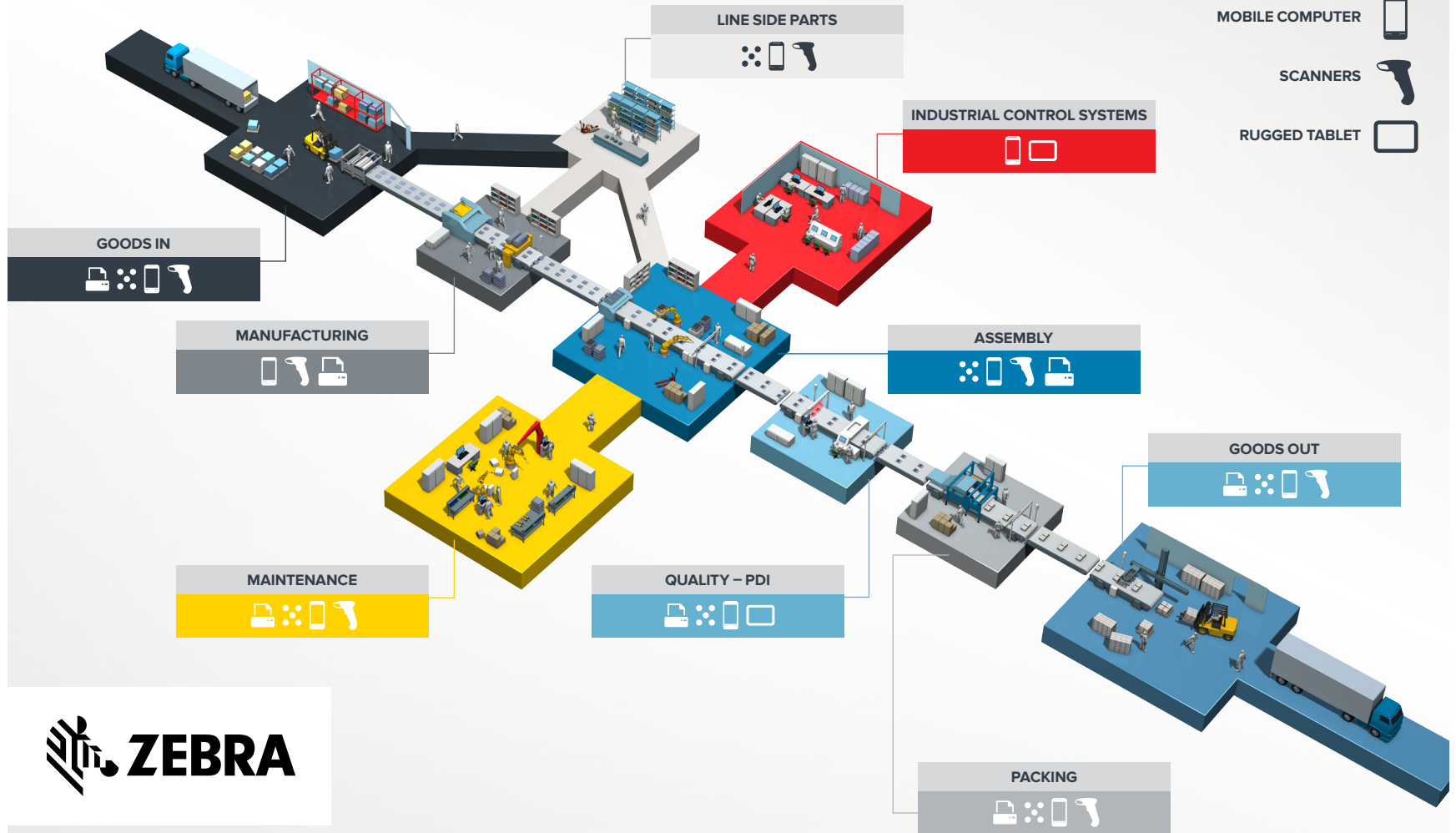
So right now you might be thinking of investing in technology to:

- Speed up receiving and shipping
- Reduce the cost footprint of stored items
- Understand why your planned manufacturing output doesn't match your actual
- Speed up the training of new starters to line side manufacturing

There are solutions for all of these items and more, which can connect across your business and beyond.

Manufacturing Plant

PRINTERS

RFID

MOBILE COMPUTER

SCANNERS

RUGGED TABLET

LINE SIDE PARTS

INDUSTRIAL CONTROL SYSTEMS

GOODS IN

MANUFACTURING

ASSEMBLY

GOODS OUT

MAINTENANCE

QUALITY – PDI

PACKING

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1 Goods In

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1 Goods In

The Opportunity/Pain Point

- Components/raw material/sub assembly booking in taking too much time – manufacturing line down time and yard congestion
- Delivered part count reconciliation with delivery manifest discrepancies
- Timeliness of deliveries vs. supplier SLA affecting just in time and storage on-site
- Material marking and booking in to stores

The Solution/Technology

- **Primary:** Barcode ID, scanning and mobile computer
- **Secondary:** RFID gate at Goods in and Manufacturing storage location
- Yard and staff management via active RFID – LS

Primary: A solution that is a starting point for technology investment.
Secondary: A solution that delivers greater density or improved performance.

Warehouse and Asset Management, and Courier/Proof of Delivery Solutions

1 Goods In

The Benefits

- Handwritten delivery note legibility issues removed
- Booking in time saving: scan, check and go
- Pre-delivery notification enables delivery planning and yard management
- Space saving in terms of storage needs (JIT)
- Efficiency
- Visibility
- Security and loss prevention

Manufacturer Business Checklist

- Do you hold pre-manufacturing inventory on-site – how much space does this consume?
- Has your manufacturing line stopped/slowed due to shortage/discrepancies?
- How many deliveries per day/week?
- Do your suppliers perform to 100% on time and in full?
- What is your consumption time from delivery to fit on line?

2 Line Side Parts
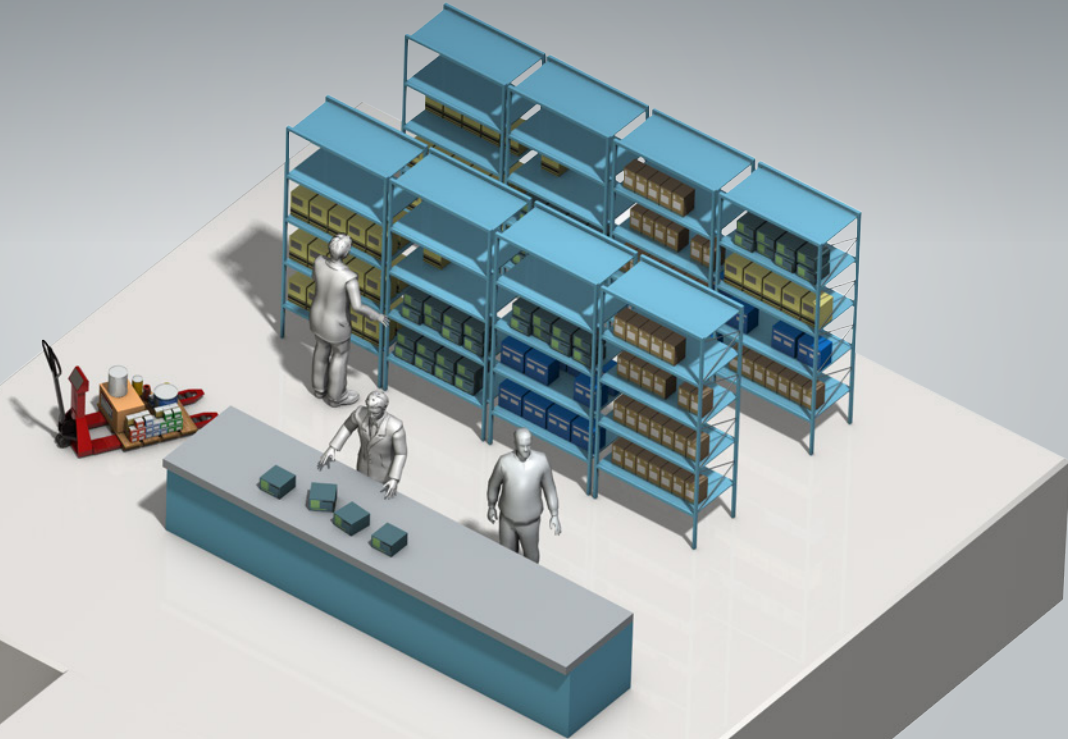
2 Line Side Parts

The Opportunity

- Manufacturing line material shortages
- Fear of adopting JIT – shrinking the number of stored parts to JIT principles increases shortage risks
- Large storage area in manufacturing facility and manual/paper-based re-ordering
- Ability to know what is on hand – parts, when managing/bounding quality issues
- Elongated EC (Engineering Change) break in point driven by material consumption

The Solution/Technology

- **Primary:** Barcode ID and scanning
- **Secondary:** Active RFID at manufacturing storage locations
- **Solutions:** eKanban solution

Primary: A solution that is a starting point for technology investment.
Secondary: A solution that delivers greater density or improved performance.

Inventory Management and eKanban – RFID

The Benefits

- Digital communication linked to SLAs from suppliers means:
  - Space saving
  - Quicker and slicker replenishment
  - Offset of cost for inventory on hand
- Pre-delivery notification enables planning
- Efficiency – easier to bound quality issues and break in ECs
- Visibility of material on hand – lower cost of manufacturing

Manufacturer Business Checklist

- Do you hold pre-manufacturing inventory on site:
  - How much space does this consume?
  - What is the stored inventory value compared to weekly usage value?
- How long does it take to replenish your line side stock and what does the process look like in terms of process steps?
- How long does it take to break in ECs?

3 Manufacture

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The Opportunity

- WIP (Work In Progress) visibility – on cost and on plan
- Material and resource consumption accurate
- Digital SOP (Standard Operating Procedure) followed – with real-time option (RFID)
- Newly manufactured parts have digital ID
- Scan in of newly manufactured part provides audit trail
- Machine-to-operator logon creates ownership
- Staff trained to SOP – skilling and deployment

The Solution/Technology

- **Primary:** Barcode ID and scanning – parts
- Personnel ID badging (barcode/RFID enabled)
- Digitise SOP onto mobile computers
- **Secondary:** RFID at manufacturing process gates
- TekSpeech Pro for training/process/activity

Primary: A solution that is a starting point for technology investment.
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Track and Trace – WIP visibility (Build Manifest), Process Compliance and SOP
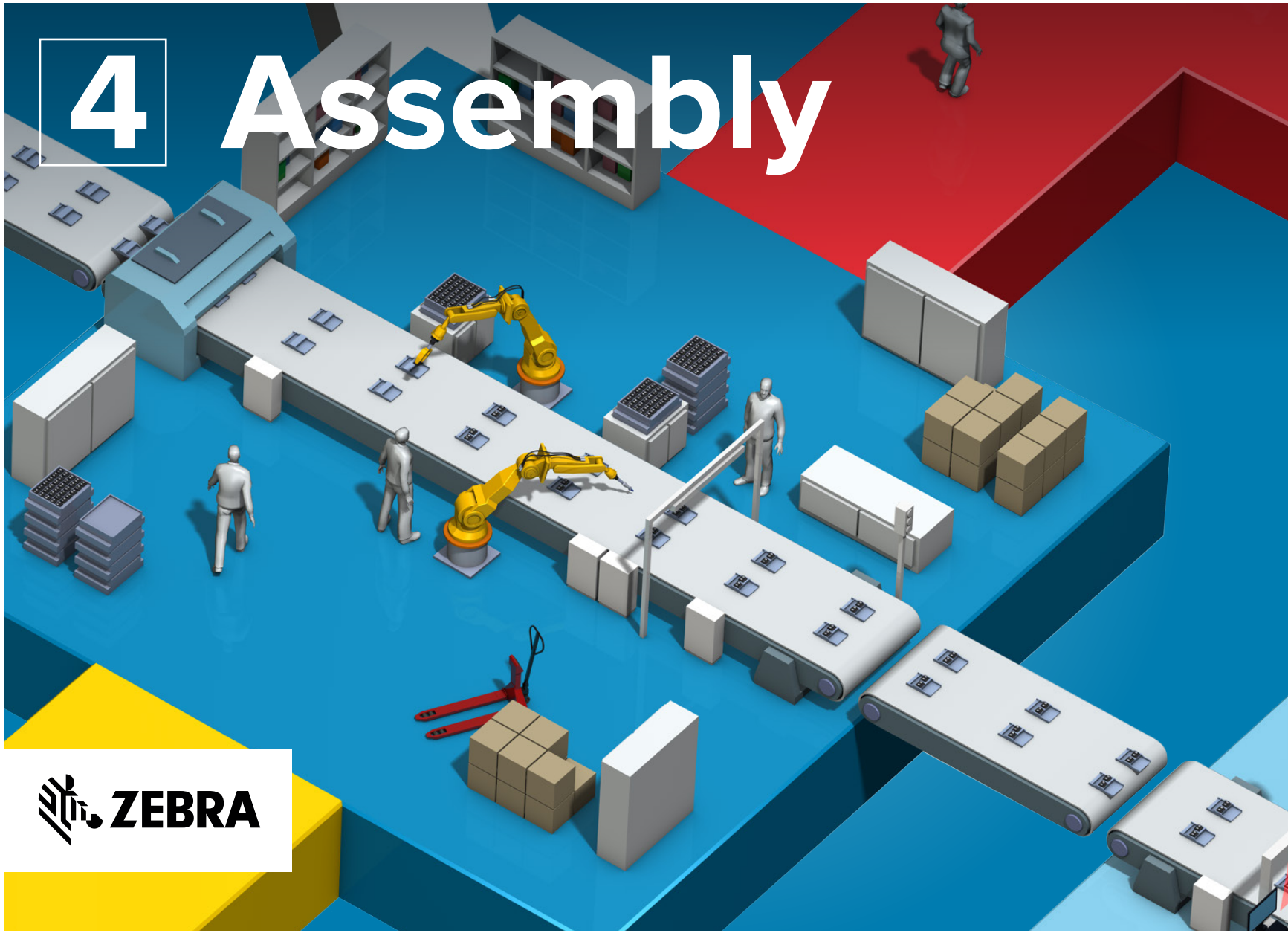
3 Manufacture

The Benefits

- Marking newly manufactured parts generates a digital voice and audit trail
- Digitising SOPs provides broader access and is quicker to update, leading to consistency of manufacture, a versatile workforce, slicker NPI (New Product Introduction), PI (Process Improvement) and EC
- Linking operator to work cell, machine and/or tooling enables efficiency analytics and ownership

Manufacturer Business Checklist

- How do you track WIP to plan and identify inefficiencies?
- How do you ensure manufacture of product consistently (SOP)?
- Mobile worker strategy: enable machine-to-human communication?
- How do you digitally manage NPI/PI/ECs?
- How do you manage multiple product manufacture – build manifest checklist?
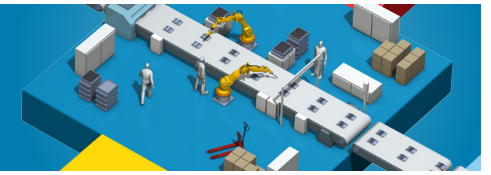- Do you train staff for multi-cell operation?

4 Assembly

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4 Assembly

The Opportunity

- WIP (Work In Progress) visibility — on cost and on plan
- Material and resource consumption accurate
- Digital SOP (Standard Operating Procedure) followed — option on real-time tracking (RFID)
- Scan in of parts during assembly ensures audit trail
- Machine to operator logon creates ownership
- Staff trained to SOP — skilling and deployment
- Automated line side parts replenishment

The Solution/Technology

- **Primary:** Barcode ID and scan — parts and tooling
- Personnel ID badging (barcode/RFID enabled)
- Digitise SOP onto mobile device
- **Secondary:** RFID at assembly process gates
- TekSpeech Pro for training/process/activity
- LS RFID to communicate replenishment

Primary: A solution that is a starting point for technology investment.
Secondary: A solution that delivers greater density or improved performance.

Track and Trace — WIP visibility (Build Manifest), Process Compliance and SOP

4 Assembly
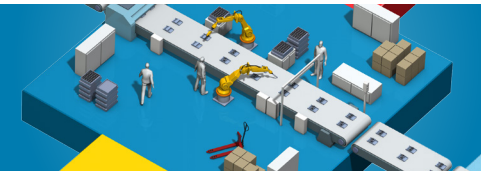
The Benefits

- Marking new assemblies generates a digital voice and audit trail
- Digitising SOPs provides broader access and is quicker to update leading to consistency of manufacture, a versatile workforce, slicker NPI (New Product Introduction), PI (Process Improvement) and EC
- Linking operator to work cell, machine and/or tooling enables efficiency analytics and ownership

Manufacturer Business Checklist

- How do you track WIP to plan and identify inefficiencies – sub assembly to final assembly?
- How do you ensure manufacture of product consistently (SOP)?
- Mobile worker strategy: enable machine-to-human communication?
- How do you digitally manage NPI/PI/ECs?
- How do you manage multiple product manufacture – build manifest checklist?
- Do you train staff for multi-cell operation?

5 Maintenance

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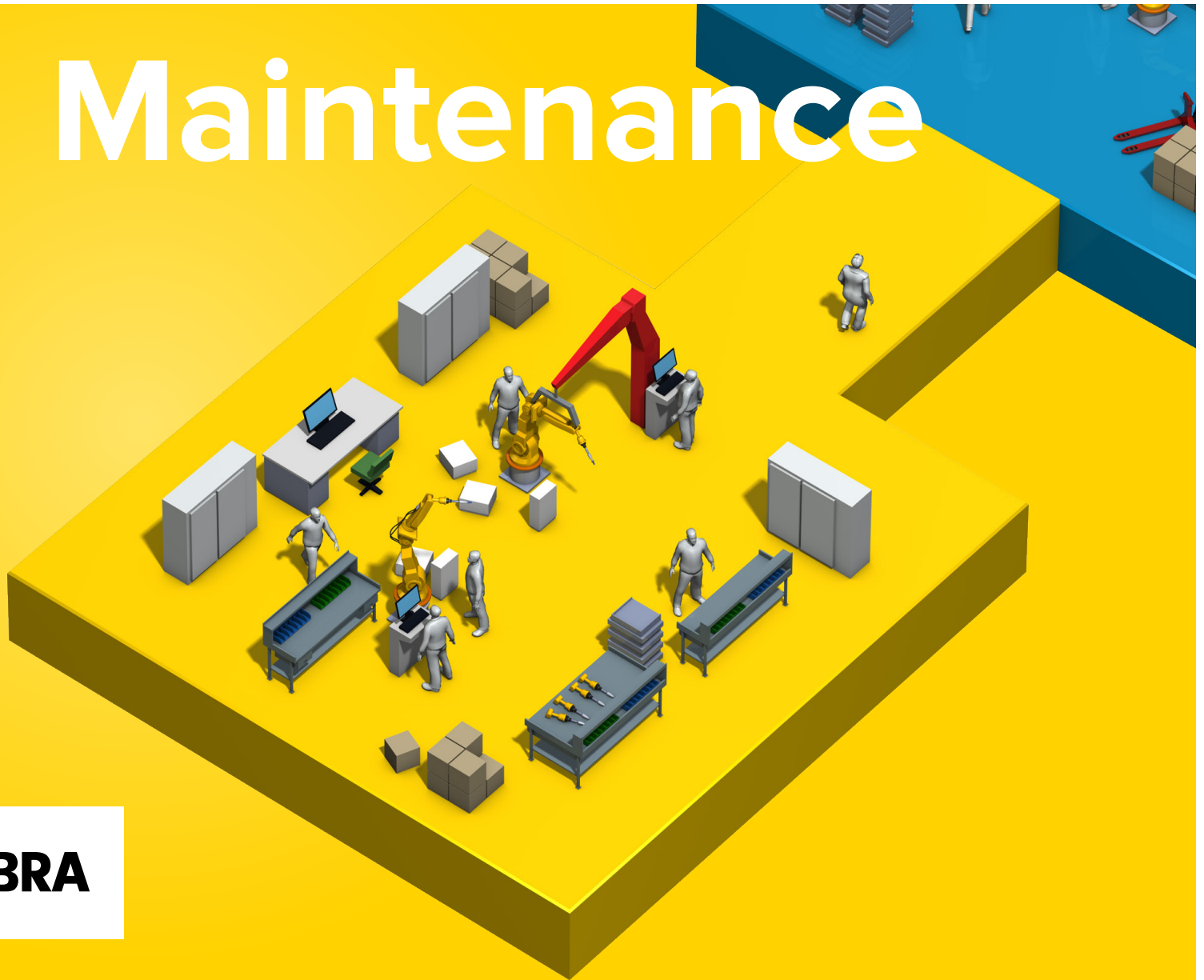
5 Maintenance

The Opportunity

- Asset locationing, tooling, machines and staff
- Spare parts inventory management with ID relevant to your operational requirement
- Digital asset register setting out planned maintenance and unplanned down time
- Tooling booking out (asset management)
- Repair manuals and schematics available digitally
- Digital record of machine settings and performance available to mobile worker

The Solution/Technology

- **Primary:** Barcode ID and scan – parts and tooling
- Personnel ID badging (barcode/RFID enabled)
- **Secondary:** RFID locationing for key assets
- Digitise info onto mobile computers

Primary: A solution that is a starting point for technology investment.
Secondary: A solution that delivers greater density or improved performance.

Asset Management and ID
Mobile Data and Communications

The Benefits

- Marking of business critical assets generates a digital voice and audit trail
- Minimise down time by having key spares on hand and digitally identified
- Providing on-demand information to your maintenance teams in mobile digital format
- Linking planned vs. unplanned maintenance enables efficiency analytics and resource plan
- Agile maintenance team digitally equipped

Manufacturer Business Checklist

- Your manufacturing maintenance plan, how is it communicated and managed?
- What is the cost of manufacturing down time currently?
- Do you have a mobile worker strategy?
- How do you track and manage key assets of the maintenance function?
- Do you carry spare parts and is the inventory effective?
- How does your maintenance team access drawings, specifications and schematics?

6 ICS
Industrial Control Systems

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6 ICS Industrial Control Systems
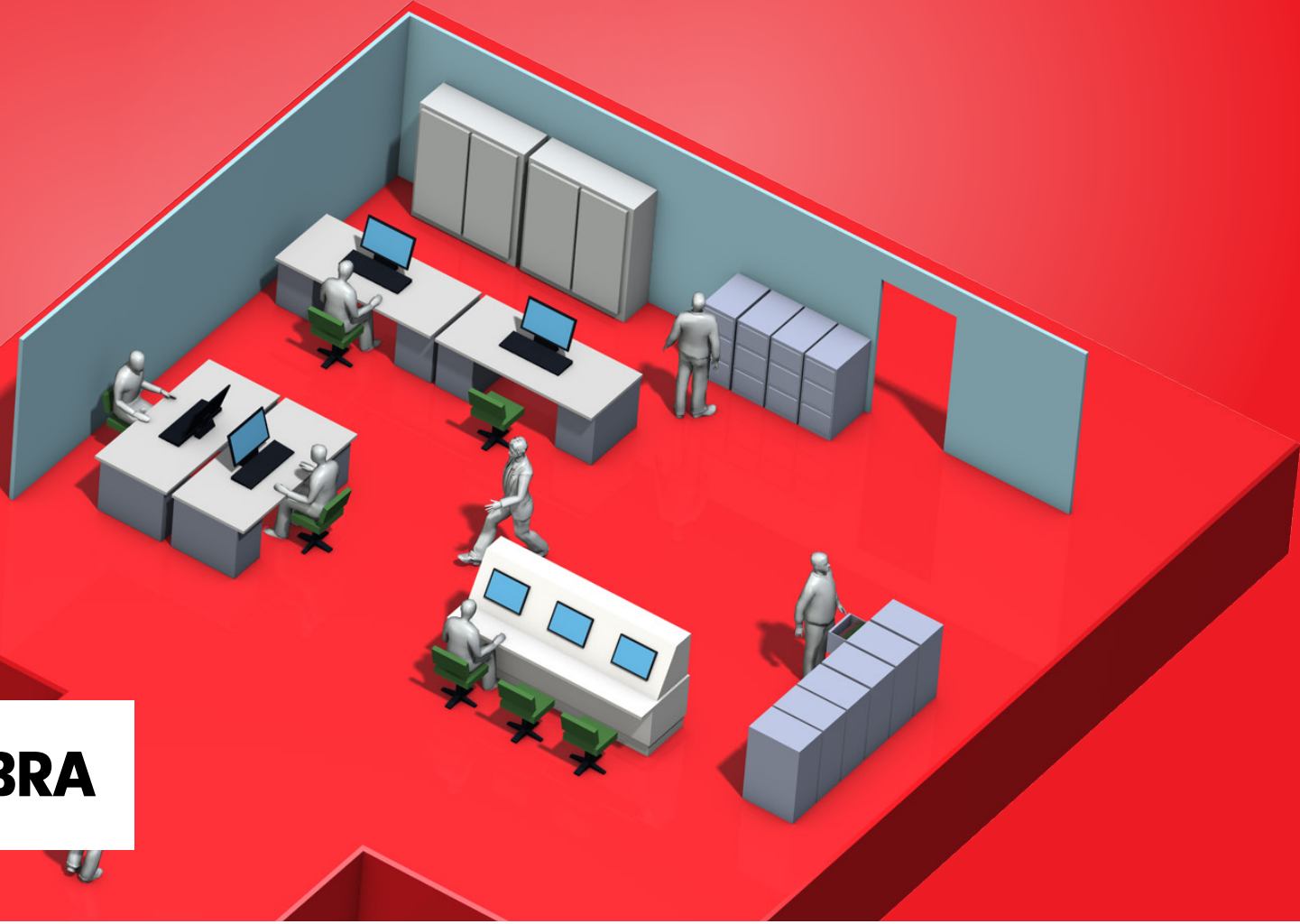
The Opportunity

- Asset locationing, tooling, machines and staff
- Digital record of machine settings and performance available to mobile worker
- Human-to-machine interface via mobile computer for managing machines remotely and reporting non-conformance

The Solution/Technology

- **Primary:** Mobile computing, Zatar
- Personnel ID badging (barcode/RFID enabled)
- Digitise info onto mobile computers
- **Secondary:** RFID locationing for key assets

Primary: A solution that is a starting point for technology investment.
Secondary: A solution that delivers greater density or improved performance.

Asset Management and ID
Mobile Data and Communications

6 ICS Industrial Control Systems

The Benefits

- Marking of business critical assets generates a digital voice and audit trail
- Providing on-demand information to your quality, maintenance and operations teams in mobile digital format
- Providing a human-to-machine interface to manage non-conformance anywhere on-site/remotely

Manufacturer Business Checklist

- Do you have a mobile worker strategy connected with ICS?
- Do you have a means to access data remotely?
- Do you, or would you, consider the cloud as a means of accessing data?
- Do you link sensing technology with locationing technology to manage your facility/estate?
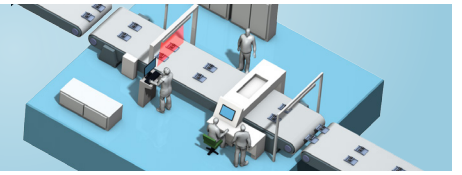- How do you manage non-conformance linked to ICS?

7 Quality – PDI

7 Quality – PDI

The Opportunity

- Goods in to Goods out visibility – ability to isolate and bound non-conformance end to end
- Digitally marked and recorded sampling
- Digital QMS (Quality Management System) including SOP enables swift corrective actions
- Digital operator ID badge = ownership and audit trail
- Digital link to machine setting and output control
- Ability to digitally mark and record to tooling/machine for calibration

The Solution/Technology

- **Primary:** Barcode ID and scanning
- Personnel ID badging (barcode/RFID enabled)
- Digitise content to mobile computers
- **Secondary:** RFID at manufacturing process gates

Primary: A solution that is a starting point for technology investment.
Secondary: A solution that delivers greater density or improved performance.

**Mobile Data and Communications
Calibration, Inspection, Maintenance: QMS**

7 Quality – PDI
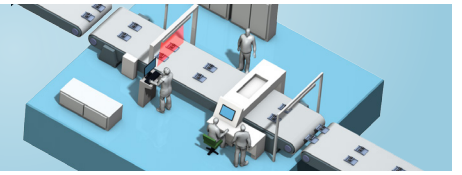
The Benefits

- Cost of quality reduced
- Time to resolve quality and reliability issues reduced
- Tighter bounding of non-compliance
- Easy reliability data logging, information available and qualified – sales tool
- Linking operator to work cell, machine and/or tooling enables swift closed-loop corrective actions

Manufacturer Business Checklist

- What is your current cost of quality?
- How do you flag/identify a quality issue?
- How do you bound a quality issue?
- How do you ensure manufacture of product consistently to spec – QMS – and is it up to date?
- How do you derive reliability data and is it robust – auditable?
- Mobile worker strategy: does your quality team have mobile tools – print, scan, computer?
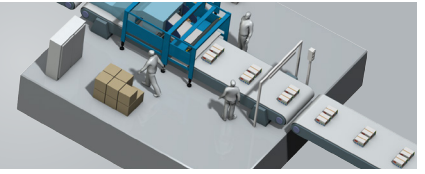
8 Packaging

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8 Packaging

The Opportunity

- Finished goods labelled correctly including compliance labelling
- Packaging labelling produced in line with customer requirements – digital/RFID
- Shipping manifest produced and conforms to legislation and customer needs – digital
- Returns labelling included as needed
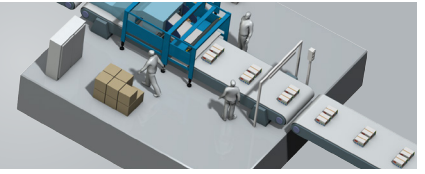
The Solution/Technology

- **Primary:** Barcode ID and scanning
- **Secondary:** RFID at item level or package level

Primary: A solution that is a starting point for technology investment.
Secondary: A solution that delivers greater density or improved performance.

Warehouse and Asset Management, and Courier/Proof of Delivery Solutions

8 Packaging

The Benefits

- Finished goods labelled correctly and logged
- Packaging labelled correctly, by customer& legislative need – flexible
- Ability to digitally scan items to package and send pre-delivery notification
- Real time information of goods on site or shipped by digitally capturing data
- Enables ability to invoice swiftly and accurately

Manufacturer Business Checklist

- How are you measured by your customers in terms of shipped goods – on time, in full?
- Have you ever experienced customer receiving discrepancies or customs discrepancies?
- Do your customers require a digital shipping manifest and scannable packages upon receipt?
- Are your customers requesting RFID shipments?
- Are you being asked for JIT shipments?
- Do you need proof of delivery?

9 Goods Out

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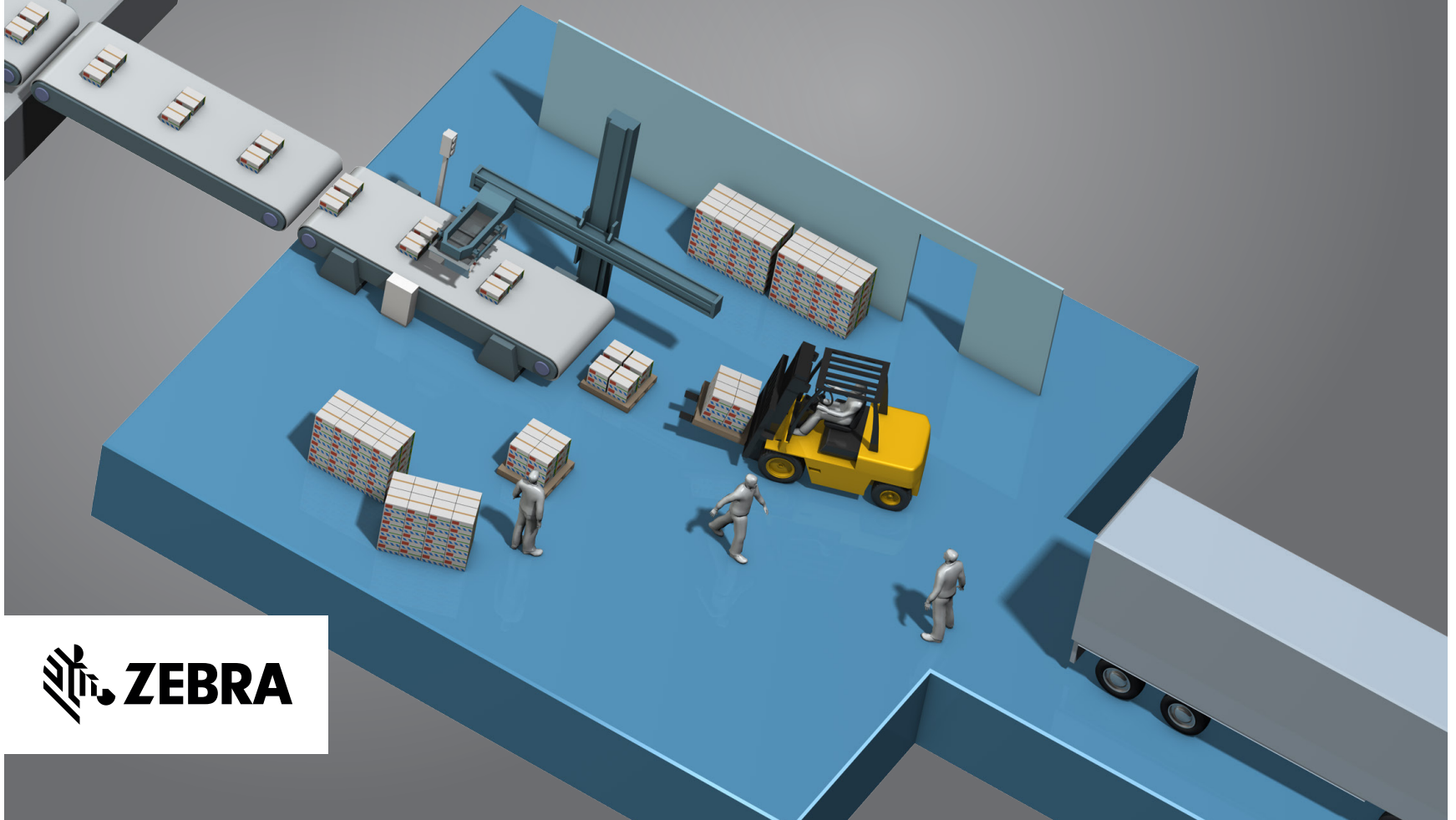
9 Goods Out

The Opportunity/Pain Point

- Booking out taking too much time – failure to make delivery deadline and yard congestion
- Delivery part count reconciliation with customer order discrepancies
- Timeliness of deliveries vs. supplier SLA affecting just in time and storage at customer
- Material marking and booking in to warehouse
- Real-time shipping information

The Solution/Technology

- **Primary:** Barcode ID, scanning and mobile computer
- **Secondary:** RFID gate at Goods Out and Manufacturing storage location.
- Yard and staff management via active RFID – LS

Primary: A solution that is a starting point for technology investment.
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Warehouse and Asset Management, and Courier/Proof of Delivery Solutions

9 Goods Out

The Benefits

- Handwritten delivery note legibility issues removed
- Booking out saving: scan, check and go
- Pre-delivery notification enables delivery planning and yard management
- Space saving in terms of storage needs (JIT)
- Efficiency
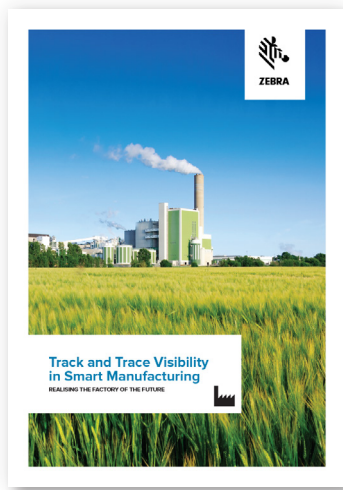- Visibility
- Security and loss prevention

Manufacturer Business Checklist

- Do you hold pre-manufacturing inventory on-site – how much space does this consume?
- How many deliveries per day/week?
- Has your customer's manufacturing line stopped due to shortages or discrepancies?
- Do you have customers that demand 100% on time – in full?
- Are you being asked for JIT shipments?
- Do you need proof of delivery?

How Zebra Technologies Can Help

Not all manufacturing lines will be fully automated by 2020. Yes, there will be some automation but Zebra recognises the need for machine-to-machine and machine-to-human interfaces and has created a range of products and solutions that harness the notion of Industrie 4.0 and IoT but make it scalable for the manufacturer so they can choose how they wish to deploy resources. This consistent thinking is one of Connected Visibility at a density that is right for your manufacturing operation now, and is scalable to meet the needs of tomorrow.

Track and Trace Visibility in Smart Manufacturing
REALISING THE FACTORY OF THE FUTURE

If you'd like more depth on this subject, take a look at our Track and Trace Visibility Guide

Connected Visibility

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