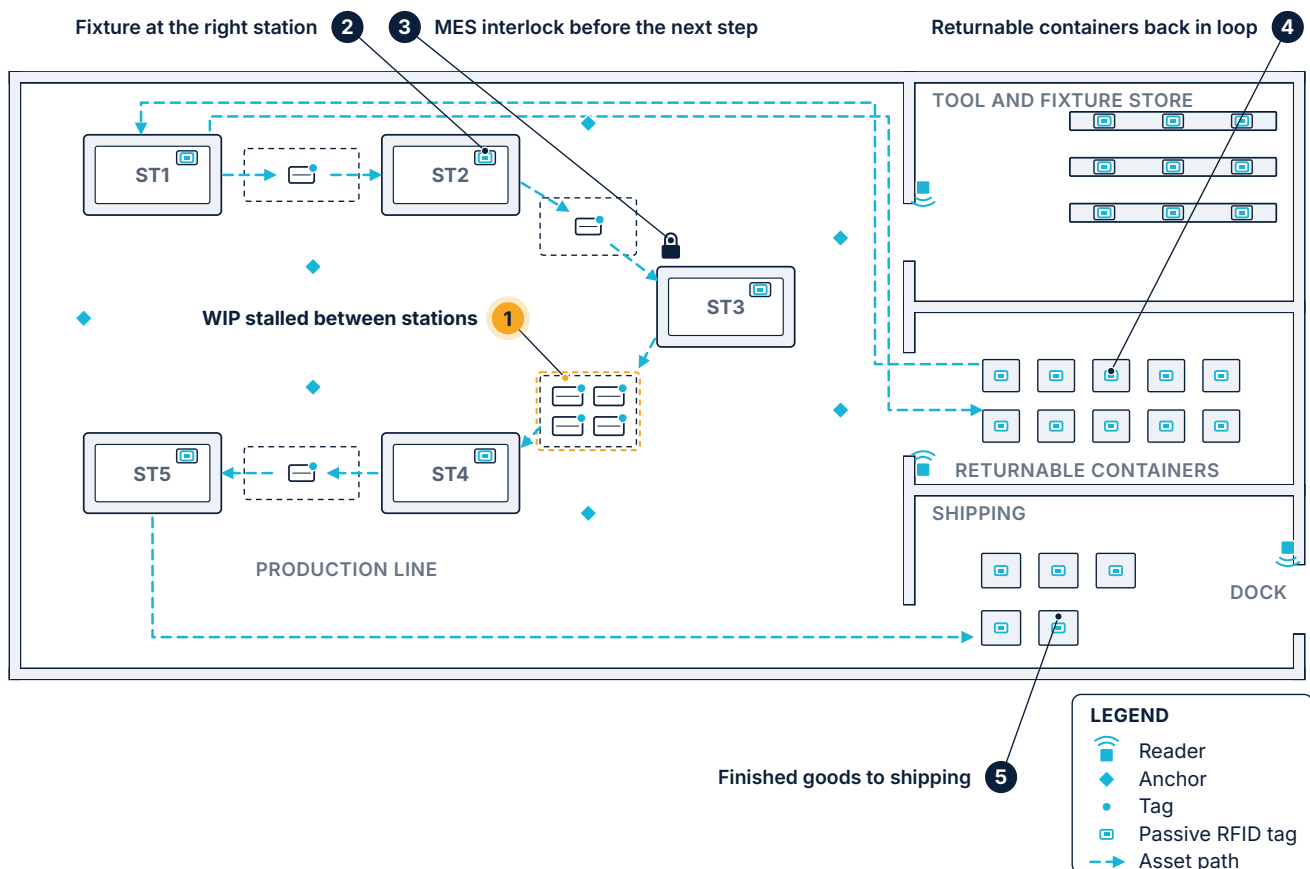


MANUFACTURING · LINE, CELLS, CONTAINERS AND SHIPPING

The order is late. The parts are somewhere between two stations.

A plain guide for production lines: work in progress (WIP) that stalls, fixtures at the right station, software checks in your MES (manufacturing execution system) before the next step, returnable containers and finished goods. A booking is the record in your system that a step is done.



Callouts match the use cases on page 2. Legend: a **reader** reads passive RFID (radio-frequency identification) tags, which have no battery; a **tag** is an active tag, which has a battery; an **anchor** is a fixed unit that locates UWB (ultra-wideband) tags. Terms used: UHF RFID: ultra-high frequency RFID, passive tags read at longer range; BLE: a common low-energy radio standard, used in small battery tags; MES: manufacturing execution system, the software that runs production.

WHO SHOULD READ WHAT

KPI: key performance indicator, a measure you track. Everyone: your own row and KPI are in the table on page 4.

Plant and production managers

Page 2 use cases, page 3 payback.

Line and cell supervisors

Page 2: use cases 1 to 3 and the KPIs you would own.

Process, quality and maintenance engineers

Page 2: use cases 2 and 3.

Materials, logistics, shipping and operators

Page 2: use cases 1, 4 and 5. Operators: use case 3.

IT and OT, finance, procurement, leadership

Page 3: technology, links and payback. OT means operational technology: the systems that run the floor.

One next step: book a free 30-minute call to talk through your site and your use case.

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What goes wrong today

WIP that stalls

Batches wait between stations and nobody sees it until an order is late.

Wrong fixture

A fixture is at the wrong station, or has missed its check.

Manual bookings

Operators book steps by hand, so missed bookings go unseen.

Containers that vanish

Returnable containers leave the loop and must be replaced.

USE CASES

Numbered to match the floor plan on page 1. Each card ends with the technology that usually fits.

1 WIP stalled between stations

Pain: Late batches are found by walking the line.

What good looks like: Each batch or carrier shows where it is and how long it has waited.

Fit: [BLE \(battery tags\) or UWB on carriers](#)

2 Fixture at the right station

Pain: Fixtures are found by memory, and their checks sit in a spreadsheet.

What good looks like: The fixture is read at the station. A wrong or overdue fixture is flagged.

Fit: [passive RFID on fixtures, reader at each station](#)

3 MES interlock before the next step

Pain: A step can start before the last one is booked or approved.

What good looks like: The MES holds the next step until the prior one is booked and approved and the right item is confirmed. Location supports this; it is a process check, not machine safety.

Fit: [RFID or UWB events into the MES, agreed with OT](#)

4 Returnable containers back in loop

Pain: Nobody knows which containers are at suppliers or customers.

What good looks like: Containers are read at the gate in and out. Late returns are flagged.

Fit: [UHF RFID \(passive\) at gates](#)

5 Finished goods to shipping

Pain: Goods wait at the end of the line before anyone books them.

What good looks like: Goods are booked as they leave the line and reach shipping.

Fit: [barcode or UHF RFID at line end and dock](#)

ALSO COVERED

- [Tools and gauges](#): issued, returned and in calibration.
- [Just in sequence](#): the right rack, station and order.
- [AMRs and AGVs](#): the right robot for each job first, then a VDA 5050 fleet manager only where every robot supports it.
- [Collision avoidance](#): forklift and pedestrian proximity alerts that support existing safety measures and don't replace them.
- [Bottlenecks](#): where jobs wait, from move data.
- [Equipment maintenance](#): service on condition and use.

KPIS TO TRACK

A KPI is a number you track. Measure it the same way before and during the pilot, by sample if needed.

KPI	WHO OWNS IT	HOW TO MEASURE IT
WIP wait time between stations	Production manager	Time from step done to next step started.
Wrong or overdue fixture events	Line supervisor	Flags raised at each station.
Manual bookings per shift	Process engineer	Hand-keyed bookings per shift.
Steps started without the right item	Quality manager	Sampled records; blocks counted apart.
Containers lost per period	Materials lead	Containers missing at each count.
Line end to shipping time	Logistics lead	Time from last step to the dock.

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Technology fit

Pick the simplest option that answers the question you have

Technology	Where it fits here	Watch for
Barcode or 2D code (square barcode)	Booking steps at staffed points, labels on goods.	One scan at a time. Missed scans mean wrong records.
Passive RFID (no battery)	Fixtures, carriers, containers and gates.	Metal and fluids affect reads. Test on your real items.
BLE (low-energy radio tags with a battery)	Zone-level location of WIP and carriers.	Zone level only. Batteries need replacing.
UWB (ultra-wideband location tracking)	Position, to confirm an item is at a station.	Needs anchors and a survey. Machines reflect signal.
OPC UA (an open machine data standard)	Machines and software sharing data.	Agree with OT which systems can write to which.

Integration

Bookings happen automatically, under your control

- **MES and ERP:** events give the MES and ERP (enterprise resource planning) the item and station, recorded after confirmation.
- **Machines and robots:** where OT approves, reader events reach line equipment via OPC UA or another supported route. For AMRs or AGVs (autonomous mobile robots or automated guided vehicles), choose the right robot for each job first; use a VDA 5050 fleet manager only where every robot supports it. Each robot keeps its own safety functions.
- **Interlocks:** any check that can hold a step needs OT sign-off. Machine safety stays with your safety system.
- **People:** Check local privacy and employee-consultation rules, such as works councils or unions, before tracking people, or tools and equipment linked to people.



ROI AND PAYBACK

ROI (return on investment) compares what you gain with what you spend. Payback is the time until the savings cover the cost. The method below works out payback from your own pilot data, not technology provider averages.

Payback (months) = one-off cost ÷ (annual benefit – annual running cost) × 12

Annual benefit = (booking and search hours saved × loaded hourly rate) + (containers no longer replaced × cost per container) + (late orders avoided × cost per late order)

The annual benefit is an estimate: count only savings you can really make, and count each one once. If it is not bigger than the running cost, there is no payback. Loaded hourly rate means pay plus on-costs such as tax, pension and overheads.

Inputs to gather

- **One-off cost:** tags, readers, anchors, survey, installation, integration, training, adviser fees and travel.
- **Running cost per year:** licences, support, batteries, replacement tags, staff time.
- **Hours today:** manual booking and search time, from your baseline.
- **Containers replaced per year** and the cost of each one.
- **Late orders** caused by stalled WIP, and the cost of each.

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What it means for you: find your role and your KPI

YOUR ROLE	WHAT IT MEANS FOR YOU	YOUR KPI
Plant or production manager	See stalled WIP before an order is late.	WIP wait time between stations
Line supervisor, maintenance and tooling	The right fixture at each station, with checks on time.	Wrong or overdue fixture events
Operator and process engineer	Fewer bookings by hand, and bookings you can trust.	Manual bookings per shift
Quality manager	The MES holds the next step until agreed checks pass.	Steps started without the right item
Materials and shipping leads	Containers stay in the loop; goods booked at shipping.	Containers lost; line end to shipping time
IT and OT teams	Events into MES and ERP, with interlocks you sign off.	Events reaching the linked system
Finance, procurement and leadership	Payback on your numbers, then a go or no-go.	Payback months, go or no-go

Events reaching the linked system: share of events arriving without manual entry.

How a TRACIO project works: five stages

1 Discovery

Your pain points, site, process and KPIs.

2 Assess and shortlist

Site survey, then the options that fit compared.

3 Pilot with KPI baseline

KPIs measured first. Pass marks agreed in writing before set-up.

4 Integrate

If useful, one agreed link into your MES or ERP, under your change control.

5 Multi-site roll-out

Only after a go decision, one area at a time.

How a pilot runs: set-up, then live weeks in normal use, then a short written report with a go or no-go. Timings are agreed per site.

Questions we hear

"We already have a system."

We give a free second opinion and check how it performs against your KPIs, using your live data and a site visit.

"How do we know it will work here?"

Judge us on method: a pilot, KPIs measured before and during it, and a written go or no-go.

"Can you bid with us, or for us?"

Yes. We team with integrators, or act as the buyer's independent adviser, but never both on the same bid.

"Do you sell or resell hardware?"

No. We don't sell hardware, so our advice stays independent. We rent pilot equipment and offer survey and installation support.

Free second opinion

Send us your technology provider's quote or spec for a free second opinion. What to send: the quote or spec, a floor plan or site photos, item counts and your current process. Bring it to the call or send it via tracio.com/contact.

TRACIO consultancy fees

- **UK:** £3k to £30k per project, £1,200 a day
 - **Europe:** €3.5k to €35k per project, €1,400 a day
 - **US and Canada:** \$4k to \$40k per project, \$1,600 a day
 - **Middle East and Australia:** \$4k to \$40k per project, \$1,600 a day
 - **Rest of the world:** \$3.5k to \$35k per project, \$1,400 a day
- Scoped per project, no packages. Fees cover our work only; hardware, software licences and other supplier costs are separate. \$ = US dollars. Travel extra.

Why TRACIO: we work for you, not for the technology providers. We compare the options across the market that fit your site, provide site surveys and installation support, and work worldwide under your change control.

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