



Use this overview to spot candidate areas: scan examples, triggers, and stop-rules. (Glossary at the back.)  
Good to keep on hand during vendor talks and planning.

## Physical handling & assembly automation

Examples	robots, cobots, palletizers, case packers, machine tending
Primary targets	throughput ↑, OEE ↑, changeover time ↓, ergonomic risk ↓, right-first-time ↑
Triggers to act	repetitive strain/manual lifts; changeovers >30 min; handling damage; small stops; labor gaps
Stop-rules (park if any true)	no guarding design; no manual fallback path; unstable part presentation; fixed layout constraints
Readiness (quick checks)	stable presentation/fixtures; safe access & fault recovery; EOAT concept feasible; changeover plan; floor buy-in
Pilot recipe (4–6 weeks)	Scope: one SKU/cell. Prep: Poka-yoke fixture, risk assessment, teach points, manual fallback. Success: throughput +10–20%, changeover –20%, ergonomics risk –1 level. Hand-off: SOPs, spares, lockout checks.
Watch-outs	safety; EOAT misfit; tolerance/variation; teach drift; maintenance coverage
Mitigations	safety assessment; EOAT trials; datum/fixture control; backup programs; technician training
Integration points	PLC/safety PLC; MES job start; andon
Stepping-stones	pick-assist/ergonomic aids → gravity/conveyors → semi-automation jig

## Inspection & test automation

Examples	2D/3D vision, inline measurement, leak/functional tests
Primary targets	defect escapes ↓, false rejects ↓, FPY ↑, scrap/rework ↓, traceability latency ↓
Triggers to act	escapes >0; false rejects >2%; FPY <95%; rework >1%; trace data late
Stop-rules (park if any true)	no stable fixturing; uncontrollable lighting/background; no reject disposition path
Readiness (quick checks)	fixturing stable; lighting/shroud feasible; labelled defect library; reject loop wiring; data owner
Pilot recipe (4–6 weeks)	Scope: one SKU group. Prep: light shroud; GR&R pass; 100+ good/bad images. Success: FPY +2–5 pts; false rejects –50%; escapes → 0 (pilot scope). Hand-off: PLC reject + MES event.
Watch-outs	lighting/background; sample bias; weak GR&R; poor labelling
Mitigations	fixed lighting; collect across shifts; tighten gauge/fixture; 2-person label review
Integration points	PLC reject; MES trace; quality log
Stepping-stones	guided visual checks → assistive vision → inline vision



## Process control & recipe automation

Examples	sensors, PLC/PID, SCADA/MES execution, interlocks
Primary targets	Cp/Cpk ↑, deviation incidents ↓, unplanned stops ↓, yield ↑, energy per unit ↓
Triggers to act	frequent operator overrides; alarm floods; CpK < 1.33; deviation incidents per month
Stop-rules (park if any true)	no recipe governance; no alarm rationalization; insecure control network
Readiness (quick checks)	P&ID/IO list; parameter limits defined; version/audit control; alarm priority rules; cyber policy
Pilot recipe (4–6 weeks)	Scope: one unit operation. Prep: parameter locks; alarm rationalization; change control. Success: deviations –50%; overrides –70%; CpK +0.2. Hand-off: recipe governance & audit.
Watch-outs	alarm fatigue; undocumented overrides; rollback risk
Mitigations	priority matrix; override logs; rollback plan & backups
Integration points	PLC/PID; SCADA; MES recipe
Stepping-stones	parameter checklists → interlocks → closed-loop control

## Intralogistics & storage automation

Examples	conveyors/sorters, shuttles, AS/RS, VLMs, AMRs/AGVs, dock loaders
Primary targets	order/WO cycle time ↓, touches/unit ↓, space use ↑, pick rate ↑, dock-to-stock ↓
Triggers to act	long picker travel paths; touches/unit high; dock-to-stock > 4h; labor gaps/turnover
Stop-rules (park if any true)	blocked egress; no manual work-around; WMS latency/accuracy poor
Readiness (quick checks)	layout map; SKU velocity profile; WMS integration spec; MTTR/maintenance windows
Pilot recipe (4–6 weeks)	Scope: one lane/zone. Prep: markers/traffic rules; WMS handshake; safety study. Success: touches –30%; pick rate +15%; dock-to-stock –50%. Hand-off: SOPs & PM.
Watch-outs	bottleneck shift; single-point failures; charge/traffic mgmt
Mitigations	buffering; redundancy; charger layout & traffic lanes
Integration points	WMS/ERP; safety PLC; dock systems
Stepping-stones	pick carts/kanban lanes → zoned conveyors → AMR in stable lanes



## Planning & scheduling optimization

Examples	APS, finite scheduling, WMS waves/slotting, labor planning
Primary targets	OTIF ↑, schedule adherence ↑, changeover loss ↓, inventory turns ↑, expedites ↓
Triggers to act	Schedule adherence <85%; daily expedites; frequent changeover overruns; high WIP
Stop-rules (park if any true)	bad routings/times; stale calendars/constraints; unclear ownership
Readiness (quick checks)	clean routings & times; constraint list; calendars; data steward named
Pilot recipe (4–6 weeks)	Scope: one value stream. Prep: validate routings; freeze calendars; define rules. Success: OTIF +3 pts; expedites –50%; adherence +10 pts. Hand-off: rulebook & cadence.
Watch-outs	opaque solver rules; metric gaming; stale inputs
Mitigations	transparent rules; KPI alignment; data refresh cadence
Integration points	ERP/MES; WMS; HR/rosters
Stepping-stones	manual heijunka board → basic finite rules → APS

## Procurement & partner communication

Examples	auto POs, reorder triggers, portals, EDI/ASNs, VMI
Primary targets	PO cycle time ↓, stockouts ↓, 3-way-match errors ↓, ASN accuracy ↑, dispute rate ↓
Triggers to act	stockouts recurring; PO cycle slow; invoice mismatches; ASN misses
Stop-rules (park if any true)	no standards/mappings; supplier adoption blocked; no exception path
Readiness (quick checks)	master data cleaned; exception flow; EDI mapping tests; supplier training plan
Pilot recipe (4–6 weeks)	Scope: one supplier/part family. Prep: mappings; test ASNs; set SLAs. Success: cycle –30%; stockouts –50%; match errors –50%. Hand-off: supplier playbook.
Watch-outs	standards drift; portal fatigue; long-tail suppliers
Mitigations	version control; vendor tiers; templates & training
Integration points	ERP/MRP; EDI/portal; receiving/QC
Stepping-stones	email templates → portal lite → full EDI/VMI



## Maintenance & reliability automation

Examples	condition monitoring, predictive maintenance, auto work orders, smart spares
Primary targets	availability ↑, MTBF ↑, MTTR ↓, planned/unplanned ↑, cost/unit ↓
Triggers to act	High unplanned downtime; repeat failures; CM/PM ratio poor; spare lead time risk
Stop-rules (park if any true)	cannot instrument; no CMMS integration; no response discipline
Readiness (quick checks)	failure modes known; sensor points; CMMS API; spare policy; craft buy-in
Pilot recipe (4–6 weeks)	Scope: one critical asset. Prep: sensor install; alert rules; response SOP. Success: unplanned –30%; alerts→WO >70%; MTBF +20%. Hand-off: sustain cadence.
Watch-outs	alert noise; model drift; parts delays
Mitigations	threshold tuning; retraining cadence; min-max & kitting
Integration points	CMMS; historian; PLC
Stepping-stones	AM/CIL checks → CBM routes → predictive

## Workforce guidance & safety

Examples	pick-by-light/voice, AR work instructions, mobile HMIs, safety wearables
Primary targets	pick/assembly rate ↑, time-to-proficiency ↓, RFT ↑, incident/near-miss ↓
Triggers to act	training time long; RFT low; near-miss/incident trend; complex SOPs
Stop-rules (park if any true)	devices unusable w/ PPE; coverage dead zones; no content owner
Readiness (quick checks)	current SOPs; content owner; device charging and ruggedness; coverage survey
Pilot recipe (4–6 weeks)	Scope: one cell or line. Prep: SOP refresh; small glossary; coverage test. Success: RFT +3–5 pts; proficiency time –30%; incidents ↓. Hand-off: content cadence.
Watch-outs	content upkeep; battery mgmt; UX w/ gloves
Mitigations	governance; charging lockers; field tests with PPE
Integration points	MES/SOP repo; Wi-Fi/BT; HR training records
Stepping-stones	visual SOPs → mobile guidance → AR



## GLOSSARY

### **3-way match**

Accounts control that matches the purchase order, goods receipt, and invoice before payment.

### **AGV (Automated Guided Vehicle)**

Driverless vehicle that follows fixed paths (lines, wires, reflectors); less flexible than AMRs.

### **AM (Autonomous Maintenance)**

Operators perform basic care (clean, inspect, lubricate) to prevent simple failures.

### **AMR (Autonomous Mobile Robot)**

Self-navigating mobile robot for moving materials without fixed routes or markers.

### **Andon**

A visual/audible signal (e.g., lights, screen, chime) that shows line status or calls for help.

### **API (Application Programming Interface)**

The contract that lets one system request data or actions from another (e.g., CMMS API).

### **APS (Advanced Planning and Scheduling)**

Planner that creates feasible production schedules using constraints like capacities, setups, calendars.

### **AR (Augmented Reality)**

Tools that overlay digital instructions or graphics onto the real world via glasses, tablets, or phones.

### **AS/RS (Automated Storage and Retrieval System)**

Automated racking with cranes or shuttles that stores and retrieves totes, cases, or pallets.

### **ASN (Advance Shipping Notice)**

Electronic pre-alert of what's shipping and when.

### **CBM (Condition-Based Maintenance)**

Maintenance triggered by actual condition indicators (e.g., vibration, temperature, wear).

### **CIL (Clean, Inspect, Lubricate)**

Daily operator tasks to keep equipment in condition.

### **CM/PM ratio (Corrective to Preventive)**

Balance of unplanned corrective work versus planned preventive work—lower is usually better.

### **CMMS (Computerized Maintenance Mgmt System)**

System for assets, work orders, preventive maintenance, and spare parts.

### **Cp / Cpk (Process Capability Indices)**

Metrics showing how well a process fits within spec limits; ~1.33 or higher is a common "capable" target.

### **EDI (Electronic Data Interchange)**

Standardized electronic messages between companies (e.g., POs, ASNs, invoices).

### **EOAT (End-of-Arm Tooling)**

The gripper or tool on a robot's wrist that contacts the part (e.g., fingers, suction, weld tip).

### **ERP (Enterprise Resource Planning)**

The business backbone that integrates finance, supply chain, production, and more.

### **FPY (First Pass Yield)**

Percent of units that meet specs w/o rework or repair.

### **GR&R (Gage Repeatability & Reproducibility)**

A study that shows how much measurement variation comes from the gauge and from different users.

### **Heijunka**

Level-loading of production to reduce peaks, valleys, and changeover chaos.

### **Historian**

Time-series database that stores machine/process data for analysis and troubleshooting.

### **HMI (Human-Machine Interface)**

Screens or devices operators use to interact with equipment or systems.

### **HR (Human Resources)**

Function responsible for staffing, training, and rosters referenced in planning/integration.

### **I/O (Input/Output)**

The signals and connections between sensors/actuators and controllers (e.g., PLC I/O list).

### **KPI (Key Performance Indicator)**

A metric that tracks performance against a goal (e.g., OTIF, OEE, FPY).

### **MES (Manufacturing Execution System)**

Shop-floor system that guides, tracks, and records production steps and outcomes.

### **MTBF (Mean Time Between Failures)**

Average operating time between failures (reliability).

### **MTTR (Mean Time To Repair)**

Average time to restore a failed asset to operation.

### **OEE (Overall Equipment Effectiveness)**

Composite of Availability × Performance × Quality to show how well a line runs versus its potential.

### **OTIF (On Time In Full)**

Orders fully delivered by the promised time.

### **P&ID (Piping & Instrumentation Diagram)**

A detailed schematic showing process equipment, piping, and instrumentation.

### **PID (Proportional-Integral-Derivative control)**

A feedback control method in PLCs that holds a process at its setpoint by correcting error over time.

### **PLC (Programmable Logic Controller)**

Industrial computer that runs real-time machine control.

### **Poka-yoke**

Error-proofing that makes a mistake impossible or immediately visible.

### **PPE (Personal Protective Equipment)**

Safety gear such as gloves, goggles, hearing protection, and safety shoes.

### **RFT (Right First Time)**

Share of work completed correctly at the first attempt, with no rework.

### **SCADA (Supervisory Control and Data Acquisition)**

Software that monitors and controls processes across machines or areas, often above PLCs.

### **SLA (Service Level Agreement)**

A vendor/customer commitment that defines response times, uptime, and support levels.

### **SOP (Standard Operating Procedure)**

Agreed step-by-step method for how to best do a task.

### **VLM (Vertical Lift Module)**

Tall automated cabinet that brings trays to the operator to save space and walking.

### **VMI (Vendor-Managed Inventory)**

Supplier monitors customer stock and replenishes it under agreed rules.

### **Wi-Fi / BT (Bluetooth)**

Short-range wireless networks used by devices; check coverage, interference, and security.

### **WIP (Work In Process)**

Items being worked on between start and finish.

### **WMS (Warehouse Management System)**

System that manages inventory locations, picks, replenishment, putaway, and cycle counts.