

Whitepaper

More output through autonomous production: How to automate material transport and machine loading with mobile manipulators and smart factory solutions.

For production managers who want to increase throughput and uptime without additional staff and reduce operational costs.

-60% Manual material handling

-75% Relief for employees

Challenges and risks for companies with traditional production

Increasing cost and competitive pressure

Manufacturing companies face cost pressures and must become more flexible—up to varying batch sizes and flexible capacity expansion depending on changing order situations. In many plants, intralogistics between machines remains manual, even though it directly limits throughput. **Material transport, replenishment, and handovers are often inefficient and error-prone.** This ties skilled workers on the shop floor to non-value-adding tasks. The result is bottlenecks, waiting times, and avoidable downtime.

Staff shortages and employee workload

At the same time, the shortage of skilled workers is worsening—raising the risk that shifts cannot be staffed reliably. Especially in highly variant-rich environments, manual stations, changeovers, and **dependencies on experienced employees** dominate. This leads to throughput limitations and quality risks because monotonous tasks remain error-prone. In regulated areas, strict requirements for documentation and traceability also apply. If material flows are not digitally recorded, manual effort for employees and audit risk increase.

Fragmented, non-scalable automation

Many companies fail not due to a lack of willingness to automate, but because of isolated solutions without integration into processes and IT. For high-performance and scalable production environments, **interoperability and standardization** are crucial: those who do not consider material supply, handovers, machine interactions, and fleet control as a whole system will not achieve effective and future-proof automation to increase competitiveness.

Lack of transparency and low data utilization

Many production managers still underutilize the data already available from machines and IT systems to **derive concrete improvement measures**. Without end-to-end process transparency and data-driven decisions, efficiency potentials remain untapped and optimizations often continue to be reactive rather than proactive.



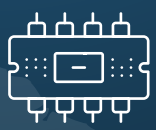
Medical Technology



Consumer Goods & Food



Pharma & Life Science



Electronics & Semiconductors



Automotive



Mechanical Engineering & General Manufacturing

The Status Quo on the Shopfloor

At the operational level, many production environments are still shaped by historically grown processes and isolated individual solutions. Despite modern machines and increasing digitalization, the material flow between storage, transfer stations, and equipment is often manually organized and only partially integrated.



Inefficiencies and costly errors due to manual material handling

Manual material handling often leads to significant inefficiencies: employees transport, check, and move parts multiple times between different stations. Each additional manual intervention not only increases time but also the risk of errors—such as incorrect assignment, damage, or incomplete process steps.

Material supply as a critical lever for output and productivity

Machine availability is directly affected by inefficient material supply and feeding processes: if material is not provided on time or machines are not continuously supplied, avoidable downtime occurs. These unplanned downtimes immediately reduce output and prevent optimal utilization of production equipment.





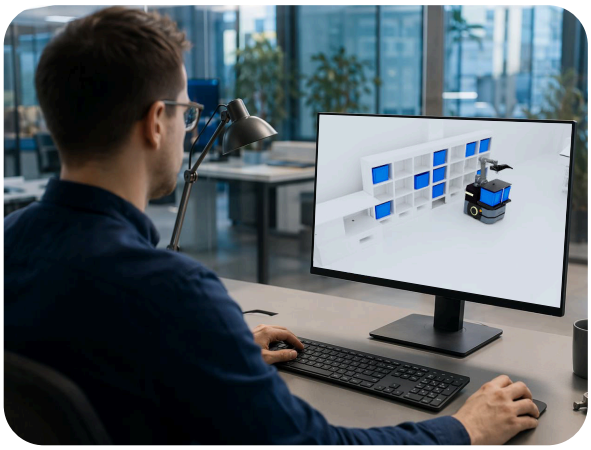
Lack of process transparency and documentation

Due to analog documentation, continuous process transparency is often missing, leaving optimization potentials in material flow and production undiscovered. Existing data is insufficiently used, while efforts for manual photo documentation and tracking continue to increase, tying up additional resources.

7 Smart Factory Elements for Greater Efficiency

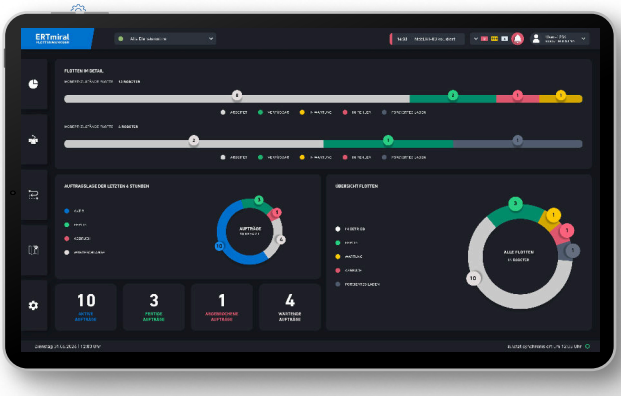
Basic Principle: The Smart Factory as an Orchestrated System

Effective automation connects hardware and software into an end-to-end system. In the smart factory architecture, mobile robots, stationary modules, and orchestration seamlessly integrate. This transforms individual robots into a manageable material flow—from storage to machine.



SmartShelf: Hybrid Entry into Process Automation

SmartShelf is a **modular storage and transfer system** serving as the interface between manual processes and automation. It acts as a physical handover station: material can be manually loaded and unloaded or picked up automatically. This allows companies to start cost-effectively and scale efficiently. In typical use cases, SmartShelf serves as a buffer, for kitting & sequencing, or for shift models where production runs automatically at night (lights-out manufacturing).



1

2

Virtual Engineering: Planning Security Through Simulation

3D layouts create realistic **digital twins** long before implementation begins. Material flow simulations reveal bottlenecks and provide precise sizing of robotics and machines. This reduces investment risks and enables decisions based on valid data rather than assumptions.

3



4

ERTmiral: Central Fleet and Order Management

With a **central control platform** connected to MES and ERP systems, transport orders are planned, prioritized, and monitored in real time. This turns robots, storage, and machines into an orchestrated system instead of isolated islands.

mobERT®: the "last mile" from warehouse to machine

5

mobERT® is a **mobile manipulator** that autonomously handles material transport from the warehouse to the machine. It can load and unload the SmartShelf as well as machining centers and machines (Machine Tending).





It relieves employees from monotonous and ergonomically stressful transport and handling tasks. The goal is optimal utilization of production facilities.

NEXTAGE: precise repetitive fine assembly and inspection

6

NEXTAGE is a **two-armed humanoid industrial robot** that reliably performs monotonous tasks 24/7. It is suitable for fine motor assembly and inspection tasks and works with both hands like a human operator. In workflows, it can be integrated via ERTmiral® – for example: mobERT® delivers parts, NEXTAGE inspects and assembles, mobERT® picks up.



Step-by-step rollout, safety, and scaling to additional plants

7

A Smart Factory is consistently modular: additional mobile robots, software, or machines can be flexibly integrated without changing existing structures. Safety concepts are considered from the start – stations recognize incoming robots and automatically integrate them into existing safety logics. This keeps automation economically feasible even in brownfield sites – with scalable expansion instead of costly complete overhauls.



Benefits of Flexible Automation

- Smart Factory Solutions Integrable into Your Brownfield Use Case
- High Flexibility and Scalability of Your Automation and Smart Factory
- Automated Image Documentation of Processes via Robotic Arm Camera
- Maintaining Night Shift Through Autonomous Lights-Out Production
- Closing Staffing Gaps Through Rapid Robot Training
- Enhancing Your Company's Competitiveness and Future Viability



Efficiency Increase

Less Downtime

Productivity Increase

High Quality

Reduced Costs Due to Errors

High Flexibility Down to Batch Size 1

Relieving Your Employees

Full Process Transparency







Practical Example: From Traditional Production Line to Autonomous Manufacturing for Operational Excellence

Seco Tools, part of Sandvik Machining Solutions, identified hidden wastes in the existing production setup and manufacturing processes (see right).

To further enhance their competitiveness, they initiated the transition from traditional manufacturing concepts to autonomous production.

- Employees handle products millions of times per year—often facing safety and error risks.
- Employees must make decisions impacting safety, quality, delivery time, and costs.
- Traditional concepts make it difficult to optimize sustainability, quality, costs, and delivery times.

Autonomous Production with Machine Tending



Through connected mobile manipulators and machining centers, Seco established autonomous manufacturing where machines automatically exchange order and status information with mobERT®.

mobERT® autonomously transports materials and semi-finished products between machines and loads/unloads them (machine tending) for maximum process efficiency.

Value Added by Seco

70 %

Fewer manual material transport distances for employees

75 %

Fewer decisions for employees: more relief, fewer errors

60 %

Less manual product handling —less effort, higher quality

Do you have questions?

Our Smart Factory experts are happy to offer you a non-binding and free consultation.

Contact us

You are in good company

B BRAUN

BOSCH

Seco

gerresheimer

MERCK

BASF
We create chemistry

ERT SOLUTIONS

ERT Solutions Inc.
1295 Armour Blvd.
60060 Mundelein
IL | USA

Phone: +1 847 393-3000
Email: info@ert-solutions.com

www.ert-solutions.com