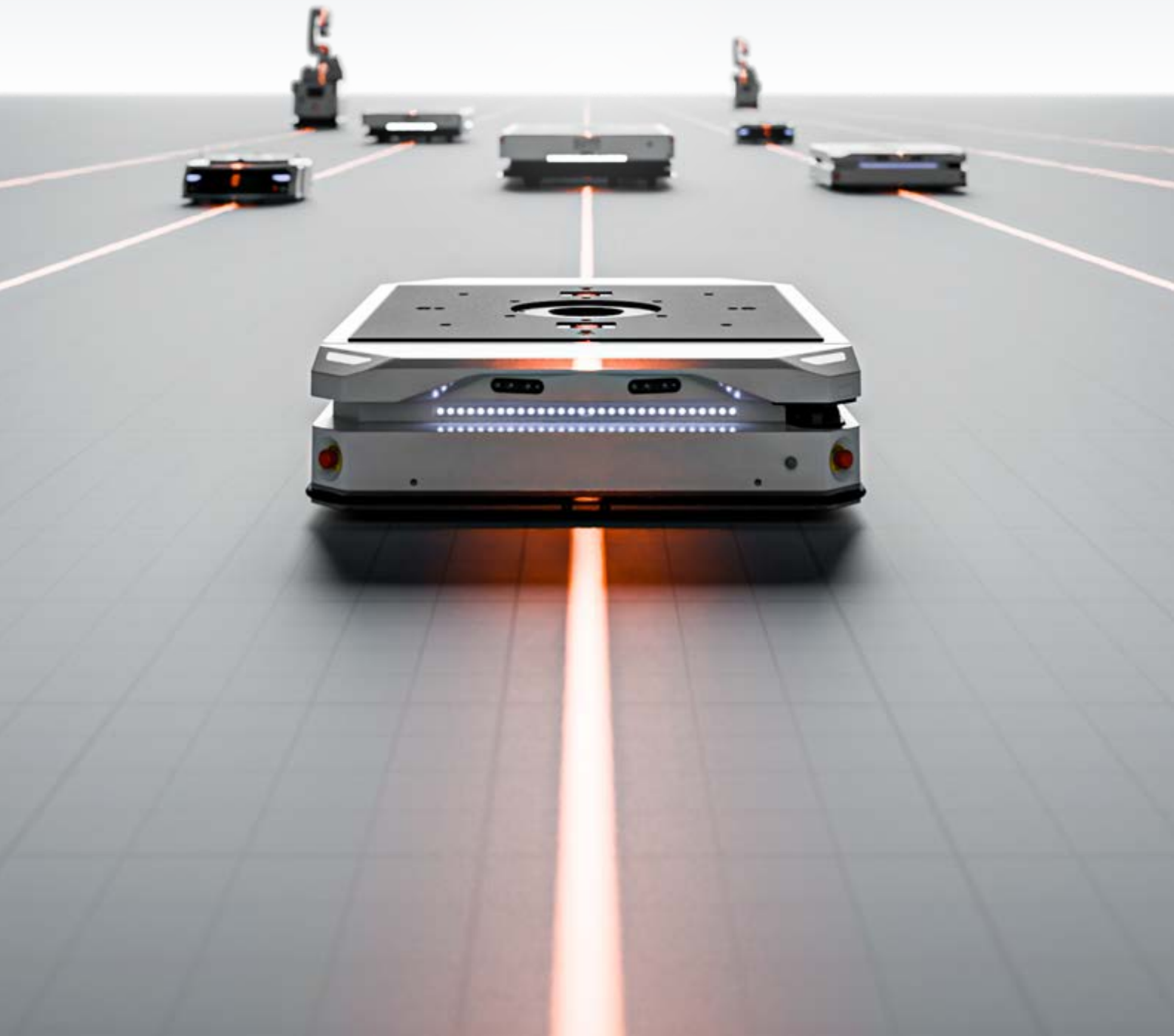
KUKA

Autonomous Mobile Robots (AMR)



Feel the flow of automation

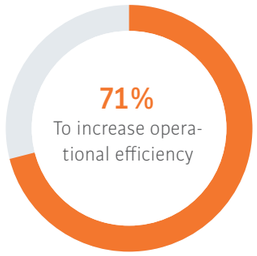
Autonomous Mobile Robots (AMR) by KUKA. AMR by KUKA provide a full range of mobile robots and multi-industry solutions based on hardware and software products developed in-house. We supply intelligent manufacturing and logistics solutions that are flexible, cross-industry and handle the entire production process.

By using technology developed and acquired over more than a century, we've dedicated ourselves to being at the forefront of smart manufacturing: in a wide range of sectors including automotive, 3C electronics, photovoltaic energy, PCB chips, white goods, warehousing and logistics.

Autonomous mobile robotics (AMR) | © KUKA 2024

Why automate internal logistics? Investing in automated material transports offers a range of benefits that can positively impact your business operations.

The challenges and drivers pushing the automation of logistics processes are intertwined, reflecting the industry‘s need for more efficient, cost-effective, and adaptable solutions to navigate the complexities of modern supply chains. As technology continues to evolve, the automation of logistics processes is likely to become even more integral to the success of businesses in the sector.



To increase operational efficiency

To overcome staffing shortages

To improve safety on-site

To reduce staff numbers

Challenges. Labour shortage as companies faces challenges in finding and retaining skilled labour

Inflation and rising labour costs has a direct and continuous impact on profitability

Changing demands and seasonal variations stresses the organisation and staff and creates planning difficulties

Creating a safe workspace and avoiding repetitive and physically demanding tasks

Drivers. Modern manufacturing requires real-time visibility of movements of goods in order to optimise the production process

Minimise risk of human errors in logistics, order handling and warehouse inventory

Improved operational efficiency leads to cost savings and increased competitiveness

Demand for sustainable solutions for social and environmental responsible business practices

How to automate internal logistics?

When choosing your automated logistics options, consider the evolving landscape where traditional methods such as manual handling and forklifts, while familiar, may not be the most cost-effective or flexible choice. At the same time, Automated Guided Vehicles (AGVs) have a history in logistics, but have limitations in terms of flexibility, while the implementation and modification of AGV systems can be resource-intensive in terms of both time and cost.

Shifting our focus to AMRs, these systems elegantly combine simplicity and adaptability. Their straightforward programming and inherent safety features set them apart. They navigate complex environments with ease, deftly handling obstacles, workers and intricate spaces such as doorways and lifts. As well as operational sophistication, these robots offer a compelling business case. The integration of fleet software ensures optimum logistical efficiency, whether managing a single unit or a fleet.

Comparison of different methods for the transportation of goods.
Manual material handling, manual forklifts, conveyors, AGVs and AMRs.

The distinction between AGV and AMR can sometimes seem a little unclear. In fact, there are major differences between the two. The most notable is the fact that AGVs are guided. This means that they rely on some kind of static infrastructure to guide the vehicles along their path. Examples of such infrastructure can be laser reflectors, where the vehicle uses a rotating laser, or radio wires embedded in the ground.

	Manual material handling	Manual forklifts	Conveyors	Automated guided vehicles	Autonomous mobile robots
Costs & efficiency	+ Cost-effective for short distances	+ Can travel quickly over long distances	+ Cost effective over long distances	+ Well proven solution	+ Low operating and maintenance costs
	– Requires full-time employees for low-value work, or high-value employees to leave their stations	+ Can travel outdoors	+ Can handle high volumes	+ Vehicles are often especially designed for specific loads	+ No staff required, keep your employees at their stations
	– Depends on worker attendance, training and attention to detail	– May require a full-time employee	– Creates obstacles for workers and other traffic	– Expensive infrastructure investment	+ High availability and efficiency
		– Depends on worker attendance, training and attention to detail	– Relatively high operating and maintenance costs	– Installation and changes require a stop of normal operations	+ Low initial investment
		– Expensive equipment and maintenance cost			+ Real time tracking of fleet
					– May require additional fixtures or stations for handling goods
Flexibility & Performance	+ Cost-effective for short distances	+ Can lift pallets directly off the floor	+ Designed for high volume between two points	+ Operates without worker interaction	+ Requires less space than AGVs and forklifts
	+ Employees can load, carry and unload material	+ Can adopt to changing requirements	– Fixed routes that cannot be changed without stopping logistics flow	– Fixed routes that cannot be changed without stopping logistics flow	+ Minimal infrastructure and floor space required
	+ Employees can operate in narrow and dynamic areas	– Not appropriate in highly dynamic areas where driver might not notice obstacles or people	– Installation requires often no production periods	– Installation requires often no production periods	+ Navigates through complex and dynamic environments
	+ Operators can adopt to changing requirements	– Requires extra space for maneuverability		– Obstacles placed in the path of the vehicle will stop the transport all together	+ Can be reprogrammed during operation
	– In peak production periods, pulling workers from other positions				+ Automatic warehousing and buffering functions
	– Humans does not do every-thing the same way every time, which can lead to quality problems and mistakes				+ Scalable solution – start small and expand
					– One AMR does not replace one manual forklift (appr. 1.5 AMRs per manual forklift)
Health & Safety	– Depend on training and oversight	– Depends on training and oversight of driver	– High speeds or loads represent a safety hazard for workers	– High speeds or loads can represent a safety hazard for workers	+ Can safety stop for or navigate around equipment, obstacles and human workers
	– Risk of work-related injuries	– Introduces risks to workers in area where forklifts are operating	– Transportation of goods is unmonitored from a safety perspective	– Only detects obstacles/ dangers in the height of the safety scanner	+ Monitor and modify priorities and traffic rules in real time

Bring your production into flow. As you can see from the pros and cons on the previous pages, AMR solutions offer several advantages for your intralogistics needs.

AMRs are flexible and intelligent, finding the best route to a destination and reacting spontaneously to events and obstacles in the environment. As a result, AMRs are a sensible solution in many cases where manpower is scarce, processes need to be optimised or costly equipment needs to be used as efficiently as possible. Most importantly, AMRs offer a scalable solution that can grow and adapt to your changing needs and requirements. Without disrupting or changing your existing processes.

Deploying autonomous robots is easier and cheaper than expected, as no major changes to the environment are required for power or navigation, and a high degree of deployment flexibility is ensured.

AMR by KUKA: What to expect and demand

Flexibility

AMRs offer flexibility, allowing for **gradual expansion or immediate large-scale deployment** without requiring fixed infrastructure. **Installation and commissioning times are minimised,** often with no disruption to ongoing operations.

They enable **swift adaptation to layout changes** and new requirements, seamlessly adjusting to reorganised workspaces, new production lines, or temporary storage areas. Changes can be made online and during operation.

AMRs **exchange data with management systems, ERP systems, and PLCs via Wi-Fi,** receiving tasks and performing complex sequences effortlessly integrated into existing systems.

Dynamic mapping capabilities eliminate dependence on static maps. Scanners enable automatic map creation and updates, with operators **flexibly designating routes and pickup/delivery points.** Empty areas can be defined as storage zones, with automatic assignment and management of storage spaces based on rules like FIFO.

Real-time information sharing through the AMR management system ensures **constant visibility and traceability of goods** within the facility, providing a comprehensive track-and-trace system.

Safety

Our autonomous robots are developed and manufactured with the latest technologies and innovative functions to meet the **highest standards in performance, reliability and safety.** Our automation portfolio includes series products for industry that meet different specific requirements. These high-quality standards are also applied exactly to the AMRs. Thanks to our extensive experience and specialised know-how, we are also able to develop targeted concepts for your tasks in this field.

Laser scanners: These sensors use laser beams to accurately measure the distance to objects. They create detailed 2D or 3D maps of the environment, allowing for accurate obstacle detection.

3D cameras: Cameras, in particular stereo cameras or depth cameras, enable visual perception of the environment. By processing images, robots can detect obstacles which are not detectable with the laser scanners and determine their position relative to them. In case of an potential collision of the AMR or the transporeted goods, the AMR stops.

Bumper Sensors: These sensors detect physical contact with the robot and stop it immediately. They can be used to detect unexpected obstacles or deviations from the planned route.

Ease of use

Setting up and modifying the system should be as simple as programming a collaborative robot. **No-code software enables quick and effortless system setup and maintenance.** Whether it's mapping, creating routes, workflows, or exchanging signals, coding isn't necessary. Graphical configuration eases use, opening up system operation to users without programming expertise.

In the need of manual handling of vehicles features such as **local operator panel, remote control and brake release functionality** should be available. This enables operators to handle vehicles in case of unforeseen issues such as loss of Wi-Fi or other disturbances.

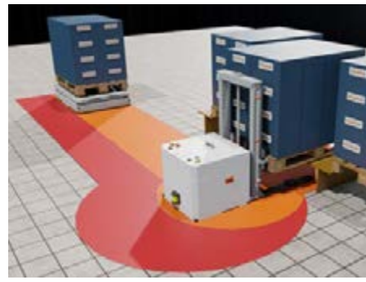
An intuitive and user-friendly HMI interface which enables operators and users to easily **navigate and monitor the status and performance** of the complete solution and fleet of vehicles.

Besides a no-code environment, **predefined commonly used workflows** should be available from a library for creating commonly used tasks i.e. signal exchange flow for open and passing doors, light curtains etc. **Automatic monitoring of battery levels and an integrated charging strategy** are other examples of premade functions that are needed in every application.

Space requirement

As forklifts and AGVS usually require space behind the load that also means that they require more space for turning in tight spaces. KUKA AMRs on the other hand **carry their load on their back and can turn around its center point.**

Thanks to this the use of AMRs requires **40-60% less space compared to the use of forklifts or AGV forklifts** at a way lower investment. That means that you will use less space for your storage needs, or when it comes to navigating between production machines, use more space for production without the need for expanding your facilities.



In the pictures the footprint required by a forklift AGV and an AMR is compared. A manually operated forklift would in fact require even more space depending on type used.

Feel the flow. KUKA's AMR business started in 2008 with the development of a heavy-duty AMR solution for aerospace applications.

At the beginning of 2023 KUKA changed the focus from the solution business to the product business and launches a completely new product portfolio.

Our current AMR product portfolio

KMP 600P

Payload
– max. 600 kg

IP54 Protection
– Splash water
– Dust

KUKA Navigation
– Node label navigation
– No Code Fleet management
– Positioning accuracy ±5 mm/±0.5°

High Safety
– 360° protection by laser scanners
– Front and rear 3D obstacle avoidance
– Sound warning & Indicator light

Hand-held Control Unit FNB
– Only for trained people
– Drive and lift motions
– 5G option

Differential drive
– Preferred driving direction (+ turn on spot)
– Up to 2.0 m/s speed

Certification
– CE-certified by TÜV Rheinland

Integrated Lifting Device
– max 80 mm lifting stroke (option)
– Rotating stroke 360°
– Centering cone*4

LFP Batteries
– 8 hours running time
– Less than 2 hours charging time
– More than 1.500 full charge cycles
– Inductive charging

Manual charger
– Portable
– User-friendly

Compact dimensions
– 980 x 686 x 270 mm

KMP 1500P

Payload
– max. 1,500 kg

IP54 Protection
– Splash water
– Dust

Easy Maintenance
– Easy exchangeable control & power electronics cabinet

KUKA Navigation
– SLAM Navigation (based on laser scanners)
– QR Code Navigation (based on bottom camera)
– Fleet Management
– Highest flexibility without external efforts

High Safety
– laser scanners in front and rear (360° Protection)
– 3D cameras in the front and rear
– Reduced velocity and sound alarm for backwards driving
– emergency stops & side bumpers
– Sound alarm & visual signaling

Manual Controller
– Only for trained people

Load Detection Came
– Load Identification & tracking

Certification
– UL certification by TÜV Rheinland
– FCC Options

Integrated Lifting Device
– max 60 mm lifting stroke

Li-Ion/LFP Batteries
– up to 10 hours running time
– Less than 2 hours charging time
– Less than 1 hour recharged 20% – 80% SOC

Differential drive
– Preferred driving direction (+ turn on spot)
– Up to 1.5 m/s speed

Touch Display
– Status / Control menue

KMP 3000P

Payload
– max. 3,000 kg

IP54 Protection
– Splash water
– Dust

Easy Maintenance
– Side disassembly of wheel units and inductive charger

KUKA Navigation
– SLAM Navigation (based on laser scanners)
– QR Code Navigation (based on bottom camera)
– VDA 5050 interface
– Highest flexibility without external efforts

High Safety
– 2× laser scanners in front and rear (360° Protection)
– 4× 3D cameras in the front and rear
– 6× emergency stops & side bumpers
– Sound alarm & visual signaling

Manual Controller
– Only for trained people

Load Detection Came
– Load Identification & tracking

Certification
– CE and UL certification

Integrated Lifting Device
– max 100 mm lifting stroke

LFP Batteries
– 6 – 8 hours running time
– Less than 2 hours charging time
– Less than 1 hour recharged 10% – 90% SOC
– Inductive charging on the ground

Omnidirectional drive
– Omnidirectional movement
– Unloaded max velocity 1.2 m/s (flat)
– Loaded max velocity 1.0 m/s (flat)

Touch Display
– Status / Control Display screen 5"

KMR iisy

Both payload (15 R930 and 11 R11300)
– LBR R930 with 15 kg and LBR R1300 with 11 kg available

IP54 Protection
– Splash water
– Dust

Easy Maintenance
– Large opening for easy access and serviceability

KUKA Navigation
– SLAM Navigation (based on laser scanners)
– no Code Fleet Management
– Highest flexibility without external efforts

High Safety
– x laser scanners in front and rear (360° Protection)
– Reduced velocity and sound alarm for backwards driving
– 4× emergency stops & led strips
– Sound alarm & visual signaling

SmartPad Pro
– Rear Door: Take out the SmartPad easily for robot teaching and programming
– Monitoring and manual operation

ISO 61340-5-1 & ANSI ESD S20.20
– ESD Protection for sensitive workspaces
– ISO 3 Cleanroom version available

WLAN antenna
– Top mounted for best WiFi signal strength 5G (planned)

Li-Ion battery/wireless in-process
– 8 hours running time
– Less than 2 hours charging time
– Less than 1 hour recharged 20% – 80% SOC

Differential drive
– Preferred driving direction (+ turn on spot)
– Up to 1,5 m/s speed

Touch Display
– Status / Control menue

KUKA.AMR Fleet: The No-Code-Platform with AI functionality is easy and intuitive to use. The navigation system makes it possible to configure settings by cursor in the browser instead of programming them. This allows new or modified routes to be planned quickly and efficiently. Additional comfort and AI functions as automatic rack recognition increase the efficiency during integration.

The software also enables comprehensive fleet management of the entire AMR system. It fully regulates all fleet traffic and is able to automatically reschedule in the event of obstacles.

Autonomous Mobile Robots (AMR) | © KUKA 2025

KUKA.AMR Fleet

KUKA.AMR Fleet is an expert management system for KUKA mobile robots. Based on a variety of complex AI scheduling algorithms, flexible process choreography and full coverage of peripherals, it delivers collective intelligence, task execution and efficient collaboration of a number of different mobile robot types. KUKA.AMR Fleet manages entire factory processes, supports countless industrial scenarios, and creates a truly unmanned and digital 'smart factory'.

Advantages

Easy to use: no-code platform software with easy-to-use interface configuration to meet the needs of countless industrial scenarios.

Efficient delivery: the system can be deployed with one button and configured efficiently for more than 90% of industrial scenarios, achieving rapid delivery within 48 hours.

Safe and reliable: monitors the entire operation in real time, detects abnormal information prompting, quickly locates the cause of the problem, and provides solutions.

Efficient collaboration: RCS can dispatch multiple robots of different brands and types at the same time to maximize efficient collaboration.

High precision navigation

Multimodal fusion navigation: Supports Laser Slam, QR code and other positioning systems. Features lane line detection and recognition function, including lane keeping and deviation warning functions.

High Accuracy Positioning: High navigation and positioning accuracy, navigation and positioning accuracy down to the millimeter. Features a ground texture odometer with improved accuracy and robustness.

Excellent performance: Stable operation in dynamically changing environments, autonomous planning of operating paths and avoidance of operating obstacles.

One Platform, three Systems

Workflow Control System

- Total freedom in workflow scheduling
- Supports customized system interfacing
- Monitors full-process job execution in real time

The WCS is KUKA's intelligent logistics workflow control system. Acting as an intermediate element between the customer's upstream system and the internal scheduling system, it takes tasks from the upstream, helps with the full-process completion of tasks with flexible scheduling, and provides feedback to the upstream. It also has a simple recovery function should task abnormality occur, a key factor in any factory's low-cost, high-efficiency operation and maintenance.

Robot Control System

- Traffic control based on lock-free dependency calculation
- Global and resource optimal path planning
- Cross-brand and multi-model mixed-field scheduling

RCS is KUKA's robot control system which uses a variety of AI intelligent scheduling algorithms. RCS delivers efficient collaboration, task completion, traffic control and obstacle avoidance for multi-brand and multitype AMRs in the same field – while avoiding deadlocks and ensuring unmanned, less humanized and intelligent orderly production.

Equipment Control System

- Graphically configures device control rules
- Gives a real-time view of device operation status
- Execution process log management

ECS is KUKA's external equipment control system, which can manage other hardware devices besides AMR, such as electric doors, hoists, elevators, conveyor lines, robotic arms and other equipment. ECS gives access to device signals and completes docking transformations to achieve smarter and more efficient collaboration and helping customers to build a truly smart factory.

KUKA – your partner for AMR

With an advanced AI algorithm, SLAM navigation technology, development by a powerful global R&D team and extensive project experience, KUKA delivers unparalleled services covering the four areas of transport, picking, storage and warehousing. Combined with the technology of KUKA robot products and our industrial six-axis system, we provide customised solutions for the entire factory process: inbound, loading and unloading, picking, transport, assembly, recycling, and outbound.

Get in touch with us!

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