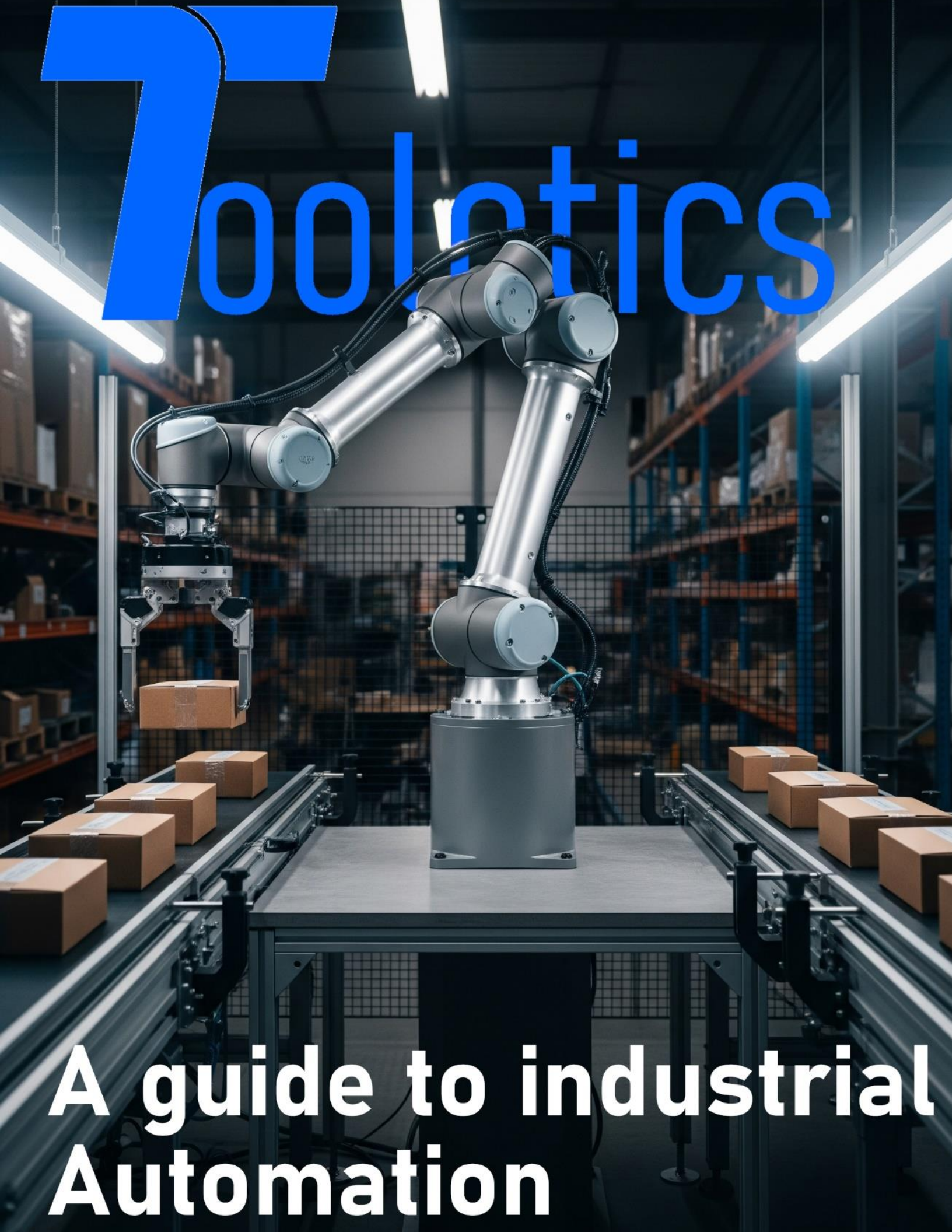

Toolotics

A guide to industrial Automation

Enhancing industrial productivity

Collaborative robots, or cobots, are rapidly becoming a crucial element in the industrial automation space. Unlike traditional industrial robots, cobots are designed to work alongside human operators in a shared workspace. Their flexibility, ease of programming, and safety features make them suitable for various tasks across different industries, from packaging and sorting to picking produce and inspecting equipment.

This report explores how cobots can be leveraged to improve productivity in different industrial operations.

1. Cobots in Package Sorting

Overview

Package sorting is an essential operation in industries such as logistics, e-commerce, and manufacturing. Cobots can significantly enhance efficiency by automating repetitive and physically demanding tasks, ensuring a faster and more accurate sorting process.

Applications and Benefits

- **Sorting by Size, Shape, and Weight**: Cobots equipped with advanced sensors and AI-powered vision systems can differentiate packages based on size, shape, and weight, automating the sorting process that previously required manual labor.
- **Improved Accuracy**: Cobots reduce human error, improving accuracy and minimizing the chances of incorrect sorting or package misplacement.
- **Speed and Throughput**: With cobots working alongside human operators, sorting speeds increase, leading to higher throughput. The continuous work cycle of cobots, without fatigue, ensures sustained productivity over long shifts.
- **Flexibility**: Cobots can be reprogrammed to handle different types of packages, offering flexibility for handling different product lines or varying seasonal demand.

In e-commerce fulfillment centers, cobots like those from **Locus Robotics** or **Fetch Robotics** are used to assist human workers in sorting packages. They move packages through the warehouse to appropriate locations, ensuring high efficiency and quicker order fulfillment.

2. Cobots in Produce Picking

The agricultural industry is increasingly adopting automation, especially in tasks like produce picking. Cobots can enhance productivity by reducing labor costs and handling delicate produce with precision.

Applications and Benefits

- **Delicate Handling**: Cobots are designed with soft, adaptive grippers or suction cups that can handle fragile items like fruits and vegetables, minimizing damage.
- **Increased Efficiency**: Cobots can work at a consistent pace, reducing the time it takes to harvest produce. When paired with AI and machine learning algorithms, they can identify ripe fruits or vegetables, improving harvest timing.
- **24/7 Operation**: Cobots do not need breaks, allowing for continuous operation during peak harvesting seasons, which can be especially valuable in large-scale farming operations.
- **Cost Reduction**: Cobots can replace or assist human labor for picking tasks, which is particularly helpful in regions where labor shortages exist or wages are high.

FFRobotics, a robotics company specializing in agriculture, has developed cobots that can pick fruits like apples. These cobots are equipped with vision systems to determine ripeness and employ soft robotics to ensure minimal damage during the picking process.

3. Cobots in Equipment and Parts Inspection

Regular inspection of machinery, equipment, and parts is crucial to maintaining product quality and operational safety. Cobots can enhance inspection capabilities by automating the process, improving consistency, and providing real-time data analysis.

Applications and Benefits

- **Precision Inspection**: Cobots, equipped with advanced cameras, sensors, and AI algorithms, can detect even minute defects or irregularities in parts or equipment that might be missed by the human eye.
- **Data-Driven Decisions**: Cobots can collect detailed data during the inspection process, feeding it into predictive maintenance systems. This allows companies to anticipate failures before they occur and minimize downtime.
- **Consistency and Accuracy**: Unlike humans, cobots can repeat the inspection process with high consistency, ensuring that every part is examined according to the same standards, reducing variability in quality control.
- **Safety**: Cobots can be used to inspect hazardous or hard-to-reach areas, reducing the risk to human workers. For example, they can inspect machines or parts that involve high temperatures, corrosive materials, or tight spaces.

Universal Robots has collaborated with companies like Porsche to implement cobots for inspecting parts during production. These robots are integrated with high-resolution cameras and sensors to identify flaws in car parts, ensuring superior quality control.

4. Cobots in Assembly Line Operations

Assembly lines, particularly in industries like automotive manufacturing and electronics, can benefit significantly from the use of cobots. They assist in repetitive tasks, reducing worker fatigue and increasing production rates.

Applications and Benefits

- **Human-Robot Collaboration**: Cobots work alongside human workers to handle repetitive tasks such as tightening screws, placing parts, or welding components. This minimizes the strain on human workers and allows them to focus on tasks requiring more dexterity or decision-making.
- **Customization**: Cobots can be easily reprogrammed and retooled for different types of assembly operations, making them a flexible solution for manufacturers dealing with a variety of product lines.
- **Reduced Downtime**: Cobots can keep assembly lines running even when human workers are on break or off-shift, leading to fewer interruptions and higher overall output.

BMW uses cobots on its assembly lines to assist workers in performing tasks such as lifting heavy parts, which helps reduce the risk of workplace injuries and increase the speed of production.

5. Cobots in Packaging and Labeling

The packaging process often requires precision, consistency, and speed. Cobots can be integrated into packaging lines to perform tasks such as placing products into boxes, applying labels, and even preparing items for shipment.

Applications and Benefits

- **Precision**: Cobots can place products in boxes with a high degree of precision, ensuring that packages are properly packed and ready for shipping. This reduces the need for human intervention in repetitive, labor-intensive tasks.
- **Labeling**: Cobots with vision systems can detect product orientation and ensure that labeling is done correctly, reducing the risk of labeling errors that could result in shipping mistakes.
- **Enhanced Speed**: Cobots can perform tasks faster than human workers, reducing the time it takes to package and prepare items for shipment.

KUKA, a leading robotics manufacturer, offers cobots that are used in packaging and labeling. Their cobots help companies streamline the process and ensure that products are properly packed and labeled for distribution.

6. Cobots in Welding and Material Handling

In manufacturing environments where welding and material handling are key processes, cobots can increase productivity by assisting with heavy lifting, precise welding, and material transportation.

Applications and Benefits

- **Welding**: Cobots equipped with precision tools can perform welding tasks with high accuracy, reducing the variability seen with manual welding and improving overall product quality.
- **Material Handling**: Cobots can be used to move heavy or bulky materials, reducing the risk of worker injury and increasing the speed of operations. They can also optimize workflows by ensuring that materials are delivered to the right place at the right time.

KUKA's LBR iiwa is a cobot designed for precision tasks such as welding. In industries like automotive manufacturing, cobots are used to handle materials and perform welding with a level of accuracy and efficiency that meets high industrial standards.

Enhancing Workplace Safety with Cobots in Industrial Automation

In industrial environments, worker safety, well-being, and productivity are top priorities. **Collaborative robots (cobots)** are increasingly being integrated into manufacturing and logistics settings to enhance workplace safety while improving operational efficiency. Cobots are designed to work safely alongside human employees, helping reduce physical strain and eliminating the need for humans to perform repetitive and monotonous tasks, which can lead to distraction and mistakes.

This report explores how cobots can contribute to **workplace safety** by addressing physical hazards, preventing human fatigue, and eliminating risks associated with repetitive tasks, particularly in operations like heavy lifting, sorting, and packing.

1. Cobots in Preventing Heavy Lifting Injuries

Lifting heavy boxes or materials is a significant cause of workplace injuries in industries such as logistics, manufacturing, and warehousing. These injuries are typically related to musculoskeletal disorders, which occur when workers are required to lift, carry, or move heavy loads repetitively.

How Cobots Contribute to Safety

- **Heavy Lifting Assistance**: Cobots are designed with advanced actuators and sensors to handle heavy loads safely. They can be used to lift, move, and transport large, heavy boxes or materials that would otherwise be unsafe for human workers to lift. By offloading these tasks to cobots, the risk of injury from improper lifting techniques is significantly reduced.
- **Ergonomic Benefits**: Cobots help maintain the proper posture for lifting tasks, reducing the strain on human workers' muscles and joints. This ergonomic benefit extends to human workers, who can focus on other tasks without having to worry about performing strenuous lifting duties.
- **Constant Motion without Fatigue**: Unlike human workers, cobots do not experience fatigue. As a result, they can consistently perform tasks that require high physical effort over long periods without compromising safety or performance.

In warehouses, cobots from companies like KUKA or Fetch Robotics are being used to transport large boxes of goods from storage shelves to packing areas. This reduces the need for warehouse employees to carry heavy boxes manually, which can result in back injuries or strain over time.

2. Cobots in Eliminating Repetitive and Boring Tasks

Many industrial jobs involve repetitive tasks, such as sorting, packing, or assembly. These tasks, while necessary, can be mentally taxing and physically exhausting for human workers. Prolonged repetition of the same actions can lead to fatigue, boredom, and distraction, ultimately resulting in decreased productivity and safety risks.

How Cobots Contribute to Safety

- **Reduction of Boredom and Fatigue**: Cobots take over repetitive tasks, allowing human workers to focus on more complex or engaging activities. This reduces the mental fatigue and boredom associated with repetitive work, which can lead to accidents caused by distraction.
- **Attention to Detail**: Cobots can perform repetitive tasks with a high degree of precision and without deviation, ensuring that every task is performed consistently. This reduces the risk of human error, which is particularly critical in tasks like quality control, packaging, and sorting.
- **Boosting Human Engagement**: By automating monotonous tasks, cobots allow workers to engage in more value-added activities. This improves job satisfaction, reduces turnover rates, and fosters a safer, more efficient work environment.

In assembly lines, cobots like those from Universal Robots are used to perform tasks such as screwing bolts, sorting parts, or moving components to the next station. This allows human workers to focus on tasks requiring decision-making, such as inspecting parts for quality or troubleshooting equipment.

3. Cobots in Reducing Human Exposure to Hazardous Environments

Certain industrial environments involve hazardous substances, extreme temperatures, or dangerous machinery, making it risky for humans to be in close proximity to these dangers for extended periods.

How Cobots Contribute to Safety

- **Handling Hazardous Materials**: Cobots can be programmed to handle hazardous substances, such as chemicals, hot materials, or toxic gases. They can perform tasks like mixing, packaging, or moving hazardous materials without risking human exposure.
- **Reducing Human Interaction with Dangerous Machines**: Cobots can work alongside heavy machinery, such as press machines, welding equipment, or grinders, to handle the materials or tools required, eliminating the need for humans to operate in close proximity to dangerous machines.
- **Remote Operation**: Cobots can be controlled remotely, allowing human workers to supervise processes without entering potentially dangerous environments. For

example, cobots can inspect hazardous areas or conduct maintenance on machinery from a safe distance.

In the automotive industry, cobots are used to assist in welding tasks. By taking over welding operations, the cobot reduces the human worker's exposure to the heat and fumes associated with the welding process, thereby enhancing safety.

4. Cobots in Reducing the Risk of Workplace Accidents from Distraction

Distraction is a common cause of accidents in industrial settings. When workers are bored or fatigued from performing monotonous tasks, their attention can wander, leading to mistakes or unsafe behavior.

How Cobots Contribute to Safety

- **Constant Focus on Repetitive Tasks**: Cobots can handle repetitive tasks with unwavering focus, ensuring that operations continue smoothly without any lapses in attention. This allows human workers to focus on more complex, higher-value tasks that require critical thinking.
- **Eliminating Cognitive Load**: Repetitive tasks often lead to cognitive overload and mistakes due to mental fatigue. Cobots offload these tasks, keeping human workers mentally alert and reducing the likelihood of accidents caused by cognitive distractions.
- **Improved Safety Monitoring**: Cobots can be integrated with sensors that monitor workplace conditions and ensure compliance with safety protocols. They can detect unsafe conditions, such as overheating equipment, gas leaks, or changes in environmental parameters, and alert human workers in real-time.

In a distribution center, a cobot might handle package sorting while human workers focus on tasks like inspecting shipments or addressing quality control concerns. By reducing the amount of repetitive and physically strenuous work, human workers are less likely to become fatigued and distracted, resulting in a safer environment.

5. Cobots in Automating Dangerous Maintenance Tasks

Routine maintenance tasks, such as inspecting machinery for wear and tear, replacing parts, or cleaning hazardous equipment, can be risky for workers due to exposure to high temperatures, corrosive chemicals, or moving machinery.

How Cobots Contribute to Safety

- **Remote Maintenance**: Cobots can be used to perform maintenance tasks remotely. For example, they can be tasked with inspecting equipment in confined spaces, replacing filters, or lubricating parts, without putting human workers at risk.
- **Inspection in Hazardous Environments**: Cobots can be equipped with cameras and sensors to inspect machinery and equipment in hazardous conditions, such as inside reactors or near high-pressure systems. This prevents the need for workers to enter these dangerous spaces.
- **Predictive Maintenance**: Cobots can monitor machinery continuously and use sensors to detect early signs of failure. By alerting workers before a machine breaks down, cobots reduce the risk of workplace accidents caused by malfunctioning equipment.

In the chemical manufacturing industry, cobots are used to inspect and maintain pipelines that carry hazardous chemicals. By utilizing cobots, human workers can stay safely outside of hazardous zones while the robot handles potentially dangerous tasks.

Conclusion

Cobots are transforming industrial automation by enhancing productivity, improving safety, and reducing operational costs. They are highly adaptable and can be used across a range of tasks, including package sorting, produce picking, equipment inspection, assembly line operations, and more.

By enabling human-robot collaboration, cobots empower workers to focus on higher-value tasks while performing repetitive, physically demanding tasks efficiently and with precision. As technology continues to advance, cobots are expected to become an even more integral part of manufacturing and industrial processes, helping companies stay competitive in an increasingly automation-driven world.

Cobots represent a significant advancement in industrial automation, particularly in improving **workplace safety**. By reducing human involvement in heavy lifting, repetitive tasks, and hazardous operations, cobots help minimize the risk of workplace injuries and accidents. They also improve worker well-being by reducing mental fatigue, promoting ergonomic practices, and ensuring a safer working environment. As cobots continue to evolve, their ability to complement human workers in the workplace will grow, creating safer, more efficient, and more productive industrial environments.

With the increasing focus on **employee health and safety** and **workplace efficiency**, the adoption of cobots is becoming a vital part of modern industrial operations.