Illuminate NEBRASKA
POWERED BY NEBRASKA PUBLIC POWER DISTRICT

AUTOMATION

MANUFACTURING PROCESS

CONCEPT In automation, the manufacturing process begins with the design of the product and the creation of a manufacturing plan that includes the selection of appropriate robotic systems and the programming of their actions. The use of robotics automation in manufacturing processes can significantly increase efficiency, safety, accuracy, and productivity, while reducing costs and improving product quality.

BACKGROUND

Early 1960's robots were large and expensive, with very basic programming. They were able to perform simple tasks such as welding and material handling, which still improved efficiency and productivity. Development of more sophisticated robots and the introduction of computer-aided design and manufacturing (CAD/CAM) software in the 1980s enabled robots to be programmed with greater accuracy and complexity.

In the 1990s, robots began to be integrated with other technologies such as sensors, vision systems, and artificial intelligence, which enabled them to perform more complex tasks such as quality inspection and assembly.

FORMULAS

CYCLE TIME: Time it takes to produce one unit of product

THROUGHPUT: Rate at which products are produced, measured in units per hour or day

OEE (OVERALL EQUIPMENT EFFECTIVENESS): A measure of the effectiveness of a manufacturing process

ROI (RETURN ON INVESTMENT): A measure of the financial returns on an investment in robotics automation, taking into account the costs and benefits over time

DOWNTIME PERCENTAGE: The percentage of scheduled production time that a machine or system is not operating due to downtime

COBOT (COLLABORATIVE ROBOT): Robot designed to work alongside humans in shared space

Make sure it measures up

EXAMPLES

Industrial robots are used to perform various tasks such as assembly, welding, painting, material handling, and quality inspection. During the process, sensors and cameras monitor the quality of the products and identify defects or deviations from the required specifications. The robots may work in collaboration with other robots or human workers, depending on the complexity of the manufacturing process. The data collected is analyzed to improve the manufacturing process and ensure consistent quality.

Industrial robots perform various tasks such as assembly, welding, painting, and material handling.

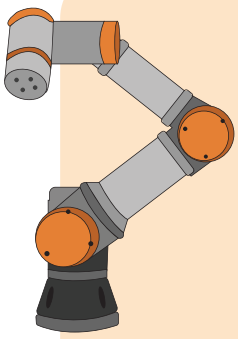
End-effectors are tools or grippers attached to robots to perform specific tasks.

Sensors measure physical properties such as temperature, pressure, and distance. They are used to monitor the manufacturing process and ensure quality control.

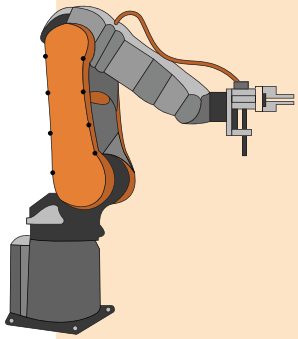
Controllers send commands to the robots and control their movements.

Programming languages are programs that control the robots and their actions.

Vision systems are cameras and image-processing software that enable the robots to identify parts and components and navigate through the manufacturing process.



Collaborative Robot



Traditional Industrial Robot

REAL WORLD CONNECTIONS

Arka use robotic automation to manufacture advanced aerospace products. In their process, robots are used to drill, mill, and cut complex parts made of titanium and composites. This allows for precision and consistency, which is critical for aerospace components that require high levels of performance and reliability.

They utilize this robotic system in space to service and assemble space systems, repair malfunctioning spacecrafts, on refueling missions and to move cargo from one orbit to another. They even have a system designed to capture space debris for recycling as well as advanced optical systems which support ground, air and space missions.

APPLICATION

A company called Vexos, located in Markham, Ontario, Canada, uses cobots in their manufacturing process to assemble and test electronic components. They perform tasks such as pick-and-place, soldering, and quality control, which are repetitive and require high levels of precision. Vexos has implemented a human-robot collaboration approach, where human workers and cobots work together in a shared workspace. This has enabled Vexos to improve worker safety and ergonomics, while also improving the overall efficiency of the manufacturing process.

Illuminate NEBRASKA
POWERED BY NEBRASKA PUBLIC POWER DISTRICT

powered by: Nebraska Public Power District
Always there when you need us