Illuminate NEBRASKA
POWERED BY NEBRASKA PUBLIC POWER DISTRICT

AUTOMATION

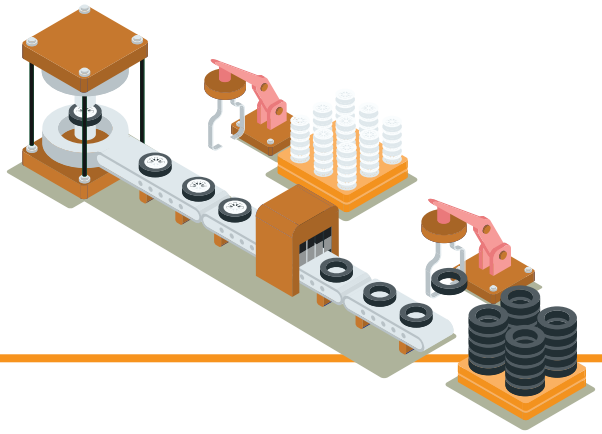
SEQUENTIAL PROCESSING

CONCEPT Sequential processing refers to a method of organizing and executing tasks in a specific order or sequence. By breaking down a complex process into a series of smaller, more manageable steps, sequential processing allows for greater control and precision and enables the automation system to respond quickly and adaptively to changes in the environment or input data.

BACKGROUND

From the very beginning when Henry Ford invented the first entirely human-powered automotive assembly line for his Model T, the ongoing quest for better processes and ways to automate factories has been the goal. The term automation was coined in the automobile industry about 1946 to describe the increased use of automatic devices and controls in mechanized production lines.

With the development of modern computer systems and the widespread use of software-based automation tools, sequential processing has become an integral part of many industrial and manufacturing processes.



EXAMPLES

FIXED AUTOMATION: Sequence of processing operations is fixed by the equipment configuration.

PROGRAMMABLE AUTOMATION: Sequence of processing operations can be changed by reprogramming.

FLEXIBLE AUTOMATION: Allows for changes in the sequence of processing operations without requiring reprogramming.

SEQUENCERS: Software or hardware devices that enable the automation system to execute a series of tasks in a specific sequence. They provide the logic and control necessary to ensure that each task is executed in the correct order.

APPLICATION

In the process of producing smartphones, Foxconn, a leading manufacturer of electronic products, uses robots that perform a series of sequential tasks, including assembly, testing, and packaging. A robot may pick up a circuit board and place it onto a conveyor belt, where it is carried to the next station for component insertion. Once the components are inserted, another robot may test the device to ensure that it is functioning correctly, before passing it on to the final packaging station. The robots are programmed to perform each task in a specific order, with minimal errors and waste. This allows for faster production times and lower costs, as well as a higher degree of customization and flexibility in manufacturing.

FORMULAS

CYCLE TIME: Amount of time it takes for a system to complete one cycle of operation, from the beginning of one process to the beginning of the next process. It is calculated by dividing the total production time by the number of units produced.

THROUGHPUT: Amount of material or data that can be processed by a system in a time period. It is calculated by dividing the total amount of material or data processed by the time it takes to process it.

LEAD TIME: Amount of time it takes for a product to be manufactured and delivered to the customer. It is calculated by adding the processing time, wait time, and transportation time.

ERROR RATE: Percentage of errors or defects in the output of a system. It is calculated by dividing the number of errors or defects by the total number of units produced.

REAL WORLD CONNECTIONS

Tesla's assembly line is highly automated, with robots performing most of the assembly tasks, including welding, painting, and attaching components. The robots are programmed to perform a specific sequence of tasks. The process is controlled by a central computer system, which coordinates the movements of the robots and ensures that each task is completed in the correct order and at the appropriate time. By using sequential processing, Tesla can achieve high levels of efficiency, consistency, and quality in its manufacturing processes as a result.