AUTOMATION

Working with new technology pages 120- 124 (part 1)

WHAT IS IT?

Automation is the use of machine to carry out tasks that involve making decisions.
Replacing human beings with machines is called "mechanisation", but automation is more: it's a sort of integration of machines into a self-controlling system.
Automation is different from mechanisation also because the machine regulate itself through feedback.

What is a feedback:

FEEDBACK: Nel linguaggio tecnico/scientifico è il processo per cui il risultato dell'azione di un sistema (dispositivo) si riflette sul sistema stesso per correggerne il funzionamento.

A feedback system, called a "loop" enables a machine to monitor its own output , compare it with a set of standards and adjust its performance. The adjustment is made up of three steps:

1) MEASUREMENT: THE PHYSICAL VARIABLES IN THE SYSTEM ARE MEASURED THROUGH SENSORS (PHOTOELECTRIC CELLS, THERMOCOUPLES, X-RAY MACHINES) THAT MEASURE WEIGHT, TEMPERATURE, PRESSURE, COLOR OR ELECTRICAL RESISTANCE.

2) EVALUATION: A COMPUTER EVALUATE THE INFORMATION, CONFRONTING THEM WITH STORED DATA AND DECIDING IF A CORRECTIVE ACTION IS NECESSARY.

3) CONTROL: WHETHER DISCREPANCIES EXIST, THE COMPUTER BRING BACK THE MACHINE TO THE PROGRAMMED PERFORMANCE.

An automated system is able to regulate its behaviour even if it is not possible to foresee all the scenarios, for example an airplane auto-pilot is a classical example of feedback device.

A modern automated factory may have thousands of interconnected self regulationg loops.
The application of automation to manufactory is called "process control" .
Automated machines are commonly used to carry out different jobs: by reprogramming the computer a machine may be used to do different tasks.

ADVANTAGES OF AUTOMATION

There are several areas where machines and automated system are far more effective than people:

1) HIGHLY COMPLEX TASKS: Automated system can make decisions, such as coordinate the traffic lights or maintain the flow of traffic, that would be too complicate for humans.

2) RAPID DECISION- MAKING TASKS: The high speed military aircraft, for example, use automated guidance system so that they can chnage direction faster than a pilot, if an obstacle occur.

1) HIGHLY REPETITIVE TASK: The monotoning of some work such as assembling, inspecting and packaging manufactured products may produce health and lack of concentration problems to people, while machinery is not affected at all.

1) DANGEROUS TASKS: There are environments (reparing underwater pipelines, defusing bombs, carrying out space researches) where the risk for workers is too hight to be run. Machinery can operate in these environments.

SUMMING UP:

AUTOMATED SYSTEM, ONCE SET UP, WORK MORE
CHEAPLY THAN PEOPLE.
THINK ABOUT THE REPETITIVE WORK AT THE
SUPERMARKET CASH, FOR EXAMPLE: WHEN GOODS ARE
SOLD, STOCK LEVELS ARE AUTOMATICALLY ADJUSTED
AND NEW PRODUCTS ORDERED WHEN NECESSARY.

PROGAMMABLE LOGIC CONTROLLER (PLC):

A PLC is a specialized device for controlling machines and processes in automation. It is used in many industries and it enables all the different elements to work together.
A PLC contains delicate electronics element but it must be robust to survive in the industrial enviroment.
They are in many shapes and size.

THE COMPONENTS OF A PLC CAN BE DIVIDED IN THREE AREAS:
1) POWER SUPPLY
2) CPU (central processing unit): made up of microprocessor, memory chip and others circuits it controls logic, communication and monitoring.
In operating mode it download a program, while in run mode it excutes the program.

THE PLC IS A DEDICATED CONTROLLER, SO IT PROCESSES THE SAME PROGRAM AGAIN AND AGAIN.

The CPU memory stores the program and the input/output values.
The most common form of programming for PLC is called "ladder logic".

3) INPUT/OUTPUT (I/O) SECTION: This provides the physical connection between the external components and the PLC. The input devices may be digital and analogue. (The analogue input (voltage or current) may be converted into a digitally equivalent number thet the CPU may understand.

ANALOGUE INPUT DEVICE: pressure transducers, flow meters and thermocouples.

DIGITAL INPUT DEVICE: light, LEDs and motors.