

BASIC KNOWLEDGE

THE IMPORTANCE OF PROCESS CONTROL ENGINEERING FOR PROCESS ENGINEERING

Process control engineering is vital to the automated operation and monitoring of complex technical processes. These processes represent the unit operations of material transformation. Raw materials are transformed into products, often using other materials and energy. The processes may, for example, involve the production of ethanol from biomass; the separation of petrol from mineral oil by rectification; or the treatment of waste water.

With the aid of process control engineering, processes are monitored and influenced as they happen. This is enabled by the measurement and control of variables such as flow rate, pressure, temperature, and concentration.

Process control engineering topics

- Metrology

Sensors are used in the measurement of the variables. The variables involved may, for example, be pressure, flow rate, temperature and concentration in process engineering systems. In modern systems these variables must be converted into equivalent electrical signals for further processing.

- Actuation systems

Actuators have direct influence on the process meaning that they can change the measured variable. Targeted manipulation of the flow rate in a pipeline by a control valve is an example of this.

- Control engineering

The **controller** receives the measured variable (e.g. a flow rate) from the sensor as an input signal. In the controller this measured variable signal is compared against the reference variable signal pre-set by the operator. The controller sends an output signal corresponding to the control difference to the actuator. The signal processing in the controller follows a functional correlation between the input and output variables. A detailed knowledge of the process itself is necessary to allow for optimum setting of the functional correlation (e.g. via controller parameters P, I and D) within the controller.

- Open-loop control

The signal processing sequences in process engineering systems are often repeated. Such sequence control can be implemented by **programmable logic controllers (PLCs)**.

- Process visualisation

Process visualisation ensures that the operator is integrated into the technical environment. A simplified visual representation of the process is essential to increasing operator understanding of complex processes and also provides him with the necessary information on the process state. From the **control station**, operators can use the visual information to make decisions and influence the process as appropriate.

- Communication

The safe transfer of data from the process to the control station and from the control station to the process is a key aspect of process control engineering. **Field bus systems** are employed in the interconnection of multiple devices, such as controllers, PLCs and actuators, with the control station.

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