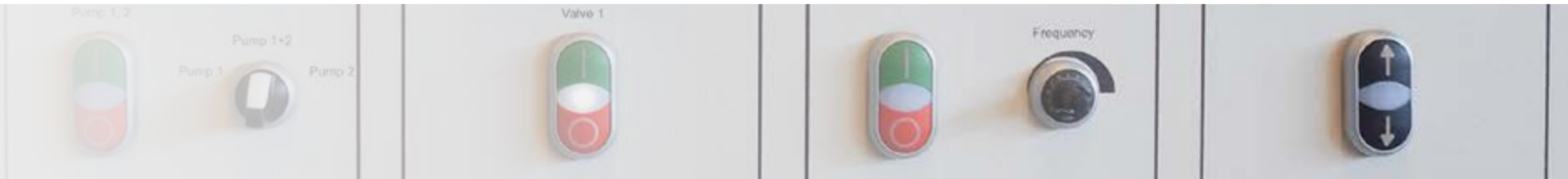


Industry 4.0

Process control engineering in context



Industry 4.0 enforces the networking and digitalisation of technical processes. Industrial processes are equipped with a large number of control loops. The number of sensors is constantly increasing. The generated process data are the basis for process control. This is implemented in automated operation with the aid of a PLC and integrated digital controllers. The PLC is part of the process control engineering. With the help of the process control engineering, processes are monitored and influenced during operation.

An important part of the efficient design of the processes is, for example, the optimal parameterisation of the controllers. Due to the complexity of the processes, this requires a detailed knowledge of control engineering.

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. Non-electrical input variables must be converted into electrical output signals by the sensor. The conversion is based on scientific principles.

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. The visualisation with control function used as an interface for interaction with the plant is called "human-machine interface" (HMI).

Communication

The safe transfer of data 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.

Process engineering

Process control engineering

