

# The practical fundamentals of process engineering



HL 960 Assembly station  
pipes and valves and fittings

The theoretical fundamentals and laws for understanding process engineering are extremely manifold. Process engineering is an interdisciplinary science and also uses the knowledge of other engineering disciplines. In this chapter, we are presenting a device range with which you can impart the typical basic theoretical learning contents of a process engineering curriculum.

## Pumps and compressors

Pumps and compressors are the heart of every process engineering system. They convey the media or generate the pressures required for the respective process. Various principles of operation are used in this process, depending on the application and the medium. To be able to select these components correctly, the user has to know their characteristics.

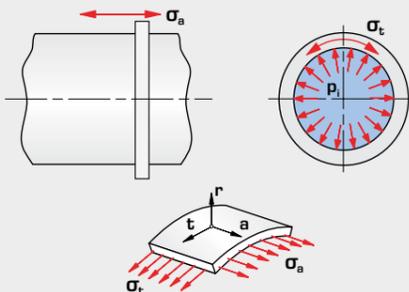
In the worst case, an unexpected failure of pumps and compressors may result in a standstill of the entire process engineering system. It is therefore essential that these components are serviced and maintained by qualified experts.



MT 181 Assembly & maintenance exercise:  
multistage centrifugal pump

## Tanks and materials

Tanks are key components of every process engineering system. Whether it is solids, liquids or gases: the reactants, products and intermediate products of a process must be stored safely. The principal stresses in the material are decisive factors for the calculation and design of steam boilers, pressure vessels and pipelines. The experimental units presented in this chapter enable students get hands-on experience of the established calculation methods.



Stresses in tanks

## Piping elements, valves and fittings



MT 157 Assembly exercise:  
butterfly valve and non-return  
valve



VS103 Cutaway model:  
screw down valve

The transportation of substances involved in process engineering often takes place through pipelines. The correct installation of piping elements, valves and fittings requires knowledge about the way different connecting elements like flanges or compression type fittings work. In addition, practical experience is also essential in order to establish leak-tight connections. Valves and fittings with different functions are suitable for different applications. Shut-off devices can, for example, be selected based on properties such as adjustment characteristics and pressure loss. Among other things, this chapter contains sectional models that demonstrate the mode of operation of various valves and fittings. In addition, more trainers enable intensive examination of the valves and fittings during operation.

## Heat exchangers and steam generators

Whether for evaporation, condensation, preheating, cooling or controlling the temperature of reactors: heat exchangers serve numerous purposes in process engineering. Depending on the application, used media and their aggregate states, different types of heat exchangers are used, e.g. plate or shell & tube heat exchangers. Many processes, especially in thermal process engineering, require steam. Information about the safe operation of steam generators is therefore also a key part of the process engineering curriculum.



WL 315C Comparison of various  
heat exchangers

ET 860 Safety devices  
on steam boilers

## Applications of control engineering



RT 682 Multi-  
variable control:  
stirred tank

There are numerous control engineering tasks in process engineering systems. Knowledge of the control response of industrial components is extremely important when developing and planning such systems. Often several controlled variables affect each other and the behaviour of real controlled systems differs from the simple theoretical fundamentals. Operation, installation, maintenance and repair of process engineering systems also requires comprehensive control engineering skills. This chapter therefore presents trainers to familiarise students with real components such as controllers, control valves and sensors. The interaction of these components can also be examined using typical process engineering tasks.