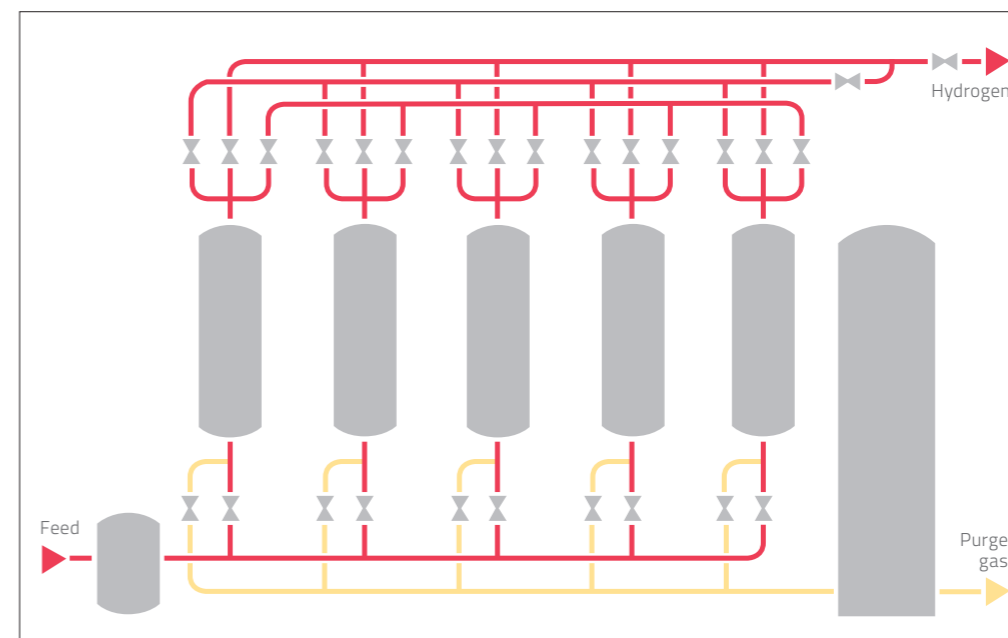


# HYDROSWING

## The hydrogen purification system



### PLANT FEATURES

Capacities from 100 to 20,000 Nm<sup>3</sup>/h

Feed pressure between 6 to 40 bar(abs)

Purities up to 99.9999 vol.-%

Design for long lifetime

High availability due to special control system and the feature to switch-back to an operation with reduced number of adsorber vessels

**High operational reliability:** High reliability due to proven first class plant components for PSA-applications (e.g. PSA-valves or butterfly-valves and instruments). Many years of experience in plant design, engineering and manufacturing guarantee high reliability.

**High quality and high safety standard**

**Fully automatic operation and remote control:** The HYDROSWING system is designed for automatic and unattended operation and automatic adaptation of cycle times according to plant capacity. Even automatic start-up, shut-down, control and automatic load adjustment via remote control is possible.

**Completely pre-manufactured valve skid**

**Easy maintenance and accessibility**

**High yield**

- Individual design according to feed gas composition
- Programmable control system ensures high recovery even at part load operation

**Cost efficiency**

- Low power consumption
- Minimized maintenance and operating cost
- Minimized cost for supervision

## The basic process

HYDROSWING systems are designed for the recovery and the purification of hydrogen from different hydrogen-rich gases coming from steam reforming, methanol reforming or from various refinery or petrochemical off-gases. For this task the principle of pressure swing adsorption (PSA technology) is applied.

Depending on customer's focus and demands the hydrogen PSA systems are designed with either 4, 5 or 6 adsorber vessels and different modes of operation.

The PSA technology applies the principle of physically binding the impurities contained in the hydrogen-rich gases by individually selected adsorbent materials. Since the binding forces for such impurities depend on the pressure, the PSA operates on an alternating cycle of adsorption at high pressures and desorption at low pressures.

To achieve a continuous hydrogen product flow at least one adsorber is in operation, while the others are in various stages of regeneration. The process is defined by four main steps.

### Adsorption

The feed gas enters the bottom of the adsorber at high pres-

sure, the impurities are adsorbed by e.g. molecular sieves and high purity hydrogen leaves the adsorber at the top. Before the adsorption capability of the adsorbents is exhausted, a regenerated adsorber is automatically switched on to adsorption, thus a continuous product flow is ensured.

### Desorption

The regeneration is done in several pressure reduction steps. First hydrogen-rich gas is used for repressurization and purging those adsorbers that are in different stages of regeneration. By further depressurization the adsorbed impurities are released and fed to a ventline or to a buffer vessel to be used as fuel gas.

### Purging

At the lowest pressure level the adsorber is purged with hydrogen-rich gas from another adsorber. The purge gas is either vented or sent to a buffer vessel.

### Repressurization

The pressure of the purged adsorber is stepwise increased to the required adsorption pressure by several pressure equalizations with other adsorbers and finally by recycled pure hydrogen.

## Applications

HYDROSWING systems are suitable for many different applications in the refining, metallurgical and steel industry, petrochemical and chemical/pharmaceutical industry.

## Feed gases

Hydrogen can be recovered by the HYDROSWING system from very different feed gases, e.g.:

- Synthesis gas from steam reforming, partial oxidation or gasification processes
- Hydrogen-rich refinery off-gases
- Ethylene off-gases
- Methanol and ammonia purge gases
- Coke oven gases

Due to the flexibility of the control system the HYDROSWING system can be adapted to a certain change in feed gas composition or temperature.