

HYDROFORM-M

The hydrogen generator



The basic process

The HYDROFORM-M system is based on steam reforming of methanol as feed to produce a hydrogen-rich gas. The purification of the hydrogen-rich gas is done by means of the subsequent HYDROSWING system.

Pretreatment of the feed mixture

Methanol and fully demineralized water are fed to a storage vessel. Continuous measuring of density and level ensure the availability of the correct ratio of methanol and water. This feed mixture is pumped up and then preheated by heat recovery from raw hydrogen-rich gas. Vaporization of the feed and superheating to the optimal reactor inlet temperature is done by means of thermal-oil in the subsequent heat exchanger.

Methanol reforming reactor

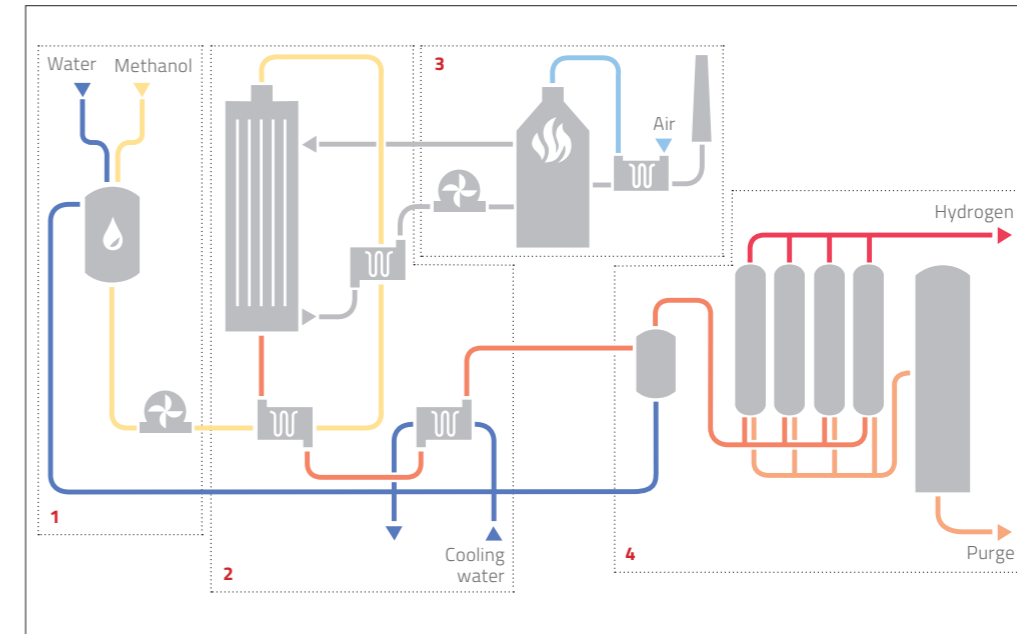
The vaporized methanol-water mixture is catalytically reformed within the tubular thermal-oil heated reactor over copper catalyst into a hydrogen-rich synthesis gas. The reaction is endothermic and the required heat is transferred to the process by means of thermal-oil which ensures an even temperature distribution inside the reactor. The thermal-oil is heated by combustion of purge gas from the HYDROSWING system.

Gas cooling by heat recovery

The hydrogen-rich synthesis gas coming from the methanol reactor is cooled down in heat exchangers by simultaneous economical preheating of the feed mixture. The process condensate is separated and sent back to the feed storage vessel to be reused.

Gas purification – HYDROSWING

The hydrogen-rich gas is sent to the HYDROSWING system which usually consists of four or five adsorbers filled with different adsorbents. This process is based on pressure swing adsorption by which the impurities are separated to obtain hydrogen with purities up to 99.9999 vol.-%. The purge gas from depressurization and purging during the regeneration step is used as fuel gas in the thermal-oil system.



1 Pretreatment of the feed mixture 2 Methanol reforming and heat exchanger unit 3 Thermal-oil system
4 Purification unit – HYDROSWING system

Applications

Hydrogen generation based on methanol reforming with subsequent purification is a well-established process for hydrogen production and the alternative method at locations with limited access to hydrocarbons (e.g. natural gas, LPG or naphtha).

- Metallurgical and steel industry
- Petrochemical and refining industry
- Glass and float glass manufacturing
- Chemical and pharmaceutical industry
- Production of H₂O₂
- Food industry
- Electronics industry
- Technical gases

Highlights

With the use of thermal-oil the hydrogen production plant will keep its operating temperature extremely stable and can be restarted at short notice e.g. if a power failure occurs.

With Mahlers' technology and design an overheating of the reactor is prevented and the low temperature catalyst, which is highly temperature sensitive, is protected by using a heat transfer media (thermal-oil) buffering any temperature peaks. This helps to protect the catalyst for the complete lifetime.

PLANT FEATURES

Capacities from 200 to 5,000 Nm³/h

Product pressure between 10 to 30 bar(abs)

Purities up to 99.9999 vol.-%

Design for long lifetime

High operational reliability:
Many years of experience in plant design, engineering and manufacturing guarantee high reliability of the HYDROFORM-M system.

Low investment cost

High quality and high safety standard

First class sub-suppliers for equipment and components

Fully automatic operation and remote control:

The system is designed for automatic and unattended operation, e.g. change of capacity. Even automatic start-up, shut-down, control and automatic load adjustment from long distances is possible.

Prefabrication in skids/modules:

The system is pre-assembled and delivered in prefabricated skids.

Easy maintenance and accessibility

Optimized consumption figures:

Optimal heat recovery, e.g. preheating of combustion air and recovery of process condensate.

Thermal-oil system to protect the catalyst even in part load

Additional/Optional features:

Individual plant concepts with respect to product compression, turn-key delivery, water treatment, hydrogen product storage etc. can be offered.