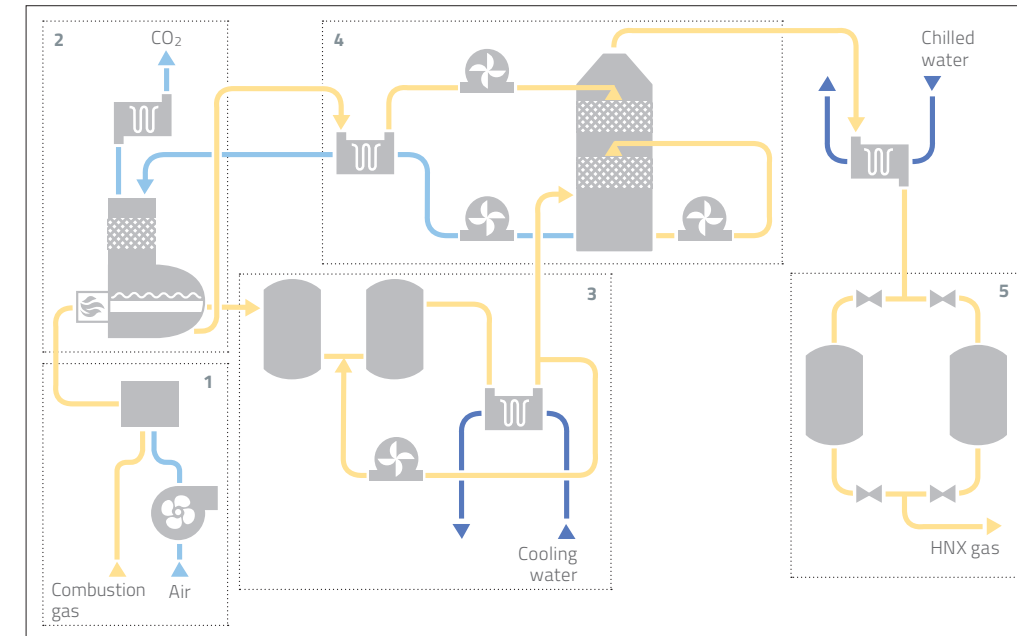
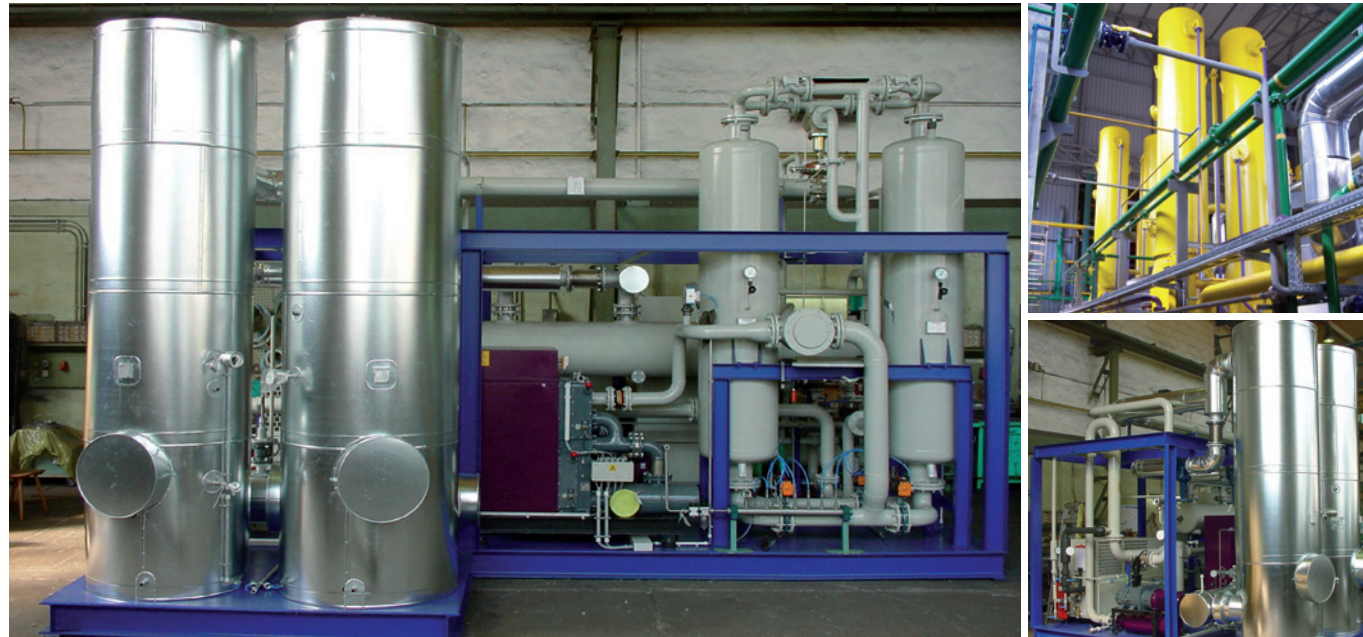


HNX

The protective gas generator



1 Ratio control 2 MEA boiler and CO₂ stripper 3 CO converter HT-1 and LT-2 4 CO₂ scrubber 5 HNX gas drier

PLANT FEATURES

Product flexibility:

- Plant capacity up to 1,000 Nm³/h
- Adjustable H₂ content between 0,5 to 15 vol.-%
- Gas analysis, typical values:

H ₂ :	0.5 - 15 vol.-%
CO:	50 - 1,000 ppmv
CO ₂ :	50 - 100 ppmv
CH ₄ :	20 - 100 ppmv
O ₂ :	< 5 ppmv
N ₂ +Ar:	balance
· Dew point:	-70 °C
· Delivery pressure as required	

High reliability:

Many years of experience in plant design and manufacturing guarantee high reliability of all HNX protective gas generators.

Full automation:

All HNX protective gas generators are designed for unattended operation and automatic load adjustment.

Independent and low-cost on-site production:

Production is not affected by road transportation or weather conditions.

Cost efficiency:

Minimized maintenance and operating costs.

The basic process

The process is based on the substoichiometrical combustion of hydrocarbons with air.

Ratio control

The ratio between combustion gas and air is kept constant by means of a fully automatic ratio control. In addition the flue gas is analyzed continuously. In case of a deviation the ratio is immediately corrected.

MEA (Mono Ethanol Amine) boiler and CO₂ stripper

The combustion is effected in a refractory lined reaction chamber. This chamber is equipped with an electrical ignition, an ignition burner and an automatic self-controlling UV-flame monitoring device.

The hot flue gas, generated by this process, releases its heat by means of a heating register to the MEA-boiler, thus regeneration steam for the CO₂ stripper is produced. The flue gas leaves the MEA-boiler at approx. 350 °C and is routed to the CO-converter.

The CO₂ enriched MEA lye coming from the CO₂ scrubber is removed in the CO₂ stripper column.

CO converter HT-1 and LT-2 (HT/LT = High / Low Temperature)

The two-stage CO shift conversion in the reactor HT-1 and LT-2 takes place in presence of steam to generate CO₂ according to the water-gas shift reaction.

The reaction is effected at a temperature of 300 °C in the HT-1 respectively 200 °C in the LT-2 reactor. To achieve an inlet temperature of 200 °C in the LT-2 reactor, the hot CO-convert gas of HT-1 is cooled by quenching with condensate.

CO₂ scrubber

A regenerative organic alkaline solution (MEA) is used as CO₂ absorbent. The loaded alkaline solution is routed to the CO₂ stripper column where the CO₂ is removed by means of the strip-steam generated in the MEA-boiler.

Gas drying

The "wet" HNX protection gas is dried in a thermally regenerated two bed absorption drier. Molecular sieve is used as drying agent. While drying is applied in one absorber the other is regenerated at temperatures exceeding 200 °C. After drying the HNX gas is provided to the customer.

Applications

Mahler's HNX protective gas generators cut the production cost considerably, e.g. in the following industrial applications

- Heat treatment of steel in the metallurgical / steel industry (e.g. bright annealing, galvanizing)
- Float glass manufacturing