

# **Drying of natural gas with an absorption/membrane hybrid process**

*U. Lubenau<sup>1</sup>, R. Mothes<sup>1</sup>, D. Worch<sup>1</sup>, J.-Th. Kühnert<sup>2</sup>, M. Weyd<sup>2</sup>, H. Richter<sup>2</sup>*

*<sup>1</sup>DBI GUT GmbH, Leipzig, Germany; <sup>2</sup>Fraunhofer IKTS, Hermsdorf, Germany*

## **Background**

Natural gas has to be buffered in underground storages seasonally. During storage natural gas absorbs humidity. When gas is extracted from the storages and pumped into pipelines to consumers it has to be dried again in order to avoid condensation. Normally this drying process takes place by an absorption process using TEG. The operation range of the TEG is 0.5 wt.% to approx. 2 wt.% humidity. After water absorption the TEG has to be regenerated. The conventional step for this process is a distillation at temperatures of 190 °C to 205 °C.

## **Membrane Project**

As an alternative to the thermal regeneration method a membrane based pervaporation process using hydrophilic zeolite membranes were developed. The membrane process should work at lower temperatures reducing energy usage and thermal cracking of TEG. The TEG-drying by zeolite-NaA membranes could be an economic alternative to the TEG regeneration by distillation. A lower energy consumption, longer lifetime of TEG and fast switch-on/switch-off opportunity increasing the flexibility of the process would reduce the operation costs of natural gas drying. Another advantage of this method is that no gaseous emissions are generated due to the dewatering process as known from the reboiler of the conventional distillation process.

Zeolite NaA membranes prepared inside of ceramic tubes in 4-channel geometry were developed by IKTS some years ago. The membranes show convincing properties in ethanol dewatering by vapor permeation or pervaporation and prove their practical applicability in large pilot scale plants.

## **Pilot plant**

After successful testing in realistic TEG-water-mixtures a pilot plant for TEG drying on an underground storage site was built and equipped with 20 m<sup>2</sup> membrane area. The TEG-membrane unit is designed for a capacity of 10.000 m<sup>3</sup>/h natural gas. The plant has been in operation since October 2016.