LOWERING THE RATE OF INCREASE OF WATER VAPOUR CONTENT IN NATURAL GAS STORED IN A SALT STORAGE CAVERN TEST RESULTS AND APPLICATION OF SUMP SEALING

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Introduction

Subsurface caverns in salt formations have been constructed for the storage of natural gas for more than 40 years.

A gas storage cavern is usually created using solution mining for

- the equalization of seasonal fluctuations in gas demand
- daily peak shaving operations or as
- an emergency reserve to cover interruptions in supply from gas production fields.

The gas intended for storage is injected into the cavern at pipeline specifications, i.e. with a dew point of around - 8°C to - 20°C at 70 bars pressure (water vapour content approx. 0.07 - 0.02 $g/m^3(V_{st})$).

When gas is withdrawn from the storage cavern for transport through the pipeline a number of reasons make it desirous that the withdrawn gas does not exceed the dew point of the pipeline specifications.

When gas is stored during gas first fill of a solution mined gas storage cavern the natural gas has a base level equal to that of the casing shoe of the brine removal string (figure 1). As a result a certain residual amount of brine remains in the cavern. It is also extremely likely that the cavern walls are still wet after the gas first fill process.

The residual brine in the sump and the moisture on the salt cavern walls have the effect that the gas becomes saturated with water vapour during its storage period. As a result

- the dew points of the withdrawn gas cannot be maintained within the demanded pipeline specifications without undergoing an additional drying process, and

- at high production rates hydrate formation is probable before the minimum permissible storage pressure

is reached.

In an attempt to save the cost of the expensive drying plant concepts have been drawn up since the early 70s as to which measures could inhibit or reduce the rate at which water vapour is absorbed by the stored gas.

This objective is also of interest, especially for storage facility operators, if the risk of hydrate formation can be reduced by slowing the rate of water vapour absorption of the gas.

It is also the case that having a lower dew point during gas production means that the probability of water vapour condensation occurring in the production string will be delayed in time and hence corrosion periods reduced overall.