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Nitrogen Buffer for Large Scale Conditioning of H- to L-Gas
How to fit an existing cavern to capacity and performance requirements?

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Abstract

Gasunie is the operator of the Dutch gas grid (is the Dutch gas transmission system operator) and responsible for reliable gas supply of the industry and household sector. Traditionally, main gas volume is produced in the Groningen field. But with ongoing depletion of the field import of natural gas from North Sea Territory and Russia becomes more and more important. Before using import gas in the Dutch gas grid it has to be blended to get a Groningen gas composition (G-Gas) from H-Gas composition. For blending in high performance cycles nitrogen is used which has to be stored in a cavern.

Aim of the presentation is to show how thermodynamic calculations can help defining a cavern completion concept and a minimum required cavern volume.

Starting with an already existing cavern volume of 750.000 m^3 a thermodynamic simulation model was developed. In this model attention was paid to the heat conduction through cavern surrounding rock after leaching.

The next step was to define requirements regarding cavern performance and determination of limits for cavern operation (flow velocity, temperatures, dynamic/static pressures).

Several simulation runs with the thermodynamic simulator predicted how changes in cavern volume, depth of last cemented casing (maximum allowable pressure), dimension of gas production string and type of subsurface safety valve have an effect on cavern performance and which minimum requirements arise. Part of this evaluation also was the reduction of working gas volume in the first stage of operation caused by rewarming of cavern surrounding rock (after leaching) and convergence.

Finally, the realization of subsurface part of the project itself will be described.

Key words: Nitrogen Buffer, Caverns for Gas Storage, Thermodynamic Calculations, Dimensioning of Caverns, Cavern Completion, Cavern Design