



University of Bahrain
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STUDY OF HYDRATE FORMATION TO MINIMIZE ITS INFLUENCE ON NATURAL GAS PIPELINES

Abstract

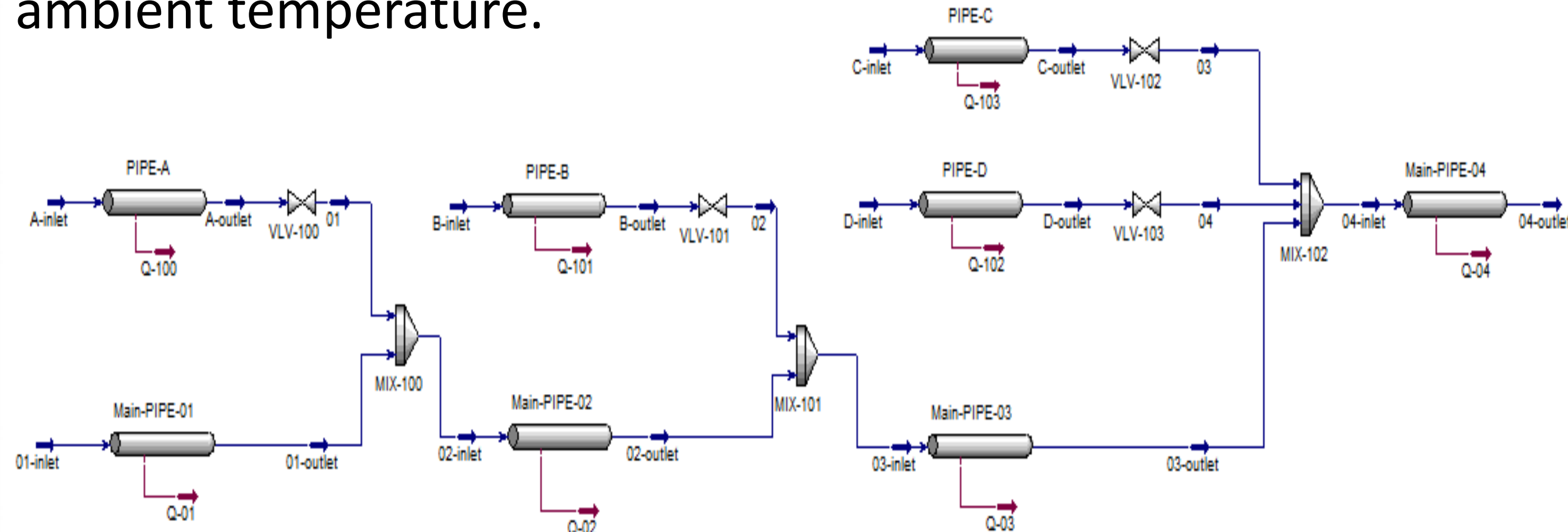
The purpose of this project is to study Hydrate formation to minimize its influence on natural gas pipelines. Aspen HYSYS modeling has been used in this project to estimate the possibility of hydrate formation in the gas pipeline. This project was done by studying the thermodynamic properties that cause the formation of hydrates. The proposed model was confirmed using the operational data of a refinery gas pipeline. The pipeline was simulated, and the results were compared with experimental data.

Design and Implementation

Associated Gas pipelines from compressor stations to LGP are classified into North Header Compressor Stations to merge point, South Header Compressor Stations to merge point and the gathering line common section from merge point to LGP. The study will focus on pipeline A, pipeline B, pipeline C, and Pipeline D which are the four headers entering the main pipeline and reaching LGP.

Aspen HYSYS is used to develop a model to determine and locate the hydrate formation.

The risk of hydrate formation is located in the headers due to the low inlet temperature which is considered lower than the ambient temperature.



Conclusion

The global focus has always been on the removal of hydrate after its formation with so many findings on its properties and ability to rupture a service pipe but not on its ability to initiate corrosion which is a bigger problem for the industry. Economic, environmental, and human consequences of hydrate prevention and management options were considered to minimize hydrate formation. For future work, maintain both the temperature and pressure outside the formation condition.

Objective and Motivation

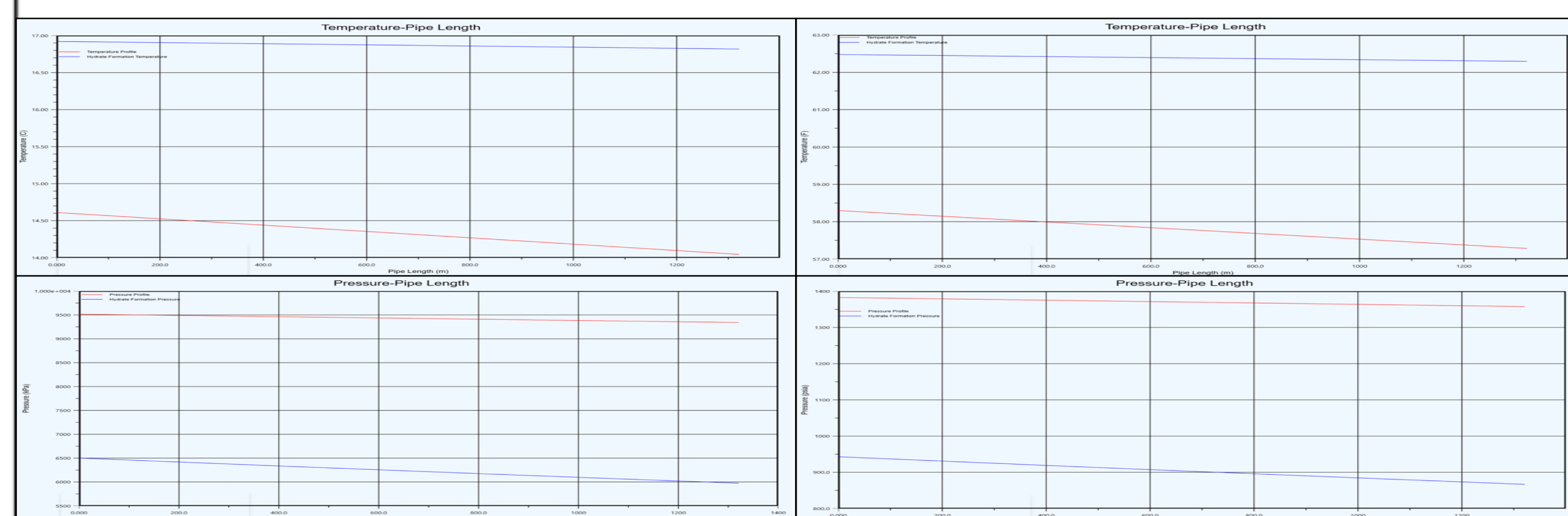
Hydrate formation along the natural gas pipeline has been identified as a serious threat to the survival of the oil and gas industry. Gas hydrate problem is a frequent problem met in gas transportation. Gas hydrate formation can cause pipeline blockage and an increase in the pressure drop across the pipeline which would require high-pressure energy to overcome the loss in the pressure. The hydrate formation is influenced by a drop in the temperature of the gas flowing in the pipeline below the hydrate temperature.

This work focuses on minimizing gas-hydrate formation by optimizing the temperature and pressure. The best way to determine the hydrate-formation temperature and pressure is to measure these conditions experimentally. In Aspen HYSYS, a steady-state simulation of natural gas treatment and production was developed. In addition, many various case studies that could avoid or limit hydrate development were evaluated to investigate the impact of temperature control. Since then, the oil and gas industry has been more willing to investigate the problem.

Results

One of the preventions of hydrate formations is to increase the inlet temperature; in the first case, the temperature increment in pipeline-A, B, and C is more than in pipeline D. There is no risk of hydrates formation due to the increase in temperature, which is above the ambient temperature. In contrast, the hydrate formation temperature in the original model is determined by Aspen HYSYS.

In the second case, There was a comparison between the original model and the new case study, which changed the outlet pressure and checked the effect of pressure on hydrates. As a result of case two, the hydrate formation in the second case was determined by Aspen HYSYS at the same range as the original model.



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