

Drag Reduction in Geothermal & District Heating systems to LOWer investment and operational costs

Publieke samenvatting / Public summary

Aanleiding

The energy transition to reduce CO2 emissions is both a technical and public challenge. Natural gas will be replaced by low carbon heat supply. District heating is a proven concept and these systems are expected to fulfill 50% of the thermal energy needs of buildings in the Netherlands. Integrated geothermal multi-source district heating can deliver low-carbon heat to the built environment. This proven concept is simple and robust but requires major investments with low returns. The main challenges are to reduce cost of infrastructure and operations, and minimize environmental impact. As water is the medium to be circulated to transport heat through the system, high pumping power is required to overcome flow resistance in pipelines. Additionally, to control flow resistance pipe diameters must be increased, raising infrastructure costs. Reducing flow resistance or drag is possible using so called Drag Reducing Agents (DRA's), currently primarily used in the oil and gas industry. Adding low concentrations of DRA molecules to the water can significantly reduce flow resistance, allowing pipe diameters to be considerably smaller (CAPEX) and lowering the required pumping power (OPEX).

Doelstelling

The goal of this project is to assess the techno-economic viability of DRA's for geothermal multi-source district heating networks. The project

Projectinformatie / Project information

Projectnummer / Project number
MOOI32022

Subsidiebedrag / Grant amount
€ 1.816.469,00

Algemene informatie / General information

Penvoerder / Secretariat
Nederlandse Organisatie voor
Toegepast-Natuurwetenschappelijk
Onderzoek TNO

Publicaties en materialen / Publications and attachments

- 18.11.2022

MOOI32022
Voortgangsrapportage 1

- 25.05.2023

MOOI32022
Voortgangsrapportage 2

- 10.09.2025

Eindrapport MOOI32022

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investigates the technical and economic contribution of DRA's to district heating networks and geothermal wells. The DRAGLOW project focuses on the development of technical knowledge and system design tools which should lead to practical usable solutions and instruments for cost-effective geothermal Multi-Source district heating systems in the built environment. Preliminary analysis revealed that substantial reduction in CAPEX and OPEX is feasible by controlling the flow resistance in the pipelines and all subsystems of the district heating system. If the flow resistance can be reduced substantially, 20-30% cost reduction is within reach. DRA's lower the pumping and construction costs in oil pipelines by reducing the friction between the oil and the pipe surface. This concept triggered the idea to apply such agents in the very cost driven geothermal and heat network systems. Several groups of molecules have drag reducing properties depending on the conditions such as liquid composition, temperature and Reynolds number.

Korte omschrijving

DRAGLOW's innovation plan consists of clustered activities with focus on the following: Assessment of drag reducing agents for application in pipe flow conditions and according to geothermal and district heating compliance, with development of low drag system design tools and engineering models. Business model assessment and social acceptance through information sharing. All partners together provide knowledge based on science and practical experience from the industrial and public sector. They also provide data of long term actual operational conditions of existing systems. The research capacity of Nouryon contribute with in-depth specific know-how on drag reducing molecules and production capabilities. All contributions are used to design experimental setups matching actual flow conditions. Research organizations TNO and TU Delft lead the experimental research. The industrial partners lead the development of designs, models and techno-economic analyses to apply the results of the experimental research. Branch organizations will



contribute to knowledge sharing and dissemination promoting sector-wide benefits.

Resultaat

In the last decades several DRA molecules have been applied in different sectors. The aim of DRAGLOW is to identify and characterize suitable agents for geothermal and district heating systems which will have both its own set of functional and implementation requirements. The specific risks and opportunities will be investigated and the techno-economic impact will be modelled based on a reference case to fully understand the benefits of required DRA's. Implementation of DRAGLOW leads to: Substantial cost reduction for the sector; Validated, standardized methods to test and qualify DRA materials for application in geothermal multi-source district heating networks; Classification of the drag reducing performance of selected and tested presently available DRA products under relevant geothermal and district heating flow conditions; Classification of DRA products for reservoir compliancy for relevant sedimentary formation in the Dutch sector; Tools and models to design low drag network architecture; Engineering & construction guidelines and models; Business assessment model for geothermal and district heating networks; Data sets of the results available for the sector via a website.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.

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