

Result 2 | DRA performance assessment in the representative conditions

Goal

To assess the performance of DRAs in experiments, the following tasks will be performed:

1. Design and build flow loop(s) to evaluate DRA performance.
2. Perform experiments to evaluate DRAs in turbulent pipe flow at conditions determined in Result 1.
3. Evaluate operational challenges in implementing DRAs, i.e. degradation in pumps, impact of the DRA on heat exchangers, potential filter clogging.

Method

Two flow loops are being created to run the experiments:

1. An ambient flow loop with demi water at room temperature with 1", 2", 4" and 6" pipes.
2. A high temperature (20°C – 120°C), high salinity (water, 100,000 ppm and 300,000 ppm of salt) flow loop with diameters of 1" and 2".

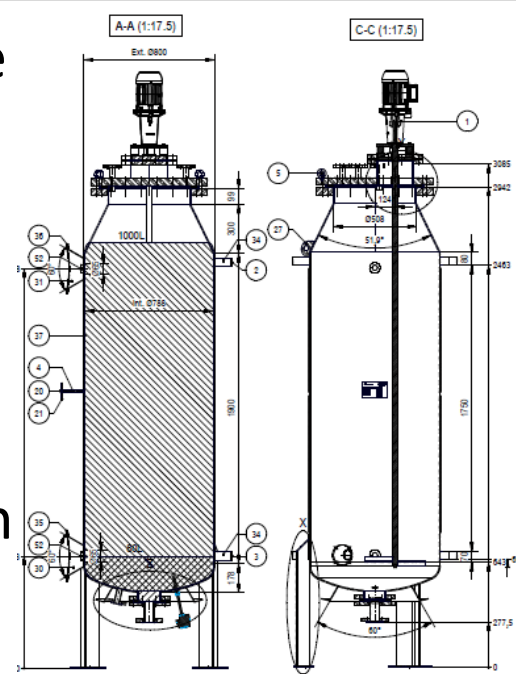
Ambient condition flow loop

Modifications have been made to the existing flow facility at TNO to run experiments at different pipe sizes (1" to 6"). Currently the setup is being commissioned. Experiments will determine the diameter dependence of the performance of a reference surfactant DRA.



Vessel design (high temperature loop)

The vessels in the high temperature loop required a detailed design and will be custom made: they must handle corrosive liquids at high temperature, must be pressurized to a specific pressure to generate flow, and the first tank must contain a heater and a low-shear mixer.



Experiments (high temperature loop)

In the experiments the DRA performance will be quantified for conditions relevant for geothermal wells and district heating networks. The used DRAs will follow from the selection in Result 1.

Quantity	Geothermal well	District Heating
Temperature	20, 40, 60, 80, 100, 120 °C	20, 50, 90 °C
Brine	Water, 100000 ppm and 300000 ppm of dissolved salt	Water
DRAs	Polymers and Surfactants	Surfactants
Diameters	1" and 2" *	

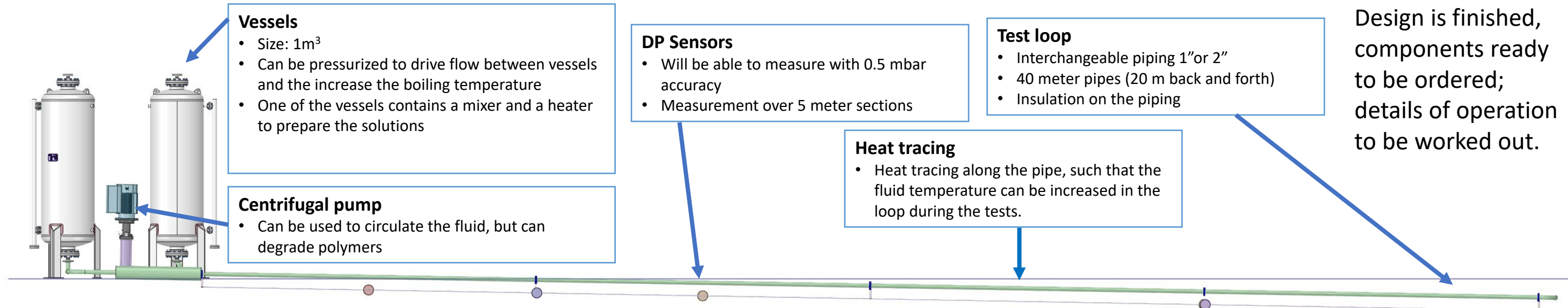
* Larger diameters to be investigated in atmospheric conditions

No experimental results are found in literature for both such high temperature and such high salinities. Based on these experiments, in combination with the results from the ambient condition flow loop, scaling rules for the flow rate and the diameter will be created.

Subsequently experiments will be performed on challenges of implementing DRAs on surface facilities.

The obtained results will be used in the modelling in Result 4 and to estimate the business case in Result 6.

Design of the high temperature, high salinity flow loop



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