Faculty Engineering Technology Program
Mechanical Engineering

UNIVERSITY OF TWENTE.

COLLOQUIUM

Group: **Engineering Fluid Dynamics**

As part of his MSc thesis assignment

P. Kerssens

will give a presentation, entitled:

Design and proof of concept for an alternative velocity string

Date: 02-09-2016
Time: 14:00
Room: Horst building, room OH111

Summary:
Many gas wells also produce some liquids, either due to condensation of hydrocarbons or due to water influx into the well. As the gas reservoir is progressively depleted, the gas velocity in the wellbore becomes too low to transport those liquids to surface. When this happens, liquid accumulates at the bottom of the wellbore, which floods the well and thus restricts and eventually ends gas production.
One way to prevent flooding of a gas well is installing a velocity string, which is simply a smaller string that is inserted inside the existing production string, the pipe running down the well from top to bottom. The smaller diameter of the velocity string increases the velocity of the gas and thus enhances liquid transport.
However, the costs for a velocity string are quite significant, especially for deeper wells, high pressure wells and reservoirs with acid gas. A low-cost alternative for the velocity string would save money on workover operations and additionally open up the possibility of velocity string installation for a higher number of wells, which is attractive for both Shell and the industry at large. Designing such an alternative and proving that it could work is the goal of this research.

Several possible alternatives have been developed and compared using the Analytic Hierarchy Process. A concept using a cement gel that is deposited on the tubing wall by slip forming was identified to be the most promising and has therefore been detailed further. With this design in mind, the most important technical challenges of the design were tested in experiments on lab-scale.
Firstly, several additives to instantaneously gel a cement slurry have been tested. In these tests, a combination of a cement slurry, premixed with calcined gypsum, and a sodium silicate solution as accelerator has been proven to gel within a short time and with sufficient gel strength. Furthermore, the mixing of these two liquid streams at the required flow rates has been tested for different mixer designs. Lastly, a setup has been developed that can test the depositing method in a small piece of tube.

The experimental work shows that the slip formed velocity string could be a viable alternative to traditional velocity strings. To conclude the study, some experimental investigations to further mature or improve the technology are suggested.

Assessment committee:

Prof.dr.ir. C.H. Venner	(chairman, supervisor)
Ir. P.C. Kriesels	(Shell supervisor)
Ir. M.C. van den Berg	(Internal member)
Dr. ir. R. Bosman	(External member)

Chairman,

d.d. 17/8/2016