APPLIED ELECTRICAL DC-POTENTIAL AS A FLOW IMPROVEMENT. A STUDY BY CHEMOMETRIC INTER-CALIBRATION.

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Multivariate calibration methods are used to study a possible flow improvement in a water flow in a pipeline made of stainless steel. The objective is to study whether an applied electrical DC-potential to the pipeline have an effect on the flow velocity profile. The flow velocity profile is measured by laser over the cross-section of the pipeline, and is measured in a plexiglas section of the pipeline.

The water flows through a pipeline from one reservoir to another under constant pressure conditions. The pipe length is 15.45 m, and its inner diameter is 52 mm. The circulating fluid in this system is tap water containing fluorescent microparticles. The electrical potential is applied between a reference electrode which is electrical insulated from rest of the pipeline, and the pipe itself. The laser used is a Nd:YAG laser (Dantec FlowMap PIV 2000 Processor), using the Particle Image Velocimetri technique. The laser beam is introduced horizontally and perpendicular to the water flow, and is tuned to detect the fluid velocity in 42 localizations within the range 9.8 mm from the pipe wall into the water stream. The camera which is mounted underneath the plexiglas pipe, detects the reflected laser light by the fluorescent microparticles in the water flow.

The studied flow improvements are carried out with flow regimes under four different mean flow rates (1,2,3,and 4 l/s), and under five different temperatures (15,18,21,24 and 27 °C). During each experiment, with and without exposure to the electrical potential, the flow velocity profile is detected. The obtained results show an increase in the velocity profile when a very particular electric potential is introduced. Applied potentials below and above this particular potential showed no effect at all on the velocity profile. It appears that there is a socalled window-effect for the applied potential to achieve a flow improvement.