

# Evaluation of Internal Electrical Heater for Pipe Temperature Control Using FEA Model

Bo Xu<sup>1</sup>, Marcus Heydrich<sup>1</sup>, Stephen Edmondson<sup>1</sup>, Alireza Jahangir<sup>1</sup>

<sup>1</sup>ShawCor Ltd., Toronto, ON, Canada

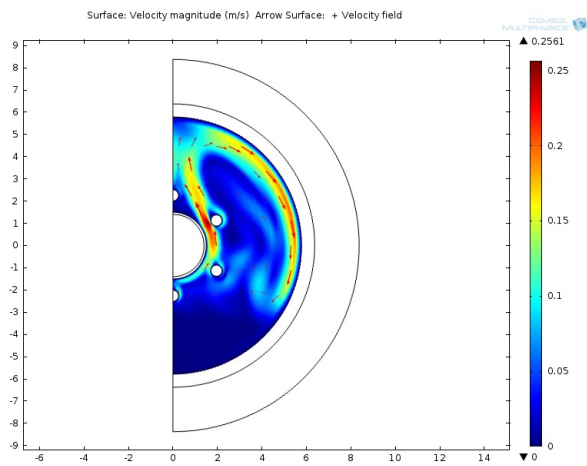
## Abstract

In the oil and gas industry, electrical heater is often used to control the pipe temperature to simulate the pipe service temperature when pipe coating performance tests at high temperature are conducted. In those tests, a uniform temperature is very important. However, it was experienced that a uniform temperature distribution around circumferential direction was hardly achieved for some tests. In order to find the potential problems in the heater design, this work evaluates heat transfer performances of one design of internal electrical pipe heater design (Figure 1) by simulating the both conduction and nature convection heat transfer around the heater and the steel pipe. The simulation results revealed the limitation in the heater design. Figure 2 shows the air flow around the heater element due to the temperature gradient and Figure 3 shows the temperature distribution in the pipe and heater region. It is clearly shown that a uniform temperature distribution in the pipe is not achievable by using this heat design. The study is based on multiphysics Finite Element Method simulations using COMSOL Multiphysics with the CFD Module.

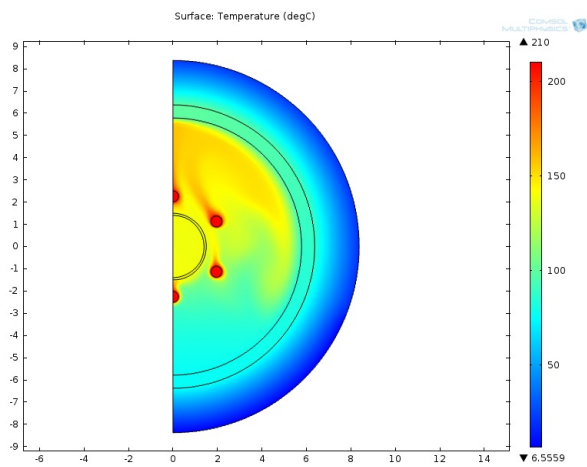
## Figures used in the abstract



**Figure 1:** First generation heater design.



**Figure 2:** Air flow around heater.



**Figure 3:** Temperatuer distribution in the pipe and heater system.