



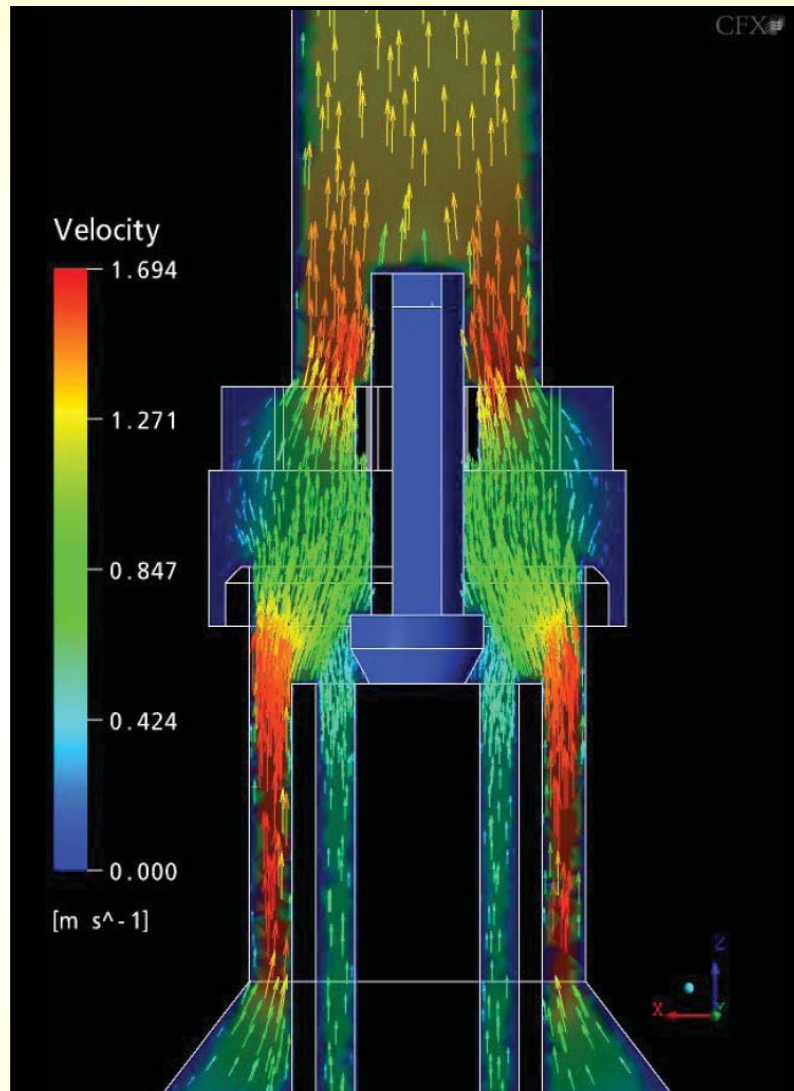
Overview

Dr. Peter Gray of Ground Support Services commissioned Frank Soto & Associates to evaluate the shear force on a valve stem and recommend an appropriate coil spring to resist the resultant forces due to variable resin viscosities with the changes in supply pressure and flow rate, and evaluate alternative valve stem designs to provide the greatest flexibility between preloaded spring force and expected minimum valve unseating water pressures for this equipment.

Testimonial

"Post analysis testing of the Injection Head validated the results and conclusions arrived at from the analysis in ANSYS CFX minimising the prototype development time and associated tooling costs."

Bernard Farrington
Supervising Mechanical Engineer
Frank Soto & Associates



Challenge

To evaluate the spring force required within a resin/water injection head, for a needle valve to maintain sufficient resistance to wall shear and blind end suction due to the flow of the two part resin mix with velocity dependant viscosity values. A careful selection was required to ensure the valve would still unseat within the specified range of water pressures for use with this machinery.

Solution

Several design iterations were carried out investigating the behavior of the fluid and its potential for lifting the valve with alternative valve stem configurations, including a conical blind end tip. The conical tip design provided a greater lift force than that of the negative pressure region across the blind end of the flat ended valve stem (as shown). Thus the spring selection was made with CFX output results from the blind end valve stem simulations.

Benefits

Simulation provided data enabling a single prototype iteration whereby successful trials were carried out, validating the simulation results and subsequent spring selection.