

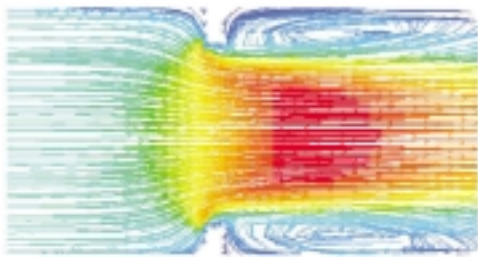
Computational Fluid Dynamics

Demonstrate Swagelok TS Series Fitting Design Minimizes Fluid Holdup

Computational fluid dynamics (CFD) analysis was used to show predicted flow paths and predicted velocity fields in both ISO 2852-type and Swagelok TS series fittings. The gasket intrusion values used in this analysis were derived from performance testing, which measured significantly higher gasket intrusion in ISO 2852-type fittings compared to TS series fittings. The analysis used water at ambient temperature, with an inlet velocity of 5.5 feet per second (1.67 m/s).

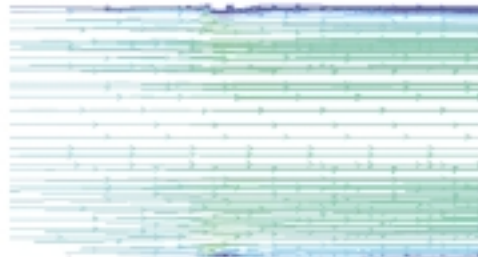
The resultant flow stream graphics show that flow through the ISO 2852-type fitting becomes turbulent as it passes through the gasket. Eddies created on the downstream side become potential entrapment areas, which may be difficult to clean. The Swagelok TS series fitting flow stream graphic indicates good laminar flow through the connection, with no concern for deposits or dead spaces.

ISO 2852-Type Fitting



Predicted Flow Paths
0.120 in. (3.05 mm) intrusion
5.5 inlet ft/s (1.67 m/s) velocity

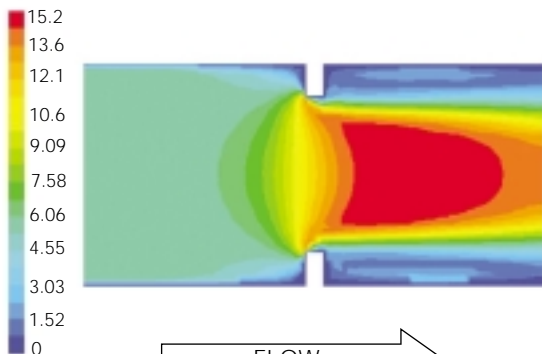
Swagelok TS Series Fitting



Predicted Flow Paths
0.015 in. (0.38 mm) intrusion
5.5 inlet ft/s (1.67 m/s) velocity

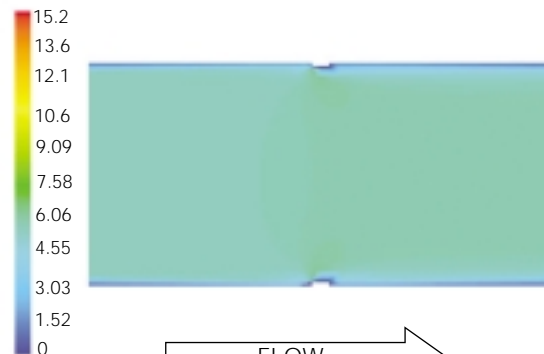
The resultant velocity graphics show that as water moves through the smaller orifice of the ISO 2852-type fitting, velocity increases—as shown by the yellow and red areas. Such velocity increases are often associated with cell shear. The dark blue areas on the downstream side indicate low flows of 1.5 feet per second (0.45 m/s). These low flow areas or dead spots are far below the flow recommended for good sweeping action associated with proper cleaning. The TS series fitting maintains desired flow through a large percentage of the flow path. Velocity increases are minimized, and the velocity quickly returns to within target range for a large area downstream of the gasket. There are no dead spots.

ISO 2852-Type Fitting



Predicted Velocity Fields
0.120 in. (3.05 mm) intrusion
5.5 inlet ft/s (1.67 m/s) velocity

Swagelok TS Series Fitting



Predicted Velocity Fields
0.015 in. (0.38 mm) intrusion
5.5 inlet ft/s (1.67 m/s) velocity