FLUENTA

WE'RE FLUENT
IN SIMPLE SOLUTIONS FOR COMPLEX INSTALLATIONS

FLUENTA CFD OPTIMISATION

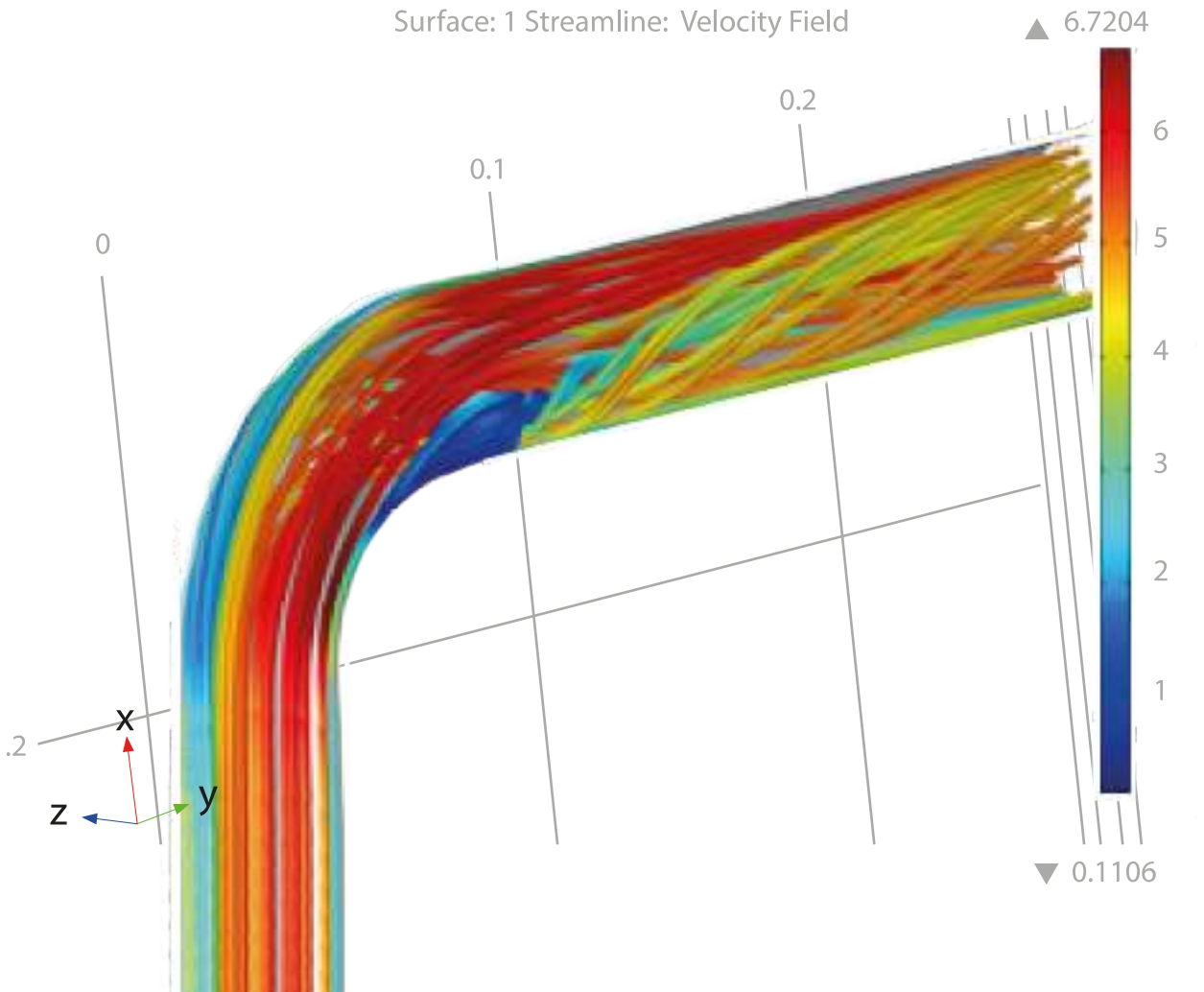
CFD: A SOLUTION FOR SPACE LIMITED INSTALLATIONS

Fluenta flare gas meters require just 15 diameters of straight pipe for accurate measurement.

For customers who do not have this available, CFD offers a solution. Fluenta will commission an independent study based on your specific process and facility. This study will model gas flow profile, allowing for calculation of flow profile shapes. The meter will then be adjusted accordingly for best possible performance.

What is CFD?

Computational Fluid Dynamics (or CFD) is a method of simulating the flow of fluids and gasses in a system, and their interactions with boundaries and other such objects. A number of conditions are supplied, and high powered computers employ a number of mathematical techniques to model flow conditions.



Services Available

Depending on customer budget and requirements, we offer two levels of CFD; Mechanical Optimisation and Advanced Optimisation.

Mechanical Optimisation

CFD is used to calculate optimal transducer angles and chord offsets for maximum performance in a provided pipe network.

Advanced Optimisation

In addition to the Mechanical Optimisation, flow profile correction factors are calculated and uploaded to the meter, compensating for non-uniform flow profiles.

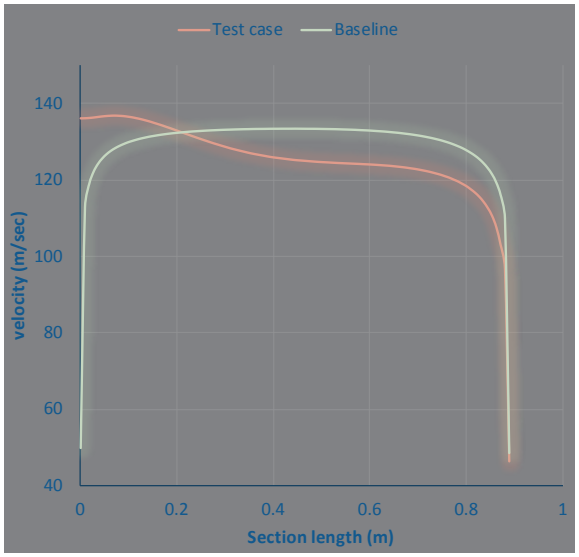
CFD Uses

- CFD simulates gas flow in complex pipe work, allowing us to place measurement transducers for optimal meter performance.
- Fluenta uses CFD at multiple test velocities to predict flow profiles and adjust meter linearisation accordingly.

CFD Limitations

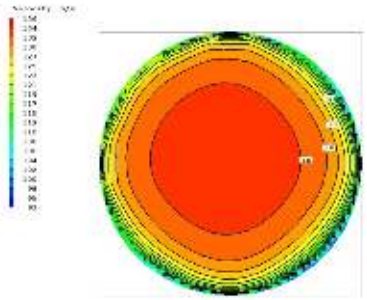
- CFD is not a meter calibration. Calibration of the meter is performed to remove errors in the measurement of time-of-flight and such a calibration might still be required alongside CFD, depending on customer requirements.
- CFD inputs are without tolerances. As such, it will assume all pipes are exactly the specified diameter and perfectly round, and all joints are smooth and all angles are exact.
- CFD takes many gas properties into account, including viscosity and temperature. The dynamic nature of flaring means that these factors may change without warning, and those changes may not be evident. Each CFD analysis produced will only be valid for a single set of gas properties.
- CFD may not be able to fully compensate for all conditions. Most pipe networks can be modelled and the meter adjusted to meet customer accuracy requirements. A combination of extremely complex pipework and high accuracy requirements might result in performance outside the customer specifications.

CFD: EXAMPLES AND REQUIREMENTS

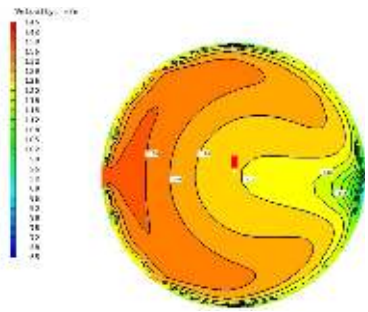


Once we have the sectional model, we can then identify the chord that contains the most flow profile information.

The image on the left shows the cross-sectional flow profile data for the chosen chord. The final choice of chord should be made based on the full set of test cases.



Baseline 15 D straight pipe



CFD test case with in-plane bends

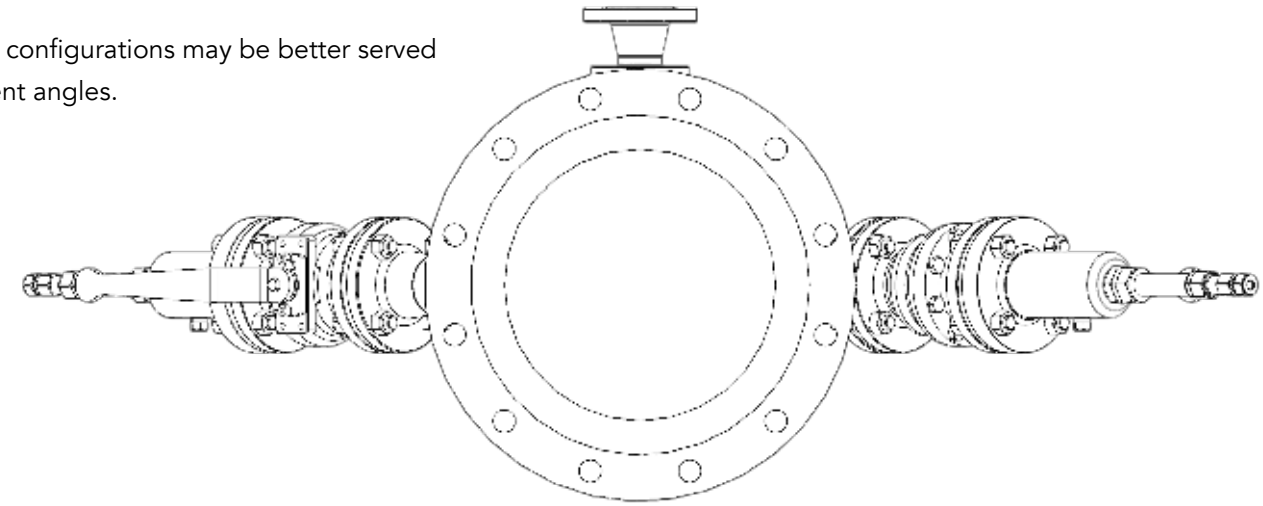
The baseline case shows a symmetrical profile, while the test case is quite eccentric and max flow occurs close to the pipe wall.

Please note that the scale is not the same on both images

Transducer Positions

This CFD test case recommended transducers be placed at 90° and 270°, which is standard.

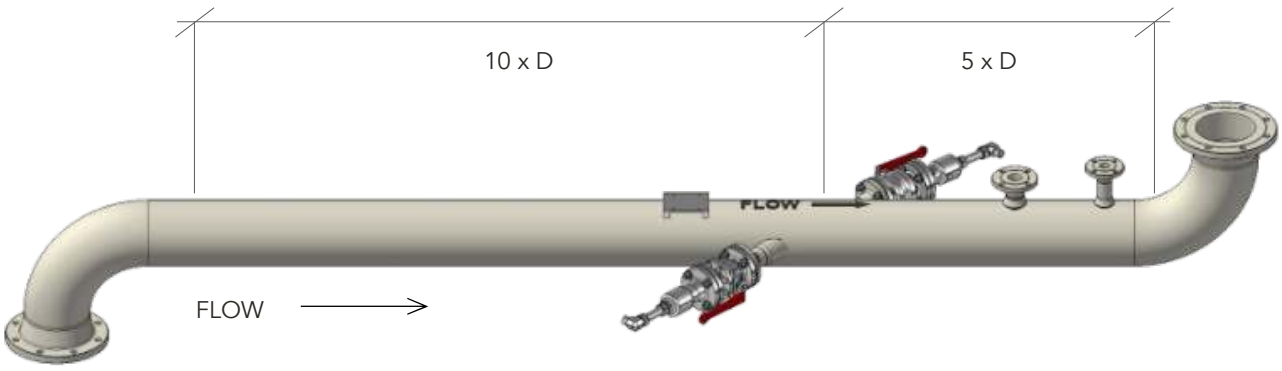
Some pipe configurations may be better served with different angles.



Required inputs for CFD

- Pipe ID
- Pipe network diagram describing the following minimum requirements
  - Upstream 40 x D or min 3 bends / features
  - Downstream 20 x D or min 2 bends / features
- Measurement point restrictions
  - Position along the pipe
  - Rotation / space (min 2m + pipe OD perpendicular to the pipe axis)
- Pipe materials
- Pipe internal surface roughness
- Typical / reference gas composition
- Typical / reference temperature and pressure
- Velocity range

Preferred orientation: Horizontal installation on a horizontal line



WE'RE FLUENT. WE'RE FLUENTA.

With over 3,000 installs across 6 continents, Fluenta has the experience to help you more accurately measure flare gas, to make better business decisions and meet the most stringent regulations.

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