

CRV® Solution for Post Elbow Metering Applications

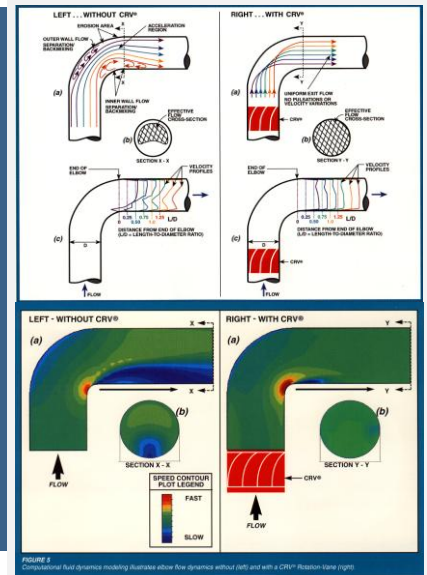
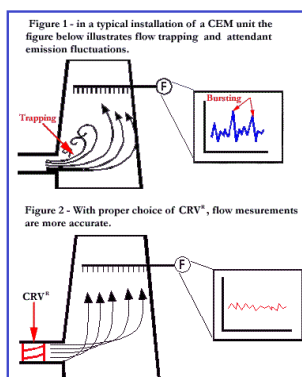
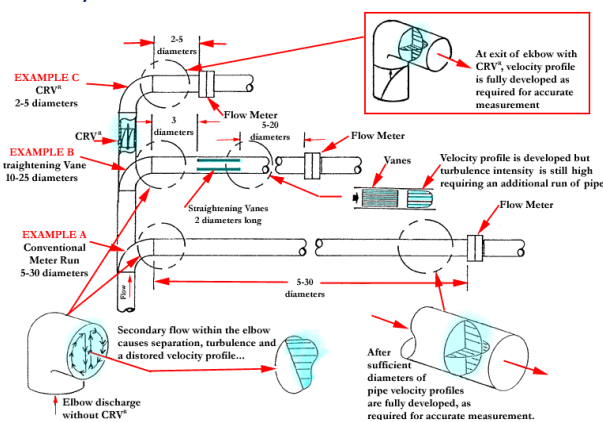
The CRV® is the only true solution for post elbow metering applications. The CRV® prevents problematic flow separation in an elbow and removes need for long meter runs to condition the flow. A steady equilibrium flow distribution is necessary to achieve optimal accuracy from the measurement instrument. All flow meter or measurement instruments are calibrated to respond with accuracy and precision to symmetrical uniform velocity profiles. Such optimal symmetrical shapes vary from the parabolic laminar profile to the top half or flatter turbulent profile.

Distortion and separated flow, always accompany the flow through an elbow. The constriction in a pipe section caused by the separation regions, can be seen in the figures to the right. These separation regions on the inside and outside in turn generate downstream of the actual elbow section a profile deformation which can be quite drastic. This deformation is introduced because centrifugal forces create a pressure gradient across the elbow as well secondary motions.

The traditional treatment to deal with this in the metering industry for the deformed highly turbulent flow leaving an elbow is to use long meter runs to allow viscous forces to re-establish the steady equilibrium flow distribution. For a plain elbow standard meter runs are up to 30 diameters depending on type of fluid. Tubular flow straighteners still require 20 diameters and when there is no room often times more expensive flow meters are installed. Meter runs that dissipate the flow disturbance are still required. Lack of these meter runs and minimizing them still affect accuracy. The traditional treatment is to dissipate the flow disturbance via viscous forces. The solution of a CRV® is to prevent them from occurring in the first place.

With a CRV®, we have a uniform profile immediately exiting a profile. Here one can insert a turbine meter or an orifice meter and get a respectable accuracy out of the device. Essentially any flow meter can be inserted immediately downstream of an elbow with a CRV® inserted before an elbow. The CRV® prevents the flow disturbance from happening instead of removing it after it has already happened. The CRV® has shown many benefits to metering; prevents the flow separation & the turbulence generation associated with flow through an elbow.

Flow metering devices cannot provide accurate measurement of the flow rate through a pipe when flow entering the measurement device is distorted. Consequently, flow meter manufacturers and a number of independent organizations such as ASME, AGA and ANSI/API recommend that flow meters not be installed near and downstream of elbows. With the CRV® one can reduce the straight pipe run length for an orifice plate flow meter preceded by elbows as seen below.



Problem: Upstream Piping Requirements

Meter Type	Upstream Piping
Orifice Meter	10-30 D
Flow Nozzle	10-30 D
Pitot Tubes	20-30 D
Vortex Meters	10-20 D
Turbine Meters	5-10 D
Venturi Meters	5-10 D

Traditional Treatment for Post Elbow Metering

Upstream and downstream piping requirements
Straightening vanes
More expensive meters

CRV® Benefits for Metering Applications

Elimination of elbow flow separation
Elimination of large scale turbulence
Uniform flow at a known location for metering
Reduces head loss

CFS is dedicated to solving our customer's fluid flow problems by using our technology and experience, along with our patented products, the Cheng Rotation Vane (CRV®) and Large Angle Diffuser (LAD®)

