



3255 West Stetson Avenue
 Hemet, CA 92545-7799 USA
 Tel 909 652-6811
 Fax 909-652-3078
 e-mail: info@mccrometer.com
 Web site: http://www.mccrometer.com

June 9, 1998

V-Cone vs. Orifice Plate Comparison

Feature	V-Cone	Orifice plate
Installation requirements:	0-3 diameters upstream 0-1 diameters downstream with no straightening vanes	6-70 diameters upstream 2.5-4.5 diameters downstream with no straightening vanes
Recommended maximum DP for an application:	50 inches of water column	100 inches of water column
Headloss: Will vary with different beta ratios. The headloss will be expressed as a percentage of DP created.	For different beta ratios: 0.45 74% of DP 0.55 61% of DP 0.65 49% of DP 0.75 36% of DP 0.85 24% of DP Since the V-Cone has less recommended max. DP, the total headloss can be substantially lower.	For different beta ratios: 0.35 85% of DP 0.45 77% of DP 0.55 68% of DP 0.65 58% of DP 0.75 46% of DP From Miller†
Long term performance:	V-Cone will protect its edges with boundary layer formed as flow passes over cone surface. Beta edge will not be directly impacted by erosive materials.	All flow must pass through center of orifice plate. Particles, liquids, etc. which flow along the walls of the pipe will pass over the sharp edge, wearing it continually.
Plugging, coating:	The centrally located cone does not block with a flat plate. The increase velocity at the cone area and the "swept through" design allows for little build up or coating on the meter surfaces.	A flat plate will collect build up and coating by the directly impact of the flow fields. The downstream areas will also collect particles and debris.
Wet gas: (See wet gas CD-ROM available through McCrometer.)	V-Cone allows free flow of liquid to go by the cone.	Orifice plate can hold a substantial amount of water downstream of the plate.
Turndown:	10:1 minimum ‡	4:1
Signal noise:	Low signal to noise ratio, even in disturbed flows.	Higher signal to noise ratio.

Reliability, repeatability, reproducibility:	The V-Cone is reliable and repeatable over time due to self-cleaning and low wear. Like the orifice plate, there are no moving parts.	No moving parts, but edge wear will change performance over time.
Proven product:	The V-Cone has a ten-year history of success in markets as varied as municipal water measurement to industrial offshore platform measurement. Each V-Cone is individually calibrated so any manufacturing variations are discovered before delivery.	Orifice plates are proven over a long history. Meters are reliable based on historical database and flaw-free manufacturing.
Cost: purchase	Medium	Low: crude machined plate Medium: quality plate with flanges and taps High: fittings for plate removal and multiple plates
Cost: installation	Low	High
Cost: maintenance	None Routine maintenance is not needed or recommended with the V-Cone, thus removal and/or inspection of the tube section is not necessary. If removal is necessary for pigging or other purposes, an insertion V-Cone is available.	High
Cost: pumping/compression	Low to medium	Medium to high

† R.W. Miller, Flow Measurement Engineering Handbook, Third Edition, McGraw-Hill, 1996

‡ Despite the conservative accuracy statements on DP transmitters, V-Cone and single DP transmitter flow systems typically see $\pm 1.0\%$ of rate system accuracy or better. This is due to the stable and consistent signal generated by the V-Cone. Low level signals are then much easier for the DP transmitter to measure.
Example: recent CEESI calibration showed 13:1 turndown with a system accuracy of $\pm 0.54\%$ of mass flowrate using only one transmitter.