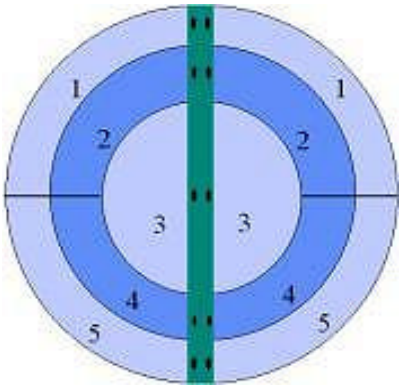
City of Frederick, Maryland Solves Difficult Flow Monitoring Problem

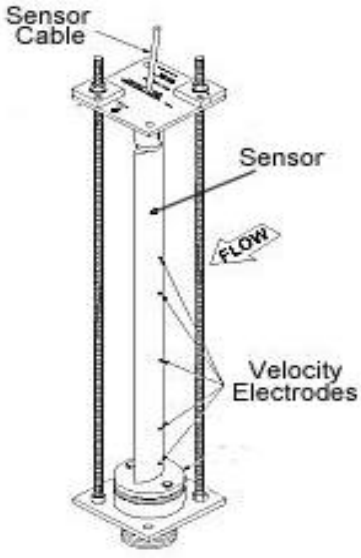
In municipal pumping stations it's not unusual to find that the configuration of pipes is not conducive to accurate flow metering. All too often there just isn't enough straight-run for traditional flow meters to perform well. A difficult piping arrangement that included limited distance between the metering site and pipe fittings posed such a dilemma for the engineering staff at a raw water pumping station in the City of Frederick, Maryland - the second largest city in the state.

The city had previously installed a traditional full-bore magmeter but the limited straight-run of pipe upstream and downstream of the metering point caused erroneous and unacceptable flow readings. Upon learning that the Marsh-McBirney Multi-Mag Electromagnetic Flowmeter was designed for difficult applications like theirs, the City of Frederick decided to replace the existing flowmeter with the Multi-Mag.

The patented flowmeter has an array of electromagnetic sensors strategically located on the insertable probe that spans the entire pipe diameter. Unlike traditional full-bore (also called *spool-piece*) meters that only provide a single-point flow measurement the Multi-Mag insertable probe automatically detects and compensates for shifting profiles. Sealed within the probe are five electromagnetic coils and mounted adjacent to each magnetic coil is a pair of electrodes which are used to measure the velocity of each of the five locations. Each electrode measures the velocity within a region of equal area, so that the measurement of each electrode will have equal area weighting (see image at left). The electrodes are connected in parallel, so that the velocities measured by each electrode pair are averaged and effectively deliver the average velocity of the flow through the pipe.



The streamlined sensor shape minimizes flow disturbances, thus providing minimal pressure drop especially when compared to vortex meters, turbine meters and orifice plates. The Multi-Mag requires significantly less energy to operate than most flowmeters, including pitot tubes.



Although costs for most flowmeters, including spool-piece magmeters, increase substantially as pipe size increases, this is not so with Multi-Mag. Flow is calculated in the

instrument via the Continuity Equation by multiplying the average velocity by the cross-sectional area of flow (calculated from the pipe inside diameter). The sensor has no pressure ports to clog, unlike pitot tube flowmeters. Both initial installation and removal are simple and can be done while fluid is flowing and the pipe is under pressure. No site calibration or velocity profiling is needed. The sensor is inserted through a tap in the pipe wall and reaches across the interior of the pipe to the opposite wall.

Initially installed on a trial basis the Multi-Mag has proven its abilities and is now permanently installed at the pump station. Water Plant Superintendent Bill Luhn reported that the flowmeter immediately began collecting accurate flow data and eliminated all erroneous fluctuations in the flow that had been reported with the full bore magmeter. The ease of installation, dependability and the minimal amount of maintenance were the determining factors that sold the city of Frederick on the Multi-Mag™ flowmeter for this pump station monitoring requirement.

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