

Pipe & Stack Linear Placement Advantage for OFS

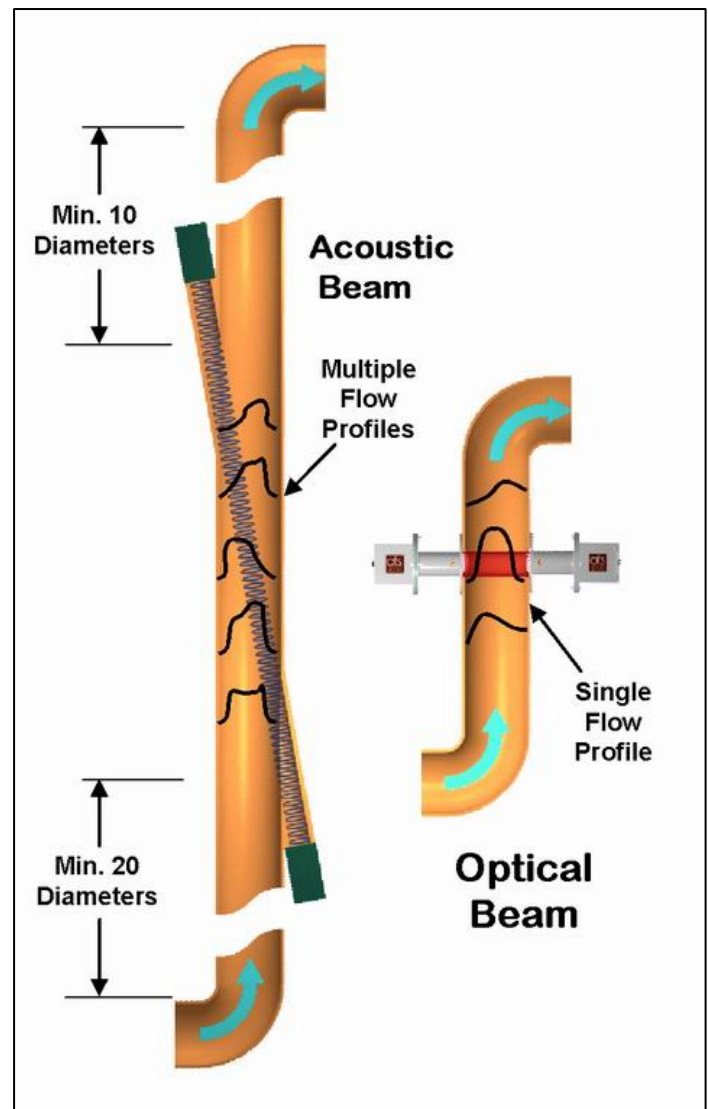
One of the major concerns for installing a flow sensor is the placement requirement for some amount of leading and trailing linear length from bends or flow disturbances in the pipe or stack. Because the flow is constantly changing its profile along the flow path, the best location for any flow sensor is always at the place where the flow profile is well developed (consistent). For different types flow sensors, the placement requirements are different. Most types need very long and straight runs while a few, like the OFS, can tolerate a much shorter linear length.

The figure at right shows a typical pipe installation for two different types of flow sensors. The OFS (using an optical beam) is installed perpendicular to the flow direction. It projects a beam of light across the same cross-section area of the flow. The total amount of flow is the flow speed times the cross-section area at that location.

The OFS provides a line-averaged flow measurement that is most representative to the overall flow profile across that cross-section area. Whereas the ultrasonic flow sensor is required to install at an angle (usually 45°) to the flow. It is clear that the flow profiles change along the flow direction.

The ultrasonic sensor transmits a slant-path sound wave across different cross-section areas with different flow profiles as shown in the figure. It is more sensitive to the profile changes along the path. Therefore, to obtain a representative flow measurement for an ultrasonic sensor, a more uniform (or well-developed) flow profile location is required.

Usually the ultrasonic sensor cannot make a representative measurement unless there is a linear length more than 20 times the pipe diameter leading and 10 times the pipe diameter trailing from the elbow. However, this requirement can be greatly relaxed for the OFS.



Because the OFS light beam shoots across the same flow profile cross-section, the OFS can make accurate representative line-averaged measurements, even for a less developed flow profile. Usually linear lengths more than **two** times the pipe diameter leading and **one** times the pipe diameter trailing are good enough for OFS to make a representative flow measurement. For some extreme cases, OFS were installed right at the elbow of a pipe and provided satisfactory measurements.