EXACT TECHNICAL TIP: Helical Dual Rotor Performance

Although several versions of dual-rotor turbine flowmeter technology have been patented, only a few have been successfully marketed. One version uses two rotors rotating in the same direction. The front rotor is the primary element and the rear rotor is referred to as the sensing rotor. The sensing rotor has a much shallower blade angle and is influenced largely by the flow exiting from the front rotor. Inlet swirl and/or changes in bearing drag will create changes in the front rotor speed. The change in the exit angle of the front rotor will change the sensing rotor speed, even though the flow rate remains constant. While both rotors are rotating in the same direction, the change in the difference between the rotor speeds must be used to correct the flow rate calculation. Inlet swirl will affect both rotors, reducing the RPM and shifting the accuracy of the output of the meter, similar to that of a single-rotor turbine flowmeter.

Exact Flow's patented approach uses two closely coupled rotors, turning in opposite directions. The flow exiting from the first rotor greatly affects the inlet incidence angle on the rear rotor. The two rotors now become hydraulically coupled. Swirl conditions on the first rotor will have an opposite effect on the second rotor. This means that if the front rotor slows down, due to swirl effect, the rear rotor will speed up by the same percentage. The inverse is also true. If the front rotor speeds up, the rear rotor will slow down. The sum (or average) of the two rotors is constant, regardless of swirl effects on rotor RPM. Therefore, flow straighteners are not required in most applications, making it possible to install the flowmeter in tight spaces where the added length of piping cannot be tolerated.

An additional benefit of the hydraulically coupled rotors is that the RPM ratio can be monitored to determine bearing integrity, due to wear or particulates. Exact Flow's flow computer will send out an error code when the error ratio set point is exceeded, thereby signaling the event when it occurs. Bearing diagnostics have many practical applications, e.g., noting anomalies when securing test data over long periods of time or while on the floor of the ocean in a subsea pod application.

The increased incidence angle into the second rotor results in the ability to measure over a wider flow range, providing turndowns of up to 500:1. Obviously, the advantage is that a dual-rotor turbine flowmeter could cover the range of two single-rotor turbine flowmeters.

Today, dual-manifold systems are used that could be eliminated by employing a dual-rotor turbine flowmeter, saving the cost of actuator valves and dual-channel flow computers. The reliability of the system would be much improved and installation would be greatly simplified by using less space.

Other additional performance features can be read in a white paper titled, "***Modern Turbine Flowmeter Enhancements***."

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