Measuring Flow Using a Permanent Magnet with a Large Constant Gradient

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Magnetic Resonance (MR) has long been used for measuring flows, as it has the unique advantage of being a truly non-invasive method by which to do so. In this research, we show the use of a permanent magnet with a large constant gradient to measure two decades of average flow velocities (0.002-0.7 m/s) using a time of flight (TOF) measurement method developed by Osan et al. Thanks to the repeatability afforded by the stable gradient, the transition to turbulence for pipe flow through the magnet is reliably pinpointed.