Effect of Pump Pulsation and Particle Loading on Membrane Filter Retention

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Abstract

Hydraulic shocks caused by flow stoppages through microporous membrane filters have been shown to dramatically increase particle release from the filters. The magnitude of the release can be mitigated by techniques like Stabilized Distribution™[1]. In Stabilized Distribution™, a minimum flow rate is always maintained through system filters to minimize particle release. Changes in the flow rate through a filter have also been shown to affect filtrate particle concentrations [2].

This experiment was undertaken to determine if pulsations induced by different pumps also affect filter performance. Three types of pumps (diaphragm, bellows, and centrifugal) with varying degrees of pulsation were tested at similar average flow rates and backpressures. The magnitudes of the flow pulsations from each pump type were measured at all test conditions. Particle retention by 0.1 µm membrane filters was characterized as a function of pump pulsation intensity and particle loadings. At low loading, particle retention decreased with increasing pulsation intensity. Particle retention also decreased with increasing particle loading. The decrease was most pronounced for the pump with the highest pulsation intensity.