

# **Evaluation of low frequency pulsation damping devices**

by:

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### **Abstract:**

Reciprocating compressors are strong sources of pulsating flows in process installations. Since the typical frequencies related to these pulsation sources are related to compressor speed and thus in the order of 3 to 10 Hz and higher harmonics thereof, the pressure pulsations are only slightly damped by viscothermal effects. Therefore they can be a cause of strong pipe vibrations even at large distances from the compressor. In order to dampen the pressure pulsations, various pulsation damping devices can be applied in the installation. First of all, pulsation bottles are installed, at the compressor suction and discharge side, to dampen the high frequency components of the pulsating flow generated by the compressor. Furthermore orifice plates are often installed at the compressor nozzles and pipe connections of the pulsation bottle. In order to dampen the resulting pressure pulsations in the installation, additional pulsation dampers can be installed such as orifice plates, perforated plates, side branch resonators, damper internals, secondary pulsation bottles or acoustical filters.

In a joint research project from the EFRC a number of damping devices has been evaluated, both experimentally and analytically. Both the effective damping and pressure drop have been determined as a function of frequency and flow rate. A single bore orifice plate, a perforated plate and a so-called Kotter plate with an equivalent effective area were compared. The experiments were carried out in the air test facility of TNO TPD in Delft at atmospheric pressure under well-defined resonance conditions. A 3" sized damper plate with effective area reduction of 20% and 40% were evaluated in a frequency range between 3 and 300 Hz, and at a mean flow velocity of 3- 30 m/s in the 3 inch piping.

The experimental results will be presented and the effectiveness of the various damper designs will be compared for the frequency range and flow rates specified.

