

# Externally Pressurized Bearings Allow Rotor Dynamic Optimization

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## ABSTRACT

Characteristics of externally pressurized bearings (EPB) are a function of bearing geometry, shaft rotational speed and external pressurization. Characteristics of internally pressurized bearings (IPB) are a function of bearing geometry and shaft rotational speed. External pressurization of the lubricating fluid supplied to the bearing allows control and adjustment of bearing characteristics independent of shaft rotational speed and bearing geometry. The supply pressure and fluid temperature can be varied over a range to optimize the stiffness and damping of a bearing for a variety of operating conditions. The application of a four pocket, orifice compensated, EPB to a Clark 1M-6 centrifugal compressor demonstrates that the overall rotor dynamic response can be significantly affected by varying fluid pressure and fluid temperature. Bearing lubricant supply pressure was varied to produce a bearing stiffnesses of 150% and 60% of the nominal value. Bearing lubricant supply temperature was varied to produce bearing a damping of 110% and 85% of the nominal value. Results indicate a significant change in rotor dynamic response can be achieved with the application of an EPB to the Clark 1M-6 compressor.

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