

VIBRATION DAMPER SEALS FOR TURBOMACHINERY

The Pocket Damper Seal (PDS) was invented at Texas A&M University (TAMU) by Dr. John Vance and Richard Shultz. The University holds the patent. It is licensed by Bearings Plus under the trade name “TAMSEAL”. This non-contacting seal has orders of magnitude more direct damping than conventional labyrinth seals, and no de-stabilizing cross-coupled stiffness. It has been used to suppress rotordynamic instability in a number of large multistage high-pressure centrifugal compressors. In most of these machines the critical frequency to suppress is between 3200 and 6000 cpm, and the PDS has maximum damping in that frequency range. The latest design configuration of the TAMSEAL™ can produce either positive or negative stiffness, to tune the natural frequency of the machine as desired.

High-pressure (up to 1000 psi) tests of PDS were recently carried out by Dr. Bugra Ertas at speeds up to 20,000 rpm with excitation frequencies 0-300 Hz. Effective damping coefficients are measured to be larger than any other type of non-contacting seal in the frequency range of 40-100 Hz. Dr. Ahmed Gamal continued the research to measure leakage as a function of blade profile and blade pitch. Increased blade pitch was shown to reduce the leakage, so that fewer teeth can be used in a given seal length, which increases the damping. Eccentricity (shaft off center) was shown to produce a smaller increase in leakage for the TAMSEAL™ as compared to a labyrinth seal.

References

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