

COMMISSIONING OF PRESSURIZED GAS BEARINGS IN A 180 HP METHANE TURBOEXPANDER IN AN LNG PRODUCTION FACILITY

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ABSTRACT

The US Department of Energy (DOE), the Idaho National Engineering and Environmental Laboratories (INEEL), and Pacific Gas & Electric (PG&E) have been involved in the development of new technologies to produce liquefied natural gas (LNG) for diverse consumer use at a PG&E facility in Sacramento, CA. Their goal is to establish packaged LNG facilities at / near conventional high-pressure natural gas letdown stations where high-pressure (750-900 psig) pipeline gas is throttled to distribution pressures of 50 to 60 psi.

Typically, in the past, this throttling process was achieved via pressure regulation valves. The new technology utilizes a turboexpander as the pressure-throttling device. The turboexpander consists of a single stage radial inflow expansion turbine wheel on end of the shaft and a centrifugal compressor wheel on the other end of the shaft, in a conventional, double overhung arrangement. The benefit of the new process is to recover the energy of expanding pipeline gas from 750 psig to 60 psig, while at the same time re-compressing a portion of the pipeline gas.

INEEL and PG&E initially attempted to commission the turboexpander in early 2002. Due to stability issues, the turboexpander could not be operated above 55-60,000 rpm. The LNG process, however, required that the turboexpander be operated at 70,000 rpm. INEEL and PG&E continued to work with the turboexpander OEM from early 2002 through March 2004 with over 1000 unsuccessful attempts to commission the turboexpander.

In late March 2004, Bently Pressurized Bearing Company was asked to retrofit the turboexpander with pressurized radial / thrust bearings utilizing the high pressure pipeline gas (methane) as the pressure source (425 psi) for the bearings and the gas distribution system as the low-pressure sink (60 psi) for the bearings.

This paper documents the design modifications made to the turboexpander rotor and casing in order to accommodate the pressurized methane gas bearings, as well as the operating characteristics of the turboexpander with the retrofitted methane pressurized gas bearings.

The turboexpander was successfully commissioned in September 2004 and now successfully and continually operates with pressurized methane gas bearings, at 70,000 rpm.

Keywords: pressurized bearing, stability, turboexpander, gas bearing