

## Cylinder Pressure Transducer

The single most important measurement for condition monitoring of reciprocating compressors is cylinder pressure. Armed with accurate cylinder pressure at each point in the piston's stroke, a Pressure-Volume (PV) curve can be constructed, which provides indispensable information on the machine's health. Historically, in-cylinder pressure measurements were made only intermittently. Even if a transducer was permanently installed on the machine, it was isolated from the cylinder by using a Kiene® valve or similar isolation device. Users would manually open the valve, exposing the transducer to in-cylinder conditions whenever measurement data was desired. Then, they would close the valve again after data was obtained. Today, however, Bently Nevada has the transducer technology to deliver continuous, online cylinder data – technology built to survive year-after-year in this toughest of all environments, the inside of a compressor cylinder.

Bently Nevada is pleased to announce the release of a completely re-designed Cylinder Pressure Transducer



– the 165855. Its robust construction is built to withstand continuous monitoring of aggressive, in-cylinder environments. In fact, it's the only transducer of its kind (that we're aware of) with a 3-year warranty. It was designed specifically to complement our 3500/77M Recip Cylinder Pressure Monitor, ensuring that this key measurement can be made with the confidence that you're using a robust, fit-for-service transducer with the same standard warranty duration as any other Bently Nevada product. Available in a variety of pressure ranges, from 100 psia to 10,000 psia, the transducer provides continuous static and dynamic pressure data.

The chemical environments encountered in many recipcs have also been carefully considered. Sour gas (i.e., large concentrations of H<sub>2</sub>S), hydrogen, ethylene, chlorides, and other chemicals can destroy a transducer in a matter of days unless appropriate materials and construction techniques are employed. Our new 165855 uses advanced materials, gold plating, and special construction technologies to ensure long, trouble-free operation in such environments – in fact, a patent is being pursued encompassing its construction and our innovative use of materials. And, because the sensor is physically segregated from its signal conditioning electronics by a 1-meter cable, the sensor element can be placed in environments with much higher temperatures than sensors using an integrated design.

Each 165855 is shipped with a calibration curve over pressure and temperature, and this information can be programmed into the 3500/77M monitor during configuration along with compressor operating information. This increases the accuracy of the overall cylinder pressure measurement along with derived measurements which use cylinder pressure. The sensor is supplied with 7/8-14 UNF threads and a Hifluor™ o-ring to seal between the process gas and

the outside environment (an ethylene propylene o-ring is also included in the packaging and should be used in place of the Hifluor version in ammonia environments). 3/4 NPT and 1/2 NPT adapters are available from Bently Nevada, allowing the transducer to be used with indicator ports such as Kiene® valves having these thread sizes (be certain to select indicator ports and adapters whose materials are compatible with the process gas being used). The sensor and

adapters supplied by Bently Nevada comply with Society of Automotive Engineers (SAE) specification J1926. In order to ensure proper sealing of the sensor, the SAE J1926 specification must be used for adapters or indicator ports that mate directly with the sensor.

To learn more, download the 165855's datasheet from [www.bently.com](http://www.bently.com), or consult your nearest Bently Nevada sales professional. ☺

## Cylinder Pressure Transducer Surpasses a BILLION Cycles – and Keeps on Going!

Cylinder pressure measurement in industrial reciprocating compressors presents many challenges. Cyclic pressure swings inside the cylinder occur with each revolution of the crankshaft – hundreds of millions of times per year! The cylinder pressure transducer also requires adequate frequency response – on higher-speed reciprocating compressors (near 1200 RPM) this will extend beyond 5 kHz. In addition, the transducer must be relatively immune to dust, heat, and vibration. And, it must be able to withstand chemical environments that are extremely aggressive and corrosive – such as H<sub>2</sub>S.

The qualification process for our new 165855 cylinder pressure transducer included a careful review of the above specifications. The goal: such specifications would be met with no maintenance or calibration required for at least three years, and the transducer would carry Bently Nevada's standard 3-year warranty. To put this in perspective, six years of continuous operation for a 300-RPM compressor equates to just under a billion cycles.

Testing on the new 165855 has been underway for nearly a year using an apparatus designed to simulate the cycling inside a cylinder with a discharge pressure of 100 PSIA and an approximate 2-to-1 compression ratio. Not only is the transducer itself remarkable, but even the test apparatus represents significant innovation – so innovative that a patent is being pursued on it as well. Recently, the transducer surpassed the 1.1 billion cycle mark while still operating properly – calibration has been re-verified several times during testing and is still within initial specifications. Cycle testing will continue until the pressure transducer or the test rig fails.

Thorough and rigorous testing such as this helps ensure Bently Nevada customers have access to the industry's most robust and reliable cylinder pressure measurement technology. ☺