High-pressure, High-density Centrifugal Compressor Technology

For Floating Production Vessels (FPSOs)

Dresser-Rand helps clients achieve their business objectives by providing innovative solutions. Our leadership in technology, business processes and operational excellence create products and services capable of achieving a high level of satisfaction and long-term loyalty throughout the global energy industry.

Setting the Standard

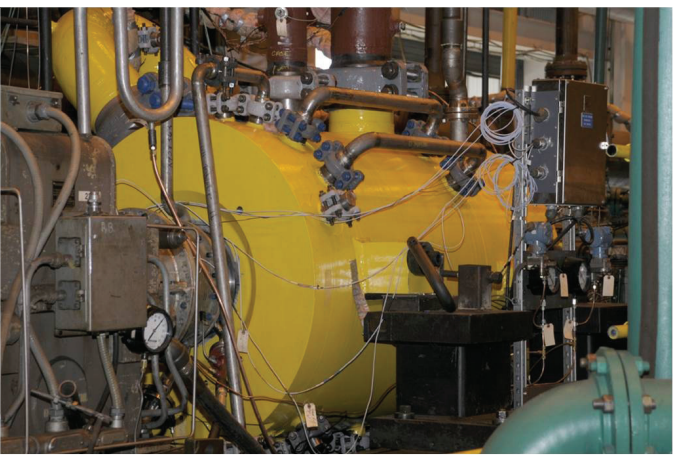
The Dresser-Rand DATUM® line of centrifugal compressors continues to set the standard for modular design and high-efficiency performance. As a direct result of their serviceability, these compressors have reduced downtime and lowered life-cycle costs. More than 800 DATUM units have been sold for virtually every type of critical gas compression application.

Building on the successful experience of the DATUM line of compressors, Dresser-Rand has developed a high-pressure, high-density centrifugal compressor which is believed to be the world's highest density compressor for re-injection services.

The first unit manufactured is being used in the oil and gas upstream market; however, the technology is applicable to other market segments that require compression of carbon dioxide and heavy gases such as urea production and carbon capture and sequestration. The unit, which compresses a mixture of natural gas and carbon dioxide, is one of two trains installed on a floating production, storage and offloading (FPSO) vessel in the "pre-salt" fields offshore Brazil.

The Technology Challenge

Gas density is one of the most critical parameters affecting a compressor's stability and its ability to operate reliably. The design of this class of compressor presented many challenges such as reaching discharge pressures that exceed 550 bar (7,975 psi) while compressing gases that are heavier than typical offshore natural gas blends, including a CO_2-rich gas blend that is nearly 65 percent heavier than these natural gas blends. At these conditions, the unit handles a gas in a supercritical state (a "gas" that is between its gaseous and liquid phases) which requires highly accurate prediction tools. Challenging the commonly accepted paradigm of instability and high pressure, the technology used by Dresser-Rand made it possible for the unit to actually become more stable with increasing pressure and density.



In addition, this new technology will significantly reduce CAPEX, footprint, weight, and operating costs while increasing reliability by eliminating the need to install, operate and maintain high-pressure injection pumping systems downstream of the compression system.

With this DATUM high-pressure and high-density compression technology, the total footprint required by a conventional compression and pumping module can be reduced by approximately 50 percent while

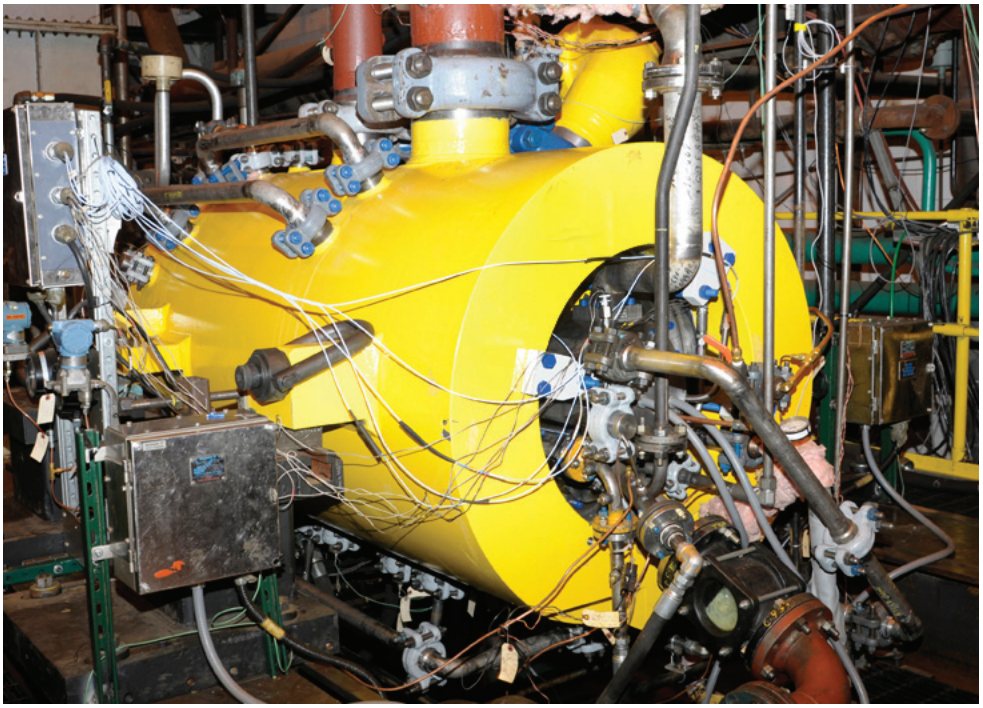
DRESSER-RAND®

its weight can be reduced by approximately 35 percent or more depending on the exact configuration. Dresser-Rand believes this attribute makes our high-pressure and high-density compressor technology uniquely suited for services frequently required for FPSOs, enhanced oil recovery (EOR) applications and floating LNG.

Furthermore, the client can start producing earlier. The cycle time for this machine from time of order through successful load testing was less than 14 months.

Compressor Proves its Mettle

Dresser-Rand conducted a full-load hydrocarbon test at field conditions in order to demonstrate to the client the reliability, performance and capability of this compressor prior to shipment from the factory. During test, the unit achieved a discharge pressure in excess of 560 bar (8,120 psi) compressing the CO_2-rich gas while exhibiting a very robust and stable rotor dynamic behavior, generally considered the greatest challenge in this class of machinery. When the unit operated at this condition it reached what is believed to be the highest gas density any multi-stage centrifugal compressor has handled. This density level is equivalent to what a natural gas compressor would achieve at a discharge pressure of approximately 900 bar (13,000 psi).



For a complete list of Dresser-Rand products and services, visit us at **www.dresser-rand.com** or contact one of the following locations:

Dresser-Rand
Corporate Headquarters

West8 Tower Suite 1000
10205 Westheimer Road
Houston, TX 77042 USA
Tel: (Int'l +1) 713-354-6100
Fax: (Int'l +1) 713-354-6110

112, Avenue Kleber
75784 – Paris Cedex 16
Tel: (Int'l +33) 156 26 71 71
Fax: (Int'l +33) 156 26 71 72

email: info@dresser-rand.com

Regional Headquarters

The Americas
Dresser-Rand
West8 Tower Suite 1000
10205 Westheimer Road
Houston, TX 77042 USA
Tel: (Int'l +1) 713-354-6100
Fax: (Int'l +1) 713-354-6110

EMEA
(Europe, Middle East & Africa)
Dresser-Rand S.A.
31 Boulevard Winston Churchill
Cedex 7013
Le Havre 76080 France
Tel: (Int'l +33) 2-35-25-5225
Fax: (Int'l +33) 2-35-25-5366 / 5367

Asia-Pacific
Dresser-Rand Asia Pacific Sdn Bhd
Unit 9-4, 9th Floor
Bangunan Malaysian Re
17 Lorong Dungun
Damansara Heights
50490 Kuala Lumpur, Malaysia
Tel: (Int'l +60) 3-2093-6633
Fax: (Int'l +60) 3-2093-2622

Form 2278

DRESSER-RAND®