

# DATUM<sup>®</sup> Compressor

## LINE ADDRESSES

### Environmental Concerns

*By Harry Miller,  
Product Manager – Marketing*

**FROM THE START, OUR GOAL** was to produce a more efficient, maintenance-friendly and environmentally compatible centrifugal compressor. It's a goal that continues to this day.

As we celebrate the 14th anniversary of the DATUM product line, it's often difficult to believe how far we've come since its introduction at the Turbomachinery Symposium in September 1995. The DATUM D-16 unit represented the first in the line – and the beginning of a new era in compression solutions. Looking back, I recall that one of our greatest challenges was to introduce a line of compressors that had not been proven in the marketplace.

Last year, we reached several exciting milestones: we sold our 700th DATUM compressor; received our first order for the new DATUM I integrated compression system (ICS); and shipped our first

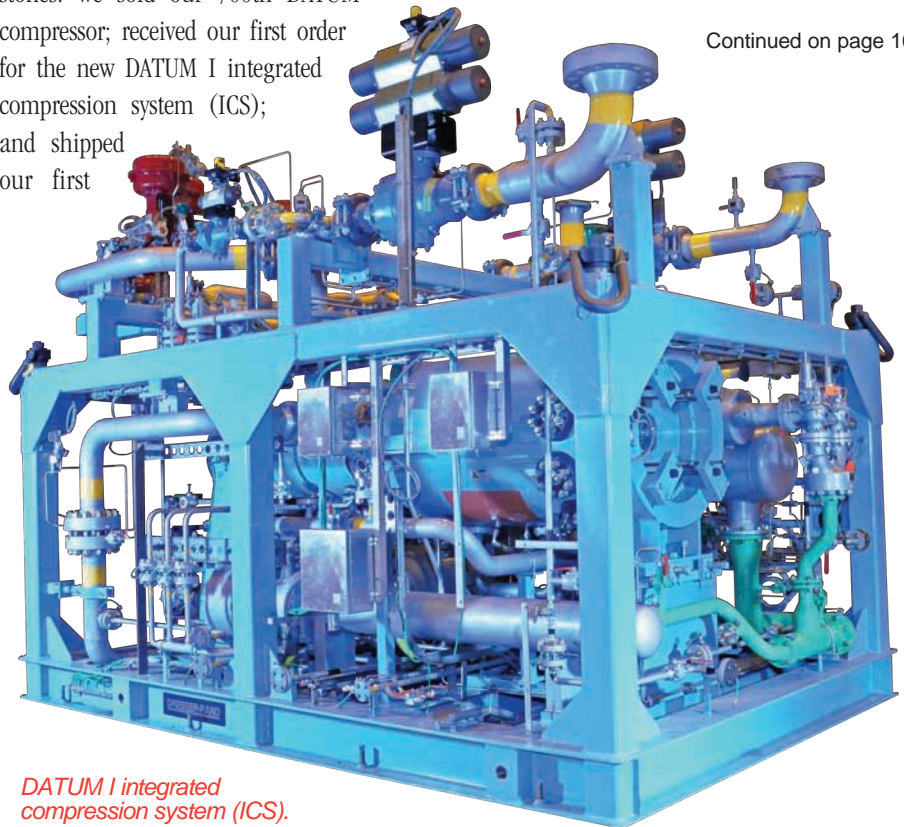
DATUM C “compact” compressor.

The more than 700 units we've sold to date represent applications in 45 countries and nearly the full range of gas compression applications – including some new ones such as acid gas ( $H_2S + CO_2 + H_2O$ ) and carbon capture and sequestration (CCS). But perhaps most importantly, many of these installations represent repeat orders by some of our most valued clients, offering further testament to their confidence in the DATUM line.

### DESIGNED FOR EFFICIENCY AND LOW EMISSIONS

The superior efficiency of the DATUM compressor reduces fuel consumption and lowers the emission of  $CO_2$  and  $NO_x$  – an important benefit because of increasing environmental and health concerns and the ever more stringent environmental regulations. We remain com-

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*DATUM I integrated  
compression system (ICS).*

mitted to addressing critical environmental concerns such as these through our continuing efforts to improve operational efficiencies. When one considers the more than 700 DATUM compressors that have been sold, the aggregate savings in fuel consumption and reduction in emissions (compared to traditional compressors) is nearly equivalent to 20 million standard cubic feet of natural gas a day and 20 tons of carbon dioxide emissions, which is roughly comparable to that of a conventional 150 MW coal-fired electric power plant.

Depending on application requirements and configuration, DATUM compressors often operate at efficiencies that are two to five percent greater than competitive turbomachinery, thereby reducing fuel consumption or increasing throughput for each installed horsepower. Improved aerodynamic design and larger shaft diameter enable DATUM compressors to handle greater flows and pressure ratios than standard designs for a given frame size. We've produced several DATUM units with case pressure ratings of up to 10,500 psi and inlet flow rates of more than 100,000 cfm.

To achieve dramatic improvements in efficiency, we continue to develop new families of impellers and matched stationary flow-path components using the latest aerodynamic design and analysis technology and three-dimensional computational fluid dynamics. We've been developing new manufacturing techniques; for example, single-piece impellers made from nickel-based super alloys to withstand the corrosive effects of acid gas that is being injected into the ground for environmental protection.

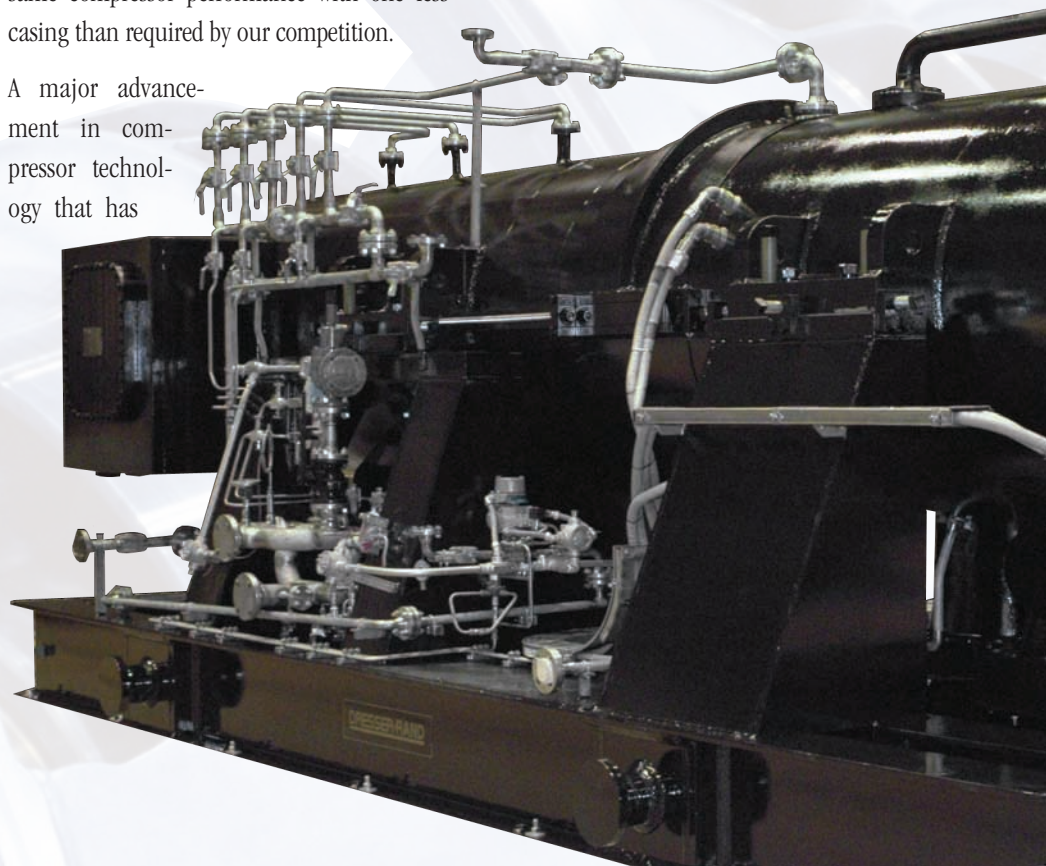
In addition, the high efficiency of DATUM impellers permits gas to be compressed using less power than required by competitive machines. In many cases, a single DATUM unit can deliver pressure ratios that previously required multiple traditional compressor bodies. The beneficial results are a smaller footprint, reduced power consumption and the conservation of precious natural resources.

In large flow applications that require multiple compressor trains, the DATUM unit may be capable of handling those applications in fewer compressor trains than the competition. For example, one Dresser-Rand alliance client selected DATUM compressors (a D24R7S H<sub>2</sub> recycle train driven by a fixed-speed synchronous electric motor, and a D18R9S and D12R9S net gas train driven by a variable speed drive system) for its southern U.S. refinery two years ago. This client was able to achieve the same compressor performance with one less casing than required by our competition.

A major advancement in compressor technology that has

been available since the inception of the DATUM line is a modular bundle (comprising rotor, diaphragms, stationary flowpath components, bearing, seals, and instrumentation) to enhance on-site maintenance. The DATUM module can be replaced in the field, typically in less than one day, which greatly reduces maintenance shutdown periods and improves plant availability. This compares to a traditional design that could require a shutdown of more than five days.

Other advancements in DATUM technology through the years include new dry gas seals (dry gas seals eliminate the need for processing sour seal oil, further reducing harmful emissions) and hole pattern damper seals that have the demonstrated ability to increase rotordynamic stability even as discharge pressures, gas densities and power inputs are increased.



In many instances, other centrifugal products have been updated with DATUM technology. For example, we took the high efficiency DATUM impellers and flow path components and applied them to our legacy Dresser-Rand M-Line and B-Line products. We also have been effective in applying DATUM technology to other manufacturers' installed base of equipment for improved performance.

We've even addressed the problem of noise pollution with the introduction of our D-R<sup>®</sup> duct resonator array technology. This technology has led to the development of compressors that operate quietly and efficiently with significant field noise level reductions in the range of 10 to 20 decibels. This is of particular importance to clients who have installations in urban areas or in areas with noise abatement standards.

### GAME-CHANGING TECHNOLOGY

We are proud of our leadership in developing innovative solutions in the compression industry. But a decade ago, we knew we could not stand still and that we needed to continue to

improve the performance of the DATUM line through advancements in components, and new applications of DATUM technology.

So we did just that.

The DATUM C is an integrated, electric motor-driven, hermetically sealed compressor that was recently developed for a major pipeline transmission client in the northeastern U.S. It uses an integrated, high-speed motor driver with magnetic bearings. It requires no oil, and has no shaft seals. Furthermore, it has no site emissions and offers a more compact footprint than any conventional centrifugal compressor with similar capabilities.

With no shaft seals exposed to the atmosphere, clients who need to compress highly toxic and lethal gases are looking at this hermetically sealed design with great interest. The reason is that there is no leak path for the gas to escape from the inside of the compressor to the atmosphere. This is similar to the compressor in your home refrigerator/freezer. This "green" design also lends itself very readily to unmanned remote operation that further enhances its safety and environmental friendliness.

We also developed a brand new compression concept—the DATUM I integrated compression system (ICS). The ICS is engineered with centrifugal separator technology incorporated on the compressor rotor to provide an efficient, compact solution to compression system design. It's designed for onshore, offshore and sub-sea applications.

We integrated our separation technology (for removing liquids from gases) and packaged it

with process coolers, piping and valves to create the ICS. This concept typically reduces the total footprint required by traditional modules by as much as approximately 50 percent, and it cuts the weight by approximately 50 percent. The compressor remains dry and runs reliably at full performance while our competitors are still trying to figure out how wet the compressor can get before performance and reliability are compromised (something our president and CEO, Vincent R. Volpe Jr., refers to as "game-changing technology").

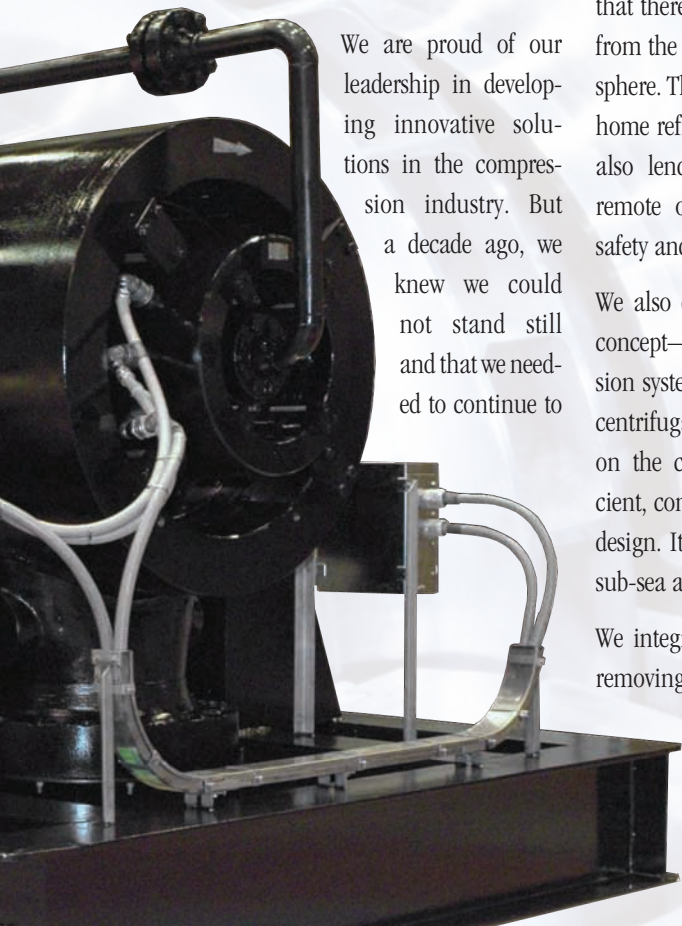
Not only are we developing new compressors, but we're also adapting the DATUM line in emerging market applications. The DATUM has been recently applied to CO<sub>2</sub> capture and sequestration by a major electric utility IGCC power plant in Kentucky, U.S. And it's being planned for the same service at a potential new oxy-coal power plant in Jamestown, New York, U.S.

### WE PUT THEM TO THE TEST

Testing is the ultimate quality function. Our extensive testing capabilities have contributed greatly to the success of the DATUM line. Many clients request ASME PTC 10 Type 2 test using our own shop drivers at our test facilities in Olean, New York, U.S. and Le Havre, France. To further ensure successful field operation, we also conduct (at a client's request) full-load, full-pressure testing and ASME PTC Type 1 hydrocarbon tests.

As a quality control measure, each DATUM I integrated compression system undergoes factory-testing at our new, dedicated ICS test facility

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**DATUM C**  
*"compact" compressor.*



*DATUM ICS test stand in Olean, New York.*

in Olean and delivered to our client as a fully assembled module. We recently tested our first production unit, which will be delivered this year and used to boost the gas-lift capacity of a Petrobras P-18 semi-submersible platform. The P-18 semi-submersible production platform has been operating for 14 years in Campus Basin, approximately 110 kilometers off the coast of Rio de Janeiro, Brazil.

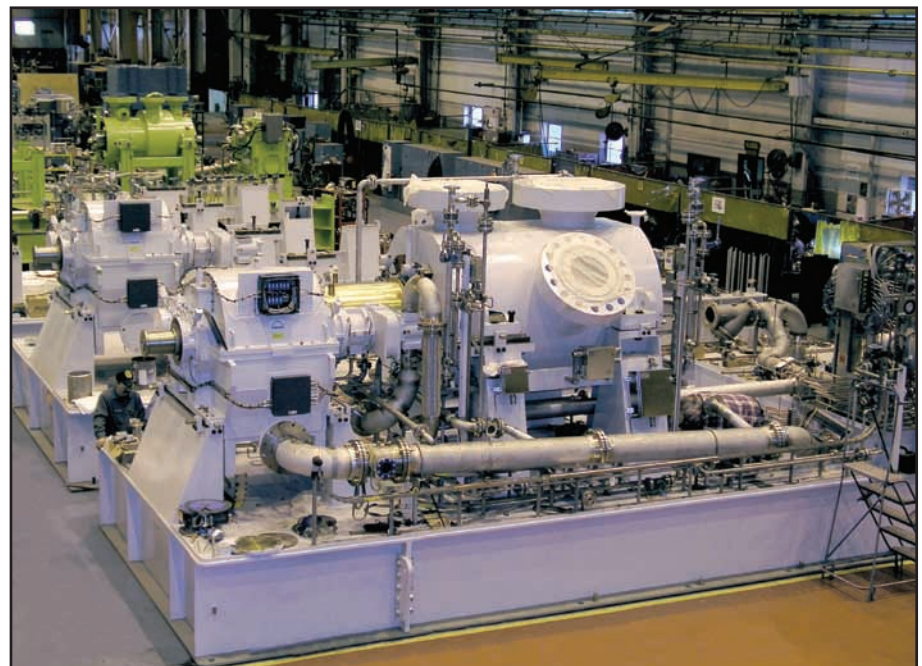
Earlier this year, Dresser-Rand completed construction of its large compressor full-load test facility in Le Havre, increasing its worldwide testing capacity with natural gas up to 150 MW (gas turbine drive) or 100 MW (electrical drive). This facility includes a high capacity quay with direct sea access that facilitates compressor train delivery and shipment from and to any location in the world.

### SAVING SOME “GREEN” FOR CLIENTS

In these times of economic uncertainty, controlling costs is getting more attention. The

cost of operating a compressor is directly proportional to its efficiency, which has two components: aerodynamic losses and mechanical losses. From the very beginning, we’ve strived to achieve the highest levels of efficiency in the industry with our DATUM compressor line. This translates into saving some “green” for our clients.

It’s been an exciting 14 years as the DATUM compressor line continues to establish new industry benchmarks for compression performance and reliability in the oil, gas and petrochemical industries. We’re proud of the results this equipment line has produced for our clients and its contribution to making the world a cleaner place to live. ■



*DATUM Model D14 centrifugal compressors on manufacturing floor in Olean.*