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DRESSER-RAND

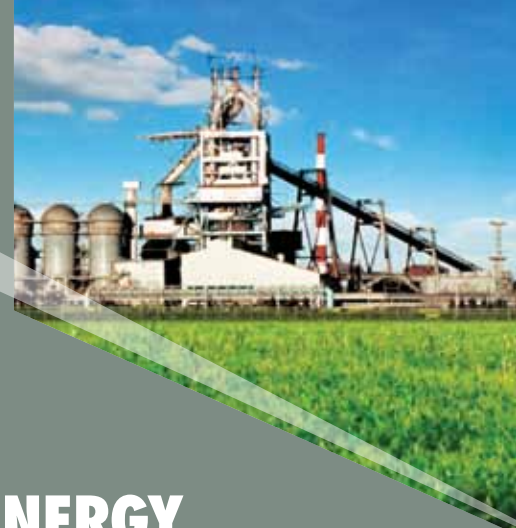
Bringing energy and the environment into harmony.®



DRESSER-RAND

BRINGING ENERGY AND THE ENVIRONMENT INTO HARMONY.®

Products and Services Overview



LEADING THE BUSINESS OF ENERGY WITH THE SPIRIT OF ECOLOGY.

Dresser-Rand® is among the largest suppliers of custom-engineered rotating equipment solutions for the worldwide energy infrastructure, including oil, gas, petrochemical, power generation, and process industries. Our high-speed rotating equipment is also supplied to the environmental market space within energy infrastructure.

These products—centrifugal and reciprocating gas compressors, gas and steam turbines, gas expanders, gas and diesel engines, and associated control panels—are used in oil and gas production, high-pressure field injection and oil recovery, gas liquefaction, gas transmission, refinery processes, natural gas processing, petrochemical production, general industry (including paper, steel, sugar, and distributed power), power generation, and military applications.

Our clients know us best for our ability to bring equipment solutions and premier service for rotating equipment to the energy infrastructure markets. We continue to widen our markets by investing in new technologies and companies that offer exceptional environmental benefits and economic value propositions that allow our clients' facilities to operate more efficiently or help them to be more competitive in their markets.

Our custom-engineered products are also used in other advanced applications in the environmental markets we serve, where they reduce carbon footprint and increase energy efficiency. These include, among others, hot gas turbo-expanders for energy recovery in refineries; co- and trigeneration combined heat and power (CHP) packages for institutional and other clients; and a large number of steam turbine applications to generate power using steam produced by recovering exhaust heat from a multitude of sources. Biomass and biogas applications for our steam turbine product line include gasification of municipal solid waste or incineration of wood, palm oil, sugar, or pulp and paper residues to generate power. Our equipment is used in compressed air energy storage (CAES) applications for utility-sized power generation that is environmentally friendly and provides unique grid management features.

Our worldwide client base consists of oil and gas producers and distributors, national oil companies (NOC), and chemical and industrial companies in more than 150 countries.



TECHNOLOGICAL LEADERSHIP—We are an industry leader in introducing new, value-added technology. We have developed many of the technological and product breakthroughs in our markets, and manufacture some of the most advanced products available. For example, our VECTRA® 40G power turbine features a new modular concept to provide maximum serviceability while reducing downtime.

OUTSTANDING SERVICE—With roots dating back to 1840, Dresser-Rand has more units in the field than anyone else—with thousands of rotating equipment units installed in more than 150 countries. Because of the critical role played by the equipment we sell, clients place a great deal of importance on our ability to provide rapid, comprehensive service. With the most extensive global service network in the industry for our class of equipment, we're prepared to deliver service *anytime, anywhere* and for *any brand*.



UNIQUE BUSINESS PROCESSES—With the support of our Corporate Product Configurator, our business processes enable faster cycle times for all phases of projects.

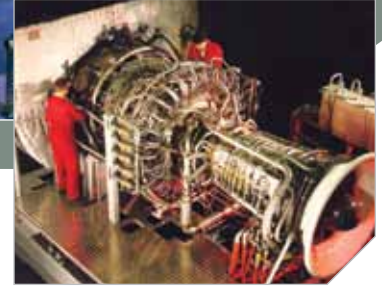


COMPLETE ENERGY SOLUTIONS—Dresser-Rand can be your single source for everything from rotating equipment to turnkey solutions, operation and maintenance (O&M) services, as well as compression, power generation and energy conversion.

WORLDWIDE MANUFACTURING—Our manufacturing capabilities are global, with 13 state-of-the-art facilities located in Olean, Painted Post, and Wellsville, New York; Burlington, Iowa; Houston, Texas; Salem, Virginia (all USA); Le Havre, France; Peterborough, England; Oberhausen and Bielefeld, Germany; Kongsberg, Norway; Ahmedabad, India; and Zumaia, Spain.



Dresser-Rand remains committed to building and servicing reliable, energy-efficient rotating equipment for use in delivering environmentally friendly energy to every corner of the world.



TURBOMACHINERY

Thousands of Dresser-Rand turbomachinery units in operation add up to experience no other company can match, plus innovation that has led to such products as our highly efficient, reduced-emissions DATUM® centrifugal compressors. Dresser-Rand seeks to provide lowest total cost of ownership solutions for your oil and gas production, gas processing, refining, petrochemical, and environmental solution applications.

TIME TESTED. FIELD PROVEN.

Centrifugal Compressors

DATUM® (Oil, Gas & Process Applications)

- Discharge pressures up to 15,000 psig (1,000 bar)
- Flow rates up to 680,000 acfm (1,100,000 m³/hr)
- Power greater than 120,000 bhp (90 MW)

DATUM® P (Natural Gas Applications)

- Discharge pressures up to 3,000 psig (207 bar)
- Flow rates up to 53,000 acfm (96,000 m³/hr)
- Power greater than 40,000 bhp (30 MW)

DATUM® C (Compact Compressor)

- Integrated high-speed electric induction motor
- Magnetic bearings (oil-free operation)
- Hermetically sealed

DATUM® ICS (Integrated Compression System)

- Integrated high-speed electric motor, liquid separator, magnetic bearings, and process gas intercoolers
- Compact footprint

PDI (Natural Gas Applications)

- Discharge pressures up to 1,500 psig (104 bar)
- Flow rates up to 60,000 acfm (102,000 m³/hr)
- Power greater than 40,000 bhp (30 MW)

Supported Legacy Compressor Models—M-line, B-line, CBF

Axial Compressors (Air)

- Inlet flow up to 670,000 acfm (1,100,000 m³/hr)
- Discharge pressure up to 80 psig (5.5 bar)
- Carbon steel casing construction
- Continuously adjustable stator vanes

Gas Turbine Products (Onshore and Offshore Applications)

KG2

- Power capabilities 1.5 up to 2.25 MW
- Small profile, low weight
- Reliable standby and continuous power supply
- 99.3% start-up reliability

VECTRA® Power Turbine

Combines the GE LM2500* with the Dresser-Rand proprietary VECTRA® modular power turbine.

Power capabilities include:

- Model 30G (LM2500)—23.5 MW
- Model 40G (LM2500+)—31.4 MW
- Model 40G4 (LM2500+G4)—34.3 MW

Expanders

- Convert waste flue gas from FCC and RCC units to mechanical power
- More than 130 units installed
- Inlet pressures up to 160 psig (11 bar)
- Inlet temperatures up to 1,400 °F (760 °C)
- Inlet flow up to 1,600,000 lbs/hr (730,000 kg/hr)
- Power up to 60,000 bhp (45 MW)

*LM2500 is a registered trademark of General Electric Company.



STEAM TURBINES

Our custom-designed steam turbines provide reliable energy solutions for markets and applications that include oil and gas, FPSO (floating production, storage and offloading) vessels, process industries, sugar refining, universities, medical centers, district energy, marine, paper manufacturing, and palm oil. Green power generation applications include biomass, cogeneration, combined-cycle, and waste-to-energy. We manufacture our steam turbines at six worldwide, ISO-certified facilities and support them and other OEM steam turbine equipment with strategically located service centers.

BUILDING ON A HERITAGE OF INNOVATION.

Single-stage Turbines

- From 1 hp (0.746 kW) up to 4,695 hp (3,500 kW)
- Inlet pressures up to 900 psig (62 bar)
- Inlet temperatures up to 950 °F (510 °C)
- Drive pumps, fans and generators

Multi-stage Mechanical Drive Turbines

- Wide range of models from 670 hp (500 kW) up to 94,000 hp (70 MW)
- Pressures up to 2,000 psig (138 bar)
- Temperatures up to 1,050 °F (566 °C)
- Condensing and noncondensing up to 800 psig (55 bar)
- Drive compressors, chillers, pumps, fans, generators, and mills

Turbine Generator Sets

- Engineered for applications up to 100 MW
- Inlet pressures up to 2,000 psig (138 bar)
- Inlet temperatures up to 1,050 °F (566 °C)
- Geared and direct connected, 60/50 Hz
- Condensing, noncondensing, single and double automatic extraction
- Up, down, side, and axial exhaust capabilities



RECIPROCATING COMPRESSORS

The result of more than a century of design and manufacturing expertise, our reciprocating compressors have established an outstanding record for performance, efficiency, reliability, and low maintenance in the most demanding upstream, midstream and downstream applications including process and separable gas-field compressors manufactured to stringent specifications.



PERFORMING FOR DECADES IN THE TOUGHEST ENVIRONMENTS.

Process Compressors

- Designed and built to meet API-618 and ISO 13707 specifications
- Power capability up to 45,000 hp (33 MW)
- Maximum combined continuous rod load from 10,200 lbs (4,627 kg) up to 350,000 lbs (158,700 kg)
- Cylinder diameters from 1.625 in (42 mm) up to 44.5 in (1,130 mm)
- Cylinder rated discharge pressures up to 60,000 psig (4,138 bar)
- Compressor strokes from 5 in (127 mm) up to 16 in (406 mm)
- Speeds up to 720 rpm
- Operate in many types of process applications including severe and corrosive gases

High-pressure and Low-pressure Compressor Applications on U.S. Navy Ships

Separable Gas Field Products

- Designed and built to meet client requirements (including ISO 13631 and API 618 when required)
- Power capability up to 11,250 hp (8 MW)
- Maximum rod load ratings from 15,400 lbs (6,985 kg) up to 90,000 lbs (40,824 kg)
- Cylinder diameters from 3.5 in (89 mm) up to 32 in (813 mm)
- Cylinder maximum allowable working pressures from 130 psig (9 bar) up to 10,000 psig (689 bar)
- Compressor strokes from 3.5 in (89 mm) up to 8.5 in (216 mm)
- Speeds up to 1,800 rpm
- Engineered to operate in natural gas, CO₂, air, process, and in corrosive and non-lube environments
- Custom pipeline storage and high-pressure injection applications

Related Services

- Foundation build and repairs
- Casting repairs
- Portable machining
- Mechanical repairs





DRESSER-RAND GUASCOR® GAS AND DIESEL ENGINES

Backed by more than 45 years of experience, Guascor® gas and diesel engines provide energy solutions from a bare engine to a complete generation plant (turnkey project). Our product offerings include diesel, gas, dual-fuel engines, gen-sets, and containerized diesel and gas units for distributed energy-generation plants.

Our gas and diesel engines cover a power range from 150 to 1,350 kW, providing excellent solutions for the installation of cogeneration and trigeneration configurations, which represent one of the best ways to reduce your energy costs and your carbon footprint. These engines meet the highest level of efficiency, while reducing emission levels to meet the most exacting standards.

Markets served for continuous and emergency power applications include food, ceramic, textile, hotels, medical centers, sport centers, universities, farms, greenhouses, and other industries requiring an uninterrupted power supply. Our containerized gen-set provides turnkey generation solutions for isolated areas with little or no electrical utility access.

Engines/Gen-sets

Guascor gas engines can use natural gases and a variety of biogases such as syngas, mine gas, sewage gas, and others, providing bioenergy solutions for wastewater treatment plants, landfills and digestion plants.

FG Series (Atmospheric Engines)

150–238 kWb/142–226 kW

FGLD Series (Mechanical Carburation)

275–800 kWb/264–774 kW

SFGLD Series (Electronic Carburation)

252–985 kWb/242–957 kW

SFGM Series (Miller Cycle Electronic Carburation Engines)

1,055–1,100 kWb/1,025–1,065 kW

HGM Series (High-performance Miller Cycle Engines)

520–1,350 kWb/502–1,308 kW

SFD TA-LG Series (Dual Fuel)

360–1,087 kWb/347–1,048 kW

Diesel Engines/Gen-sets

These power generation solutions for diesel engines produce electricity without relying on the local utility.* They are cost effective and are a reliable, independent power source. They also can be used in cogeneration or trigeneration systems.

SF TA-LG Series

395–1,180 kWb/381–1,135 kW

*Diesel engines not available in U.S. or its territories.

Energy Assets

Dresser-Rand owns, operates and maintains a power system in rural Brazil using containerized Guascor diesel gen-sets. Together they form a 172 MW network that stretches for miles along the Amazon and provides much-needed electricity to the residents of this rural area.

In Spain, additional assets include six animal waste-to-energy plants with a total treatment capacity of 610,000 metric tons/year, 90 MW Guascor engines installed and 700,000 MWh/year of electrical energy generated.



ENVIRONMENTALLY RESPONSIBLE ENERGY SOLUTIONS THROUGH NEW PRODUCTS AND TECHNOLOGIES.

Dresser-Rand can help maximize your plant efficiencies, improve productivity and reduce your carbon footprint with our full suite of energy solutions. Our ongoing development and acquired technologies in the areas of renewable energy resources, combined heat and power, energy storage, and others continue our commitment to bringing energy and the environment into harmony and earning our clients' loyalty for life.

CHP Turnkey Designs

Dresser-Rand provides packaged combined heat and power (CHP) solutions through:

- Initial concept design
- Feasibility studies and commercial analysis
- System selection, manufacture and testing
- Installations



Compressed Air Energy Systems (CAES)

Dresser-Rand **SMARTCAES**™ technology reflects our unique qualification to deliver the total integrated rotating equipment CAES system including:

- All ancillary services
- Heat exchange equipment
- Pollution abatement system
- Plant controls
- Performance guarantees (for compression and power generation modes)



Echogen Power Systems

A new and innovative waste heat-to-energy solution using a CO₂-based power cycle generates emission-free electricity without burning fuel. The compact, packaged power system, with up to 50 MW capabilities, reduces overall cost of ownership with lower transportation and installation costs. The cycle can operate water-free, which is critical for many regions worldwide.





PV Solar Energy

Our experience in the PV solar sector provides a full range of services and applications to offer turnkey solutions to our clients including:

On Grid: Utility-scale solar PV farms, roof tops, carports, etc.

Off Grid: Mini-grid systems and solar home systems.

- Engineering and design
- EPC services and commissioning of turnkey projects
- Financial services
- Operation and maintenance

Dresser-Rand also offers similar services for the development of wind energy.



Wave Energy

Dresser-Rand has patented the HydroAir™ variable radius turbine (VRT) used on oscillating water column (OWC) power plants. Incoming surface waves induce an oscillating flow of air within the chamber which, in turn, flows backwards and forwards through an air turbine. The turbine converts this air movement into electrical energy. Benefits include:

- Single moving part—the rotor
- Lower rotational speeds than competing turbines
- Wide operating range

Compressor Capacity Control System

The Dresser-Rand capacity control (CapCon) suite is comprised of three variable control systems—(1) infinite step control (ISC); (2) gas-controlled stepless pockets (GSP); and (3) hydraulic variable-volume clearance pockets (HVVCP). Each technology allows variable output from stepped or fixed-output compressors over a wide range of operating conditions.

This variable-capacity control system gives operators an infinite number of intermediate steps so the compressor can run at less than full design capacity and use less energy when appropriate. Exerting this throttle over the compressor allows you to save operating energy and reduce energy costs.

Supersonic Ejector

The Supersonic Ejector captures fugitive emissions in hydrocarbon gas applications. The recovery and recycling process captures virtually all targeted greenhouse gas emissions during normal operation. A successful field test for a 24 MW gas turbine showed a reduction of 1,600 metric tons of CO₂ greenhouse gases per year.

Fugitive Emission Controls

Dresser-Rand fugitive emission control systems for reciprocating compressors provide a cost-effective means for eliminating gas leakage through the pressure packing, along the piston rod, around the cylinder valve covers, and through valve and clearance pocket up-loader packing to meet stringent fugitive emissions requirements.

High-Pressure Fuel Injection

Enginuity® HPFi provides an optimally mixed air/fuel charge for natural gas engines, enhancing combustion performance to:

- Reduce NOx emissions up to 95%
- Reduce CO emissions up to 50%
- Save up to 8% on fuel

Gas Engine Emissions Technology

- Advanced technologies for emissions reduction and reliable performance of natural gas-fueled reciprocating engines/compressors
- Regulatory consulting and equipment evaluation to assure compliance and uptime
- Enginuity catalyst and air-fuel management products, aftermarket services, training, and 24/7 support



ADVANCING PRODUCT PERFORMANCE, EFFICIENCY AND RELIABILITY.

At Dresser-Rand, we believe that technology is a key enabler to the value we bring to clients. So we continuously invest in extending the capabilities of our existing product technology platforms.

Synchrony® Magnetic Bearings

- Eliminate oil lubrication systems
- Reduce process downtime
- Extend machine life
- Improve machine efficiency
- Reduce maintenance costs



Gas Seals

- Dresser-Rand proprietary design
- Patented pusher ring design to avoid “hang-up” for wide range of applications
- Pressures greater than 2,900 psig (200 bar)
- Continuous speeds up to 32,700 rpm



Gimpel® Trip and Throttle Valves

- Trip, trip throttle and non-return valves for protection of steam turbines, and API 611 and 612 steam turbine drives
- Hydraulic-operated valves; mechanical, latch-type valve trip cylinders; optional servo-valve and LVDT are available for precise flow control

COPPUS® Portable Ventilators

- Industrial air movers to meet virtually any portable ventilation or cooling needs—confined-space environmental control, heat stress control, air curing, and drying
- Electric explosion-proof, compressed-air-drive, steam drive, and marine-water-drive models
- Centrifugal, axial and venturi designs



Control Systems (equipment & plant)

- Advanced control system solutions for all rotating equipment needs
- Control panels, field instrumentation and control buildings
- Lower cost of ownership through OEM-leveraged knowledge base



Envision® Condition Monitoring Suite

Dresser-Rand Envision® software integrates online performance and condition monitoring with a comprehensive equipment health assessment.

- Fast, expert OEM analysis increases availability
- Mechanical and performance optimization of plant assets
- Applicable to many rotating assets
- Helps reduce maintenance costs

High-speed Motors & Generators

- High-speed drive trains with magnetic bearings and power electronics
- Direct drive eliminates gear box and associated oil lubrication systems
- Range up to 400 kW and 20,000 rpm
- Permanent-magnet motor up to 97% efficiency
- High-frequency power electronics
- VFDs maximize efficiency at a wide range of loads
- Inverters/converters for generators ensure high efficiency and high power quality
- Control system integration increases reliability and reduces cost





SERVICES

With the largest installed base and service and support network of any OEM in the industry, Dresser-Rand is ready to deliver service quickly, efficiently and safely. Our comprehensive range of services and solutions, along with our service personnel, are available to help maximize the reliability, production revenue and profitability of your rotating equipment. We welcome the opportunity to show you how our service and solutions can satisfy your particular requirements.

RESPONSIVE SUPPORT, WHENEVER AND WHEREVER IT'S NEEDED.

Parts

- OEM design integrity for optimum performance, reliability and safety
- Advanced manufacturing, inspection processes and technology

Upgrades, Revamps, Reapplications, Rerates, and Remanufactured Equipment

- Meet new or changing requirements with existing equipment
- Provide cost-effective alternative to new equipment
- Improve reliability, availability and efficiency by incorporating latest material and design technology
- Extend equipment life
- Reduce maintenance costs
- Latest design and manufacturing improvements

Service Centers

- Strategically located throughout the world
- Repair and overhaul services
- Two dedicated U.S. Navy repair centers
- Comprehensive machining and testing capabilities
- Rotor storage at select locations

Turbine Technology Services

- Dedicated repair centers for heavy industrial gas and steam turbines
- F-class gas turbine repairs
- Complete state-of-the-art in-house capabilities

Field Services

- Skills-based, hands-on training—factory or client site—and web-based training courses
- Technical services (field service representatives, field consultants, field crews)
- Project services
- Equipment reliability improvement programs
- Engineering, procurement and construction projects
- Integrated maintenance programs

Applied Technology

- Dresser-Rand experience and technology applied to most brands of similar-class rotating equipment
- Complete units, major assemblies and individual parts
- Unique solutions for equipment operation and performance

Operation & Maintenance Services

Dresser-Rand offers long-term service agreements for operation and maintenance for renewable energy applications including CHP, PV solar, wind energy, waste treatment plants, and biomass plants.

