

## POWER GENERATION SOLUTIONS



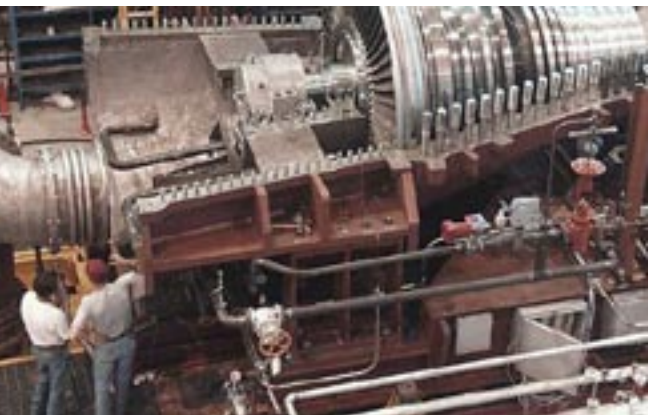
**DRESSER-RAND**

INNOVATIVE energy solutions



# P ower generation

*Unmatched experience  
makes Dresser-Rand your  
partner of choice.*



This 45 MW axial exhaust condensing steam turbine is being tested prior to installation in a major utility company's combined cycle plant.

## BUILDING ON A HERITAGE OF SUCCESS

Since 1957, Dresser-Rand (D-R) has designed, manufactured, tested and shipped more than 2,500 MW of steam turbine power for electric power generation. We've also delivered more than 1,200 gas turbine generator sets and played a pioneering role in the development of compressed air energy storage. The vast majority of these systems are still in operation—some after more than 30 years of service. This tradition of success has made Dresser-Rand a key supplier in providing power-generation solutions for industries such as utilities, oil and gas gathering, refining, petrochemical, chemical, pulp and paper, and sugar and palm oil, as well as universities, municipalities and hospitals.

What's behind this enviable record? It starts with Dresser-Rand technology. We continuously develop and integrate improvements into our conservative, reliable equipment designs that have withstood the test of time. We customize each system, optimizing the configuration

and components for maximum efficiency and reliability with minimum maintenance. As a result, you get a power-generating system with lower overall life cycle costs. Our steam turbines are manufactured in compliance with API 611, 612 and other major industry standards.

D-R is wherever you are. Integrated teams stationed in three key regions throughout the world will work with experts at our global manufacturing and technology centers to find the best solutions for your power-generating needs, then deliver them on-time and on-budget. This seamless teamwork, along with our ability to supply the entire power train, means you'll get a system whose components all work together for maximum efficiency. Purchasing from a single source also means you'll spend less time managing the project and your transaction costs will be lower.

**1956**

Developed 12.6 MW condensing turbine generator set for the steel industry. Nearly 50 years later, Dresser-Rand continues to provide parts and service for this set.

**1972**

Developed 100 kW turbine generator set for major oil company. More than 100 Dresser-Rand standard turbine generator sets are providing power for backup applications today.

**1976**

Developed 12.5 MW back-pressure turbine generator for an Indonesian LNG plant. First of 18 API-612 critical-service turbine generator sets installed at this location.

Developed 2 MW double extraction/condensing turbine generator set for U.S. Naval Academy. Today, Dresser-Rand units generate more than 600 MW of electricity for the daily operation of universities, hospitals and banks worldwide.

**1940**

Developed 16.5 MW condensing turbine generator set for municipal power. First application to utilize standardized low-pressure staging groups for larger-volume flows.

**1969**

Developed 7.5 MW back-pressure turbine generator set for a major sugar provider in Florida. Dresser-Rand has manufactured more than a hundred turbine generator sets for the sugar industry worldwide.

**1975**

Developed three 30 MW condensing turbine generator sets for waste-to-energy facility. One of the first refuse-derived fuel (RDF) power generation facilities in the U.S.

**1980**



This 15 MW topping steam turbine reduces steam pressure from 400 psig (29 bar) to 100 psig (8 bar) and generates electricity for a rubber polymer manufacturing facility.

**“Considering the constant operation of the 15 MW Dresser-Rand steam turbine at our Beaumont, TX, chemical plant, we’re very pleased with the lack of maintenance problems. We’ve also been impressed with the engineering that went into the design and manufacture of the turbine—there’s virtually no vibration at all. You can sum it up with four words: sound engineering and reliability.”**

—Goodyear Tire and Rubber Co.

**1984**

Designed two 11.4 MW condensing turbine generator sets for woodwaste processing cogeneration application. Dresser-Rand units are currently providing more than 400 MW in cogen applications.

**1989**

Dresser-Rand built a 47.2 MW cogeneration extraction/condensing turbine generator using coal mining waste (culm). It supplies a 10-acre facility with thermal energy to grow hydroponic tomatoes and peppers.

**1993**

Designed 32.8 MW extraction/backpressure turbine generator set for a Florida paper company. More than 55 Dresser-Rand units are providing power for the pulp and paper industry.

**1999**

Provided 14.3 MW backpressure turbine generator set to a plastic manufacturer for a combined-cycle application.

Two Dresser-Rand 37.4 MW double-controlled extraction/condensing turbine generators supply power for refinery in California. Dresser-Rand units have been providing electrical power for the refinery industry since 1966.

**1985**

Designed and built 110 MW compressed air energy storage (CAES)/ power generation train for Alabama Electric Cooperative, McIntosh, AL. Only installed/operating CAES train in the U.S.

**1990**

Provided replacement 23 MW condensing turbine generator set to a chemical manufacturer with a reduced cycle time of 42 weeks, saving the client hundreds of thousands of dollars in electrical production costs.

**1996**

Designed and built a 102 MW backpressure turbine generator set capable of inlet flows of more than 2,400,000 lbs/hr (1,091,000,000 kg/hr).

**2002**



# Total solutions

*We go beyond delivering innovative products.*



This 42 MW steam turbine generator set is being prepared for operation in a one-on-one combined cycle installation.

## FLEXIBLE SERVICES THAT BROADEN YOUR OPTIONS

To meet your power-generating needs, we feel it's important to do more than deliver reliable, cost-effective equipment in a timely manner. So rather than thinking solely in terms of machinery—after all, our clients are looking for electricity, not hardware—we consider a broad range of creative solutions that can free up your resources and allow you to devote more attention to your core business.

### Operate and Maintain

**(O&M)**—We can take full responsibility for operating and maintaining your power-generating equipment, no matter who built it, including providing appropriate performance guarantees.

**Installation Services**—We can either perform the complete installation ourselves (ensuring complete compliance with your warranty), assist with specific parts of the installation, or provide technical support while your people do the work.

### Extended Life Analysis—

Knowing how long your equipment will run—and how to make it run longer—is a key factor in your profitability. We can help with preventive and predictive maintenance, testing and inspections to ensure continued safe operation, and a structured service program that includes appropriate procedures and documentation.

### Rental Compressor Fleet—

We have a variety of units available to provide the initial pressurization required by compressed air energy storage facilities.

### Engineered Solutions—

We offer a number of cost- and time-saving alternatives to new equipment. For example, we can expertly **remanufacture** equipment to fit your present operating conditions. This can be done with your existing equipment, or we can locate suitable machinery with our comprehensive database.





If your existing equipment no longer meets your needs, we can often **revamp and rerate** it to meet new operating specifications. As part of the **reapplication** process, we'll evaluate your needs and inspect your equipment, modifying it if necessary. These services are available for all your equipment, no matter who built it.

**Field Solutions**—The dedicated people at our network of repair centers

are ready to keep your equipment up and running with responsive, reliable technical support 24 hours a day, anywhere in the world. This includes **replacement parts** incorporating the latest design improvements, either from your own inventory (which we can manage for you) or from our parts warehouse on wheels; **upgrades** to improve equipment performance and extend its usefulness; start-to-finish **project management**, so you can remain focused

on your business; **contract maintenance**; and **product training** for your operations, maintenance and engineering personnel using one of our many regularly scheduled courses at either a regional location, a D-R factory or a D-R service center—or machine-specific, customized training programs at your location.

**“When we needed gas turbine powered equipment for our Sleipner A production platform, we chose Dresser-Rand because of the way their very competitive solutions met our requirements for low weight, minimum dimensions, and easy inspection and maintenance. It was one of the largest orders ever placed for such equipment in the North Sea, and Dresser-Rand delivered on schedule. We’ve also been pleased with the 98% average availability of the generator packages over the past five years.”**

—Statoil (the Norwegian state oil company)



# Turbines, Generators and More

*The right combination  
for every application.*



This four-stage low-pressure CAES expander has an output of 100+ MW with a 1,600°F (871°C) inlet temperature.

## ENGINEERED FOR RELIABILITY, CUSTOMIZED TO YOUR REQUIREMENTS

There's no such thing as a "standard" power-generating application. So we don't pull a design off the shelf and try to force it to fit your specs. Instead, we take the time to apply our superior engineering expertise to develop the power-generating solution that will best meet your needs. Because we carefully match our equipment to each application, you'll get up to four percent higher operating efficiency, lower maintenance costs, and greater reliability—in other words, lower life cycle costs.

## STEAM TURBINE GENERATORS

These customized units are available with outputs up to 110 MW, either direct-drive or geared. Ideal for cogeneration and many other applications, they accommodate inlet steam conditions up to 2,000 psig (139 bar) and 1,050°F (566°C), with exhaust conditions from 800 lbs. (299 kg) to condensing. Configurations can include condensing (axial, up, or down exhaust flanges), or back pressure; single-valve, multi-valve, or sliding pressure inlet arrangements; single- or double-automatic extraction, or induction mixed-pressure designs.

Every component is built for decades of reliable performance:

- Innovative profiled ring and vane (PRV) diaphragms precisely match the pressure, temperature, steam flow and required pressure drop across each stage.

- Proven bearing designs are used to maintain machine reliability under demanding operating conditions. Bearings can easily be inspected or removed without disturbing the upper half of the turbine casing or rotor.
- Solid rotors are tailored to each application to run smoothly throughout the operating range.

## GAS TURBINE GENERATORS

Whether used for base load or standby power generation, Dresser-Rand gas turbine units have an enviable reputation. The more than 1,200 generator sets we have delivered to more than 50 countries around the world are used extensively for general power applications, as well as by offshore facilities and the cogeneration market.

For applications such as telecommunication and computer centers, airports, hospitals, banks, oil platforms and many others, protection against blackouts has become a necessity. Gas turbines are a very attractive alternative to diesel sets for such standby/emergency power duties. D-R offers a range of systems specifically designed to deliver the reliable power this application demands. Our KG2 turbine/generator sets, for example, supply both onshore and offshore emergency power with 99.3 percent starting reliability and minimized maintenance in installations from 1 MW to 10 MW. Other gas turbines in our line can provide standby, continuous or peaking power up to 43 MW.



systems to many oil and gas companies worldwide has given us a special insight into their priorities. We consistently meet the industry's standards for health, the environment, safety, quality assurance/quality control, and numerous other regulations.

### **POWER RECOVERY EXPANDERS**

These compact, highly efficient units recover energy from hot process gases, then use it to drive generators, compressors or other rotating machinery. Our high-temperature expanders handle gas temperatures to 1,400°F (760°C) with capacities to 46,900 kW. Dresser-Rand medium-temperature multistage turbines employ a combination of impulse and reaction staging to recover power from gases up to 1,000° F (538° C).

### **COMPRESSED AIR ENERGY STORAGE (CAES)**

CAES works by using plentiful off-peak electricity to power a motor/generator that drives compressors to force air into an underground storage reservoir at high pressures. During intermediate and peak electrical demand periods the air is withdrawn from the reservoir, heated in gas-fired combustors, and expanded through turbines that drive the same motor/generator to produce electrical power.

Using off-peak power to meet intermediate and peak demand is less expensive than using units that are completely powered by fuel or purchasing power from neighboring utilities. CAES generators can

be on-line in less than 15 minutes, are environmentally compatible, and are faster and less expensive to build than larger power plants.

D-R is uniquely qualified to deliver total CAES solutions. We designed and built the entire turbomachinery train for Alabama Electric Cooperative's McIntosh facility, the first CAES plant in the U.S. It has been building an impressive record of availability and starting reliability since 1991, while satisfying the intermediate and peaking electrical production needs of this major utility.

### **THE INGERSOLL-RAND MICROTURBINE FAMILY**

The Ingersoll-Rand microturbine is a new and efficient technology for generating onsite electricity and useful thermal energy. It connects directly to a facility's electrical distribution system—either operating in parallel with the utility grid or when grid power is not available. The rugged and compact microturbine can operate on a variety of fuels, produces extremely low emissions, and offers businesses a competitive advantage for energy savings.

The clean output of the microturbine generator can offset higher-cost utility power 24 hours a day or just during peak-demand periods. Also, heat energy recovered from the microturbine exhaust can efficiently supply a facility with domestic hot water, space

heating, manufacturing-process heat, or power for some other thermal load.

The Ingersoll-Rand microturbine is currently available in 70 kW and 250 kW models on modular skids that can be configured to meet both power and physical installation requirements.

The simple and reliable single-shaft design of the Ingersoll-Rand MT250 microturbine is adapted directly from its bigger brother, the 2 MW KG2 gas turbine. With nearly a thousand installations and over 15 million hours of dependable operation, the KG2 engine has built a proven reputation as the most reliable industrial gas turbine in its power range.



The MT250 microturbine shares those features that contribute to its high reliability and long life, so scheduled maintenance is required only about once a year over the system's long operating life.

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