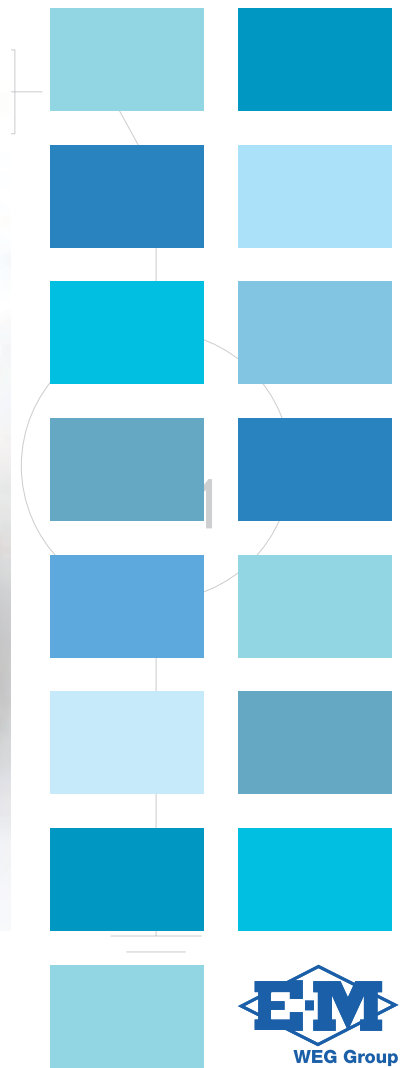


Energy

ST20 Turbogenerator Line

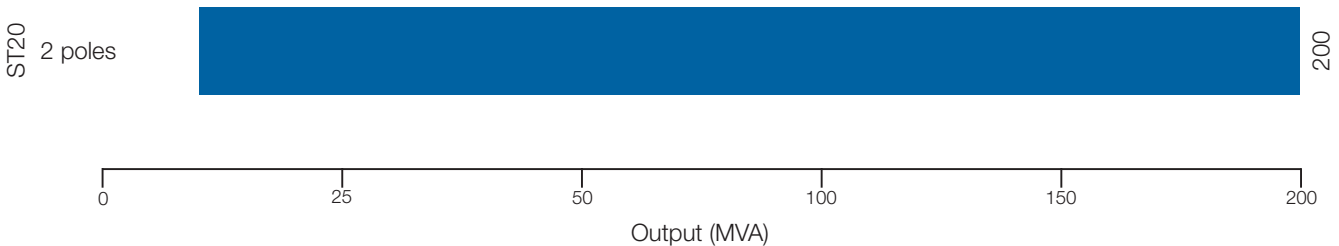


ST20 Turbogenerator Line

The WEG Electric Machinery's ST20 2-pole turbogenerators are used to generate electricity in utility-scale, offshore, cogeneration, geothermal, and other industrial power generating applications. The ST20 line has been developed using our extensive experience in rotating electric machinery and is designed to be driven by steam turbines and gas turbines. WEG Electric Machinery has built over 1,000 units since 1947; representing over 20,000 MW of installed capacity worldwide.

Technical Data

- Output up to 200,000 kVA - 13,800 V - 60 Hz - 3,600
- Output up to 160,000 kVA - 11,000 V - 50 Hz - 3,000
- Construction: Horizontal
- Excitation: Brushless excitation, static with collector rings
- Standards: NEMA, ANSI, IEEE, IEC, API 546, ISO 9001
- Enclosures: Room Air Cooled, TEWAC, TEAAC
- Special Notes: Continuous or peaking duty
- Degree of protection: IP23 to IP56W/IP65W
- Mounting: IM1001 or IM1005 (B3)
- Other characteristics on request



Certifications

WEG Electric Machinery quality system complies with the requirements of ISO 9001 and ISO 14001. The quality system is audited and certified by Lloyd's Register/Bureau Veritas Quality Institute. In order to meet the most demanding markets requirements, WEG Electric Machinery turbogenerators are certified by the most important certification entities worldwide, such as: CSA, BVQI, NBR, ATEX, ABS and DNV.



Customer: Weyerhaeuser Paper

Country: Canada
57,882 kVA, 13,800 V, 2 poles
Application: Steam turbine



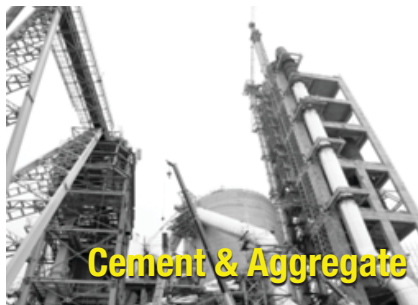
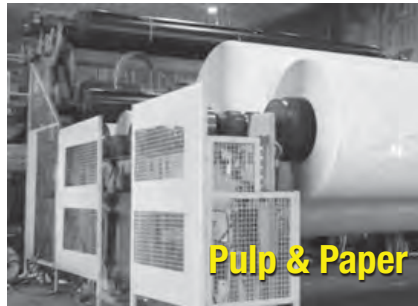
Customer: DRESSER-RAND - Chevron Bigfoot

Country: USA
35,300 kVA, 13,800 V, 2 poles
Application: Gas turbine



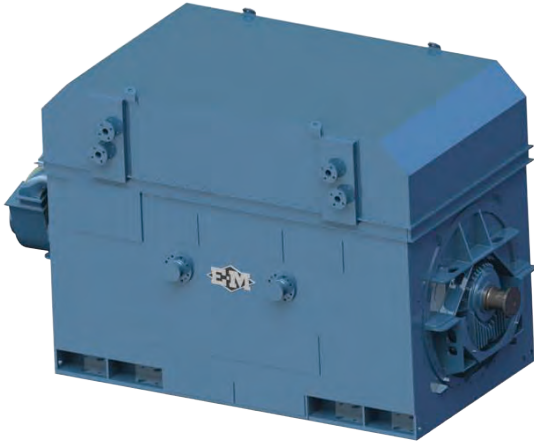
ST20 Turbogenerator Line - Power Solutions

WEG Electric Machinery ST20 turbogenerators offer power solutions for a wide variety of industrial segments. WEG EM ST20 Turbogenerators are designed to be used with a large range of steam and gas turbine drives. Accessories and features can be provided to meet demanding customer specifications. Trust your turbogenerator service to the manufacturer with more than 100 years experience.



ST20 Turbogenerator Line

The ST20 turbogenerators are manufactured with state-of-the-art technology, providing high quality, reliability and low maintenance ensuring long lifetime. Special characteristics and accessories can be supplied in order to meet specification requirements.



Design

WEG Electric Machinery's rotating electrical machines are designed with modern software applications, developed in conjunction with universities based in Europe, USA and Brazil. Our experienced engineering staff designs our generators to our client's particular requirements and specifications and ensures we deliver the maximum generator efficiency and a fully-optimized project.

Main Features and Advantages

- Compliance with local content requirements
- Customized engineering in order to meet the application mechanical, electrical and structure requirements
- Cooling system by means of air-air or air-water heat exchanger
- Robust design combined with state-of-the-art technology for dynamic balancing at rated speed provides low vibration levels, which results in longer lifetime and smooth operation
- The terminal boxes can be mounted on bottom or side of the turbogenerator so as to meet the installation requirements
- Mounted on its own bearings and tested at rated speed and voltage to comply with the application requirements
- All projects include the necessary characteristics to comply with the strict requirements of the different operational regimes, load variations and peak load
- Different mounting types to meet the turbine set requirements.

Main Components Features

Frame & Stator Core

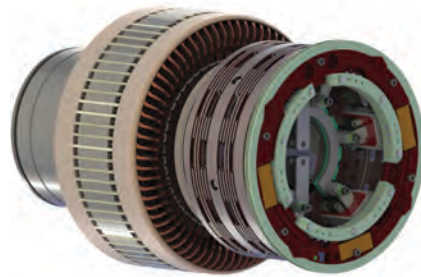
The frame is designed, welded and machined to withstand the forces produced by the mechanical stresses on the lamination core. The core lamination is punched in low loss silicon steel with electrical insulation film. The lamination segments are stacked on circular studs, which extend lengthwise within the stator frame. As the stator core laminations are stacked, vent duct spacers are inserted at specific intervals to provide cooling passages in the stator core for uniform cooling. The stator coils are preformed and vacuum impregnated (VPI) in order to meet the insulation class F requirements. This system provides excellent dielectric properties, greater resistance to moisture and chemicals, excellent mechanical integrity and longer lifetime.

Rotor

The rotor forging is a special alloy steel containing nickel, chromium, molybdenum, and vanadium. The forging material is produced from an electric furnace vacuum degassed ingot. The forging manufacturer performs ductility, tensile strength and chemical tests. In addition, ultrasonic tests are made to assure that the forging is sound. Ventilating slots are punched in the straight portion of the coils to allow for radial discharge of cooling air. Rotor coils are held in place by retaining rings of either magnetic or non-magnetic material (for higher performance).

Brushless Excitation System

The brushless excitation system mounted on the shaft has diodes with redundant fuses and earth fault detection system (optional) for reliable operation. WEG Electric Machinery's brushless excitation system provides high reliability through elimination of brushes, collector rings and carbon dust, which in turn greatly reduces inspection and maintenance costs. As an alternative, a static excitation system is available.



Manufacturing Process

Insulation System

WEG Electric Machinery DURAGUARD™ insulation system is based on the Vacuum Pressure Impregnation process (VPI), which was developed together with the world's most renowned suppliers of insulating materials.

This system ensures perfect insulation for the turbogenerator winding using special epoxy resins and its process is totally free from gases harmful to the environment. The VPI process has shown its efficiency and reliability in electrical rotating machines in many different applications. The insulation system is used in low and high voltage machines that use form wound coils from 380 to 15,000 V. Besides the DURAGUARD™ insulation system, WEG Electric Machinery also has the technology to manufacture using Hard Coils or Resin Rich Coils.



Winding

The winding process adopted by WEG Electric Machinery is especially developed and specified for the turbogenerators according to their voltage and application. The windings are manufactured with preformed rectangular copper bars and are completely insulated with mica tape. The winding process also uses conductor and semiconductor tapes in the coils ensuring the suitable characteristics for the required insulating level. WEG Electric Machinery also has the capability to produce Roebel bars to improve thermal characteristics of the stator.

Balancing

All the rotors are dynamically balanced in three symmetry planes at the turbogenerator operating speeds. The process is computer-controlled and it may have three degrees of balancing: regular, reduced or special. Increased bearing lifetime and lower vibration levels are some of the benefits of a good balancing, thus increasing the service life of the turbogenerators.



Plasma cutting



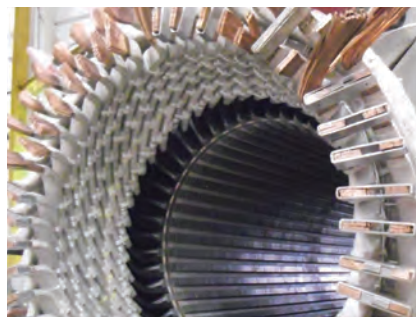
Rotor milling



Vertical lathe



2-pole rotor



Winding

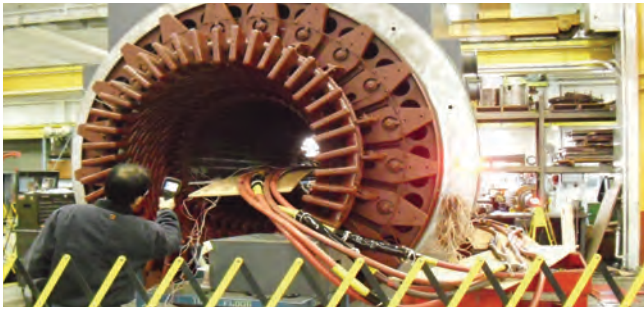


Impregnation system



Test Laboratory

WEG Electric Machinery turbogenerators are tested according to the NBR, IEC and IEEE standards in a modern laboratory capable of testing generators with output up to 200,000 kVA and voltages up to 15,000 V, highly sophisticated monitoring and control equipment meant to minimize manual work. The tests are divided into three categories: routine, type and special tests.



Technical Assistance

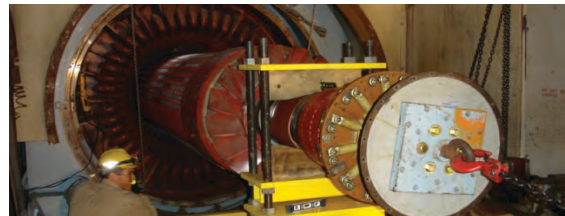
The WEG Electric Machinery technical team provides the customers with full after-sale support. The services include support to general questions and service in the field, such as diagnosis, commissioning of machines and on duty service 24/7. The technical assistance team is well qualified and experienced, able to handle many different field situations and provides remote support using state-of-the-art equipment, ensuring reliability to the results. WEG Electric Machinery also provides worldwide network of authorized repair shops.

Services

The customers can count on WEG Electric Machinery Service Team to restore medium and large electrical machines to optimal conditions. The same technology used to manufacture motors and generators is used for inspection and restoration. The services are executed at the factory in Minneapolis, MN, which is also homologated to execute services on equipment for application in explosive atmospheres. The plant in Minneapolis counts on the full structure and support of the engineering, industrial process and quality control departments, enabling fast, reliable and top quality service.

Scope of supply:

- Three-phase induction motors (squirrel cage or slip ring; medium and high voltage)
- Synchronous motors (with or without brushes; medium and high voltage)
- Synchronous condensers
- Turbogenerators
- Hydrogenerators
- Scope valid to all brands



WEG Electric Machinery services: flexibility, agility and experience to optimize your time and productivity.

Parts and Components

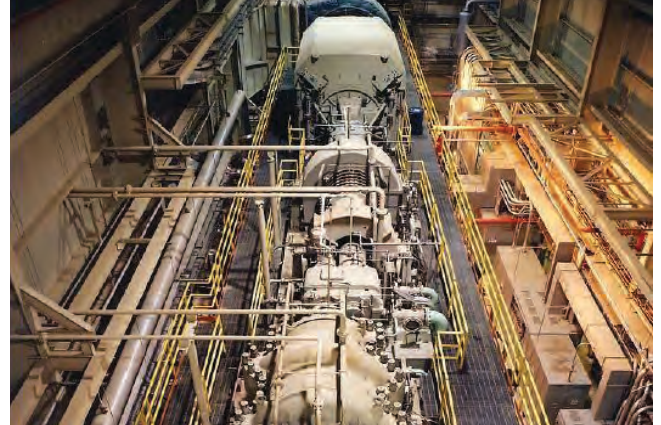
As their time in service increases, turbogenerators need maintenance to continue working properly. We recommend that you use original spare parts supplied by the manufacturer. The WEG Electric Machinery team is willing to promptly assist you in the correct identification of the required parts.

Applications



Customer: MONDI PAPER

Country: South Africa
56,500 kVA, 11,000 V, 2 poles
Application: Steam turbine



Customer: DRESSER-RAND - Alabama Electric

Country: USA
131,235 kVA, 13,800 V, 2 poles
Application: Steam Turbine - CAES



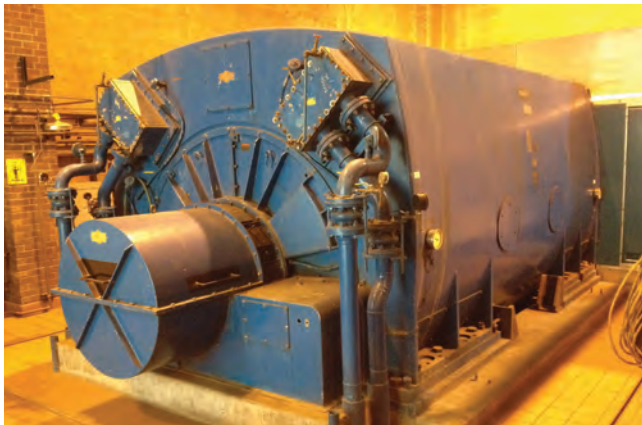
Customer: DRESSER-RAND - Michigan State University

Country: USA
24,000 kVA, 13,800 V, 2 poles
Application: Steam turbine



Customer: PVDSA - Barinas Power Plant

Country: Venezuela
62,500 kVA, 13,800 V, 2 poles
Application: Motor generator set



Customer: DRESSER-RAND - Hibbing Public Utilities

Country: USA
22,900 kVA, 13,800 V, 2 poles
Application: Steam turbine



Customer: DRESSER-RAND - Arizona Public Service

Country: USA
52,500 kVA, 13,800 V, 2 poles
Application: Gas turbine

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