



SPX POWER+ENERGY



providing critical solutions to
the power industry





SPX helps customers across the power and energy industry meet key business challenges, including the increasing demand for power generation and distribution.

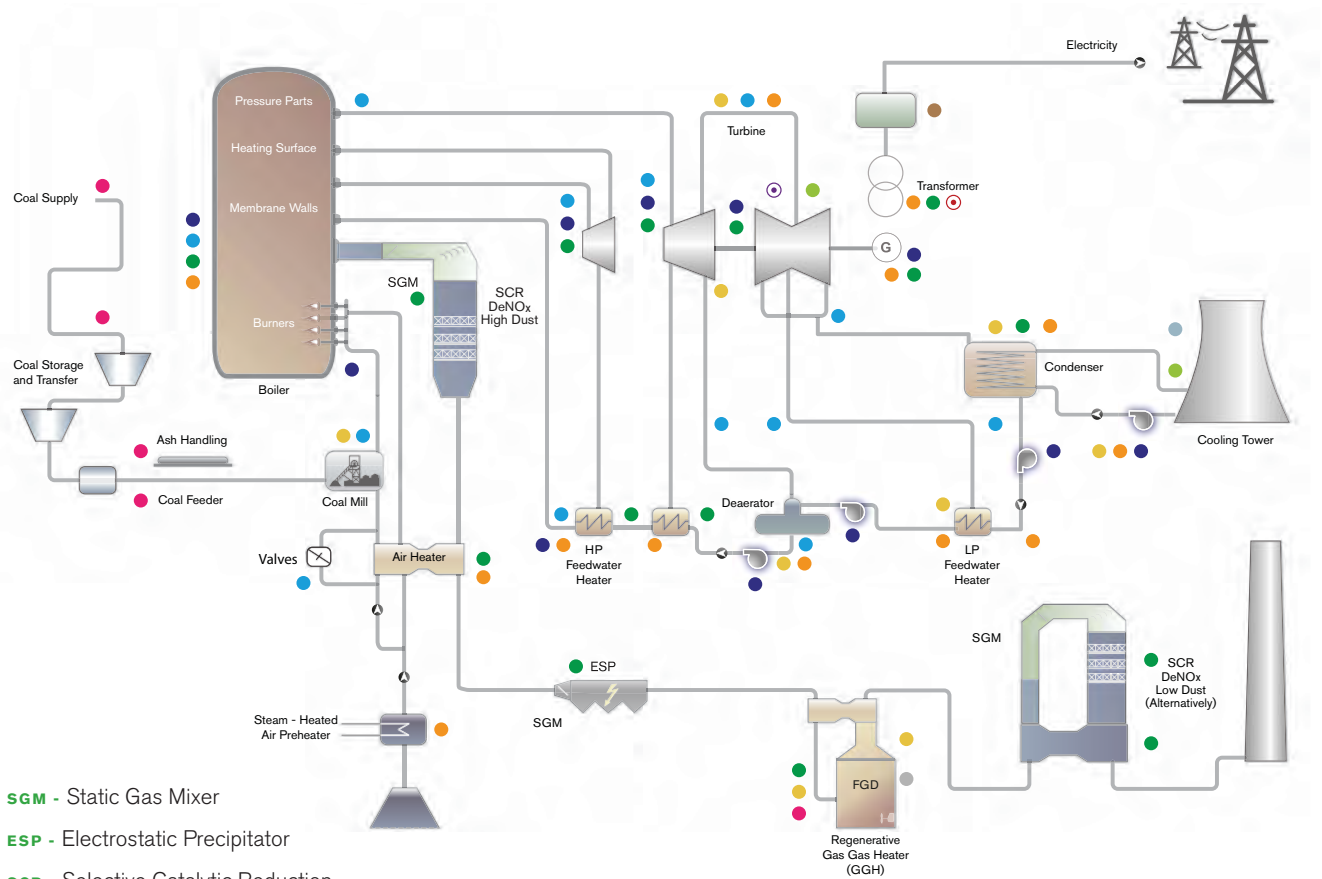
We provide the solutions needed to establish new power plants and enhance existing ones, and leverage our expertise in aftermarket services to ensure the optimization of ongoing power plant operations – as we strive to minimize environmental impact and provide efficient and low-cost products.

SPX POWER+ENERGY

In addition to our vast experience with traditional power plants, we apply our innovative, proven solutions to help advance the efficient, more cost-effective use of traditional fuel sources as well as alternative energy sources such as wind, solar, geothermal and biomass.

Wherever power is needed in the world, SPX is ready with the technologies, services and product solutions to make it happen.

Coal-fired Power Plant



- SGM** - Static Gas Mixer
- ESP** - Electrostatic Precipitator
- SCR** - Selective Catalytic Reduction
- FGD** - Flue Gas Desulphurization
- GGH** - Gas Gas Heater

For coal-fired power generation, SPX offers not only an extensive product range for steam cycle cooling and control, but also decades of experience helping power utilities throughout the world get the most from their assets. As the world requires cleaner coal-fired power, SPX is at the forefront supplying components for pollution control, including flue-gas emission control.



PUMPS



Bran+Luebbe

- Process Pumps
- Chemical Injection Systems
- Plunger Pumps
- Metering Pumps



ClydeUnion Pumps

- Boiler Feed Pumps
- Cooling Water Pumps
- Condensate Extraction Pumps
- Balance of Plant Pumps



Plenty Pumps

- Screw Pumps
- Rotary Vane Pumps



Johnson Pump

- Heavy-Duty Centrifugal Pumps
- Internal Gear Pumps
- Centrifugal Pumps
- Positive Displacement Gear Pumps



MIXERS



Lightnin

- Vertical Side-Entry Mixers



COOLING TECHNOLOGIES



Marley / Dry Cooling

- Cooling Towers
- Fluid Coolers
- Air-Cooled Condensers
- Service and Repair



HEAT TRANSFER



Balcke-Dürr / Ecolaire / Yuba

- Heat Exchangers
- Emission Control
- Service and Repair



ANALYZERS



Bran+Luebbe

- Analyzers



TRANSFORMERS



Waukesha

- Medium Power Transformers
- Large Power Transformers



PLATE HEAT EXCHANGERS



APV

- Plate Heat Exchangers



HYDRAULIC & PNEUMATIC TOOLS



Power Team

- System Installation Tools
- System Operation Maintenance and Repair Tools



CONTROL VALVES



Copes-Vulcan

- Severe-Duty Control Valves



AIR/GAS DRYERS & PURIFIERS



Hankison / Jemaco / Pneumatic Products

- Cooling Water Filters
- Instrument Air Dryers
- Hydrogen Coolant Purifiers



STRAINERS & FILTERS



Dollinger / Plenty Filters

- Filters
- Strainers
- Insulating Oil Treatment



OIL MIST ELIMINATORS

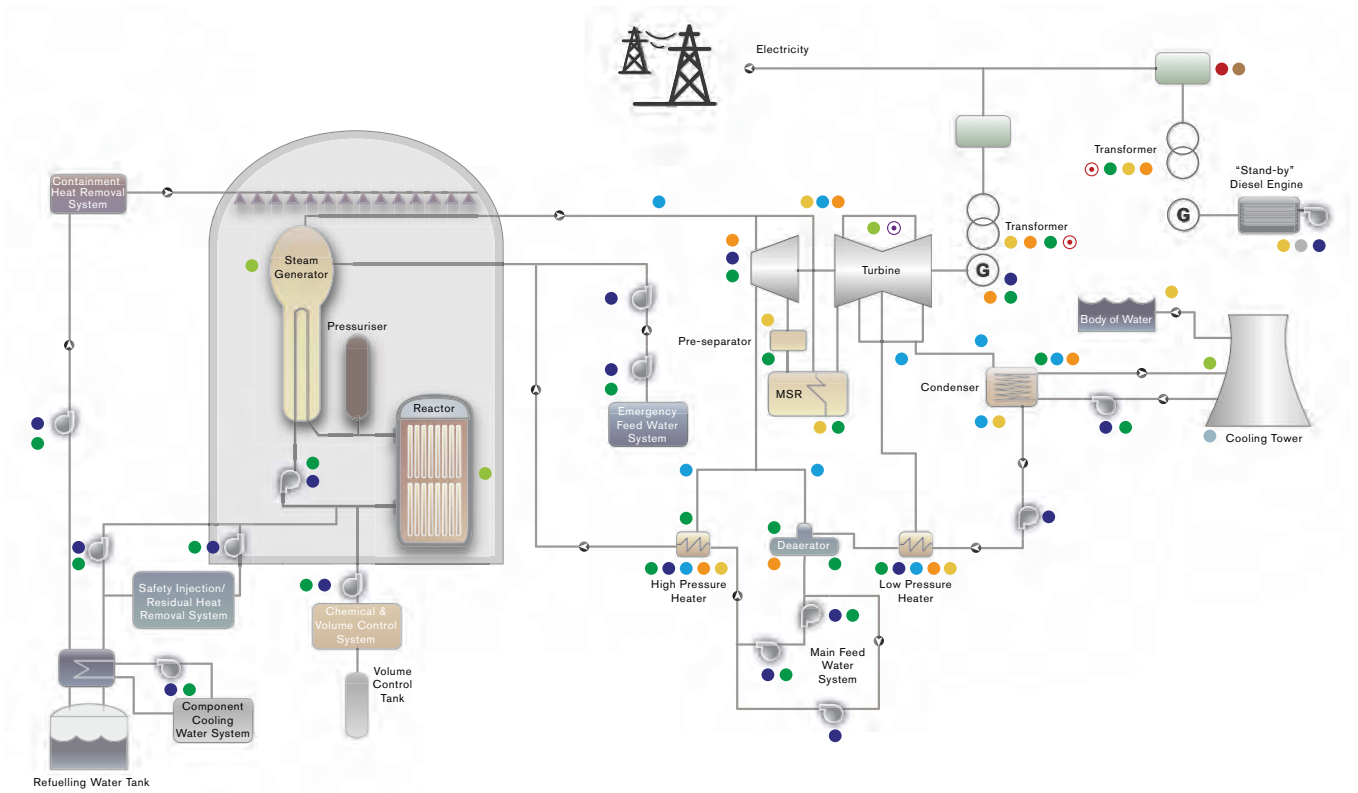


Dollinger

- Filtration



Nuclear Plant



As a global company, SPX manufactures critical components for the nuclear power industry, helping ensure high quality products with on-the-ground support around the world.



PUMPS

- Bran+Luebbe**
 - Process Pumps
 - Chemical Injection Systems
 - Plunger Pumps
 - Metering Pumps



- ClydeUnion Pumps**
 - Charging Pumps
 - Residual Heat Removal Pumps
 - Reactor Feedwater Pumps
 - Cooling Water Pumps
 - Safety Injection Pumps
 - Balance of Plant Pumps
 - Condensate Extraction Pumps



- Plenty Pumps**
 - Screw Pumps
 - Rotary Vane Pumps



- Johnson Pump**
 - Heavy-Duty Centrifugal Pumps
 - Internal Gear Pumps
 - Centrifugal Pumps
 - Positive Displacement Gear Pumps



COOLING TECHNOLOGIES

- Marley**
 - Cooling Towers
 - Fluid Coolers
 - Service and Repair



HEAT TRANSFER

- Balcke-Dürr / Ecolaire / Yuba**
 - Moisture Separator Reheater
 - Powersep
 - Feedwater Heaters
 - Turbine Condenser
 - Deaerators



ANALYZERS

- Bran+Luebbe**
 - Analyzers



OIL MIST ELIMINATORS

- Dollinger**
 - Filtration



TRANSFORMERS

- Waukesha**
 - Medium Power Transformers
 - Large Power Transformers



TEST CHAMBERS/OVENS

- Blue M / Gruenberg / Tenney**
 - Environmental Test Chambers
 - Multi-Purpose Drying Ovens



PLATE HEAT EXCHANGERS

- APV**
 - Plate Heat Exchangers



HYDRAULIC & PNEUMATIC TOOLS

- Bolting Systems**
 - Hydraulic Torque Wrenches and Stud Tensioners
 - System Operation Maintenance and Repair Tools



CONTROL VALVES

- Copes-Vulcan**
 - Control Valves



AIR/GAS DRYERS & PURIFIERS

- Hankison / Jemaco / Pneumatic Products**
 - Cooling Water Filters
 - Instrument Air Dryers
 - Hydrogen Coolant Purifiers

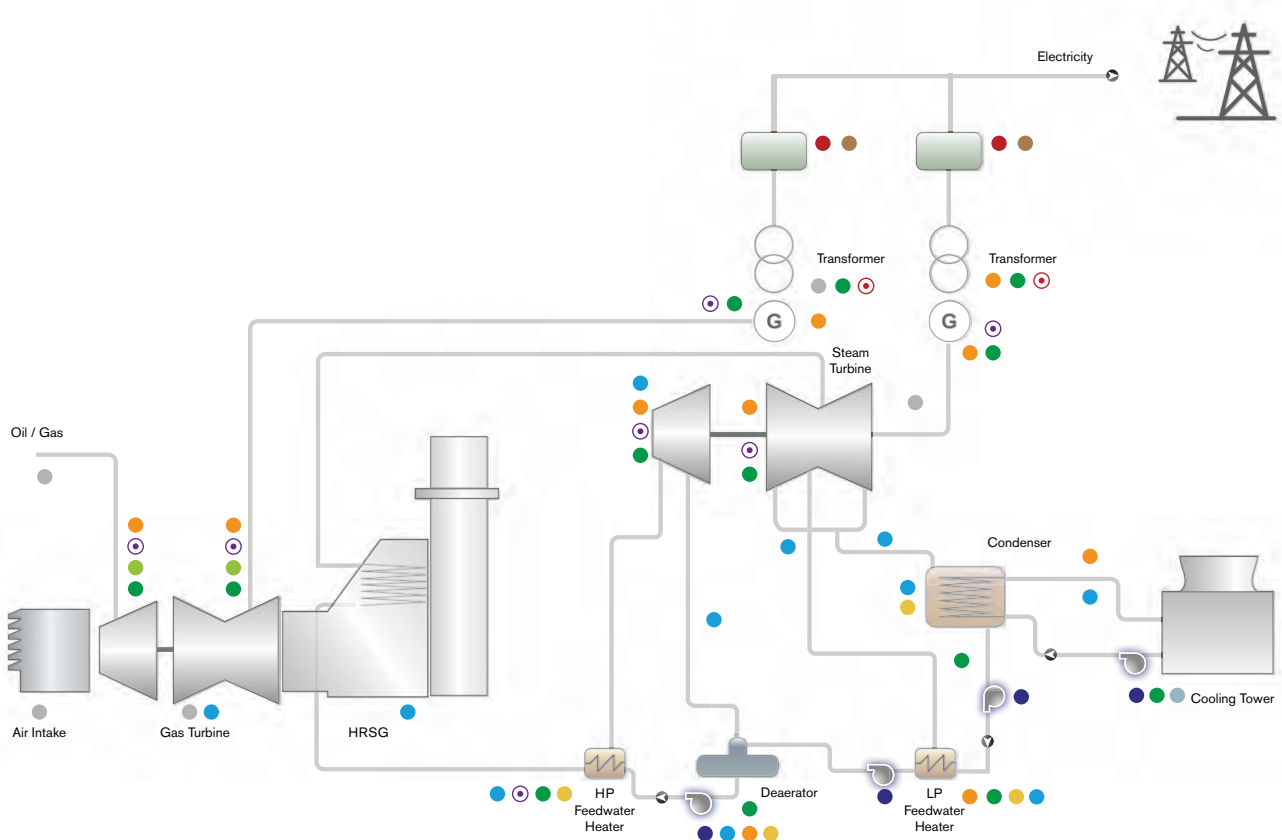


STRAINERS & FILTERS

- Dollinger / Plenty Filters**
 - Filters
 - Strainers
 - Insulating Oil Treatment



Combined Cycle Power Plant



For single and combined cycle gas turbines, SPX offers an extensive range of steam cycle cooling and control equipment.

SPX also offers an extensive range of water, gas, oil and air filters to protect the turbine and the environment.



PUMPS

- Bran+Luebbe**
 - Process Pumps
 - Chemical Injection Systems
 - Plunger Pumps
 - Metering Pumps



- ClydeUnion Pumps**
 - Boiler Feed and Boiler Feed Booster Pumps
 - Circulating Water and Auxiliary Pumps
 - Condensate Extraction Pumps
 - Cooling Water Pumps



- Plenty Pumps**
 - Screw Pumps
 - Rotary Vane Pumps



- Johnson Pump**
 - Heavy-Duty Centrifugal Pumps
 - Internal Gear Pumps
 - Centrifugal Pumps
 - Positive Displacement Gear Pumps



COOLING TECHNOLOGIES

- Marley / Dry Cooling**
 - Cooling Towers
 - Fluid Coolers
 - Air Cooled Condensers
 - Service and Repair



HEAT TRANSFER

- Balcke-Dürr / Ecolaire / Yuba**
 - Heat Exchangers
 - Air Pollution Control
 - Service and Repair



ANALYZERS

- Bran+Luebbe**
 - Analyzers



PLATE HEAT EXCHANGERS

- APV**
 - Plate Heat Exchangers



TRANSFORMERS

- Waukesha**
 - Medium Power Transformers
 - Large Power Transformers



TEST CHAMBERS/OVENS

- Blue M / Gruenberg / Tenney**
 - Environmental Test Chambers
 - Multi-purpose Drying Ovens



HYDRAULIC & PNEUMATIC TOOLS

- Power Team**
 - System Installation Tools
 - System Operation Maintenance and Repair Tools



CONTROL VALVES

- Copes-Vulcan**
 - Control Valves



AIR/GAS DRYERS & PURIFIERS

- Hankison / Jemaco / Pneumatic Products**
 - Cooling Water Filters
 - Instrument Air Dryers
 - Hydrogen Coolant Purifiers



STRAINERS & FILTERS

- Dollinger / Plenty Filters**
 - Filters
 - Strainers
 - Insulating Oil Treatment

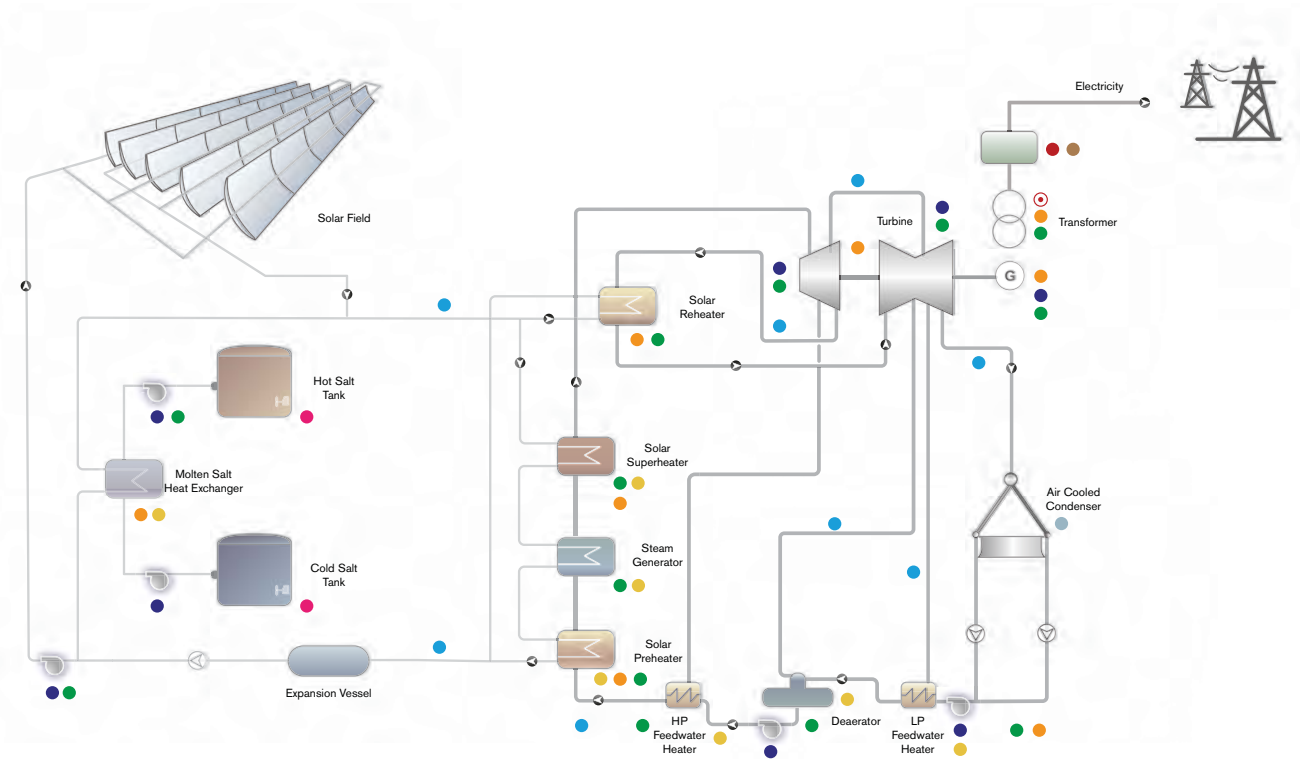


OIL MIST ELIMINATORS - AIR/GAS FILTERS

- Dollinger**
 - Filtration
 - Fuel Gas Filters / Air Filters
 - Turbine Lubricating Oil Mist Eliminators



Solar Power Plant



SPX has the execution, experience and expertise to harness the power of the sun. From steam generators to air cooled condensers, from steam control valves to molten salt mixers, our engineering teams can design and install the components you need for a successful solar thermal project.



PUMPS

- **Bran+Luebbe**
 - Process Pumps
 - Chemical Injection Systems
 - Plunger Pumps
 - Metering Pumps



- **ClydeUnion Pumps**
 - Boiler Feed Pumps
 - Cooling Water Pumps
 - Condensate Extraction Pumps
 - Heat Transfer Pumps
 - Auxiliary Pump Services



- **Plenty Pumps**
 - Screw Pumps
 - Rotary Vane Pumps
 - Lubrication Pumps



- **Johnson Pump**
 - Heavy-duty Centrifugal Pumps
 - Internal Gear Pumps
 - Centrifugal Pumps
 - Positive Displacement Gear Pumps



MIXERS

- **Lightnin**
 - Top-Entry Mixers
 - Vertical Side-Entry Mixers



COOLING TECHNOLOGIES

- **Marley / Dry Cooling**
 - Cooling Towers
 - Air-Cooled Condensers
 - Service and Repair



HEAT TRANSFER

- **Balcke-Dürr / Ecolaire / Yuba**
 - Heat Exchangers
 - Steam Generators
 - Deaerators



TRANSFORMERS

- **Waukesha**
 - Medium Power Transformers
 - Large Power Transformers



TEST CHAMBERS / DRYING OVENS

- **Blue M / Gruenberg / Tenney**
 - Environmental Test Chambers
 - Multi-purpose Drying Ovens



PLATE HEAT EXCHANGERS

- **APV**
 - Plate Heat Exchangers



HYDRAULIC & PNEUMATIC TOOLS

- **System Installation Tools**
- **System Operation Maintenance and Repair Tools**



CONTROL VALVES

- **Copes-Vulcan**
 - Control Valves



AIR FILTERS

- **Hankison / Jemaco / Pneumatic Products**
 - Air Filters



STRAINERS & FILTERS

- **Dollinger / Plenty Filters**
 - Filters
 - Strainers
 - Insulating Oil Treatment



› Dry Cooling

Air-Cooled Condensers

Dry Cooling

A-FRAME AIR-COOLED CONDENSERS

A very popular style of air-cooled condenser (ACC) is the modularized A-frame design, used on power plants of all sizes.

The integral features are:

- Long-term mechanical and thermal integrity
- Corrosion and freeze resistant



Air-cooled Condenser
China



Air-cooled Condenser
USA



Air-cooled Condenser
China



Air-cooled Condenser
Bahrain



Air-cooled Condenser
Spain

PROJECT REFERENCES

Our dry-cooling equipment is installed around the world for a wide range of environmental conditions: coastal and desert climates, remote industrial and urban locations and in temperate and freezing climates. We maintain standards of excellence in power generation and industrial markets and have installations in some of the most critical power plants in the world.

HEXACOOOL® AIR-COOLED CONDENSER

Hexacool is an air-cooled condenser (ACC), well suited for use in smaller waste-to-energy, biomass and small-size electrical power plants and industrial cogeneration.

The integral features are:

- Simplified installation procedure with a degree of prefabrication in workshop
- Simplified piping and ducting routing layout
- Easy access for cleaning and maintenance

INDIRECT DRY COOLING

Indirect dry cooling, couples a dry cooling tower with a steam surface condenser.

This type of system is particularly well suited for large power plants.

The integral features are:

- No fan power consumption (small power consumption in water loop circulation pump)
- A separated loop for steam and cooling water to avoid contamination or high water treatment requirements
- Corrosion protection

PROJECT REFERENCES



A-frame Air-cooled Condenser
Canada



A-frame Air-cooled Condenser
Belgium



Hexacool Air-cooled Condenser
Germany



Indirect Dry Cooling
South Africa

PROJECT REFERENCES



Natural Draft Cooling Tower
Germany



Counterflow Cooling Tower
Mexico



Crossflow Cooling Tower
USA



MH Fluid Cooler
China

Cooling Towers - Fluid Coolers

Evaporative Cooling

NATURAL DRAFT COOLING TOWER

- Concrete natural draft counterflow tower in varying sizes and configurations
- Efficient and reliable, most commonly used in power generation

COUNTERFLOW FIELD-ERECTED COOLING TOWER

- Desired for versatility, efficiency and quality for power and industrial facilities
- Customized to meet customers' exact specifications for performance, structure, drift and noise level
- Available in pultruded structural fiberglass, wood or concrete

CROSSFLOW FIELD-ERECTED COOLING TOWER

- Splash-fill cooling towers proven in hundreds of installations over the last 40 years
- Our most versatile tower, with a variety of fill options for heavy industrial use
- Available in pultruded structural fiberglass, wood or concrete, for unsurpassed quality and reliability

MH FLUID COOLER

- Protects process fluids from contamination
- Provides reliable, efficient year-round operation



Counterflow Cooling Tower
Australia



Counterflow Cooling Tower
Philippines



Counterflow Cooling Tower
USA

PROJECT REFERENCES



Counterflow Cooling Tower
Spain



Forced Draft Cooling Tower
Saudi Arabia



Counterflow Cooling Tower
USA

Aftermarket Services -



Extend

EXTEND™

- A premier cooling tower maintenance, parts, and service plan in North America
- Programs can be customized based on specific needs for maintenance and service
- Experienced Marley cooling tower technicians perform the work



Recon

RECON

- Highly scalable construction crews that specialize in tower reconstruction and repair get towers up and running quickly
- Capability to complete complicated scopes, critical or high risk environments, and online project execution



Safety

SAFETY

- A world-class safety process customers can count on reducing recordable incidents and meeting installation regulatory requirements
- Extensive qualifications and affiliations are proof of the credibility of our processes



Parts

PARTS

- Excellent availability of parts with over half of the stocked parts (SKUs) available for same-day shipment
- Extensive rep network for one-stop, quick turnaround of Marley parts orders
- Quality Marley parts
- With the Geareducer Solutions program, not only can a new replacement gearbox be ordered, but now, a factory-trained technician can repair the existing gearbox or rebuild a gearbox to keep your cooling tower running

Heat Exchangers - Industrial Air Filters

Nuclear

POWERSEP®

In new or existing nuclear power plants, the POWERSEP high-velocity separator can be utilized to extend component service life and increase the electrical output. It is located in the cross-under piping (cold reheat line) in front of the moisture separator reheater (MSR) and serves as an additional preseparator.

- Efficient moisture separation
- Simple, compact and robust design
- Easy to retrofit
- Very short pay-back period
- Long-term references available
- Developed, designed and manufactured by SPX

MOISTURE SEPARATOR REHEATER (MSR)

- In nuclear power plants, MSR are key components in the steam cycle. MSRs increase the overall efficiency and protect low-pressure turbines from damage.
- Manufacturer for the first EPR (European Pressurized Water Reactor)
- MSR technology based on decades of experience
- Proven designs for vertical and horizontal MSR configurations
- Fine separators (Powervane® Module) and reheater bundles

› **Balcke-Dürr®**
Ecolaire*
Yuba*

** An SPX Heat Transfer Inc. brand*

PROJECT REFERENCES



2 x 500 MW ESP Project
Korea



2 x 800 MW Air Preheater and ESP Project
Germany



POWERSEP high-viscosity separator



Moisture Separator Reheater (MSR)



600 MW Air Preheater Project
Germany

Heat Exchangers - Industrial Air Filters

Heat Exchangers

GAS GAS HEATER (GGH) ROTOR SYSTEM

- Decades of experience in engineering, manufacturing and service
- Various profiles of heating elements characterized by high heat transfer rate, low flow resistance and low maintenance requirement
- Custom designed double sealing system with massive seal plates, readjustable during operation, highly efficient and durable
- Enamelled heating element for corrosion resistance
- Custom designed center column support
- Swivel-type soot blower for high-pressure and low-pressure cleaning in a space-saving design

AIR PREHEATER (ROTOR TYPE)

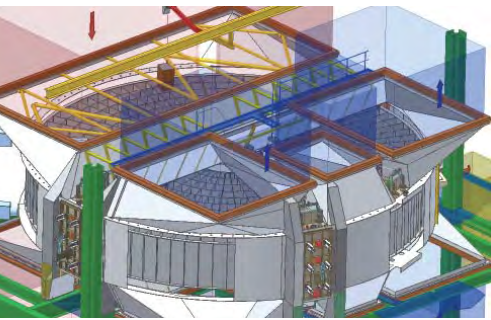
- More than 70 years of experience in engineering, manufacturing and service, with project reference that include the installation of one of the world's largest air preheaters
- Compact rotary heat exchanger for utility, captive power plant and industrial applications
- Custom-designed sealing systems
- Capability of re-engineering and modernizing rotary air heater for fuel saving and CO₂ reduction for power plant upgrades

HEATING ELEMENTS

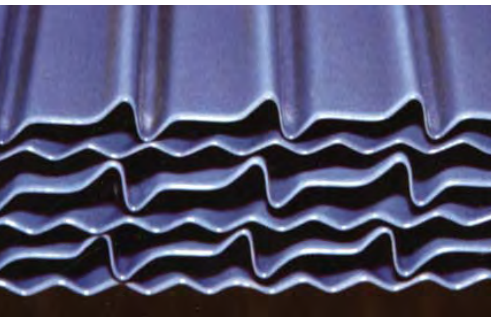
- Custom designed
- Low plugging tendency and low pressure resistance
- High heat transfer rate
- Easy-to-clean surface
- Resistant to corrosion, filth and erosion
- Patented enameling process for long lifetime under severe industrial conditions
- Temperature-shock resistance
- Basket arrangement for fast and easy replacement
- Adjustable plate thickness to withstand flue gas erosion



Gas Gas Heater



Air Preheater



Heating Elements

FEEDWATER HEATER

- A global supplier with a wide range of feedwater heaters
- Over 90 years of experience in engineering, manufacturing and service
- More than 1,200 references for header-type high-pressure heaters
- Custom-designed constructions such as U-tube or straight-tube duplex heaters

DEAERATOR

- Essential for removing gases in steam power plants, where excessive dissolved gases from the feedwater heating circuit cause boiler corrosion problems
- Specializing in nuclear and conventional large-scale power plants
- Tray-type or spray-type deaerators in combination with heaters
- Proprietary sprayer design

TURBINE CONDENSER

- More than 100 years of experience in engineering and manufacturing
- Increase output in existing power plants through rebundling
- Capable of system optimization for power plant upgrades

Industrial Filters

ELECTROSTATIC PRECIPITATOR (ESP) AND BAGHOUSES

- Compact design utilizing large plate spacing
- Bi-Corona® technology available to meet fine-particle requirements
- New twin valve cleaning system for optimum cleaning efficiency of filter bags
- AESM (Advanced Energy Saving Management) technology for controlled cleaning pressure



Feedwater Heater



Deaerator / Feedwater Tank



Turbine Condenser



Bi-Corona® Electrostatic Precipitator

Plate Heat Exchangers

PROJECT REFERENCES



PHE for Central Cooling
China



Lube Oil Cooler
China



Hybrid PHE
China

KNOWLEDGE

SPX offers an extensive portfolio of plate heat exchanger solutions for heat transfer applications in the power industry that historically were served by shell-and-tube technology. The range of APV plate heat exchangers is widely used in conventional and nuclear power stations, peak load stations, combined heat and power stations, geothermal schemes, and district heating.

APV plate heat exchanger solutions have proven reliable and efficient, helping customers to run their processes safely and effectively and meeting the need for energy conservation. Whether recovering waste heat or isolating the cooling system from the cooling source SPX has the application knowledge and product solutions to provide efficiency and performance.

APPLICATIONS

APV plate heat exchangers are used in several different applications ranging from cooling and heating to condensing and evaporating. Within power generation and district heating APV plate heat exchangers play an important role in for example:

- Central (closed loop) cooling
- Generator cooling
- Lubricating oil cooling
- Water pre-heating
- Condensate cooling/heating
- Auxiliary cooling systems (emergency cooling)

Plate Heat Exchangers

GASKETED PLATE HEAT EXCHANGERS

A wide range of gasketed plate heat exchangers suited for a large variety of cooling and heating duties, liquid as well as gaseous, and high-capacity utility cooling solutions. The optimized plate design maximizes energy use and cost effectiveness thanks to maximum heat recovery effect.

- Easy operation and maintenance – easy gasket mounting and plate alignment systems help reduce service downtime



Sirius S380 Plate Heat Exchanger

HYBRID FULLY-WELDED PLATE HEAT EXCHANGER

A range of welded plate heat exchangers combining highly efficient plates and a strong vessel construction. Designed to operate under challenging conditions where other heat exchangers may be restricted due to temperature and pressure limitations; allowing extremely low pressure drop if required. With its compact and flexible design the APV hybrid heat exchanger offers efficiency in a small installed footprint. The latest TuplaFlow plate design provides excellent conditions for steam condensing allowing high heat transfer coefficient at low pressure drop and fast condensate removal.

- Standard and custom-made solutions available



Hybrid Welded Plate Heat Exchanger



Valves



Variable Orifice Desuperheater



Control Valve



Pneumatic Diaphragm Actuator



Desuperheater

SPX develops solutions for applications found in the general industrial, oil and gas, power generation and pulp and paper industries. Valve products include globe, control, gate, butterfly, ball and surge relief valves.

Control and Isolation Valves

SPX provides a wide range of valves for the control of pressure, temperature and flow-induced noise in all types of power plants. Products include severe service and general service control valves, variable orifice desuperheaters, Raven™ trim and steam-conditioning valves and nuclear control valves, as well as custom-designed specialty valves.

THESE PROJECTS FEATURE

- Multiple types of body and bonnet styles
- Sizes from 1.9 cm (0.75") to 61 cm (24")
- Pressure class: 150 - 4500
- Available in carbon steel, chrome-moly, stainless steel and forged equivalents
- Certified to ISO 9001, ASME Sections I and III and Pressure Equipment Directives (PED 97/23/EC)

SPX has engineered and manufactured valves for the nuclear industry for over 40 years under the Copes-Vulcan® brand.

Nuclear Control Valves

SPX has engineered and manufactured valves for the nuclear industry for over 40 years under the Copes-Vulcan® brand. Products include globe, gate, swing, check, butterfly, ball and sampling valves for nuclear customers, and are all ASME Section II "N" and "NPT" Stamp certified.

NUCLEAR APPLICATIONS INCLUDE

- Feedwater
- Steam dump
- Pressurizer spray
- Reactor coolant
- Sampling
- Service water
- Safety injection
- Power-operated relief

COPE-S-VULCAN VALVES FOR

- Boiling water reactor (BWR)
- Heavy water reactor (CANDU)
- Pressurized water reactor (PWR)

Global Supplier

SPX has supplied valves to Japan, China, South Korea, the United States, Canada, Mexico, Switzerland, United Kingdom, Brazil and more.

PROJECT REFERENCES



Gaozi Power Plant
China



Taishan Power Plant
China



Butterfly Valve



Ball Valve



Globe Valve



Globe Valve



Swing Check Valve



Gate Valve

➤ **Bran+
Luebbe®**

➤ **Johnson
Pump®**

➤ **Plenty®**



Twinro Bunkering Pump



Tiro Low-pressure Pump



Vane Pump



Novaplex Process Pump

Pumps - Chemical Injection

Pumps

SPX provides a wide range of pumps for transporting and metering liquids in power plants. Pumps include: Diaphragm, Plunger, Screw, Vane, Heavy-Duty Centrifugal and Internal Gear.

LIQUIDS HANDLED

- Toxic or chemically aggressive liquids
- High- and low-viscosity liquids
- Long service life of diaphragm in pumps with remote alarm to signal failure

BENEFITS

- High volumetric efficiency
- Low vibration, low noise
- High reliability, long lifetime
- Low running cost, easy maintenance
- Custom designs

PUMP TYPES

- Diaphragm pumps
- Plunger pumps
- Screw pumps
- Vane pumps
- Heavy-duty centrifugal pumps
- Internal gear pumps
- Metering pumps

Chemical Injection Systems

SPX provides turnkey metered blending systems for the treatment of boiler feedwater in all types of power plants.

ADVANTAGES

- Cost savings by automatically adjusting treatment based on water analysis
- Safety and protection against hazardous chemicals for operators and surroundings
- Remote operation with automatic stroke control of pumps
- Long service life of diaphragm pumps with remote alarm for failure
- Can add heads for future injection points
- Can add variable-speed motor or stroke control for automatic injection in proportion to the main flow

Measuring Instruments

SPX provides on-line measurement for the continuous supervision of silica, sodium, phosphate, chloride, hydrazine or hardness concentration in boiler feedwater or during water treatment.

ADVANTAGES

- Cost savings by monitoring the important water parameters continuously
- Fully automatic operation with remote maintenance and network ability
- CAN bus, Profibus and Modbus connectivity
- Minimum operating cost due to long maintenance intervals and small reagent consumption
- Connection of up to 100 external physical-measurement sensors pH, conductivity and a.s.o.
- Easy to read interface with interactive touchscreen operation



Chemical Injection System



PowerMon On-line Analyzer

PROJECT REFERENCES



Qinshan Project
China



Ling Ao Project
China

> ClydeUnion Pumps



Boiler Feed Pump



Turbine Driven Auxiliary Feedwater Pump or RCIC Pump



Low Head Safety Injection Pump



Concrete Volute Cooling Water Pump

Pumps

KNOWLEDGE

The two main companies that form ClydeUnion Pumps both have a rich heritage and proven track record. Clyde Pumps was formed in May 2007 when the Weir Pumps business was acquired from the Weir Group plc, but its roots go back to 1871 when G. & J. Weir was founded. Union Pump has an equally proven pedigree and had been manufacturing advanced pumps since its inception in 1885 in Michigan, USA. Today ClydeUnion Pumps is part of SPX Flow Technology and is structured into customer focused business units. Our business units are at the heart of everything we do and provide expertise across the oil and gas, power generation and industrial sectors. In addition, our truly global aftermarket capability helps our customers optimize their processes.

APPLICATIONS

- Boiler Feed Water
- Reactor Feed Water
- Reactor Core Isolation Cooling
- Cooling Water
- Condensate Extraction
- Reactor Coolant
- Auxiliary Feed Water
- Safety Injection
- Residual Heat Removal
- Charging
- Auxiliary Services

TECHNOLOGY

At ClydeUnion Pumps we understand the specialized needs of the nuclear and conventional power sectors. We draw on over 100 years of pump experience to provide pumps for the most demanding duties in the conventional power industry. With facilities across the globe, three of which are fully nuclear qualified, with ASME "N Stamp" and/or RCC-M qualifications, as well as experienced local partners in China, India and Brazil we are a major global supplier of pumps for power generation. ClydeUnion Pumps boasts over 50 years of experience in providing coded, safety related and balance of plant pumps for all nuclear reactor types.

SERVICE

ClydeUnion Pumps provides world class aftermarket support for all types of pump brands via our worldwide network of manufacturing facilities, service centers and approved service providers. Our experienced aftermarket personnel provide round the clock support to all industry sectors and focus on ensuring availability, safety and life extension of pumping technologies.

Pumps for Nuclear Applications

ClydeUnion Pumps involvement in the nuclear power market began with the first ever industrial scale nuclear power plant. Since then we have been central to most major nuclear power programs globally. Our ability to design a reliable solution for the specific needs of the overall nuclear plant, allied to our comprehensive service provision means ClydeUnion Pumps has nuclear pump installations in many operational nuclear power plants worldwide across many technologies. In addition to our involvement in the commercial nuclear power market we continue to provide pumping solutions to the world's naval nuclear fleets, research reactors and other nuclear facilities. Our market focused research and development programs ensure that our solutions match the demanding requirements of current and future technologies, such as generation IV, fusion and small modular reactors.

NUCLEAR ISLAND

While many pump manufacturers have been unable to acquire or maintain the high standards required to design and build nuclear coded pumps, ClydeUnion Pumps has three coded facilities with a long history of excellence in the design and manufacture of Class 1, 2 and 3 equipment. In addition we have a global aftermarket organization that is able to offer full service and upgrade capabilities.

The systems served by ClydeUnion Pumps include:

- Auxiliary Feedwater (Motor Driven & Turbine Driven)
- Reactor Core Isolation Cooling
- Safety Injection
- Containment Spray
- Residual Heat Removal
- Charging
- Component Cooling Water
- Essential Service Water
- Auxiliary Services
- Reactor Coolant

BALANCE OF PLANT AND TURBINE ISLAND

- Main Feedwater
- Start-up Feedwater
- Cooling Water
- Condensate Extraction
- Auxiliary Services



Charging Pump



Residual Heat Removal Pump



Reactor Feedwater Pump

Pumps for Coal Fired Applications

Coal fired power stations rely on pumps at several key points in the process, including the delivery of deaerated water into the boiler, the circulation of water and the extraction of condensates. ClydeUnion Pumps, an SPX Brand, recognizes the inherent customizable nature of large scale thermal power stations and works with our clients using a tailored approach to ensure that our pumps offer maximum through-life reliability and seamless start-up and commissioning.



Boiler Feed Pump

CUP-FK PUMP RANGE

Our CUP-FK range of high pressure pumps is a preferred choice for boiler feed applications. Featuring a barrel-type design with full cartridge withdrawal for fast and easy maintenance without any need to disturb alignment or pipework, it is capable of delivering up to 2,500 m³/h (11,000 gpm) at a head of 5,000 m (16,400 ft), at water temperatures of up to 250°C (482°F).

Pumps for Combined Cycle Applications

The development of effective single-pressure heat recovery steam generators introduces an additional pumping system with its own very demanding parameters. In addition to providing the absolute reliability required throughout the power generation industry, these systems must be capable of meeting wide variations in operating conditions, and must be able to deal with starting and stopping at peak loading multiple times a year without impairing efficiency or long-term dependability.



Boiler Feed Pump

CUP-FT PUMP RANGE

The ClydeUnion CUP-FT range of ring section type pumps meet the requirements of boiler feed applications in combined cycle plants. Ring sections are clamped together using high-strength tie bolts that remove any risk of pressure loss even during thermal shock arising from rapid temperature change. Highly polished flow areas optimize efficiency between stages. The CUP-FT range is capable of withstanding suction transients, and combines the reliability of barrel casing design with the lower cost of ring-section technology.



Condensate Extraction Pump

ClydeUnion Pumps offers many other pumps suitable for thermal and combined cycle applications, including boiler feed booster pumps, a choice of concrete volute and vertical turbine pumps for circulating and cooling water, pumps for extracting and transferring condensates, vertical turbine circulating water pumps and auxiliary pumps.

Pumps for Concentrated Solar Power

From boiler feed pumps, which deliver water to the boilers that subsequently drive the main generating turbines, to heat transfer pumps which transport fluids around the solar field, pumps are mission critical to the operation of a concentrated solar plant. Concentrated solar power plants operate on a daily cycle of generating during daylight and shutting down at night. In reality, the start-stop cycle is often far more frequent since factors such as weather can have an enormous impact, and the plant is only started when a worthwhile net gain is expected. This places a severe burden on the pumping equipment used to manage the steam cycle and perform ancillary duties.

CUP-FT/FK and CUP-BB3

ClydeUnion Pumps can provide pumps for the key applications in a concentrated solar power station, including boiler feed, cooling water, condensate extraction and heat transfer pumps. Boiler feed pumps are one of the most critical pieces of equipment in a concentrated solar power plant. They deliver the boiler feed water which is heated by solar energy to form steam driving the plants main generating turbines. ClydeUnion Pumps can provide boiler feed applications on solar power projects from our extensive range of multi-stage dual volute and double case diffuser pumps.

- Designed with a higher head per stage capability than industry standards, meaning that fewer stages are needed, resulting in improved shaft deflection characteristics of the pumps
- These pumps have an inherent advantage in the demanding regime of stop-start operation in a concentrated solar plant

Pumps for Geothermal Power

Geothermal power plants draw on the extremely high temperatures deep within the earth to generate electricity. All types of geothermal technology, dry steam, flash steam, binary power and hot dry rock require specialist pumps which are designed to handle the extreme pressures and temperatures of the geothermal process as well as cope with the presence of impurities and hazards such as minerals and corrosive salts. ClydeUnion Pumps can provide a choice of pumps designed for the arduous conditions of a geothermal plant. These include hot well pumps for transferring fluid out of the ground, condensing pumps for drawing water from the condenser, vacuum pumps for non-condensable geothermal fluids, circulation pumps for moving the condensate through the system, and injection pumps for transferring the fluid back into the geothermal chamber.

HYDRAULIC SUBMERSIBLE PUMP RANGE

ClydeUnion Pumps' Hydraulic Submersible Pump (HSP) is particularly suited for high temperature enhanced geothermal applications enabling higher energy outputs than conventional lower depth wells. The HSP is turbine driven, requiring no electricity supply, and can withstand extreme temperatures.



Heat Transfer Pump



Heat Transfer Pump



Boiler Feed Pump



Hydraulic Submersible Pump

› **Dollinger®**

› **Plenty®**



Filter Basket



T-type Strainer



Back Flush Filter



STREAM-LINE™

Strainers - Filters

SPX manufactures filters, products and systems to remove moisture and contaminants from air, gas, fuel, lubricating oil and insulating fluids.

Strainers and Filters

SPX offers a range of industrial filtration solutions for multiple process industries worldwide. Products include simplex and duplex cast and fabricated strainers, self-cleaning and back-flushing strainers, high-pressure gas filters and fabricated bathtub strainers. These products provide protection for pumps, plate heat exchangers, lube oil, bearing cooling and bearing lubrication.

THE FILTERS' DESIGN FEATURES INCLUDE:

- A wide variety of materials and design codes
- Standard designs available for a variety of process applications
- Custom designs to meet customers' specific operating conditions and parameters
- Easy maintenance to ensure continuous operations
- Fine mesh inserts capable of nominal filtration of liquids and gas

Insulating Fluid Treatment

SPX STREAM-LINE™ is a high-efficiency insulating fluid treatment system that returns the fluid to a high level of dielectric strength.

- Removes fibers, rust, carbon particles as well as dissolved gases
- Significantly reduces free and dissolved water

Air Intakes and Filters

SPX manufactures a wide range of both static and self-cleaning air intake filter systems in gas turbine and turbo compressor applications. We have a full team of engineers dedicated to detail designing and project planning the major constructional components of the air intake and ventilation systems.

Custom designed systems utilizing panel filters in accordance with ASHRAE™ specifications and pulsejet cartridges complying with ARAMCO™ standards insure our customers are being provided the optimum solutions for their most hostile of environments.



Fuel Gas Filter

Fuel Oil, Fuel Gas and Lubricating Oil Filters

Well known for high performance and quality, many of our gas and oil filters are specified as standard on original equipment by gas turbine, diesel and gas engine manufacturers for use in power plants around the world. We can deliver full skids containing a complete filtration package which has been designed to meet the needs of the power plant and the incoming fuel supply from natural gas to diesel oil.

- Simple to service
- Disposable filter cartridge
- Suitable for engine or floor mounting
- Duplex units with transflow changeover valve available



Fuel and Lubricating Oil Filters

Lubricating Oil Mist Eliminators

Oil mist eliminators are designed to extract oil mist droplets from the atmospheric vent and return them to the lubricating oil system, addressing health, safety and environmental concerns.

These highly efficient filters ensure enhancements of critical components surrounding the gas and steam turbines, as well as protecting the environment from dirty and harmful oil mist. Our Oil Mist Eliminators are easily retrofitted onto existing gas or steam turbines and are also designed specifically for diesel engines with an Auto Pressure Balance (APB) control system.



Lubricating Oil Mist Eliminators

Mixers



Top-Entry Mixers



VSF Side-Entry Mixers



High-efficiency Impellers

With over 85 years experience in mixing technology, process knowledge and technological innovation, the SPX Lightnin® brand manufactures durable, long-lasting mixers, agitators, aerators and flocculators for fluid processing systems, FGD applications and molten salt mixing globally.

TOP-ENTRY MIXERS

There are three types of top entry mixers for the power industry. They are built to handle the severe duty of solids suspension and re-suspension, blending and gas dispersion.

- Series 10 — smaller vessels, sumps, solids suspension and re-suspension
- 70/80 Series — FGD process mixers (limestone, gypsum slurries)
- 700/800 Series — large storage tanks and absorber agitators

VSF SIDE-ENTRY MIXERS

Side-entry mixers specially designed for flue gas desulphurization (FGD), the pollution control system in power plants.

- Mechanical seal designed to function in a harsh FGD environment. Engineered to operate with no outside flush liquid
- Seal shutoff to provide maintenance on unit while absorber is in operation
- A-312 hydrofoil produces more flow per unit of power than a traditional propeller. This enhances solid suspension, gas dispersion and blending.

HIGH-EFFICIENCY IMPELLERS

- Hydrofoil impellers for top and side-entry applications
- Delivers operating cost savings while maintaining performance
- Reduces required capital cost for desired performance

SX IMPELLER

SPX offers a corrosive-resistant resin system that incorporates high-efficiency operation. For use in corrosive slurries, the SX system provides a robust and effective design that reduces the possibility of lining failure. The SX system is:

- More efficient than traditional metal impellers
- Inherently corrosion resistant (Derakane® 470 resin)
- Less weight for easier installation

Air and Gas Dryers

INSTRUMENT AIR DRYERS

SPX provides compressed-air dryers and filters that remove oil, water, dirt, rust and pipe scale. Contaminants found in compressed air can adversely affect all components of an air-distribution system, and can cause a malfunction of pneumatic control in the instrument air system. Properly treated compressed air can improve work efficiency and reduces maintenance. Desiccant and refrigerated type compressed air dryers are used in the control air systems of power plants.

Desiccant air dryers incorporate these quality features:

- Lowers water vapor content in compressed air
- High quality process switching valves deliver consistent repeatability to ensure system integrity and long component life cycles
- Precision timing circuits control process valve sequencing protocols to deliver optimum dew point stability and energy efficiency
- Calculated desiccant bed construction ensures ideal tower velocities to absorb moisture, stabilize dew points and prevent bed movement

The benefit of utilizing a refrigerated air dryer include:

- Lowers water vapor in the compressed air
- Modular design allows ease of installation and add-on capability
- Redundancy in critical components provides fault-tolerant operation
- Integral filtration removes solid and oil delivering clean, dry air to pneumatic controls

HYDROGEN COOLANT PURIFIERS (HCP)

The HCP is a self-contained system that dries and purifies hydrogen gas used as a coolant in electrical power plant generators. It removes water, oil and other contaminants that cause corrosion and cracking in retaining and zone rings, and reduces lead carbonate formation, increased windage losses and other potentially catastrophic consequences.

- Activated carbon bed
- DE-32 molecular sieve desiccant dryer
- Helps enhance generator output
- Removes hydrocarbons and water vapor
- High-efficiency hydrogen gas heavy-duty magnetic-drive blower

PROJECT REFERENCES



Sidi Krir and El Attf Combined Cycle Power Plant
Egypt



Daharki Combined Cycle Power Plant
Pakistan



Glow 115 MW CFB3 Project
Thailand

➤ **Hankison®**

➤ **Jemaco**

➤ **Pneumatic Products®**



Refrigerated Air Dryer; Desiccant Air Dryer



Hydrogen Coolant Purifier

Hydraulic and Pneumatic Tools



Hydraulic and pneumatic family of products

SPX is a global supplier of high-force, high-performance hydraulic and pneumatic products and systems.

High Force Hydraulic Tools and Equipment

SPX is a global leader providing professional hydraulic tools and equipment to global customers in the power industries, such as wind power, nuclear power and coal-fired power. Marketed under the Power Team® brand, the product range includes high-quality hydraulic tools, such as cylinders, pumps, and pullers that are used to install and maintain power systems.

HYDRAULIC CYLINDERS

- General and special-use cylinders

HYDRAULIC PUMPS

- Manual pumps
- Powered pumps

HYDRAULIC TOOLS

- Hydraulic presses
- Flange spreaders
- Nut splitters
- Bearing pushers/pullers
- Post-tensioning jacks

RUGGED PULLERS

- Mechanical
- Hydraulic

WIDE RANGE OF JACKS

- Post tensioning
- Portable high-tonnage
- Inflatable
- Bottle
- Toe
- Sidewinder

MAIN APPLICATIONS IN POWER INDUSTRIES

- Steam turbine installation and deviation correction
- Open and installation of steam turbine cover
- Disassembly of corrosion or thread-damaged bolts in pipe flanges and fans
- Bearing disassembly in high-power generating sets
- Bolting applications with high-torque requirements
- Lifting of huge coal pulverizer
- Heavy equipment installation and maintenance
- Wind-power tower installation and maintenance

Hydraulic Bolting Systems

Bolting Systems is the SPX product line of controlled bolting solutions, and provides numerous products and services for the power generation industry. Included are square drive and low clearance hydraulic torque wrenches, topside self-returning stud tensioners, subsea stud tensioners, nut splitters, flange management database software, system rentals and accredited training programs. These bolting solutions are designed for use in a variety of construction, operations and maintenance applications within power generation facilities, as well as oil and gas facilities.

HYDRAULIC TORQUE WRENCHES

- Square drive and low clearance
- Low-weight, high-strength steel construction
- Fine-tooth ratchet
- Floating piston design

HYDRAULIC STUD TENSIONERS

- Topside
- Subsea

HYDRAULIC PUMPS

- 700 Bar / 10,000 psi torque wrench pumps
- 1,500 Bar / 21,500 psi tensioner pumps

JOINT MONITORING AND BOLT LOAD CALCULATION SOFTWARE

- Advisor controlled bolting load calculator
- Controller joint integrity software

MAIN APPLICATIONS IN POWER INDUSTRIES

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- Disassembly of corrosion or thread-damaged bolts in pipe flanges and fans
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- Wind-power tower installation and maintenance



Hydraulic bolting systems family of products



Vacuum Oven



Tenney Environmental Room



High-Low Temperature Thermal and Humidity Test Chamber (TC)



Multi-purpose Drying Oven (TDG)

Test Chambers and Ovens

SPX develops and manufactures microprocessor-based, controlled-temperature laboratory ovens and furnaces and thermal product and test solution equipment to simulate or condition environments.

Environmental Test Chamber

SPX designs and manufactures environmental chambers, ovens and thermal products for testing, validating or storing customer samples under a variety of climatic conditions. Its custom-designed environmental test chambers and ovens can serve the needs of large-scale conventional power plants, nuclear power stations, wind farms and other types of power generation plants.

ENVIRONMENTAL TEST CHAMBER (ETCU) ULTIMATE SERIES

- Used for testing nuclear power materials

WALK-IN TEST CHAMBER (ETR)

- Used for testing outdoor equipment for all kinds of power plants

HIGH-LOW TEMPERATURE THERMAL AND HUMIDITY TEST CHAMBER (TC)

- Used for testing outdoor equipment for all kinds of power plants

MULTI-PURPOSE DRYING OVEN (LO/TDG)

- Used for drying and solidifying materials or components for power plants

Lighting and Monitoring Equipment

SPX is a global leader in obstruction lighting and a major supplier of remote asset-monitoring solutions for managing critical applications. The company provides specialized obstruction lighting products to serve the wind energy, telecommunications, and utilities markets through its Flash Technology® division.

- The Vanguard™ 370i series LED is a new product innovation that is only available through Flash Technology. This new design incorporates all new features for the Wind Energy business.
- The Vanguard™ 370d LED is a dual system that is a new design from Flash Technology. This product incorporates all new LED and Monitoring hardware and software to make it the most innovative lighting system ever offered from Flash Technology.
- The FTB 204 high-intensity obstruction light is engineered for large scale power plant facilities where highly conspicuous marking is required.
- The FTB 324 dual-strobe obstruction light is a cost-effective workhorse solution that has proven durability.

Precision Machining

SPX Precision Components offers complex machining of close tolerance, precision components for the Power & Energy market.

Key capabilities include:

- Complex Milling
- Close Tolerance Turning & Grinding
- Non-Destructive Testing
- Threading & Splining
- Coating & Finish Application
- Component Assembly



Component Assembly

Flash Technology



Vanguard™ 370i for Wind



Vanguard™ LED 370d



FTB 204 High Intensity



FTB 324

SPX Precision Components™



Threading and Splining



Complex Milling



Close Tolerance Turning and Grinding

Transformers



420 MVA top-rated, 345 kV autotransformer is ready for test in Waukesha's manufacturing facility

SPX manufactures power transformers and transformer accessories under the Waukesha® brand while also providing complete transformer service solutions for the transmission and distribution of electric power.

Medium Power Transformers

Power transformers ranging from 10 to 100 MVA in primary voltages through 345 kV

- Substation transformers:
 - Single- and three-phase
 - Two and three windings
 - Optional load tap changer
 - Series parallel re-connectable
- GSU (generator step-up) transformers
- Auto transformers (three-phase or single-phase)
- Zig-zag grounding transformers
- Special-duty transformers (motor starting, low impedance, pulse loading etc.)
- FR3 natural ester fluid-filled transformers (new units or field retrofill)
- Three-phase voltage regulators (new units or field retrofill)

Large Power Transformers

With the new facility expansion in Waukesha, Wisconsin, we are capable of manufacturing power transformers ranging from 100 to 1,200 MVA in primary voltages up to 345kV.

Waukesha transformers are synonymous with quality and reliability and are manufactured at the company's state-of-the-art transformer plants in Waukesha, WI and Goldsboro, NC. Waukesha transformers are designed, manufactured and tested in accordance with the latest standards of IEEE™, ANSI™ and NEMA™ and the quality standards of ANSI/ASQC 9001 and ISO 9001: 2008.

Transformer Components and Training

The Waukesha® components and training division operates as a leading manufacturer and supplier of components for most major current and obsolete load tap changer (LTC) brands. With an experienced workforce, wide range of machinery, integrated manufacturing systems and Continuous Improvement philosophy, the team strives to lead the industry with the shortest lead times and highest quality products. In addition to parts kits, we are the original manufacturer of a line of Transformer Health Products® designed to increase transformer reliability and life while lowering the cost of maintenance.

Our Training group provides comprehensive training solutions for today's engineering and technical field personnel. By taking a hands-on approach, our customers experience technical procedures, practices and problem-solving techniques on the actual equipment they will later encounter in the field.



Transformer Service

SPX's Waukesha® Service group provides total transformer service solutions up to 765kV. The service team focuses on maximizing the performance, reliability and working life of all the transformers and load tap changers throughout a customer's electric power system, whether manufactured by SPX or other suppliers. Our team's mission is to keep transformers up and running 24 / 7 / 365 by providing responsive and cost-effective service and maintenance support.

The dedicated technicians in the Waukesha® Service organization receive extensive factory-supported technical and safety training. Each technician is backed up by the engineering and technical support resources of SPX Transformer Solutions – an industry leader in transformer design, manufacturing and product support.



SERVICES INCLUDE:

- Transformer Hauling and Rigging
- Transformer Installation
- Transformer Acceptance Testing
- Transformer Maintenance
- Transformer Oil Processing and Reclamation
- LTC Maintenance
- Engineering Services
- Natural Ester Fluid Retrofills
- Operations and Maintenance Training
- Renewal Parts and Components

Manufacturing and Technical Facilities

Centers of Excellence





International Customer-Focused Service Platform

AFTER-SALES, SERVICE AND PARTS SOLUTIONS FROM SPX

SPX brands offer a full range of after-sales products to ensure that the original equipment continues to operate at its maximum performance.

- Repair and exchange services
- Equipment upgrade services
- Installation and start-up support
- Predictive and preventive maintenance
- Remote Diagnostics
- Process and mechanical consulting
- Asset management
- On-site field support
- Training

SPX provides innovative ways to improve your productivity and profitability. We'll help you minimize your asset investments, while ensuring that you continue to meet your production requirements. Multiple service facilities are strategically located throughout the world, providing a wide range of support 24 hours a day.

Service locations are the hub for our parts distribution. We can analyze your spare parts inventory to identify critical, damaged and obsolete spare parts, and help you create an inventory reduction program.

- High quality OEM spare parts and consumables
- Quick-ship delivery services available

To learn more about aftermarket services, visit www.spx.com.



Qualification Standards

ISO9001

ISO PED Category III

ASME

- section I, S Stamp
- section III, N and NPT Stamp Class 1, 2 and 3
- section III, NCA 4000
- section VIII

API 598

API 674

API 675

ANSI

- B 16.34
- NQA 1
- N 45.2
- B 31.1

CSA 2 2999.38Z299.4

MSS SP61





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EMEA

SPX EUROPE

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SPX reserves the right to incorporate our latest design and material changes without notice or obligation.

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