TWL™

COMBINED CENTRIFUGAL PUMP + TURBINE FOR NUCLEAR SAFETY APPLICATIONS
SPX - An introduction

SPX is a Fortune 500 multi-industry manufacturing leader, headquartered in Charlotte, North Carolina. SPX manufactures and markets products, components, services and technologies that are integral to meeting today’s challenges and tomorrow’s needs. We are a place where innovation is fostered, and the real needs of business are understood. We transform ideas into powerful solutions to help our customers meet their goals, overcome business challenges and thrive in a complex, always changing marketplace.

SPX’s Flow Technology segment designs, manufactures and markets engineering solutions and products used to process, blend, meter and transport fluids. We also offer equipment for air and gas filtration and dehydration. Our leading brands have global operations which service the food + beverage, power + energy, and industrial processes.

CLYDEUNION PUMPS, AN SPX BRAND - GENERATIONS OF EXPERIENCE

Whilst the name is relatively new, the ClydeUnion Pumps brand is known worldwide for supplying reliable and robust engineered pumping solutions stemming from over 140 years of industry expertise. Our experience spans across several complex industries including oil and gas, nuclear and conventional power generation, desalination and other key markets relevant to our product portfolio.

ClydeUnion Pumps

Our Extensive Brand Heritage:

- Union Pump
- David Brown Pumps
- DB Guiraud Pumps
- American Pump
- Pumpline

- Mather & Platt
- WH Allen
- Girdlestone
- Allen Gwynnes
- Harland
ClydeUnion Pumps, an SPX Brand, has been involved in the nuclear power market since the first ever industrial scale nuclear power plant. Since then we have been central to all major nuclear power programs globally. Our ability to design a reliable solution for specific needs of the overall nuclear plant, allied to our comprehensive service provision means ClydeUnion Pumps has nuclear pump installations in over 65% of operational nuclear power plants worldwide, across many technologies. Our market focussed research and development programs ensure that our solutions match the demanding requirements of current and future technologies.

NUCLEAR EXCELLENCE
ClydeUnion Pumps is committed to quality throughout the company. Our Quality Management System is fully approved to ISO 9001:2008 and independently verified to comply with the latest quality standards. We also understand the challenges faced to acquire and maintain the high standards required to design and build nuclear coded pumps, and the company has three coded facilities with a long history of excellence; Glasgow, UK, Annecy, France and Battle Creek, USA. In addition we have a global aftermarket organisation that is able to offer full service and upgrade capabilities.

NUCLEAR CAPABILITIES
ClydeUnion Pumps offers a comprehensive range of Class 1, Class 2 and Class 3 pumps, and provides pumping solutions for the latest nuclear power plants.

We understand the specialised needs of the nuclear power sector. With five global facilities, as well as experienced local partners in China and India, we are a major supplier of pumps globally. We draw on over 50 years of nuclear pump experience to provide coded, safety related and balance of plant pumps for all reactor types.

NUCLEAR ACCREDITATIONS
- ASME
- 10CFR50 Appendix B Program
- RCC-M
- RCC-MX
- HAF604

TWL™ - Combined pump + turbine for nuclear safety applications
Capable of being engineered to match a broad range of system requirements and consuming less physical space than separate turbine/pump configuration, the TWL™ (turbine water lubricated pump) is an excellent solution for turbine driven safety related duties in nuclear power plants.

APPLICATIONS
In a Pressurised Water Reactor (PWR) the TWL™ functions as a turbine driven auxiliary feedwater pump, providing water from the emergency feedwater storage tank to the steam generators to remove decay heat in the event of the main feedwater system being unavailable, or when the plant is in a start up or shutdown condition.

In a Boiling Water Reactor (BWR) the TWL™ serves as the turbine driven pump for reactor core isolation cooling system (RCIC). This system provides water to the reactor for decay heat removal and it is essential that it can operate remotely.

Demonstration of capability and integrity is paramount in nuclear safety equipment designs and the TWL™ has been subjected to many tests and analyses through the years. Critical to integrity for turbine driven equipment is the ability to accommodate "water slugs" in the steam line and the TWL™ has been tested to show no impact on the machine’s integrity after both start-up and running slug tests. Other tests include shaker table testing for dynamic analyses purposes and suction transient and over-speed testing are regularly performed. Ongoing analyses using finite element analysis and computational fluid dynamics, to improve performance continues as application requirements evolve.
SINGLE SHAFT IN A MONOBLOCK CASING
- No drive couplings and thus no alignment issues to accommodate between the driver and the driven unit. Rotor length is kept short.
- Shaft does not penetrate the pressure boundary therefore no need for mechanical seals. All self contained - no wearing seal components and potential leak paths (critical for contaminated water applications).

WATER LUBRICATION BEARINGS
- No oil required and thus no oil support system with complex logic needed to ensure lubrication of the bearings, all self contained within the unit and skid.

SELF CONTAINED GOVERNOR
- Governor and steam throttle mechanism all self contained on the unit and requires no external services such as AC/DC power and control oil.
- Rapid start-up with no overspeed.

SMALL INSTALLED FOOTPRINT
- Complete unit considerably smaller than separate turbine drive and pump arrangement.

OVERSPEED TRIP MECHANISM
- Multiple trip mechanisms in place to avoid the turbine running beyond the rated speed:
  - Mechanical system utilising a centrifugal bolt to push a lever once the trip speed has been met.
  - Electrical trip system that energises a solenoid valve in the trip system pipework during overspeed where electrical supply available.
  - Manual trip that can be activated at anytime.

FORGED MACHINED TURBINE WHEEL
- Turbine wheel and blades machined from a single forging ensuring highest integrity for operation and accommodation of water slugs in the steam line.
TWL™ benefits to the power plants

- Fully qualified for accident conditions in PWR and BWR applications
- Small, self contained and without the need for external services reduces complexity thus reducing downtime during overhauls and maintenance/spares holding costs
- Local and remote monitoring capability with no interlocks/start up logic, machine availability unaffected by loss of monitoring (SBO)
- In emergency conditions, can support other sources of pumped fluid such as river water and seawater

TYPICAL APPLICATIONS
- Auxiliary feedwater
- Reactor core isolation cooling
- Other safety related applications

TWL™ OPERATING PARAMETERS
- Capacities – up to 1,550 USgpm / 350 m³/hr
- Delivery heads – up to 4,000 ft / 1,200 m
- Speeds – around 7,500 rpm
- Temperature – 250 °F / 120 °C

Pump performance data above is based on maximum steam conditions, and covers the TWL™ standard pump range. Other engineering designs exist for extreme applications.
Global aftermarket capability best in service + response

Our customer focused aftermarket organisation is positioned to provide comprehensive care for our varied and diverse product lines. Heritage and obsolete products benefit from the same level of attention and expertise ensuring that reliability and availability is maximised irrespective of a pump’s length of service.

GENUINE HIGH QUALITY

Original or upgraded specification spare parts, coupled with full engineering design capability, enables longevity of reliable operation. Highly skilled and experienced service engineers ensure accuracy in build and optimised performance. The worldwide presence of ClydeUnion Pumps offers local service facilities in over 40 countries.

SERVICE SOLUTIONS

ClydeUnion Pumps is committed to supporting our installed base wherever it may be. Depending on your location we will provide either direct service support or support via our local authorised service partners. Whichever option is provided, you can be assured of the best attention from fully qualified and experienced engineers.

- Upgrades + re-rates
- Service + overhaul
- Installation + commissioning
- Technical support
- Inventory management
- 3rd party equipment
TWL™
COMBINED CENTRIFUGAL PUMP + TURBINE FOR NUCLEAR SAFETY APPLICATIONS

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