



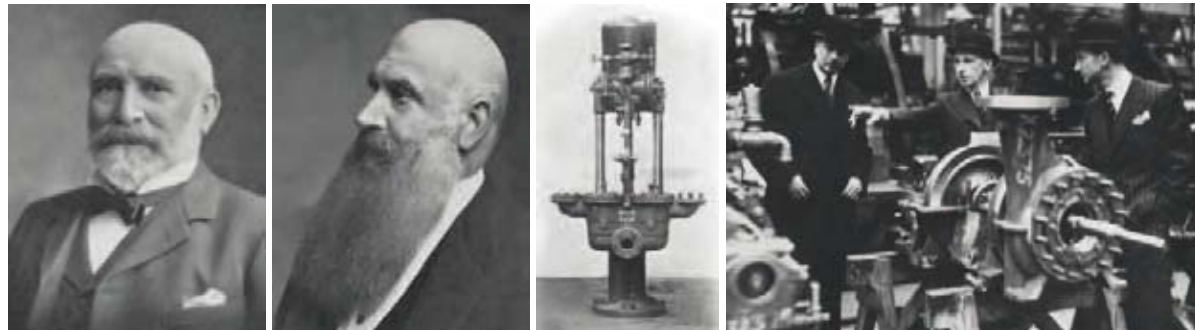
Innovation, Design, Manufacture & Aftermarket Services:
Pumping solutions for a better world

conventional power



Generations of experience

While the name is comparatively recent, CLYDEUNION Pumps is one of the most experienced specialist engineering companies in the world. Formed through the acquisition and integration of a series of highly respected pump manufacturers and designers on both sides of the Atlantic, CLYDEUNION incorporates an accumulation of well over 300 years of engineering expertise.



George Weir: The eldest of the brothers, George trained as a ship's engineer.

James Weir: The second eldest, James began work at 15 in a consulting engineers in Glasgow. He was the inventor of the celebrated direct-acting feed pump.

It's in the DNA: Inspectors oversee the assembly of a turbine feed pump, a precursor to the state of the art TWL widely used in nuclear power stations today.

The history of **CLYDEUNION** begins with the formation, in 1871, of the engineering firm of G&J Weir. Founded by brothers James and George Weir in Glasgow, the company quickly prospered as a result of the improvements they introduced to pump machinery and valve technologies. Their work found applications across the world, from marine engines and power stations to desalination plants.

By the end of the twentieth century, G&J Weir had acquired Drysdale Pumps, Harland, Mather and Platt, and WH Allen. They had also, under

the name Weir Pumps, grown into one of the most respected and iconic engineering enterprises in Scotland.

Meanwhile, just 14 years after the establishment of G&J Weir, the Union Manufacturing Pump Company was incorporated in 1885 in Michigan USA. Specialising in the design and manufacturing of steam pumps, they grew prosperous, adopted the name Union Pump and established a Canadian sister company.

In 2006, two other highly respected specialist companies, David Brown Pumps of England and DB Guinard

Pumps of France, were brought under the Union Pump umbrella.

A new chapter in the development of both companies began in 2007, when Weir Pumps was bought by Clyde Blowers, a company owned and run by Jim McColl (who had started his working life as an apprentice with Weir Pumps). At this time the name changed to Clyde Pumps. In 2008, Clyde Blowers bought Union Pump and amalgamated the two specialist engineering companies into **CLYDEUNION**.



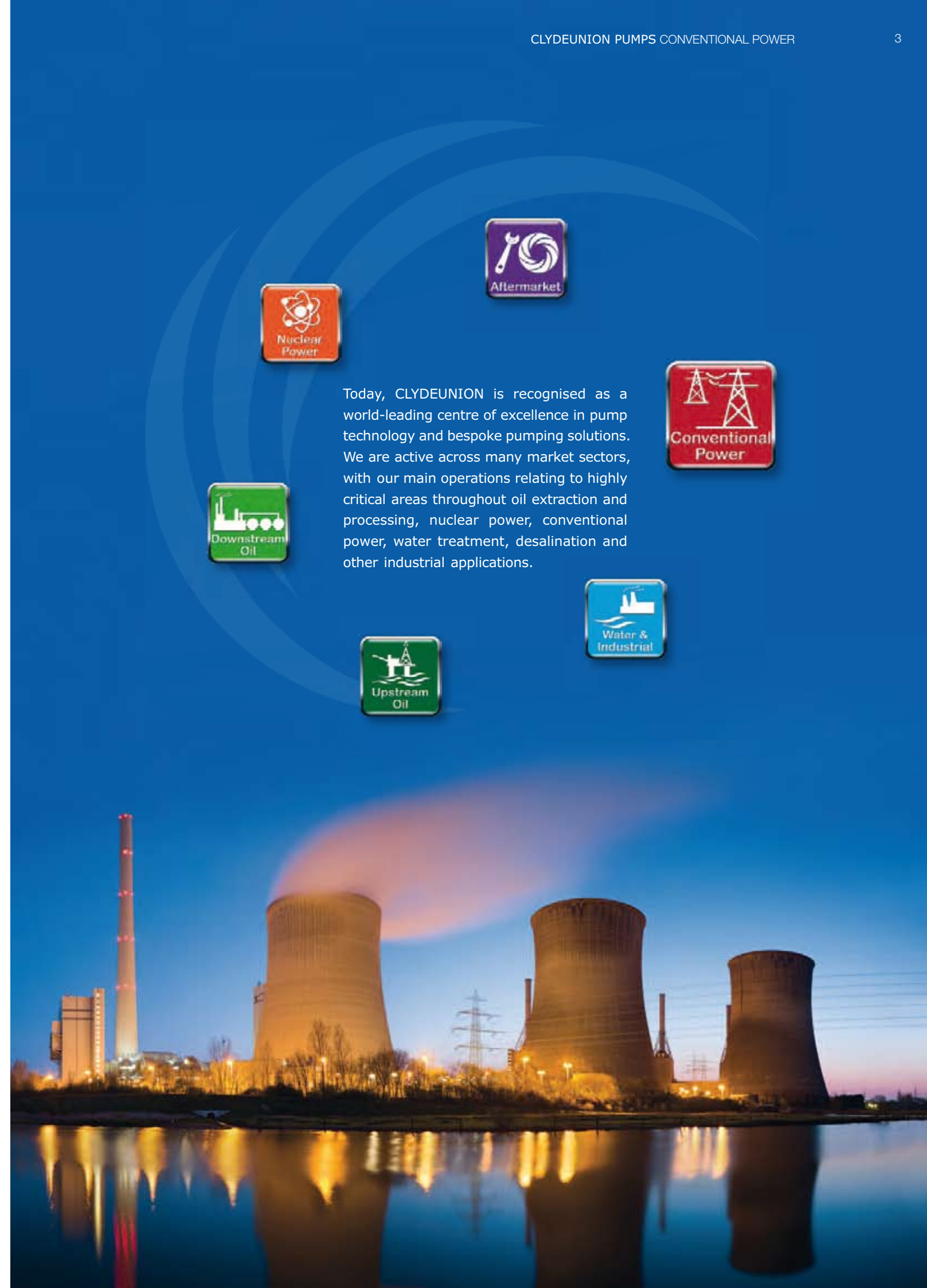
*Weir Pumps, Mather & Platt, Drysdale, WH Allen, Girdlestone, Allen Gwynnes and Harland

UNION Pump

Union Pump, David Brown Pumps, DB Guinard Pumps, American Pump and Pumpline

CLYDEUNION PUMPS

*This is a heritage product acquired when the Weir Pumps business transferred to Clyde Pumps in May 2007.



Today, CLYDEUNION is recognised as a world-leading centre of excellence in pump technology and bespoke pumping solutions. We are active across many market sectors, with our main operations relating to highly critical areas throughout oil extraction and processing, nuclear power, conventional power, water treatment, desalination and other industrial applications.

Conventional power – driven by customer satisfaction

At CLYDEUNION we understand the needs of the conventional power industries. Soon after our formation in 2008, we brought together engineering expertise and experience from throughout our global organisation to create a specialist team focused solely on serving the conventional power industry and meeting its specific requirements.

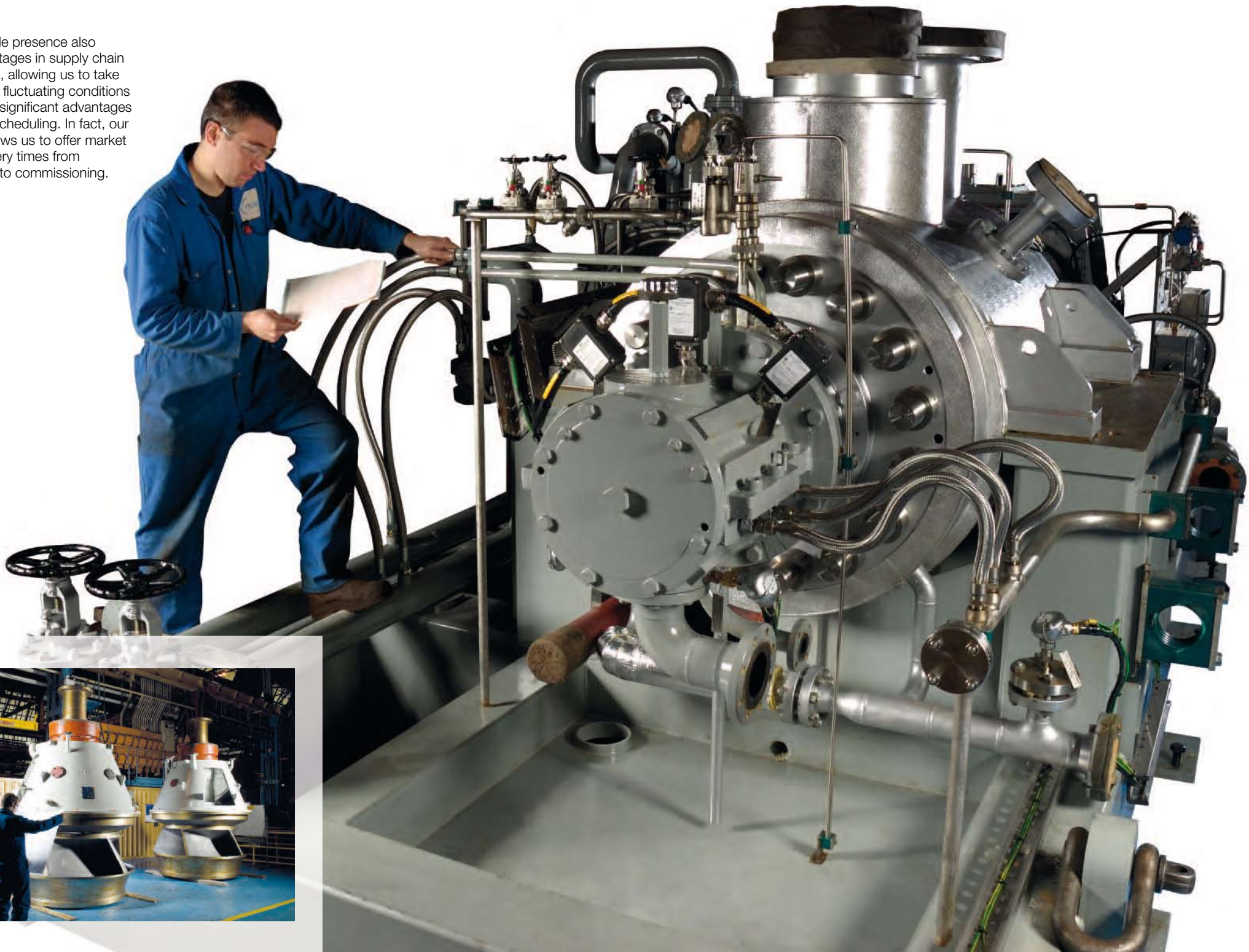
This team forms a discrete business unit, strategically aligned with customers' requirements and fully committed to the working practices, and the demands of scheduling, efficiency and reliability, that prevail within the industry. This allows us to build considerable advantages into the service we offer.

To begin with, we speak your language. We understand the paramount importance of reliability, and the only path to robust, continuous long-term performance is engineering of the highest standard. Our engineering sets the benchmark for the industry, and our products are quality assured by our comprehensive quality system and full-scale pump test facilities. Through a culture of innovation and a customer-centred approach we have positioned ourselves at the leading edge of pump design, and we stay there by constant investment in research and development, and the use of the most modern design techniques.

All of this capability is focused on satisfying the needs of our customers. And because our customers are spread throughout the world, we offer a truly global service. Wherever you are operating, you will be able to deal with a local representative with access to, and expertise in, our entire product range. You will have a local one-stop shop covering all pump equipment from reciprocating units for relatively low-power use through to supercritical boiler feed pumps, and a single point of contact with the ability to draw on global resources. Our international structure has evolved to ensure that you have the most expert and up-to-date advice possible, the most cost-efficient and robust products, full aftermarket support and a flexible, approachable service that integrates with your own working practices.

Our worldwide presence also brings advantages in supply chain management, allowing us to take advantage of fluctuating conditions and pass on significant advantages of cost and scheduling. In fact, our efficiency allows us to offer market leading delivery times from specification to commissioning.

*worldclass
engineering*



thermal

PUMPS TO SUIT YOUR REQUIREMENTS

Thermal coal and lignite fired power stations rely on pumps at several key points in the process, including the delivery of de-aerated water into the boiler, the circulation of water and the extraction of condensates. CLYDEUNION recognises the inherent bespoke 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 perfect start-up and commissioning.

In the past, thermal stations were used principally to provide base load power. Today, they are increasingly required to operate on a cyclic basis, varying their output to follow demand. The operation of the generators is thus subject to frequent change, and this places another set of demands on the generating equipment. Pumps must now be capable of maintaining their robust, dependable running through frequent cycles of starting up and stopping. In addition, they have to operate at variable loads through frequent operational transients.

CLYDEUNION pumps are designed and engineered to be tolerant of these transients. They cope with repeated starting, stopping and changes in

loading, start safely without pre-warming and are capable of withstanding suction transients and thermal shock from rapid heating or cooling. These factors present the user with a significant reduction in operating costs. By maximising the mean time between outages and eliminating both the time and the energy costs required for a pre-warming phase, they ensure that **CLYDEUNION** pumps represent the lowest total cost of ownership.

Our FK range of high pressure pumps is the perfect match 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 cubic metres per hour at a head of 5,000m, at water temperatures of up to 250°C typically found in modern plant. Its capacity, reliability and through-life efficiency mean that our pumps provide optimum operating performance for the life of the plant.

CLYDEUNION also produce equipment for other applications within thermal power stations, including boiler feed booster pumps, a choice of concrete volute and vertical turbine pumps for circulating and cooling water, and pumps for extracting and transferring condensates and a wide range of auxiliary uses.



Boiler feed FK range
Barrel type multistage pump
Capacity: up to 2,500m³/hr/11,000gpm
Delivery head: up to 5,000m/16,400ft
Temperature: up to 250°C/480°F
Speeds: 2 pole as standard
& up to 7,000rpm



CR and CW cooling water range
Vertical bowl or Concrete volute pump
Capacity: up to 120,000m³/hr/530,000gpm
Delivery head: up to 100m/320ft



EN Condensate extraction range
Vertical multistage canister pump
Capacity: up to 5,000m³/hr/22,000gpm
Delivery head: up to 300m/1,000ft



BOP ancillary applications
Vertical and horizontal end suction casing pumps
Vertical bowl pumps
Vacuum pumps
Slurry pumps for FGD application

combined cycle

INTEGRITY, RELIABILITY AND EXPERIENCE

Combined cycle power plants (CCPPs) have risen dramatically in efficiency over the past few years. The development of effective single-pressure heat recovery steam generators has enabled CCPPs to add considerably to the energy they can extract from fuel. The additional cycle requires an additional pumping system with its own very demanding parameters. In addition to providing the absolute reliability required throughout the power generation industry as a matter of course, 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 up to 200 times a year with no impairment of efficiency or long-term dependability.

To maximise the benefits of a CCPP it is vital that, on restarting, the boiler is brought up to optimum temperature in as short a time as possible. The boiler feed pump must therefore be capable of dealing with rapid temperature changes while delivering very high pressures. Working pressures can typically reach 270 bar at temperatures of around 210°C. To achieve the necessary pressures, the pumps used in CCPPs are fitted with shafts capable of higher torque, and have more stages than their equivalents in conventional power plants.

The **CLYDEUNION** FT range of ring section type pumps answer all the requirements of boiler feed situations in CCPP situations. 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, and highly polished flow areas optimise efficiency between stages. The FT range is capable of withstanding suction transients, and combines the reliability of barrel casing design with the lower cost of ring-section technology.

FT pumps deliver volumes of up to 1,800 cubic metres per hour at a head of up to 3,500m, with no requirement for pre-warming during start-up. Their exceptional mean time between outages makes them the most cost effective choice for CCPPs over the lifetime of the plant.

CLYDEUNION offer many other pumps suitable for CCPP applications, including vertical turbine circulating water pumps, condensate extraction pumps and auxiliary pumps.



Boiler feed FT range
Ring section multistage pump
Capacity: up to 1,800m³/hr/7,950gpm
Delivery head: up to 3,500m/11,600ft



CW cooling water range
Vertical bowl or volute pump
Capacity: up to 40,000m³/hr/176,000gpm
Delivery head: up to 100m/320ft



EN Condensate extraction range
Vertical multistage canister pump
Capacity: up to 5,000m³/hr/22,000gpm
Delivery head: up to 300m/1,000ft



BOP ancillary applications
Vertical and horizontal end suction
Vertical and horizontal split casing pumps
Vertical bowl pumps
Vacuum pumps

concentrated solar

COMPLETE PUMPING SOLUTIONS

Concentrated solar power generating stations use a large array of reflecting mirrors to gather and concentrate the sun's energy, and use the heat produced to generate electricity. Often, this is done by heating a fluid such as molten salt, and using that thermal energy to drive a conventional steam generating cycle. From boiler feed pumps to heat circulation pumps operating at over 400°C, CLYDEUNION is one of the few companies in the world to offer the full product portfolio for all pumping applications in a concentrated solar power plant.

These 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 circulate the molten salt, manage the steam cycle and perform ancillary duties.

CLYDEUNION can provide all the pumps required for a concentrated solar power station, including the auxiliary pumps known as 'balance of plant'. For molten salt, we recommend ring section canister design such as the EN/RN. This delivers a flow of up to 2,268 cubic metres per hour with a head of 25m at working temperatures of up to 565°C.

Heat is transferred around the solar field using fluids such as synthetic oils, and for these applications our BB2 heavy duty pumps present reliable, robust operation at elevated temperatures, providing flow of up to 1,960 cubic metres per hour with a head of 200m at up to 400°C.

In concentrated solar power applications, our FT boiler feed pumps are the recommended choice. They are designed with a higher head per stage capability than industry standards, meaning that fewer stages are needed. This in turn improves the shaft deflection characteristics of the pumps, and gives them an inherent advantage in the demanding regime of stop-start operation. It also offers a smaller footprint, providing greater flexibility in plan layout. The ability of **CLYDEUNION**

pumps to withstand thermal shock induced by rapid changes from cold to hot or vice versa also brings benefits in the concentrated solar power environment by avoiding the need for a warm-through line and associated efficiency losses.

Our comprehensive range of ancillary equipment designed to cope with demanding operational conditions includes condensate extraction pumps and vertical circulating water pumps with focus on design features to ensure optimum operational performance and longer times between overhaul. This means that our critical service pumps give trouble free operation together with reduced through life costs.



Boiler feed FT range
Ring section multistage pump
Capacity: up to 1,800m³/hr/7,950gpm
Delivery head: up to 3,500m/11,600ft



CW cooling water range
Vertical bowl pump
Capacity: up to 40,000m³/hr/176,000gpm
Delivery head: up to 100m/320ft



EN Condensate extraction range
Vertical multistage canister pump
Capacity: up to 5,000m³/hr/22,000gpm
Delivery head: up to 300m/1,000ft



BB2 Heat transfer range
Between bearings radially split range
Capacity: up to 4,090m³/hr/18,000gpm
Delivery head: up to 500m/1,650ft
Temperature: up to 425°C/800°F
Speeds: up to 3,600rpm



BOP ancillary applications
Vertical and horizontal end suction casing pumps
Vertical bowl pumps
Vacuum pumps

geothermal

SPECIALISED PUMPS FOR COMPLEX OPERATIONS

Geothermal power plants draw on the extremely high temperatures deep within the Earth to generate electricity. While their output is relatively small, geothermal plants offer many environmental advantages, including an enormous reduction in carbon dioxide and sulphur dioxide production and the elimination of nitrogen oxides, enabling them to meet the most rigorous clean air standards. CLYDEUNION'S Hydraulic Submersible Pump (HSP) is particularly suited in ultra-deep high temperature geothermal applications enabling higher energy outputs than conventional lower depth wells.

Most geothermal plant in operation today use one of three principal mechanisms. Dry steam plants pipe steam directly from an underground reservoir and use the steam to drive turbines directly. Once through the turbines, the water is passed through a condenser and injected back into the geothermal chamber for reheating. Flash steam plants, the most common form, pump hot water from underground reservoirs to the surface at very high pressure. When the water reaches the surface the pressure is reduced and some of the water instantly turns to steam which is then used to drive turbines. The third type of plant, binary power, is useful where the geothermal source is not hot enough to produce steam. The hot water is fed into a heat exchanger to heat a fluid such as isopentane, which has a lower boiling point and will turn to vapour to drive the turbine. Cooled water is then returned to the reservoir.

There is a fourth geothermal technology which can be used where there is insufficient natural fluid to carry the heat to the surface. This hot dry rock method involves injecting water into drilled holes where it captures the heat of the rock and is forced out of a second bore-hole.

All four types of technology require specialist pumps designed for the appropriate pressures and temperatures, and able to cope with any impurities and hazards, such as minerals and corrosive salts, which may be present.

CLYDEUNION can provide a choice of pumps matched precisely to the conditions in geothermal plants, including hot well pumps for transferring fluid out of the ground, condensing pumps, 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. In particular, **CLYDEUNION** can bring a unique advantage that maximises the efficiency of many geothermal plants.

Greater source heat can be accessed by boring deeper holes. Our specialised Hydraulic Submersible Pump (HSP) allows greater depths to be efficiently reached. The HSP is turbine driven, requiring no electricity supply, and it can withstand extreme temperatures. This is a major contribution to enhancing the efficiency, and thus the viability, of geothermal plants, with enormous benefits to sustainability and clean energy.



HSP Aquifer lift pump range
Hydraulic submersible pump
Capacity: up to
590m³/hr/2,600gpm/85,000bpd
Delivery head: up to 1,500m/4,900ft
Temperature: up to 220°C/425°F
(as standard – higher temps available)
Speeds: up to 10,000rpm



CW cooling water range
Vertical bowl pump
Capacity: up to
40,000m³/hr/176,000gpm
Delivery head: up to 100m/320ft



BB5 water injection range
Barrel type multistage pump
Capacity: up to
2,800m³/hr/22,000gpm
Delivery head: up to 300m/1,000ft
Temperature: up to 180°C/350°F
Speeds: up to 7,000rpm



EN Condensate extraction range
Vertical multistage canister pump
Capacity: up to 5,000m³/hr/22,000gpm
Delivery head: up to 300m/1,000ft



BOP ancillary applications
Vertical and horizontal end suction
Vertical and horizontal split casing pumps
Vertical bowl pumps
Vacuum pumps

Lifetime worldwide support



Parts: Any brand, any material, anytime. We supply parts for all of our heritage brands as well as upgrades and improvements.



Installation and commissioning: Trouble free commissioning anywhere in the world.



Every product we supply is supported by a full lifetime commitment. We will provide a full aftermarket service, drawing on either our own engineers or our fully trained and highly experience service partners, depending on the location of the installation. We have service facilities in over 40 countries spread throughout Europe, America, Asia, the Middle East and Africa.



Our after sales support extends across all of our legacy brands as well as new equipment, and we provide full backup for obsolete products and for third party equipment. The parts we supply meet the original specification, or are upgraded were appropriate, and many components can be covered by our Rapid Response option which can have parts on site within 24 hours.

CLYDEUNION spares are subject to the same supply chain management as our pump manufacturing, to provide customers with the lowest lead times and costs while meeting the highest standards of quality assurance.

In addition to spares parts, routine servicing and overhauls and inventory control, our aftermarket support covers upgrades and comprehensive technical advice about the potential refitting of existing installations for greater efficiency and reliability. We can work with your own engineers to carry out meticulous inspections and advise on maintenance schedules, carry out full vibration analysis, pressure and pulsation testing, and train your service personnel.

Our history and breadth of experience, and our geographical coverage and expertise, make us the natural first choice for any pump-related problem or inquiry, no matter what the location, the scale of the task or the original manufacturer.

*conventional
power*



Worldwide sales contacts

www.clydeunion.com



Sales:	Aftermarket:	Manufacturing:				
✓	✓	✓	Europe			
✓	✓	✓	Annecey:	T: + (33) 45 005 5600	F: + (33) 45 005 5880	E: annecy@clydeunion.com
✓	✓	✓	Penistone, UK:	T: + (44) 122 676 3311	F: + (44) 122 676 6535	E: penistone@clydeunion.com
✓	✓	✓	Glasgow, UK:	T: + (44) 141 637 7141	F: + (44) 141 637 7358	E: glasgow@clydeunion.com
✓	✓	✓	Nordic countries:	T: + (47) 815 310 02	F: + (47) 815 310 03	E: nordic@clydeunion.com
✓	✓	✓	Moscow:	T: + (7) 495 967 3453	F: + (7) 495 785 0636	E: moscow@clydeunion.com
✓	✓	✓	North America			
✓	✓	✓	Baton Rouge, LA:	T: + (1) 225 775 2660	F: + (1) 225 778 0212	E: batonrouge@clydeunion.com
✓	✓	✓	Battle Creek, MI:	T: + (1) 269 966 4600	F: + (1) 269 962 3534	E: battlecreek@clydeunion.com
✓	✓	✓	Burlington, ON:	T: + (1) 905 315 3800	F: + (1) 905 335 8262	E: burlington@clydeunion.com
✓	✓	✓	Calgary, AB:	T: + (1) 403 236 8725	F: + (1) 403 236 7224	E: calgary@clydeunion.com
✓	✓	✓	Downey, CA:	T: + (1) 562 622 2380	F: + (1) 562 622 2375	E: downey@clydeunion.com
✓	✓	✓	Houston, TX:	T: + (1) 281 372 5040	F: + (1) 281 372 5042	E: houston@clydeunion.com
✓	✓	✓	Salt Lake City, UT:	T: + (1) 801 292 7882	F: + (1) 801 292 7885	E: saltlake@clydeunion.com
✓	✓	✓	South America			
✓	✓	✓	Itapira, SP:	T: + (55) 19 3843 2520	F: + (55) 19 3843 2531	E: brasil@clydeunion.com
✓	✓	✓	Asia			
✓	✓	✓	Beijing:	T: + (86) 106 598 9500	F: + (86) 106 598 9505	E: beijing@clydeunion.com
✓	✓	✓	New Delhi:	T: + (91) 120 4640 400	F: + (91) 120 4640 401	E: newdelhi@clydeunion.com
✓	✓	✓	Shanghai:	T: + (86) 216 160 6969	F: + (86) 216 160 6968	E: shanghai@clydeunion.com
✓	✓	✓	Singapore:	T: + (65) 62 76 7117	F: + (65) 62 78 7117	E: singapore@clydeunion.com
✓	✓	✓	Middle East / Africa			
✓	✓	✓	UAE:	T: + (97) 12 631 1959	F: + (97) 12 635 1242	E: uae@clydeunion.com
✓	✓	✓	Algeria:	T: + (213) 21 69 2319	F: + (213) 21 69 3046	E: algeria@clydeunion.com

OUR EXTENSIVE BRAND HERITAGE:

