

High quality OEM parts, service, repair, upgrades & re-rates  
**Delivering value for our customers**

# *aftermarket*

## *technical services*



# Generations of experience



While the name is comparatively recent, CLYDEUNION Pumps is one of the most experienced, specialised 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 Pumps incorporates an accumulation of over 300 years of engineering expertise.



**George Weir:** The eldest of the brothers, George trained as a ships 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.



**Our Rich Heritage:** An early factory tour of the Cathcart facility.

The history of CLYDEUNION Pumps begins with the formation, in 1871, of the engineering firm of G&J Weir. Founded by brothers George and James 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 Pumps.

### Our Extensive Brand Heritage:



# Technical Services

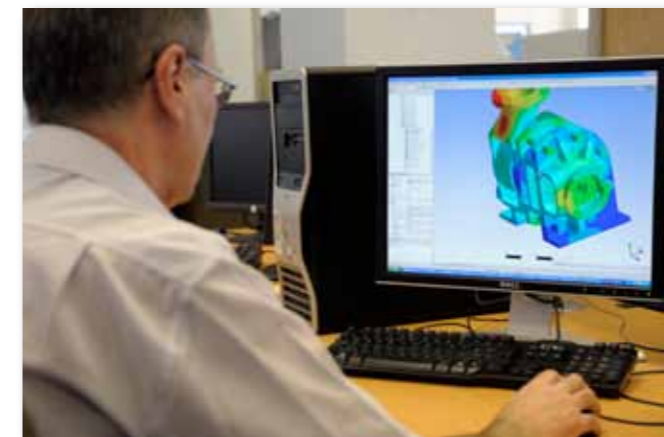


The Technical Services Team are a dedicated group of experienced Pump Engineers specialising in providing expert pump systems advice to our customers across all industries. Possessing a wealth of pump and system design knowledge, fully equipped with the latest design, analytical and pump testing equipment, our Technical Services Team can be employed across a range of services to ensure your critical rotating plant is operating reliably, safely and at optimal levels of efficiency. Working in partnership with our customers the focus of these important aspects of pump operation deliver increased MTBF and plant life, reduced parts consumption, increased production and very importantly minimising energy costs and carbon emissions.

Technical Services Team	Customer Benefits
<b>Pump System Assessments*</b>	Increased reliability and efficiency across entire system - Reduction in energy costs/emissions
<b>Thermometric and flowmeter based pump testing</b>	Verification of actual pump and system performance before and after improvement works
<b>Material and design upgrades for all brands of rotating equipment</b>	Improved reliability and plant life extended
<b>Hydraulic re-design and up-rates</b>	Enhanced efficiency, reliability and reduction in pump energy costs/emissions
<b>CLYDEUNION Academy - Pump training</b>	Greater operator knowledge to ensure optimal pump operation, maintenance and reliability
<b>Experienced on-site supervision</b>	Expert technical management of complex large machine installations, commissioning and outages
<b>Asset management</b>	Support for turnkey asset management programmes
<b>Condition monitoring (including using wireless real time data acquisition)</b>	Ongoing remote and manual data sampling and expert trend analysis to assist reliability programmes
<b>Re-engineering and upgrading of any 3rd party pumps and parts</b>	Improved reliability, quick supply with leading OEM quality and design guarantees

### \*Pump System Assessments

The Technical Services Team deploys Pump System methodology. Our objective in this method of assessment is to ensure a uniform and systematic approach in the assessment of industrial pumping systems to identify opportunities for reducing energy consumption and carbon emissions in line with legislative and government targets.



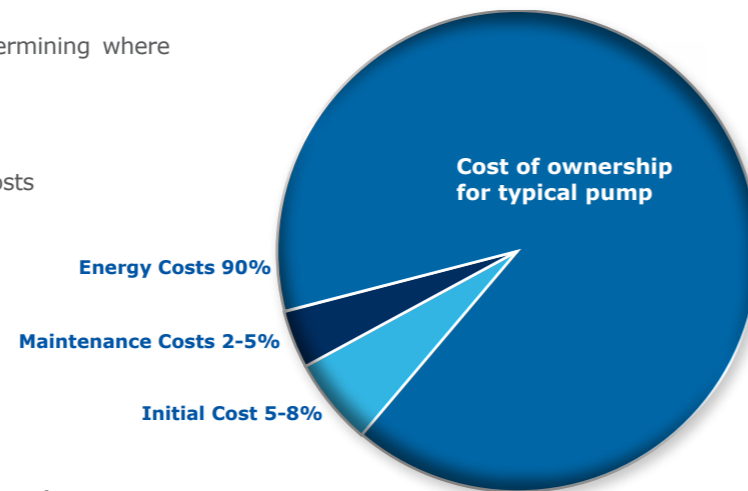
# CLYDEUNION Pumps Pump System Testing / Assessment

CLYDEUNION Pumps Technical Services offer pump testing and system assessments using thermometric and flow meter based methods to assess actual pump and system performance. This information is usually complemented with vibration, temperature and power characteristics forming a complete picture of pump and system health, efficiency and critically, determining how well matched your pump is to your system.

### Benefits:

Pump and System analysis is the first step in determining where improvements can be made in the following areas:

- Increase in pump and system efficiency
- Reduction in energy consumption and operating costs
- Reduction in system emissions
- Improved pump and system reliability
- Problem solving and Root Cause Analysis (RCA)
- Increased MTBF



### Methods employed:

The Technical Services Team deploys Pump System Assessment methodology. The objective in this method of assessment is to ensure a uniform and systematic approach in the assessment of industrial pumping systems to identify opportunities for reducing energy consumption and carbon emissions in line with legislative and government targets.

This method combines a consultative approach with a thorough system energy and reliability audit utilising our full suite of testing equipment including flow and power meters, multichannel data logger, vibration analyser, pressure transducers and temperature gauge.



Pump Life Cycle Cost chart courtesy of BPMA

### Step-by-Step approach:



# world class technology

### Symptoms of poor system and pump performance

Most pump systems will benefit from a system audit and pump test to optimise system performance, however the following are examples that not all is well and your pump is no longer matching your system requirements:

- Standby pump in continuous operation
- Pump operating conditions do not match nameplate conditions
- Pump output is controlled by discharge valve throttling
- High machinery vibration and temperature
- Poor reliability and MTBF
- High wear rates and parts usage
- High power consumption

If any of the above symptoms are evident then a site test and/or system assessment will identify how to improve your pump and system performance.

### Reporting

Our step-by-step approach will ensure that the operating history and customer requirements are fully understood prior to completing the study and presenting our findings in a concise technical report. This report will make clear our recommendations supported by anticipated improvements in performance, reliability and energy efficiency with any investment payback illustrations provided if required.



# Design Improvements Material Upgrades and Hydraulic Re-rates

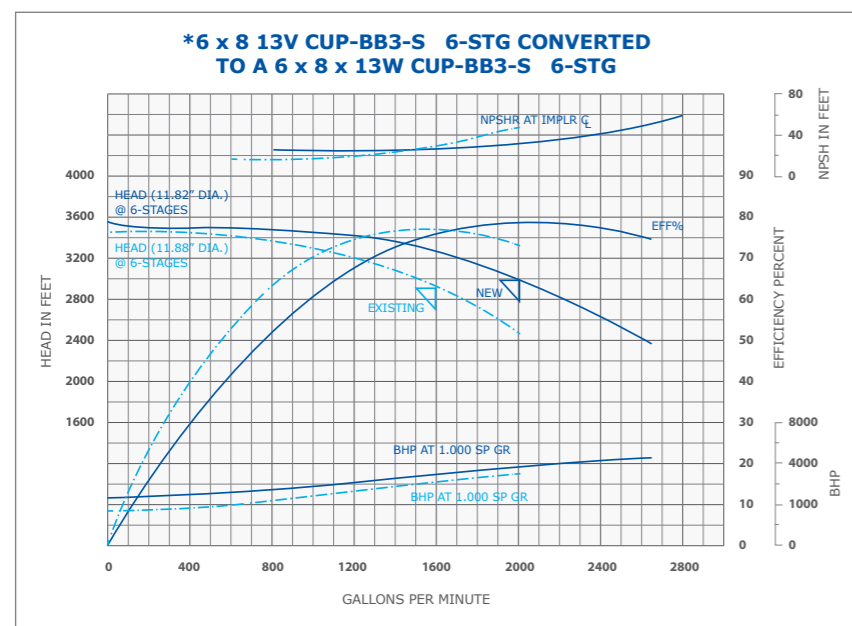
Throughout the service life of your pumping equipment process change, design improvements and material developments create opportunities to greatly improve the performance and reliability of your asset. With over 130 years of experience combined with the latest design and optimisation tools the Aftermarket Technical Services Team offer a comprehensive range of engineering solutions to modify pumping equipment to satisfy any such change in requirements.

## Engineering Solutions:

- Efficiency improvement
- Energy reduction
- Change in pump flow or pressure characteristics
- Increasing rotating equipment reliability
- Increase in pump service intervals
- 'Bad Actor' improvements

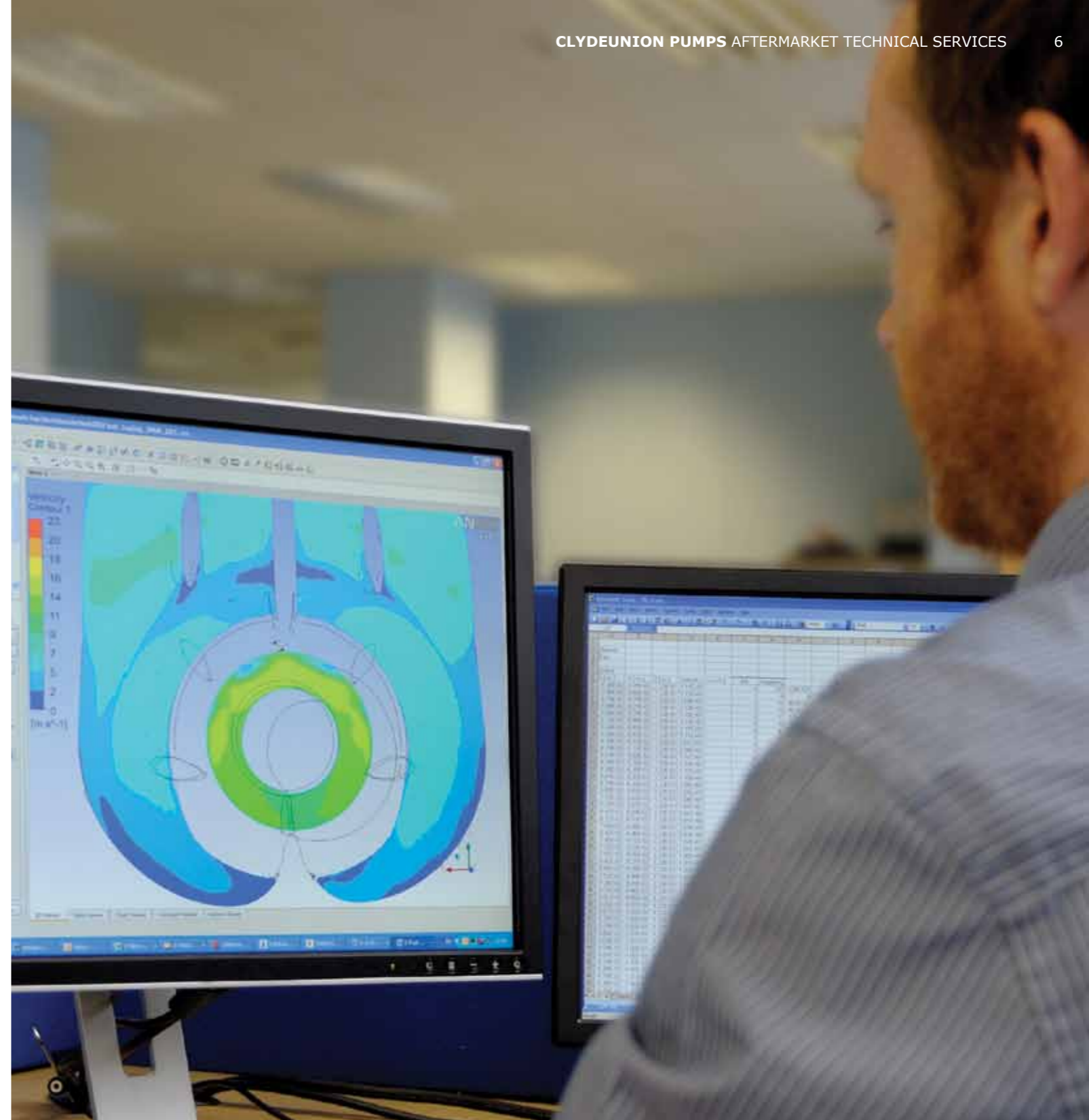
After consultation and ideally a full site survey carried out, our team of OEM pump improvement engineers will analyse the data before producing a design proposal which will either improve the mechanical design, modify the hydraulic design or change the material specification, or a combination of all three to optimise the pump performance in your system.

In line with new equipment design regulations you can also be assured that when improvements are being made they will be fully documented and all factors will be considered. Changes to the design stresses, pressure boundary loading and rotor dynamic performance will be assessed to ensure your upgrade will be problem free and OEM safety and design code qualifications fully maintained.



Hydraulic Re-rate	Impeller Inlet Re-design	Bearing Upgrade	Seal System Upgrade	Rotor Upgrade	Material Upgrade	Lubrication Upgrade	Motor Upgrade
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Problem	Cause	Solution						
Standby Pump Operation	System requirement not met by single pump							
Discharge Throttling	Pump output (flow) exceeds requirements							
Cavitation	Low NPSHA							
Bearing Failure	High loading or poor lubrication							
Seal Failure	Seal system mismatch to pump							
Insufficient Capacity	Pump not rated for process requirements							
Motor Failure	Motor power output insufficient							
Shaft Failure	High shaft loading or poor material							
High Vibration	High loading, out of balance or system resonance							
Poor MTBF	High loading, poor pump selection or design							



### Hydraulic Re-rating

Our engineering specialists offer hydraulic re-rating by means of their hydraulic design capabilities and fluid flow analysis software. This service adjusts your equipment accordingly to either match an existing system or to amend your system requirements. This optimises your pump and system interaction and improves operational efficiency.

### Mechanical Design Enhancements

A mechanical upgrading service is available for our customers who desire reliable, competitive, quality pump sets. Our engineering team analyse current design advancements using the latest 3D design tools to resolve seal leakage, reliability issues and improve noise and vibration performance.

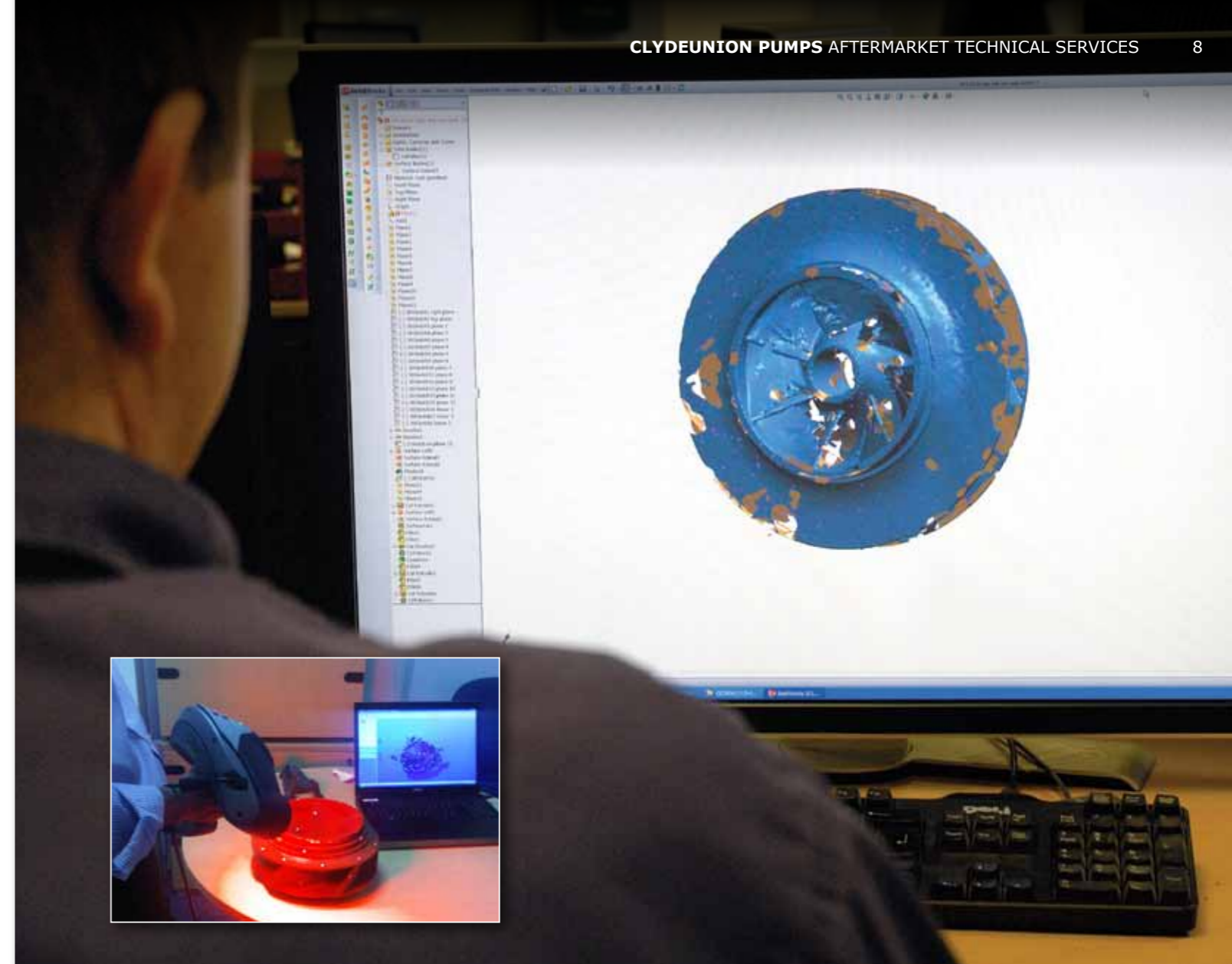
### Material Upgrades

Material upgrades are available to satisfy augmented plant life requirements and we offer our expertise in the development and application of corrosion resistant materials, wear resistant coatings and non-metallic materials. These upgrades can result in excellent solutions where irons, bronzes and less corrosion resistant stainless steels were originally specified.

# Re-Engineering and Upgrade Services for 3rd Party Equipment

The Technical Services Team brings the benefit of CLYDEUNION Pumps OEM parts quality, problem solving and design expertise for any brands of rotating equipment. By employing the same rigorous design, upgrade and rapid manufacturing principles applied to CLYDEUNION Pumps OEM parts, significant benefits can be realised for non-CLYDEUNION Pumps branded and local replicator parts.

Problem	CUP Re-Engineering Solution
<b>Mechanical failure</b>	Equipment analysis & design upgrade
<b>Corrosion and erosion damage</b>	Metallurgical failure analysis, RCA and material/design upgrade
<b>Poor machinery performance</b>	Process and design review to ensure pump design is matched to system requirements
<b>Poor parts quality</b>	Re-engineered parts manufactured to CLYDEUNION Pumps OE quality assurance standards including full inspection and material certification
<b>Obsolete parts</b>	Re-engineered parts for all brands regardless of original equipment availability
<b>Poor delivery and responsiveness</b>	Parts supplied under CLYDEUNION Pumps 'Rapid Response' process



## Re-Engineering and Upgrade Process



### 1 Consultation

Prior to commencing the re-engineering programme our engineer will meet with the client to understand how CLYDEUNION Pumps can meet your needs and improve upon the quality, delivery or part design.

### 2 Laser Scanning of Parts

Hand-held laser scanning is the perfect solution for rapid scanning and inspection of parts. Unlike surface mounted scanning arms the handheld laser scanner is extremely lightweight and does not require to be mounted to an inspection table. This allows quick deployment followed by rapid and accurate scanning of parts on site, in storage as well as in the workshop. Rapid scanning of large parts and surfaces can be carried out while maintaining accuracy on precision machined tolerated surfaces.



### 3 Analysis and Re-Engineering

Once the part is scanned and inspected the file will be electronically transmitted along with the engineers report describing the condition of the part and any operational history and improvement requirements discussed with the customer. If required a full laboratory metallurgical failure mode analysis report can be arranged at this stage to better understand complex reliability problems.

After an analysis and review by our design and improvement teams, engineers scanned data is then used to create a full manufacturing model and drawing of the part.

#### Typical improvements:

- Increased part strength and reduction of stress concentrations.
- Improved or modified hydraulic design to increase efficiency, adjust pressure and flow characteristics and improve suction design to reduce cavitation damage.
- Upgraded materials to stronger and more corrosion resistant CLYDEUNION Pumps approved materials.

### 4 Rapid Manufacture

For cast and turned parts the CLYDEUNION Pumps Rapid Response process can be employed for greatly accelerated manufacturing lead times in as little as 24hrs for turned parts. For cast parts this process utilises rapid 3D pattern manufacture processes allowing patterns to be produced directly from 3D CAD data.



### 5 Quality Assurance

CLYDEUNION Pumps re-engineered parts are manufactured exactly in accordance with CLYDEUNION Pumps Original Equipment Parts and our ISO 9001 Quality Assurance system. This system offers advantages over inferior design, low cost replicator parts and provides OEM designed parts fit for the customers requirement.

- CLYDEUNION Pumps factory processes, drawings and design specification
- Quality Plans specifying:
  - ✓ Inspection
  - ✓ NDT
  - ✓ Material Certificates
  - ✓ Manufacturing, test and balancing certificates
- Full CLYDEUNION Pumps OEM parts warranty



## CLYDEUNION Pumps Condition Monitoring

CLYDEUNION Pumps extensive knowledge of pumps and pump systems can be used in assisting with the specification of condition monitoring to provide safeguarding of all pump equipment. Being able to accurately determine when a pump requires an overhaul or when a bearing may have failed is critical to ensure maximum cost savings and pump reliability to our customers.



### Data Analysis

Data acquisition can be set up in such a way as to provide real time monitoring. This can be configured with wireless or wired systems, which can be monitored at site by the clients personnel or by CLYDEUNION Pumps remotely.

### System Upgrades

It is possible to upgrade existing system installations with the most up to date control and instrumentation equipment. This will ensure the essential measurements of pump reliability and performance are captured, using the correct selection of equipment to suit the client's requirements at site.

### Real Time Monitoring

Data acquisition can be set up in such a way as to provide real time monitoring. This can be configured with wireless or wired systems which can be monitored at site by the clients personnel or by CLYDEUNION Pumps through the internet.

## Asset Management

The task of monitoring pump condition, scheduling regular maintenance, managing maintenance staff and spares holding logistics can be a very daunting task for customers of medium to large sites. It's not surprising then that so many sites are left to go with insufficient maintenance, risking increased future costs due to equipment failure and process downtime.

### Maintenance Scheduling

CLYDEUNION Pumps are able to identify the maintenance requirements of all pumping equipment at site and determine the necessary schedule for both predictive and preventative maintenance regimes. This will ensure the equipment is kept in a condition to maximise mean time before overhaul, thus ensuring reduced costs and downtime.

### Inventory Management

The identification and management of spares will ensure all necessary maintenance, wear parts and insurance spares are stocked whilst still maintaining a cost to risk balance that can be pre-agreed with the client. Identical spares will be identified and duplicate part spares holding will be reduced. This will save on cost for spares holding as well as physical storage space.

### Trend Spotting

All maintenance records, pump history and failure diagnosis will be properly documented and maintained. Trends will be more easily identifiable and this will make problem areas more recognisable.



## Customer Training

CLYDEUNION Pumps recognise the importance training has to play in the safe, effective and efficient operation of pump equipment. CLYDEUNION Academy has a dedicated team providing a wide range of pump training courses specifically for pump customers. The training courses are structured to suit specific range of abilities & knowledge; introductory to advanced level courses, ensuring that all training needs can be provided whatever the ability and add value to your operation.



### Training Curriculum

Training courses have been developed specifically to suit the needs of system designers, engineers, operators and maintenance staff. Some of the available courses are listed below.

Course ID	Training Course Title	Duration (Days)
SP1	Applied Hydraulics	2
SP2	Vibration Analysis	2
SP3	Centrifugal Pump Failures, Diagnosis, Causes and Solutions	2
EX1	Maintenance of Pumps (BB1 / BB3)	4.5
EX2	Maintenance of Pumps (OH1 / OH2 / BB2 / BB5)	4.5
EX4	Cavitation: NPSH, Materials, Coatings	2
EX5	Hydraulic Modifications on Centrifugal Pumps	2
GL1	Nuclear Power Station Pump Training	4.5
GL2	Pump Application - Oil and Industrial	4.5
GN1	Instrumentation and Condition Monitoring	2
GN2	Introduction to Centrifugal Pumps	2
GN3	Components within a Centrifugal Pump	3
GN4	Operation Conditions of Centrifugal Pumps	2.5
GN5	Pump Maintenance - General Principles	2
IC1	Installation, Commissioning, Operation and Maintenance of Small Pumpsets (Client Specific)	1
IC2	Installation, Commissioning, Operation and Maintenance of Large Pumpsets (Client Specific)	2
RC7	Operation and Maintenance of Reciprocating Pumps (SX3, DX5, TX10, TD28)	1.5
RC8	System Design and Troubleshooting Considerations for Reciprocating Pumps	1
DA1	Direct Acting Fundamentals and Maintenance	2

### Benefits

#### Health and Safety

It is important that each task is conducted in the correct manner to ensure safety to the individual and others.

#### Reduced Costs

The methods used and experience gained will produce an increased efficiency in the employee's role.

#### Continual Improvement

Training will ensure the most current and best practices are utilised to stay ahead of the competition.





**Map Key**

- Sales
- Service Facility / Authorised Service Provider
- Manufacturing
- + Service Facility in development

SALES      SERVICE FACILITY      MANUFACTURING

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**Our Extensive Brand Heritage:**



\*Weir Pumps - Mather & Platt - Drysdale - WH Allen  
Girdlestone - Allen Gwynnes - Harland



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



**Joint Ventures & Partners**

S&N Pumps - IMBIL - Indonesia - China - India

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