SPX POWER+ENERGY

Pumping Solutions for Steam Assisted Gravity Drainage (SAGD)

INNOVATION, DESIGN, MANUFACTURE + AFTERMARKET SERVICES: PUMPING SOLUTIONS FOR A BETTER WORLD

ClydeUnion Pumps

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.

SPX® POWER+ENERGY

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

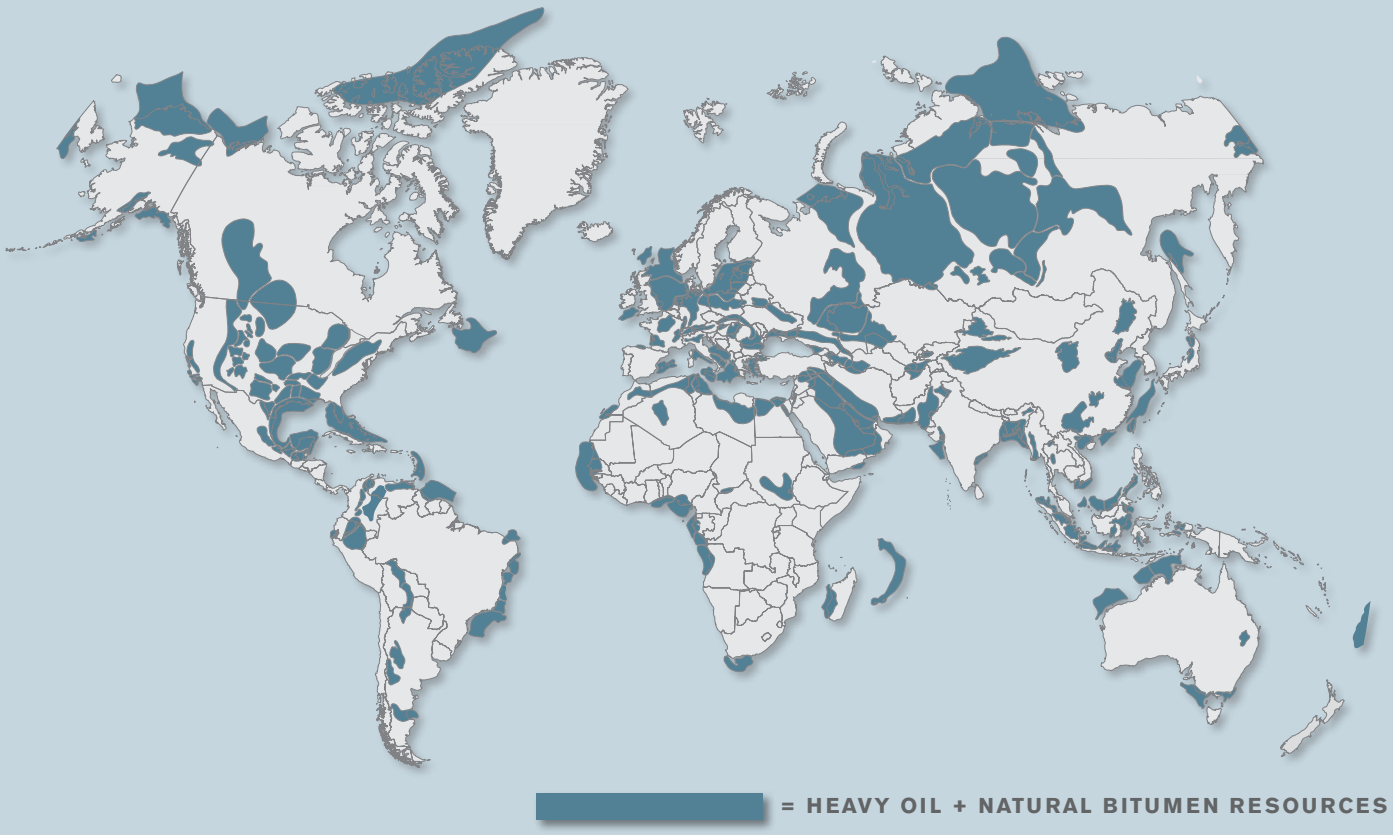
CLYDEUNION PUMPS
Weir Pumps - Clyde Pumps - Mather & Platt - Drysdale - WH Allen - Girdlestone - Allen Gwynnes - Harland

S&N PUMP CO.®

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

SPX®
›ClydeUnion Pumps

IN-SITU OIL SANDS: A GLOBAL OPPORTUNITY



In-situ oil sands – A global opportunity

Requirements to meet the global demand for energy, coupled with the growing need for diversity of supply, has seen the oil and gas industry increasingly having to move towards challenging "unconventional" oil reserves such as bitumen (heavy oil) extracted from oil sands deposits.

The recovery of heavy oil deposits represents a global opportunity with deposits found in over 70 countries worldwide. Major reserves can be found in Canada, Venezuela, and Russia.

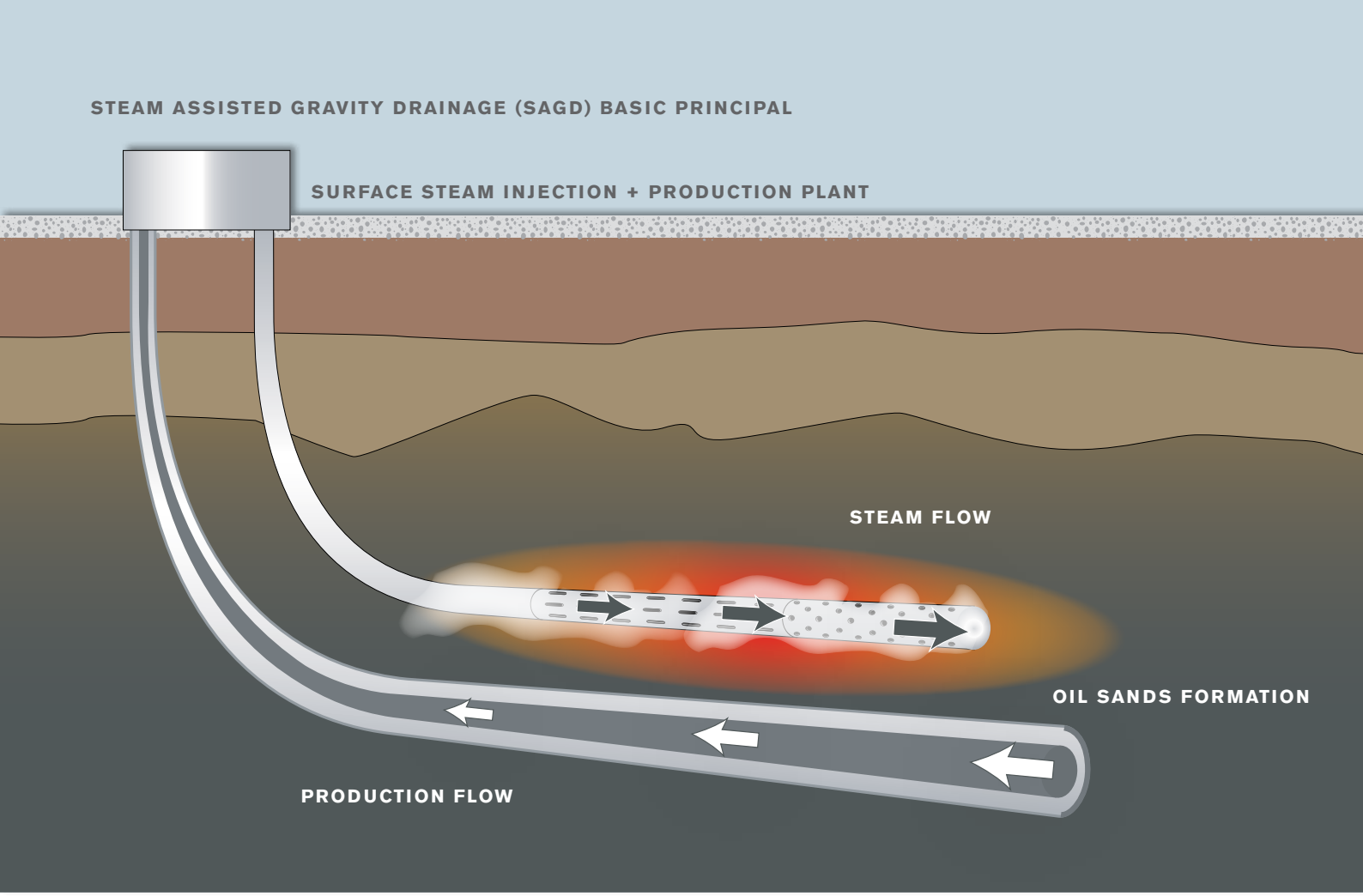
It is Canada's provinces of Alberta and Saskatchewan, in particular that are leading the way in sector growth and technology advancements.

Whilst some near surface deposits can be accessed by mature mining techniques, the vast majority of reserves require the implementation of advanced in-situ thermal recovery processes.

A variety of different extraction processes exist, depending on the geology and properties of the formations, however it is SAGD (Steam Assisted Gravity Drainage) that is leading the way as the method of choice for many of Canada's current and future planned oil sands development projects.

ENGINEERING EXCELLENCE

ClydeUnion Pumps has extensive experience in SAGD pump applications. From Emulsion wellpad pumps, HP/LP Boiler Feed pumps, to Hydrocarbon transfer and treatment pumps, Water Treatment pumps, or export/sales pumps; ClydeUnion offers a full suite of pumping solutions involved in SAGD central processing plants, well pad facilities and interconnecting pipeline networks.



Driven by customer satisfaction

We appreciate that SAGD operators are increasingly looking for advanced pump technology to optimize production rates. ClydeUnion is able to offer specialised lift pumps that can achieve MTTFs around three times greater than the industry average.

We pride ourselves on our collaborative approach with our customers and suppliers to ensure the optimum engineering solution is achieved.

STEAM ASSISTED GRAVITY DRAINAGE (SAGD) PRINCIPLE

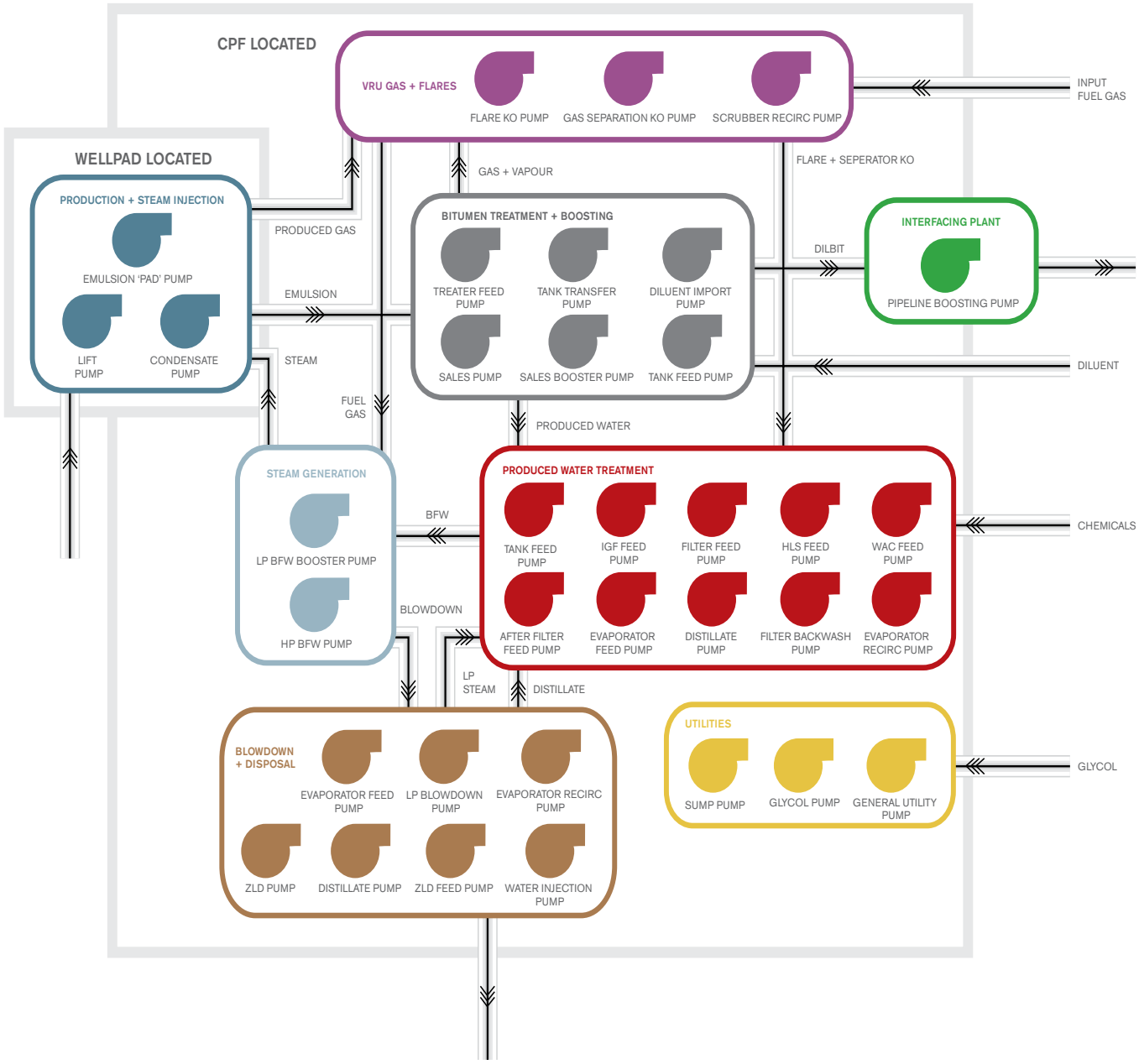
The SAGD extraction process principally comprises pairs of wells; an upper well for steam injection to stimulate the bitumen and a lower well for recovery of the produced fluids. Prior to production, steam is injected into both wells for several months in order to "soak" the oil sands deposit and to stimulate the flow of bitumen. After the soak period production begins by gravity flow of the heated bitumen downwards into the producer well whilst steam continues to be injected into the upper well to maintain the steam chamber and continually stimulate bitumen in the formation.
The resulting oil and condensed steam emulsion produced from each well pad is then pumped back to a Central Processing Facility (CPF) for separating, treating, and shipping.
ClydeUnion can offer pumping solutions at all stages of these processes.

SAGD process applications

SAGD PLANT LAYOUT + PUMP APPLICATIONS

ClydeUnion Pumps understands the complexity of in-situ oil sands installations. Our comprehensive product range detailed in the following pages provides solutions for all in-situ plant applications. From the rigorous duty requirements of emulsion “pad” pumps to tank transfer pumps and drainage sump pumps ClydeUnion Pumps has many years experience supplying into the in-situ oil sands industry.

Some typical applications by plant section can be seen below, outlining the vast scope of supply ClydeUnion Pumps can offer. Our global manufacturing capability, comprehensive heritage product ranges and local sales and service support means that ClydeUnion Pumps clients benefit from industry leading pumping solutions and product life cycle management.



Product ranges

	CUP DESIGNATION	FLOWS UP TO M³/HR	FLOWS UP TO USGPM	HEADS UP TO M	HEADS UP TO FT	PUMP SOLUTIONS: EXTRACTION	EMULSION	FILTER/TANK FEED	TRANSFER	BOILER FEED LP	BOILER FEED HP	DISTILLATE	RECIRCULATION	UTILITY	SALES BOOSTING	WATER DISPOSAL
SINGLE + TWO STAGE PUMPS / API 610																
Single/two stage axially split between bearings pump	CUP-BB1	15,000	66,000	1,000	3,300			●	●	●		●	●	●		●
Single stage radially split between bearings pump	CUP-BB2	1,500	6,600	700	2,300		●	●	●	●		●	●	●		●
Single stage end suction pump	CUP-OH2	1,700	7,500	350	1,148		●	●	●	●		●	●	●		●
Single stage vertical in-line pump	CUP-OH3	1,365	6,000	305	1,000		●	●	●	●		●	●	●		●
Single stage vertical in-line pump	CUP-OH4	1,365	6,000	335	1,100			●	●	●		●	●	●		●
Single stage sump pump	CUP-VS4	450	2,000	160	520									●		
MULTI-STAGE PUMPS / API 610																
Multi-stage axially split	CUP-BB3	3,000	13,200	3,350	11,000						●				●	
Multi-stage barrel radially split pump	CUP-BB5	2,800	12,330	4,100	13,450						●				●	
Multi-stage vertical diffuser / turbine single case pump	CUP-VS1	7,000	31,000	600	1,900										●	
Multi-stage vertical diffuser / turbine double case pump	CUP-VS6	7,000	31,000	600	1,900										●	
RECIPROCATING PUMPS / API 674																
Power driven small (single acting plunger) - simplex/duplex/triplex	Small Power	17	75	6,900	23,000						●					●
Power driven medium (single acting plunger) - triplex/quintex	Medium Power	87	385	6,900	23,000						●					●
Power driven large (single acting) - triplex/quintex	Large Power	146	645	6,900	23,000						●					●
Power driven geared (internally geared)	Geared Power	142	625	5,200	17,300						●					●
Power driven geared (internally geared)	High Power	155	680	13,800	20,000						●					●
SPECIALIST PUMPS																
Downhole multiphase lift pump	CUP-HSP	590	2,600	1,500	4,900	●										
NON-API PUMPS																
2 pole, multistage, ring section (FT) & barrel case (FK) boiler feed pumps	CUP-FT/FK (2 Pole)	1,200	5,280	3,500	11,480						●				●	
Single stage vertical in-line pump (ANSI)	CUP-VCM	410	1,800	150	500			●	●	●		●	●	●		●

Product detail - API compliant centrifugal pumps

CUP-BB1

Our CUP-BB1 single and two stage pumps are horizontally split, double suction pumps. This range includes either single or double volute casing or diffusers. Two stage pumps incorporate single inlet impellers assembled in the back to back arrangement to ensure correct hydraulic balance with superior reliability.

TECHNICAL DATA

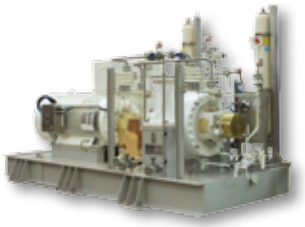
Capacity: up to 15,000 m^3/hr / 66,000 USgpm
Delivered head: up to 1,000 m / 3,300 feet
Temperature: up to 180°C / 350°F
Speeds: up to 6,000 rpm

CUP-BB2

The CUP-BB2 is a heavy duty, horizontal, single or two stage, radially split, between bearing, double suction pump. The pumps rigid body ensures vibration limits are met along with 360° bearing support and heavy centreline mounting. Reliable operation at elevated temperatures is ensured due to a number of cooling methodologies complementing inherently cool running bearing modules.

TECHNICAL DATA

Capacity: up to 1,500 m^3/hr / 6,600 USgpm
Delivered head: up to 700 m / 2,300 feet
Temperature: up to 427°C / 800°F
Speeds: up to 3,600 rpm

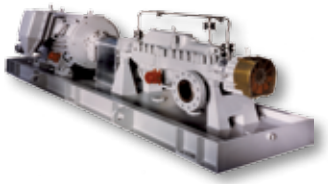


CUP-BB3

The CUP-BB3 pump is a heavy duty axial split case horizontal pump with opposing impellers and either double or single suction first stage impeller. These units are specifically designed for heavy duty, medium and high pressure applications.

TECHNICAL DATA

Capacity: up to 3,000 m^3/hr / 13,200 USgpm
Delivered head: up to 3,350 m / 11,000 feet
Temperature: up to 230°C / 450°F
Speeds: up to 6,500 rpm



CUP-BB5

The CUP-BB5 is available in two heavy duty designs: multi-stage diffuser or double case volute types. The full CUP-BB5 range has been designed to produce an advanced pump with reduced whole life costs. All the pump internals can be withdrawn quickly without disturbing pump alignment or pipework. This reduces the time and cost of maintenance.

TECHNICAL DATA

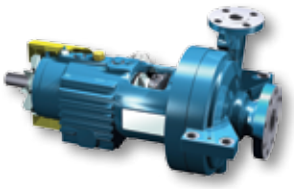
Capacity: up to 2,800 m^3/hr / 12,350 USgpm
Delivered head: up to 4,100 m / 13,600 feet
Temperature: up to 180°C / 350°F
Speeds: up to 7,000 rpm

CUP-OH2

The CUP-OH2 pump is a heavy duty, single stage, radially split, overhung end suction machine. The pumps rigid body ensures vibration limits are met along with 360° bearing support and heavy centreline mounting. Reliable operation at elevated temperatures is ensured due to a number of cooling methodologies complementing inherently cool running bearing modules. The CUP-OH2 is a back pull-out design that allows the complete rotating assembly to be removed without disturbing the suction or discharge pipework.

TECHNICAL DATA

Capacity: up to 1,700 m^3/hr / 7,500 USgpm
Delivered head: up to 350 m / 1,148 feet
Temperature: up to 427°C / 800°F
Speeds: up to 4,000 rpm



CUP-OH3

The CUP-OH3 range is an advanced single stage vertical in-line bearing bracketed centrifugal pump with exceptional flexibility and versatility to meet the requirements of in-situ applications. The unit is ruggedly designed and manufactured for minimum maintenance and heavy-duty requirements. The CUP-OH3 is a back pull out design that allows the complete rotating assembly to be removed without moving the suction or discharge pipework.

TECHNICAL DATA

Capacity: up to 1,365 m^3/hr / 6,000 USgpm
Delivered head: up to 305 m / 1,000 feet
Temperature: up to 370°C / 700°F
Speeds: up to 3,600 rpm

CUP-OH4

The CUP-OH4 range is an advanced single stage vertical in-line centrifugal pump with exceptional flexibility and versatility to meet the requirements of in-situ applications. This unit is ruggedly designed and manufactured for minimum maintenance and heavy duty applications.

TECHNICAL DATA

Capacity: up to 1,365 m^3/hr / 6,000 USgpm
Delivered head: up to 335 m / 1,100 feet
Temperature: up to 370°C / 700°F
Speeds: up to 3,600 rpm

CUP-VS1 + CUP-VS6

The CUP-VS1 pump is a vertical turbine radial flow or axial flow type, multistage, heavy-duty pump designed for wet pit, deep well or canister applications. The CUP-VS1 pump range is engineered without a barrel (suction can), an extensive hydraulic suite gives comprehensive flow and head range coverage. The same pump can be supplied with a suction canister in a VS6 configuration for low NPSH applications.

TECHNICAL DATA

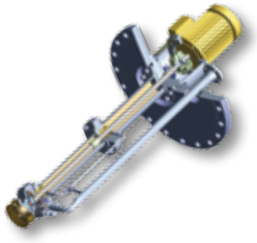
Capacity: up to 7,000 m^3/hr / 31,000 USgpm
Delivered head: up to 600 m / 1,900 feet
Temperature: up to 205°C / 402°F
Speeds: up to 3,600 rpm

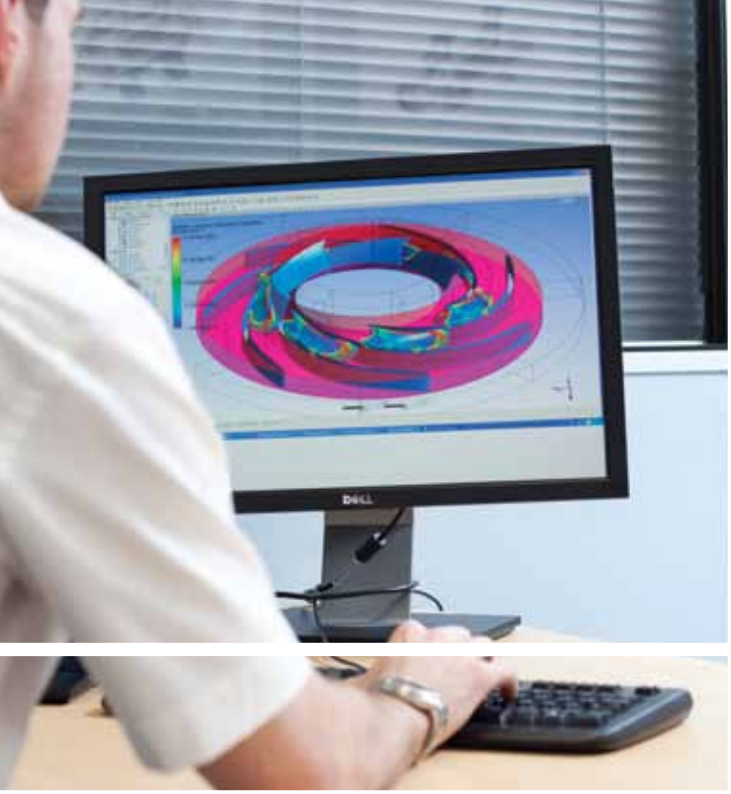
CUP-VS4

The CUP-VS4 pump is a vertical suspended, single-casing volute, line-shaft driven sump pump. The units have been designed to suit customer requirements with lengths available up to six meters sump depth. The simple construction of the pump offers ease of maintenance and reliability.

TECHNICAL DATA

Capacity: up to 450 m^3/hr / 2,000 USgpm
Delivered head: up to 160 m / 520 feet
Temperature: up to 200°C / 392°F
Speeds: up to 3,600 rpm





CUP-BB1 ON TEST

Product detail - API compliant reciprocating pumps

ClydeUnion Pumps reciprocating power pumps are designed with exceptional versatility to efficiently meet the requirements of a wide variety of pumping applications. These units are ruggedly designed for minimum maintenance and to meet the heavy-duty requirements of continuous duty operation in general industry as well as API 674 services.

These units are driven via electric motors or diesel engines through V-belt or gear reduction. Stuffing boxes are specifically designed for applications to maximise packing life and minimise maintenance. Equipment can be packaged to meet the most stringent requirements of API 674.

SMALL POWER

Capacity: up to 17 m^3/hr / 75 USgpm
Discharge pressure: up to 6,900 m / 23,000 feet (10,000 psi)
Temperature: up to 182 °C / 360 °F
Speeds: up to 440 rpm depending on model
Models include: SX3, DX5, TX10, TD28, TD30, TD60, TD90

MEDIUM POWER

Capacity: up to 87 m^3/hr / 385 USgpm
Discharge pressure: up to 6,900 m / 23,000 feet (10,000 psi)
Temperature: up to 177 °C / 350 °F
Speeds: up to 400 rpm depending on model
Models include: QD100, TD120, QD200

LARGE POWER

Capacity: up to 146 m^3/hr / 645 USgpm
Discharge pressure: up to 6,900 m / 23,000 feet (10,000 psi)
Temperature: up to 177 °C / 350 °F
Speeds: up to 290 rpm
Models include: TD240, QD400

GEARED POWER

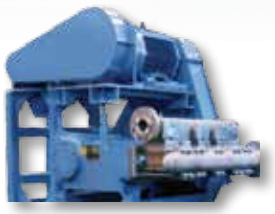
Capacity: up to 142 m^3/hr / 625 USgpm

Discharge pressure: up to 5,200 m / 17,300 feet (7,500 psi)

Temperature: up to 177 °C / 350 °F

Speeds: up to 385 rpm depending on model

Models include: TX50, TX70, TX90, TX115, TX125, TX150, TX200, QX300



Product detail - Non-API pumps

ClydeUnion Pumps also manufacture various ISO and ANSI standard pumps and a non-API ring section multi stage boiler feed pump (CUP-FT 2 Pole) which provides an extensive product range for general plant applications. For more information on products we have available for your applications please contact a member of our sales team.

CUP-FT/FK (2 pole)

The CUP-FT/FK (2 Pole) is a world class product range designed for boiler feed and steam generating applications. The range is a radially split case diffuse type pump with options for through bolt (FT) or barrel case (FK), desiged for low, intermediate and high temperature applications.

TECHNICAL DATA

Capacity: up to 1,200 m^3/hr / 5,280 USgpm

Delivered head: up to 3,500 m / 11,480 feet

Temperature: up to 190°C / 375°F

Speeds: up to 3,600rpm

CUP-VCM

The CUP-VCM is an advanced single stage vertical in-line centrifugal pump with exceptional flexibility and versatility to meet the requirements of a wide range of pumping applications. The CUP-VSM pump is designed and manufactured to ASME/ANSI B732 standards.

TECHNICAL DATA

Capacity: up to 410 m^3/hr / 1,800 USgpm

Delivered head: up to 150 m / 500 feet

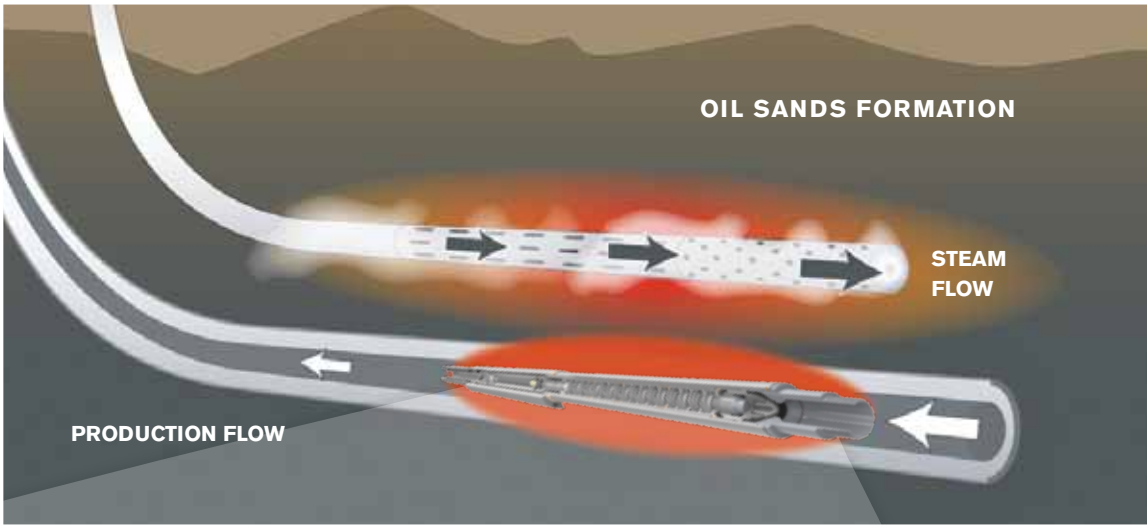
Temperature: up to 260°C / 500°F

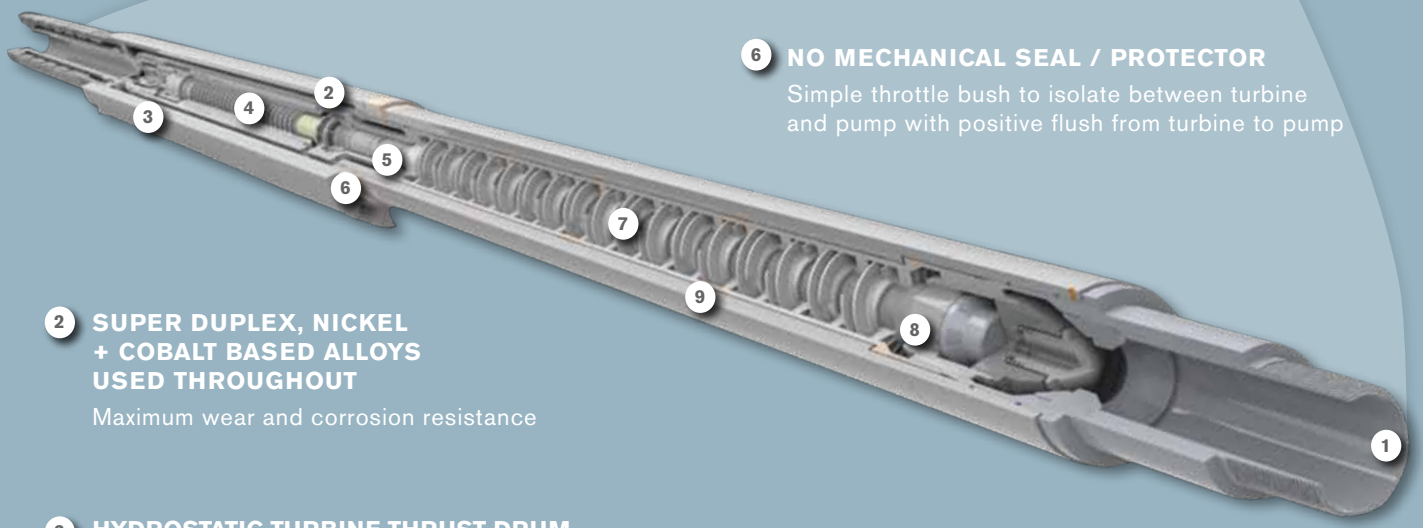
Speeds: up to 3,600rpm

Oil lift pump for production wells

SAGD operators are increasingly turning to lift pumps to optimise production rates. However, the downhole pumping environment is the most challenging one in the oil industry, characterised by very high temperatures and aggressive fluids. ClydeUnion Pumps high reliability HSP hydraulic drive pump offers an alternative to the often short lived electric submersible pump (ESP) technology. Field experience shows that the water turbine driven HSP can achieve mean time to failure (MTTF) around three times greater than the industry average for ESPs, which provides the opportunity for reductions in work over frequency, costs and deferred oil production.

KEY FEATURES OF THE HSP





1 PREMIUM THREAD CONNECTIONS
Industry standard for connection into system

2 SUPER DUPLEX, NICKEL + COBALT BASED ALLOYS USED THROUGHOUT
Maximum wear and corrosion resistance

3 HYDROSTATIC TURBINE THRUST DRUM
Non-contacting for low wear using clean feed from turbine

4 COMPACT MULTI-STAGE TURBINE
Simple, variable speed drive with a wide operating range

5 COMPACT ONE PIECE SHAFT
Shop assembled with no couplings

6 NO MECHANICAL SEAL / PROTECTOR
Simple throttle bush to isolate between turbine and pump with positive flush from turbine to pump

7 MULTIPHASE IMPELLERS
Capable of handling up to 80% gas continuously and 100% gas slugs

8 HYDROSTATIC PUMP THRUST DRUM
Non-contacting for low wear using clean feed from turbine

9 HYDROSTATIC PUMP END RADIAL BEARINGS
Non-contacting for low wear using clean feed from turbine

Other oil sands processes - In-situ + surface mining

IN-SITU PROCESSES

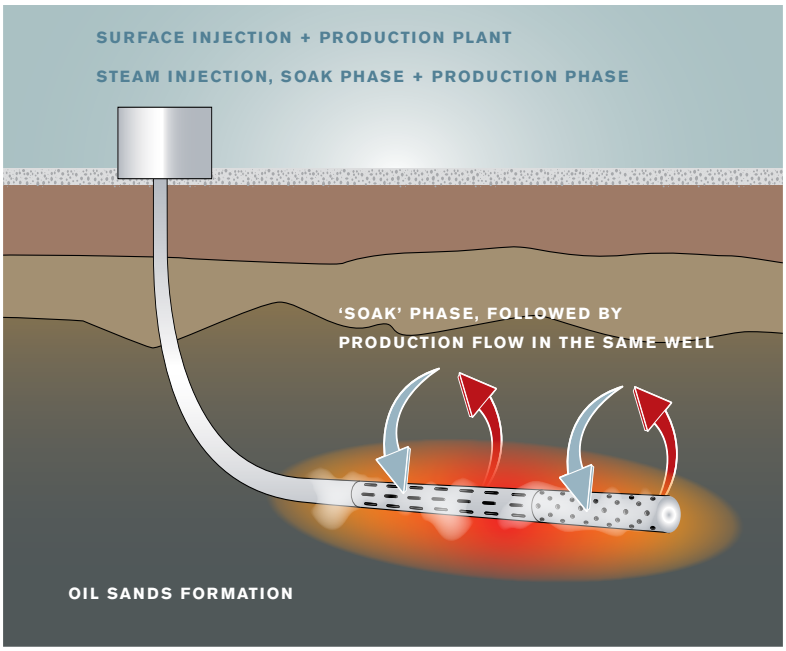
As well as the SAGD process, ClydeUnion Pumps provide equipment for the other in-situ oil sands extraction, processing and treatment technologies. Many of the applications previously discussed are directly applicable to the surface processes used in the following alternative in-situ processes.

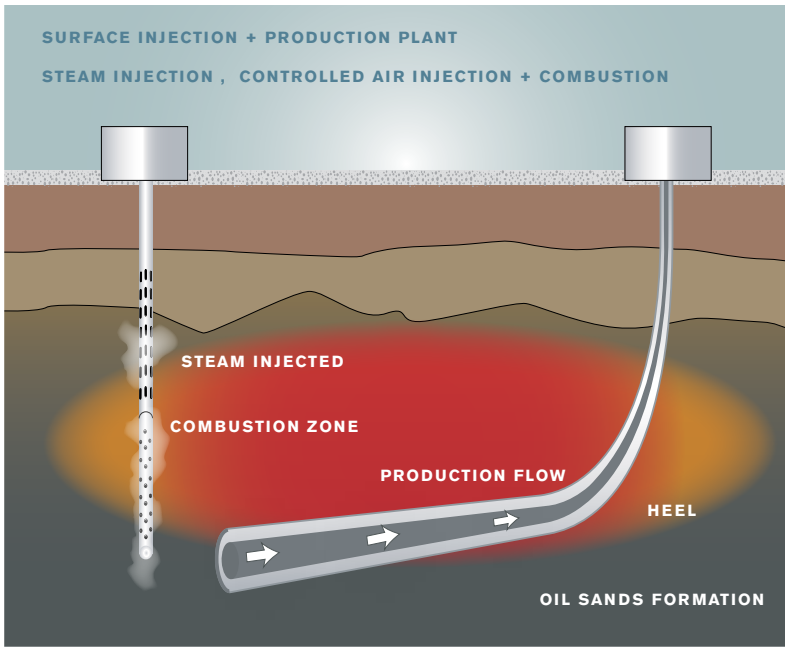
CYCLIC STEAM STIMULATION (CSS)

CSS is an alternative process to SAGD focussing on cyclic loading of single wells by steam stimulation followed by production. CSS surface equipment is similar to SAGD and as such applications discussed in this brochure are also directly applicable to CSS.

TOE TO HEEL AIR INJECTION (THAI)

THAI is a relatively new extraction technology that combines initial steam soaking of the bitumen with a combustion front fuelled by continuous air injection and hydrocarbon presence in the well. THAI topside plant is similar to SAGD and CSS but due to the reduced water requirement, water treatment and steam generation plant will be less significant.





THE VAPOUR EXTRACTION PROCESS (VAPEX)

VAPEX is similar to SAGD but instead of using steam, stimulation hydrocarbon solvents are used in the injection well to stimulate the bitumen. This process allows some partial upgrading of the bitumen within the sand formation. VAPEX is not as prevalent as SAGD or CSS and is still at an early stage of development. VAPEX topside plant is more heavily weighted to hydrocarbon storage, treatment and solvent injection than SAGD facilities.

Surface mining

Surface mining of oil sands and subsequent processing and upgrading to produce synthetic crude oil, is currently the dominant production method for bitumen from the oil sands in Canada, but will be out-produced by in-situ methods in the coming years.

Surface mining plants are on a much bigger scale than most in-situ plants and ClydeUnion Pumps has experience supplying some of the biggest companies in this market for the arduous processes involved.

INSTALLATION + COMMISSIONING: TROUBLE FREE COMMISSIONING ANYWHERE IN THE WORLD

PARTS: ANY BRAND, ANY MATERIAL, ANYTIME

Lifetime worldwide support

Every product ClydeUnion Pumps supplies is supported by a full lifetime commitment. ClydeUnion Pumps provides a full aftermarket service, drawing on either its own engineers or fully trained and highly experienced service partners, depending on the location of the installation. ClydeUnion Pumps has service facilities in over 40 countries spread throughout Europe, America, Asia, the Middle East and Africa.

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

ClydeUnion Pumps after sales support is subject to the same supply chain management as the pump manufacturing. This provides customers with the lowest lead times and costs whilst meeting the highest standards of quality assurance.

In addition to spare parts, routine servicing, overhauls and inventory control, the aftermarket support covers upgrades and comprehensive technical advice about the potential refitting of existing installations for greater efficiency and reliability. ClydeUnion Pumps 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.

ClydeUnion Pumps history and breadth of experience, as well as its geographical coverage and expertise, make it the natural first choice for any pump related problem or enquiry, no matter what the location, the scale of the task or the original manufacturer. We guarantee supply of parts for all heritage brands and/or obsolete products, including:

- Weir Pumps
- Clyde Pumps
- Union Pump
- Girdlestone
- Mather & Platt
- Harland
- Drysdale
- WH Allen
- Allen Gwynnes
- David Brown Pumps
- DB Guinard Pumps
- American Pump
- Pumpline

WELLHEAD + TREE

SPX®

SAGD - STEAM ASSISTED GRAVITY DRAINAGE

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