



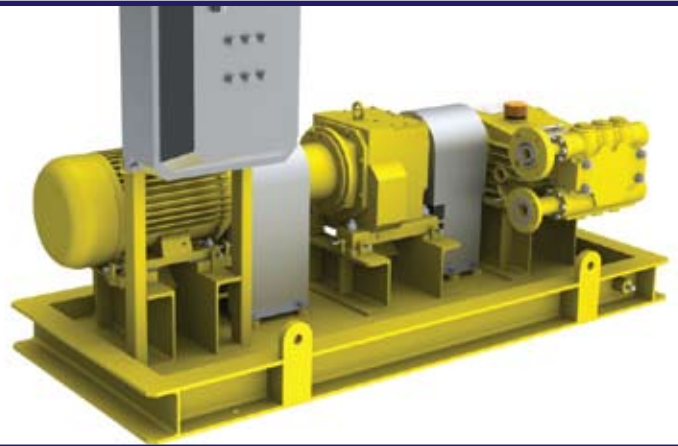
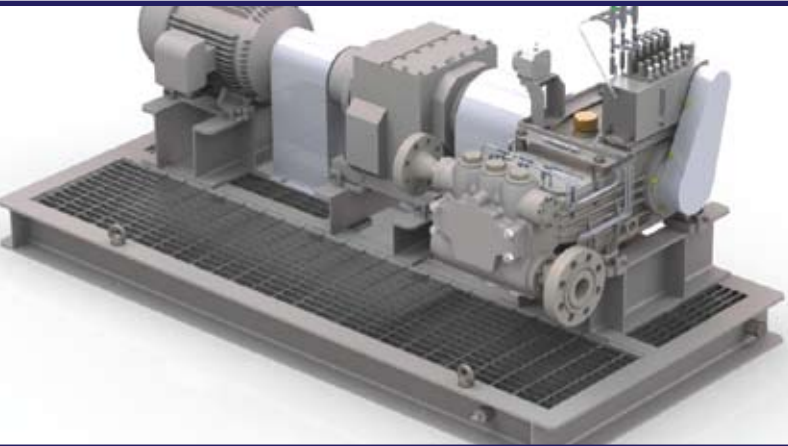
RAM PUMPS

Meeting The Toughest Challenges



**Design, Development and Manufacture
of Reciprocating Process Pumps to
Recognised International Industry Standards**

MEETING SPECIAL REQUIREMENTS IN ALL TYPES OF INDUSTRIAL APPLICATIONS



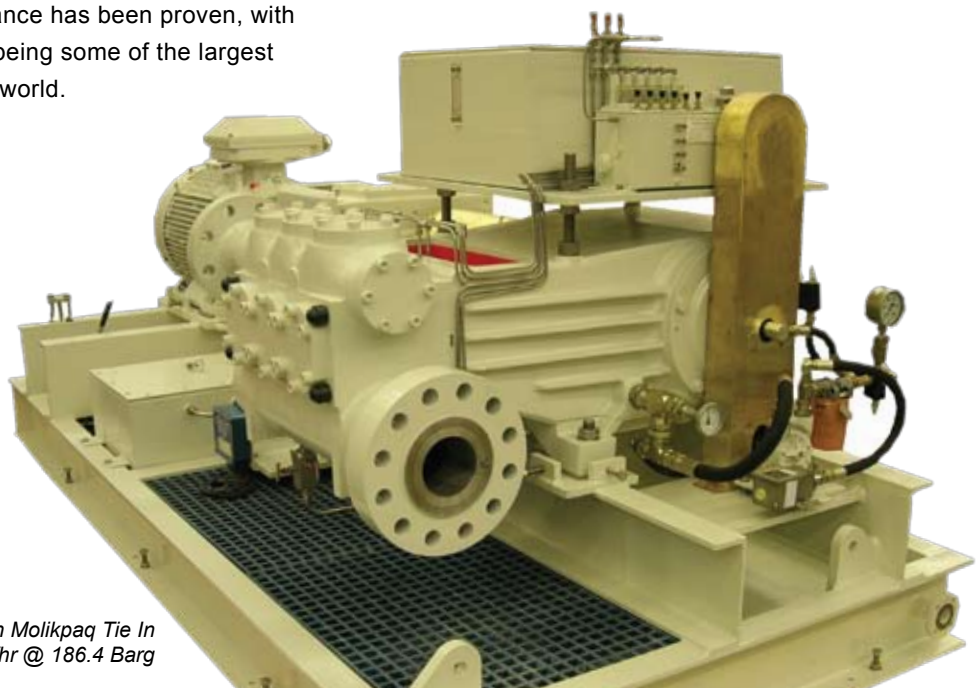
Ram Pumps Limited was formed in 1972. Our goal was, as it is today, to provide quality, dependable, high pressure reciprocating pumps to meet special requirements in all types of industrial applications.

There clearly was and is a market requirement for a manufacturer to supply a complete range of quality high pressure pumps and custom designed pump units for highly demanding applications.

The capability of our company and the range of our products have grown to meet this challenge. Our quality performance has been proven, with many of our clients being some of the largest organisations in the world.

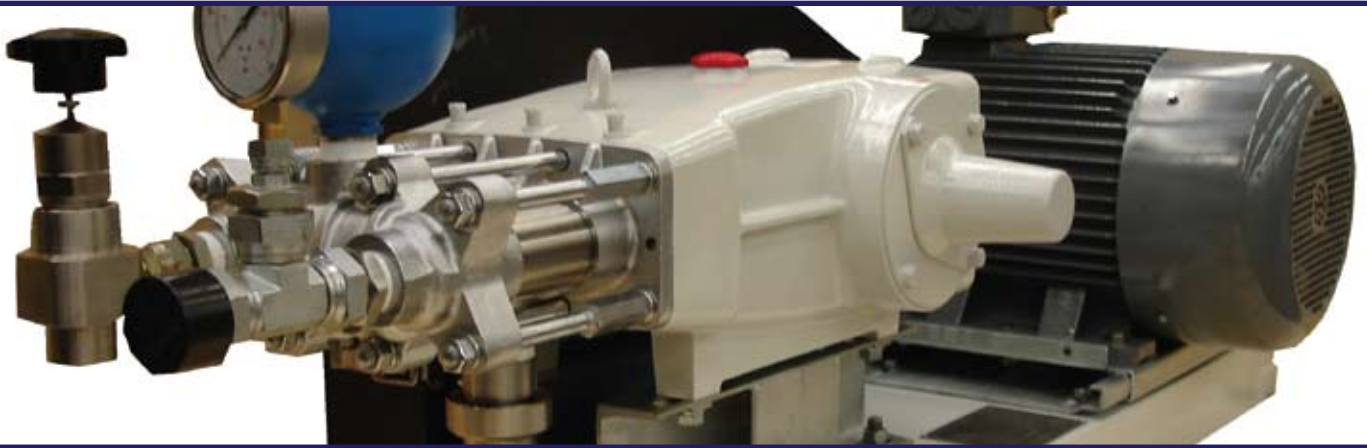
Our extensive range of pumps and pump units with their control equipment are designed to meet the exact specifications issued by our clients.

In the year 2000 the company became part of the CAT Pumps Corporation. Ram Pumps' traditional market in the oil and gas industry was further strengthened with this acquisition and a range of "standard pumps" was engineered to meet larger capacity demands of other markets such as sea water reverse osmosis.



*Sakhalin Molikpaq Tie In
NGL Condensate - 13.0m³/hr @ 186.4 Barg*

QUALITY MATERIALS & DESIGN ASSURE QUALITY PERFORMANCE



The current range of process pressure pumps from Ram Pumps is high quality, powerful and reliable to match the exacting requirements of Industries such as “Oil and Gas”, both on and off shore and chemical processing.

The Concept follows a modern design appearance that has come to be easily recognised by users of high-pressure pumps. The technical specification is based on the current American Petroleum Institute Standard 674, this being accepted as the industry standard around the world. The products have a proven track record of excellence in performance with a no-nonsense philosophy of quality engineering in all areas of construction.

Our Process Pumps have an almost infinite variation of build options that stem from over 35 years experience constructing special purpose pumps and pump units. The pumps, as a philosophy, do not have integral gearboxes, so as not to limit the exact speed and power available to the client.

Duplex Alloy and Stainless Steel liquid heads are the preferred construction, but there are many options on materials of construction such as Carbon Steel, low and high temperature alloys, and Inconel. There are also an infinite variety of

packing arrangements that can be fitted, coming from a continuing development program that has been running for over 35 years.

Motive Power

- TEFV Electric Motors, Safe and Hazardous Area
- DC Motors
- Diesel Engines
- Petrol Engines
- Gas Engines
- Steam Turbines

Transmission

- Gearbox
- V Belt
- Timing Belt
- Torque Converter
- Hydraulic
- AC Inverter
- DC Drive



PUMPS DESIGNED TO STAND THE TEST OF TIME



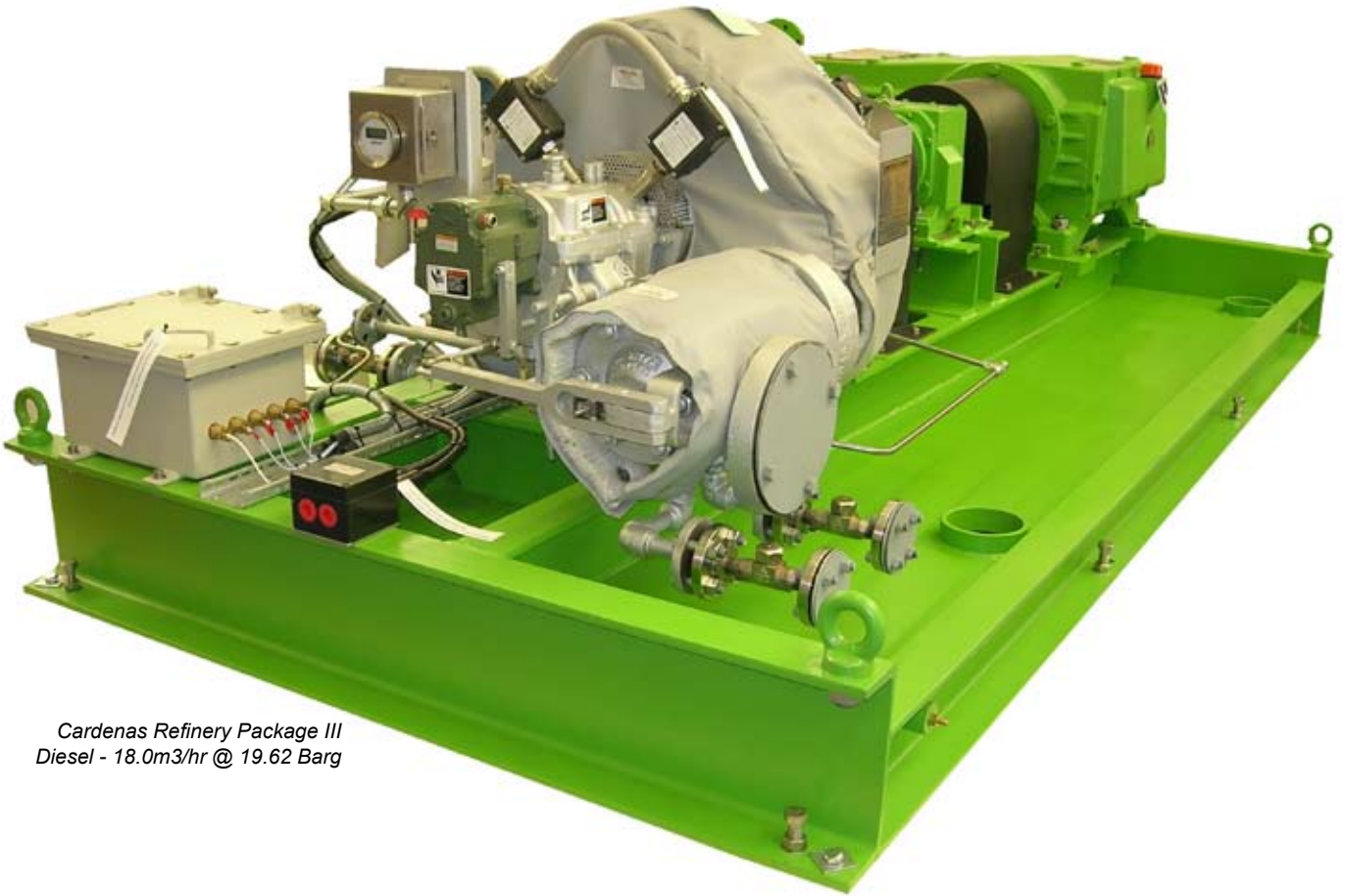
Ram Pumps has a large number of reciprocating pumps in field service with many of the major oil and gas producers all over the world. Our clients require solidly constructed, quality built, reliable, easy-to-operate, no-nonsense equipment that is designed to stand the test of time.

We set out with these points as the driving force behind the range of products being designed. The result is a wide range of products in general conformance with API 674 (the defacto standard for the oil and gas industry as issued by the American Petroleum Institute.) The Company remains committed to keeping up to date with the latest revisions and ISO 13710.

All pumps and complete packages can be offered in compliance with the ATEX Directive for 'Non-Electrical Machinery.

Our pumps have a proven performance record in many demanding applications.

- Methanol injection
- Fracking
- Glycol injection
- Liquid condensate injection
- Descaling
- Well equalization
- Reclaim oil
- Waste-water reinjection
- Boiler feed
- Hydrostatic testing
- Hydrocracking
- Gas dehydration
- Crude oil transfer
- LPG
- TEG circulation
- Gas corrosion inhibitor injection
- Hydroblasting
- Trenching
- Reverse osmosis
- Drill cutting injection



*Cardenas Refinery Package III
Diesel - 18.0m³/hr @ 19.62 Barg*

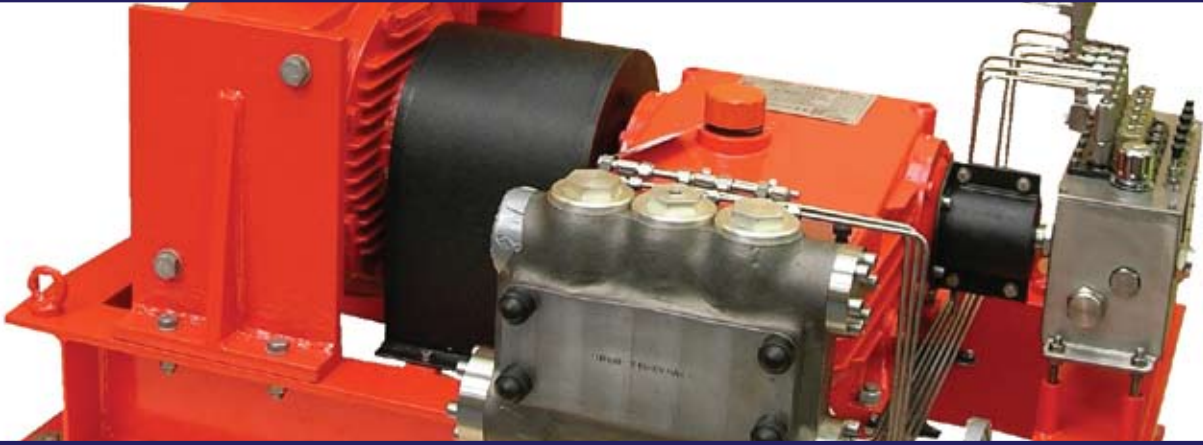


*BP Unity Mobile Pipeline 'Pigs'
Hydrotesting Unit - 7.63 L/min @ 245Barg*



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CUSTOM DESIGNED, FULLY TESTED PUMPS & PUMP UNITS



The manufacture of all the Company's machined products to ISO 9001:2000 Quality Assurance is undertaken in our factory in West Sussex, England.

A highly experienced Design Engineering Department, using 3D CAD Systems with Integrated and Finite Element Analysis produces the required drawings and technical information for production.

Our factory is staffed with a team of specialised personnel who take pride in their dedication to the production of a high quality product line, including bare-shaft pumps and custom designed pump units, fully tested and all ready for delivery and installation.

SINGLE PROJECT SPECIAL PURPOSE PUMPS

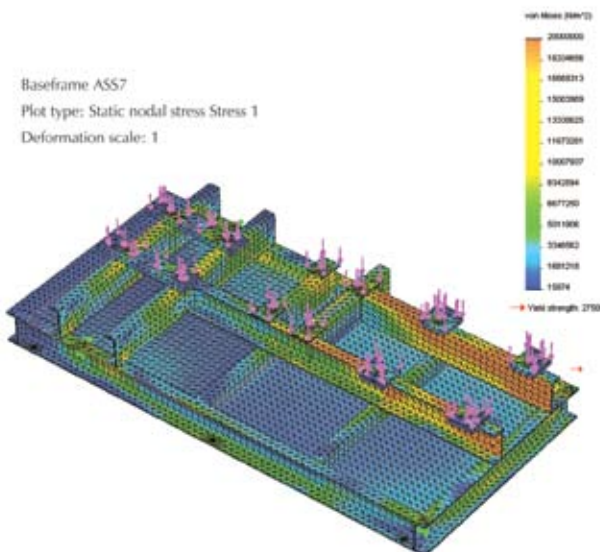
"Infinite variety of build options with API compliance for oil and gas industry"

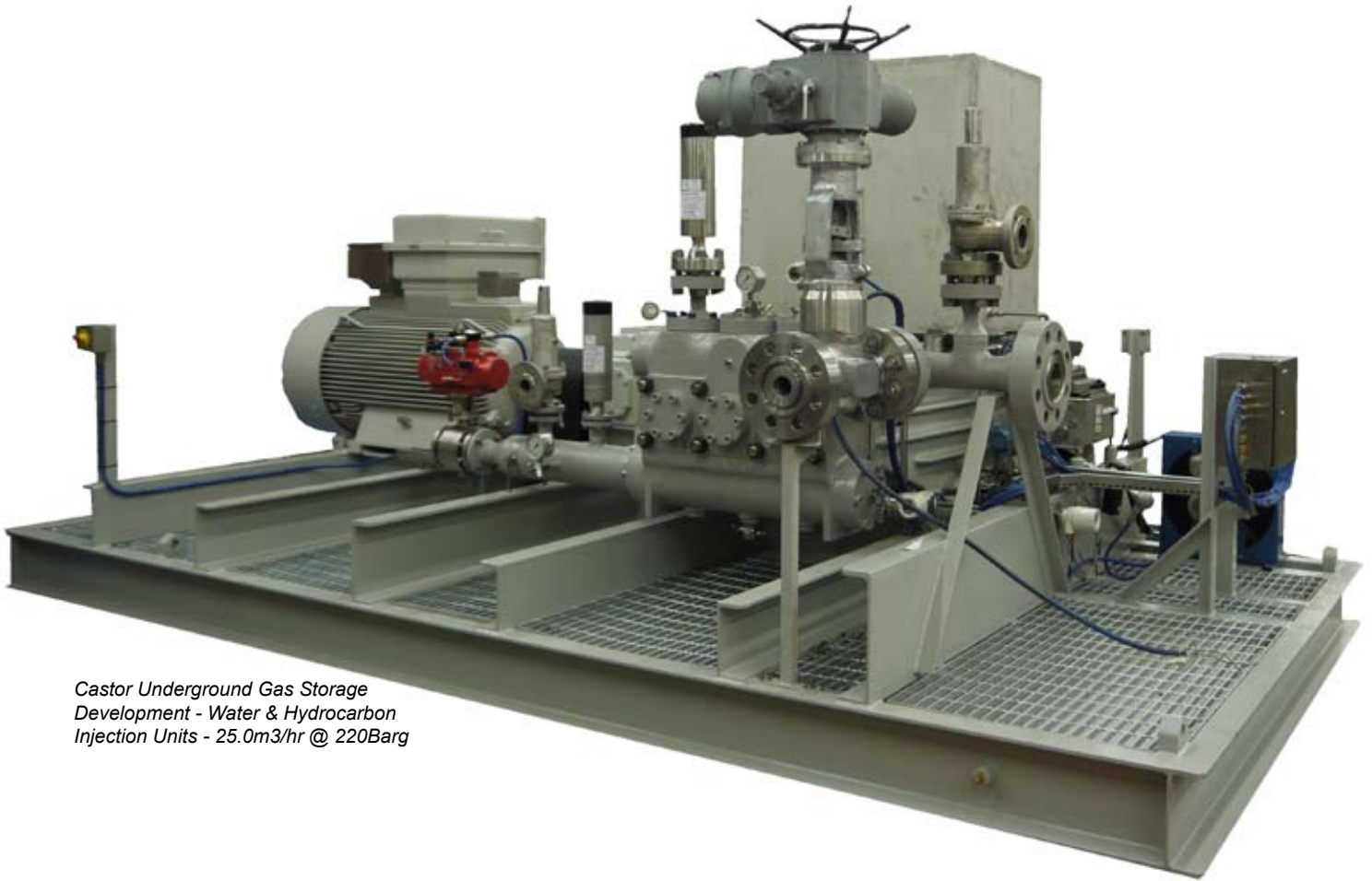
Our consistent quality engineering/manufacturing and speedy response to market conditions enable the Company to meet the exact needs of our clients, who require special purpose, custom designed pumps or pump units. We start with our standard pump design, complete a detailed review of our client's application specifications and design a custom pump or pump unit to meet each unique requirement. Special lubricating systems, high temperature packings, special plunger materials or special paint finishes are just a few of the custom features available. With the many design options, we can offer a very acceptable delivery, while meeting these special requirements.

STANDARD PUMPS

"Superior lead-time for standard performance pumps"

Significant investment in manufacturing has allowed the Company to produce standard pump models in larger production batches, offering the client superior leadtimes and favourable prices. The proven chevron packing design and concentric solid ceramic plungers are featured throughout these standard pump models. Standard duplex stainless steel liquid-end construction offers a very affordable and durable pump for reverse osmosis and other chemical and industrial applications.





*Castor Underground Gas Storage
Development - Water & Hydrocarbon
Injection Units - 25.0m³/hr @ 220Barg*



*Tecna Proyectos Y Operaciones
TEG Circulation Units - 6.3m³/hr @ 90.3Barg*



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QUALITY COMPONENTS OFFERING STRENGTH, DURABILITY & COMPATIBILITY



Crankcases are constructed from S.G. Iron offering exceptional strength, vibration dampening, and flame and spark resistance for hazardous areas. Low temperature grades also available for use in harsh environments.

Crankshafts are constructed from materials, suitably heat-treated and processed offering unmatched service life.

Bearings are large capacity tapered roller bearings offering maximum load bearing support at each end of the crankshaft. Special bearings can be fitted for high stress applications.

Lubrication on all standard pump models is splash/submersion while the larger capacity models have pressure lubrication driven directly by the crankshaft of the pump. In the latter case pressurised oil is supplied to big and small end bearings with splash to all other moving parts. Other lubrication options are available.

Liquid End: Pressure containing parts are offered in ANSI 316 Stainless Steel or Duplex Alloy 22% or 25% Cr Stainless Steel for a quality product that provides maximum life and a wide range of compatibility.

Plungers and Packings: Considerable laboratory and field testing has gone into the development of these items, providing a large number of solutions to suit varying applications. Plungers can be offered in a variety of materials from solid Ceramic to Tungsten Carbide coated, while packings are PTFE/Kevlar or any number of other materials. Long service life can be expected from the product before maintenance is required.

Transmissions: All pumps in the range are designed with a 'bare shaft' format to allow for all types of transmission to be applied giving a totally flexible product. Low power sizes are available with chassis mounted or special overhead electric motor mount, advantageous where space is at a premium [illustrations can be seen in this leaflet]. For the larger requirements, a full range of helical and worm gearboxes are offered for use with either electric motors or internal combustion engines.

Testing: Both pumps and custom designed packages are fully works tested at duty point regardless of size.



*Aramco Karan TP-1 Facilities
BCI Injection Units - 200 USGPM @ 131Barg*



Premier Fluid Solutions - Saline Water - 30m³/hr @ 82.75Barg



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OPTIMUM PERFORMANCE & PUMP LIFE



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Each frame size has a number of plunger diameter options providing a wide range of performances to best suit the application requirements.

Liquid-end construction and elastomers must be compatible with the liquid being pumped, temperature and other application variables.

The drive is dependant upon the location of the application, the available electricity, safety requirements, dutycycle and matching of the pump RPM and drive.

The pump is the heart of the system, but adequate Pressure relief and other system accessories are equally important for optimum performance and life.

If the exact model is not listed, contact our technical staff to review your custom requirements.

Volumetric Efficiency (%)

Volumetric efficiency of 95% at pressures up to 200 bar (3,000 psi). At higher pressures the volumetric efficiency will reduce. At 700 bar (10,000) psi, it will be reduced by 5%, approximately 1% per additional 100 bar (1500 psi).

Pump Speed (RPM)

Being positive displacement pumps, the RPM of each unit can be reduced to decrease the flow. Max speeds vary between 420rpm and 800rpm, dependent on pump size and application.

Mechanical Efficiency (η_m %)

The pumps have a mechanical efficiency better than 90% over most of their performance range. The conservative figure of 85% is used in determining the required power [kW / HP]. The efficiency of the transmission system should be allowed for. (η_t %)

Required Power (kW / HP)

Do not exceed the rated power [kW / HP] for the pump.

Absorbed kW

$$\frac{\text{Flow (l/m)} \times \text{Pressure (bar)}}{\eta_m / 100 \times \eta_t / 100 \times 600}$$

Absorbed HP

$$\frac{\text{Flow (GPM)} \times \text{Pressure (psi)}}{\eta_m / 100 \times \eta_t / 100 \times 1714}$$



Technical Support:

We have a highly trained sales and engineering staff available to assist you with the selection of one of our standard pump models or custom designing a pump to meet your specific needs.



Locations:

- Egypt
- India
- Indonesia
- Korea
- Kuwait
- Latvia
- Malaysia
- Nigeria
- Norway
- Oman
- Saudi Arabia
- Singapore
- Spain
- Vietnam
- UAE

Major Clients:

- AMEC
- Amerada Hess
- Aramco
- BP
- Conoco
- Fluor
- Foster Wheeler
- GASCO
- McDermotts
- SABIC
- SEIC
- Shell
- Technip
- Total
- Venture
- Vietsovetro
- Woodside



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