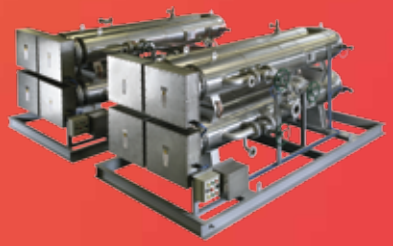
EX®
HEAT

Hazardous Area Electric
Process Heat & Control Systems



Hazardous Area Process Heat & Control Solutions

COMPANY PROFILE

EXHEAT is recognised as one of the world leaders in the design and manufacture of electric process heaters and associated thyristor control systems for both Non Hazardous and Hazardous Area equipment. EXHEAT has extensive global experience in Electrical, Mechanical and Thermal design.

From harsh offshore locations where anti-corrosion properties are of paramount importance to desert locations where high and low ambient temperatures must be considered, EXHEAT has the expertise you require.

Equipment can be supplied to meet both IEC and NEC requirements. Where it is to be installed within a Hazardous area product certification can be supplied from all certification bodies.

For both onshore and offshore applications, EXHEAT has the knowledge and expertise to design and manufacture electric process heating equipment suitable for installation within the extreme environments commonly found in the Oil, Gas and Petrochemical industries.

INDUSTRIES SERVED

Oil & Gas
Processing Plants
Chemical
Marine
Power Generation
Medical
Utilities
Petrochemical
Refineries
Pharmaceutical
Food Processing
Construction
General Manufacturers

PRODUCT APPLICATIONS

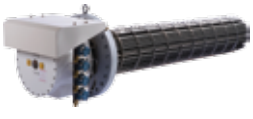
EXHEAT is a world leader in the design and manufacture of engineered electric process heaters for Hazardous Areas.

Typical applications include:

Fuel Gas
Glycol Regeneration (TEG)
Crude Oil
Hydrocarbon Liquids
Sea Water
Nitrogen/Air
Oxygen
Process Gas
Heat Transfer Liquids
Water
Hot Water Calorifiers
HVAC

250kW Exd
Removable Core Heater

300kW Exd
Fuel Gas Heaters



1000kW Exd
Fuel Gas Heater Bundle

2530kW Exe
Natural Gas Heater

Exe Air Duct Heaters

400kW Exe Heater Bundle

Exp Control Panel

Exd Control Panel

Hazardous Area
Submerged 'L' Heater

Exd Cast Line Heater

MISSION STATEMENT

EXHEAT endeavors to lead the global hazardous area electric heater's & control systems industry. We aim to achieve this through core focus on:

- Embracing new technologies & continuous improvement in our product range
- Offering innovative solutions and delivering the best quality
- Offering globally approved hazardous area certifications
- Serving customers with a high level of service in design, detailed engineering and project management
- Supporting customers worldwide with a team of support/service engineers

QUALITY ASSURANCE

EXHEAT is a Total Quality Environment committed to continuous improvement to ensure that customers' requirements are met and backed up by a level of service necessary to operate in today's global market place.

EXHEAT operates a Quality Management System in accordance with the internationally recognised benchmark standard ISO 9001:2008 and which additionally meets the Quality Assurance requirements of both the European ATEX Directive (94/9/EC) and Pressure Equipment Directive (97/23/EC) and the international IECEx scheme. Products manufactured for the European market are CE marked and meet the requirements of the European Low Voltage, EMC and Machinery Directives.

CERTIFICATION

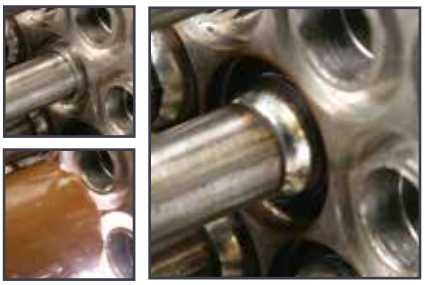
EXHEAT holds approvals from North America, Europe, China, India, Korea and globally through the IECEx scheme for the manufacture of electrical heating equipment for use in potentially explosive atmospheres:

Design & Manufacturing Capabilities

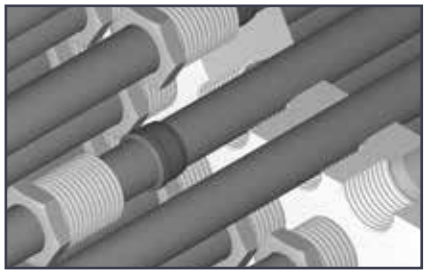
MANUFACTURING TECHNIQUES

EXHEAT meets the stringent requirements of design codes, international standards and client specifications. Our design features allow us to provide heating solutions for extreme processes from cryogenic service to gas regeneration and for pressures in excess of 500bar.

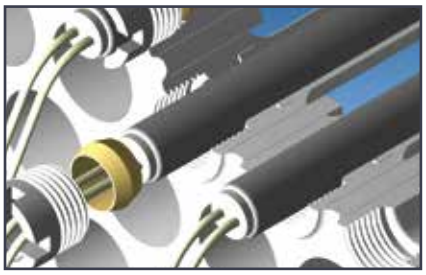
Element to tubesheet sealing using bite coupling design, automated orbital welding or cartridge elements inserted in pockets to facilitate withdrawal of the elements without the need to drain the system.



Orbital welding of element to tubesheet



Elements sealed using bite couplings



Cartridge elements inserted in pockets

ELEMENTS

Elements are manufactured from 80/20 nickel chrome resistance wire with high purity compacted magnesium oxide powder sheathed within corrosion/erosion resistant tube selected inline with process e.g.

- Incoloy 800/825
- Inconel 600/625
- Titanium
- Stainless steel 316/316L
- Stainless steel 321
- Monel

ROD TYPE:

Metal sheathed with mineral insulated rod elements are the most versatile and cost effective method of electric heating.

CORE TYPE:

Withdrawable ceramic core type elements are designed for use in heating large tanks, advantage being maintenance can be done without the need to drain the tank.

CARTRIDGE TYPE:

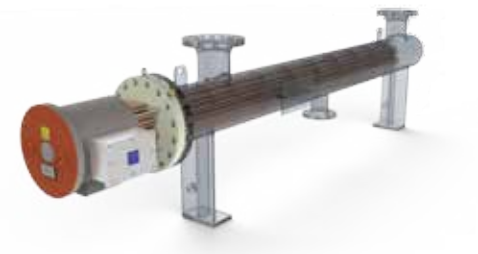
Cartridge elements are similar in construction to rod elements only both terminations are made at a single end. This allows elements to be installed in a withdrawable construction.

DESIGN

Our unique design approach and extensive range of certification offers simple solutions to complex requirements. EXHEAT design teams support customers from conceptual, FEED to EPC and throughout the life cycle of the equipment.

Our inhouse design capabilities include:

- Single heaters up to 5MW
- 3D modeling (Pro Engineer)
- Thermal design
- Electrical design
- Process design verification
- Mechanical design
- Instrumentation requirements



Ex'd' Flameproof Design

Ex'e' Hazardous Area Design

ADVANTAGES OF ELECTRIC HEATING

Compared to other types of industrial heating such as fuel and gas fired heating systems, or indirect heat exchangers, electric heating offers many advantages:-

- **Efficiency –** without the need for regular tuning or additional heat sources, electric heating boasts virtually 100% efficiency, since almost all of the electricity is converted to heat.

- **Precision –** being a direct heating solution, electric heating boasts fast reaction times, offering superior temperature control and the flexibility to deal with varying process conditions.

- **Environmental –** without the production of pollutants as a by-product, electric heating avoids the monitoring and control measures necessary to meet environmental regulations and furthermore, with minimal moving parts, noise regulations are not a concern either.

- **Physical Size –** electric heating boasts a small footprint, without the need for additional piping and supports, thereby saving valuable space.

- **Costs –** being physically smaller in size, not only are initial costs considerably less with electric heating but without the need for frequent and complex maintenance activities and their associated down times or expensive performance monitoring either, operating costs are less too.

- **Maintenance –** with minimal moving parts, electric heating requires less maintenance.

- **Installation –** electric heating boasts a simpler means of operation with faster setup times.

Exd and Exe Hazardous Area Process Heaters

EXHEAT Exd Flameproof/Explosionproof and Exe Hazardous Area electric heaters comprise a large range of process flow heaters, certified for use in a Zone 1 or Class I, Div 1 or Div 2 Hazardous Area, custom built to meet client specifications.

300kw Exd Fuel Gas Heaters

2530kw Exe Natural Gas Heater

VESSEL MATERIALS

Carbon Steel
Low Temperature Steel
Stainless Steel
Duplex
Titanium
Super Austenitic
Monel
Nickel Alloys

VESSEL DESIGN CODES

PED Compliant
PD 5500: Cat 1
ASME VIII Div 1or 2
Stoomwezen
CODAP
AD Merkblätter
AS 1210
EN 13445

Exd Explosionproof Process Heater	Exe Hazardous Area Process Heater
Up to 1000kW (larger ratings achieved by a combination of enclosures)	Up to 5000kW
ATEX approved Ⓔx II 2 G/D	ATEX approved Ⓔx II 2 G
IECEx, CSA, GOST-R	CENELEC, IECEx, CSA, GOST-R
Exd, Zone 1, Gas Group II A, B, C	Exe, Zone 1, Gas Group II
Class I, Div 1, Gas Group A, B, C, D	Class I, Div 2, Gas Group A, B, C, D
Terminal box certified weatherproof to IP66/67 or NEMA Type 4	Terminal box certified weatherproof to IP67 or NEMA Type 4x
	Lightweight stainless steel construction terminal box
Temperature Class T1 - T6 (T450°C – T85°C)	
Elements are specially sealed to prevent moisture ingress	
Elements are individually replaceable on site without the need for special tools	
Suitable and certified for use in ambient temperatures -60°C to +60°C	
Anti-condensation heaters fitted if required	

TYPICAL APPLICATIONS

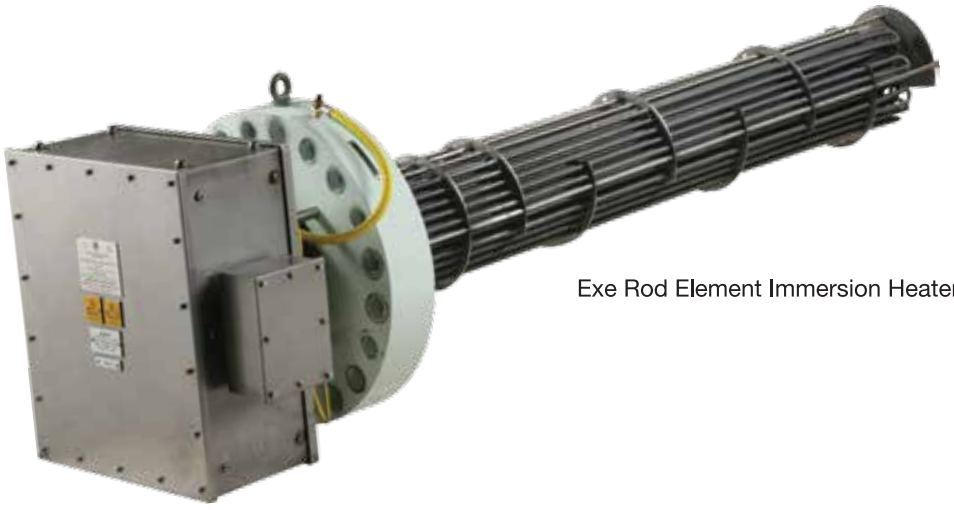
- Fuel Gas
- Natural Gas
- Molecular Sieve Regeneration
- Industrial Gases
- Heat Transfer Oils
- Fuel Oils
- Water
- Crude Oil
- Hydrocarbon Liquids
- Heating Medium
- Cleaners
- Lubricating Oils
- Vapour Degreasing
- Steam
- Dye Solutions

Exd and Exe Hazardous Area Immersion Heaters

EXHEAT Exd Flameproof/Explosionproof and Exe Hazardous Area electric heaters comprise a large range of process immersion heaters, certified for use in a Zone 1 or Class I, Div 1 or Div 2 Hazardous Areas, custom built to meet client specifications.

Exe Cartridge Element Immersion Heater

Exd Core Element Immersion Heater



Exe Rod Element Immersion Heater

Exd Explosionproof Immersion Heater	Exe Hazardous Area Immersion Heater	Hazardous Area L Immersion Heater
Up to 1000kW (larger ratings achieved by a combination of enclosures)	Up to 5000kW	Up to 150kW
ATEX approved Ⓔx II 2 G/D	ATEX approved Ⓔx II 2 G	ATEX approved Ⓔx II 2 G
IECEx, CSA, GOST-R	IECEx, CSA, GOST-R	CENELEC, IECEx, GOST-R
Exd, Zone 1, Gas Group II A, B, C	Exe, Zone 1, Gas Group II	Exe, Zone 1, Gas Group II
Class I, Div 1, Gas Group A, B, C, D	Class I, Div 2, Gas Group A, B, C, D	Terminal box certified weatherproof to IP66/67
Terminal box certified weatherproof to IP66/67 or NEMA Type 4	Terminal box certified weatherproof to IP67 or NEMA Type 4x	Durable stainless steel enclosure with removable cable entry gland plates
	Lightweight stainless steel construction terminal box	Cable entries cut to suit incoming cable requirements
		External and internal earth stud
Temperature Class T3 - T6 (T200°C – T85°C)		
Elements are specially sealed to prevent moisture ingress		
Elements are individually replaceable on site without the need for special tools		
Suitable and certified for use in ambient temperatures -60°C to +60°C		
Anti-condensation heaters fitted if required		

TYPICAL APPLICATIONS

- Crude Oil
- Hydrocarbon Liquids
- Glycol (TEG & MEG) Reboilers
- Molecular Sieve Regeneration
- Heat Transfer Oils
- Heating Medium
- Industrial Gases
- Tank Heating
- KO Drums
- Fuel Gas
- Fuel Oils
- Water
- Synthetic Oil
- Butane / Propane Vaporisers
- Molten Salt Baths

Air Duct Heaters

Exe Air Duct Heaters

EXHEAT's range of Exe and Exd air duct heaters are custom built to meet client specification and suitable for use in Zone 1 or Zone 2 Hazardous Areas.

The Exd range are CENELEC certified for use in heating, ventilation and air conditioning (HVAC) systems.

TYPICAL APPLICATIONS

- Air Handling Units
- Space Heating
- HVAC Heating
- Drying Ovens
- Furnace Heating
- Anti-icing Heaters
- Reheats
- Core Drying
- Air Pre-heating
- Annealing

Air Duct Heaters
ATEX approved ⟨Ex⟩ II 2 G/D
IECEx, CENELEC
Elements certified Exe for use in Zone 1 Hazardous Areas
IP66/67 or NEMA Type 4 weatherproof certification
Temperature Class T2 - T6
Elements are specially sealed to prevent moisture ingress
Elements are individually replaceable on site without the need for special tools
Various types of over-temperature cut-outs available. e.g. certified thermostats, RTD's or thermocouples
Anti-condensation heaters fitted if required

Flameproof Cast Line Heaters

The range of cast aluminium line heaters provide an effective heating solution for constant flow liquids or gases, eliminating the requirement for a costly pressure vessel. Particularly in high pressure applications or when exotic process materials are required the flameproof cast range can provide significant commercial advantage.

The design incorporates electric heating elements and an indirect process heating coil imbedded within marine grade cast aluminium. This provides excellent heat transfer properties combined with low surface temperatures. It should be noted that this design is not suitable for constantly varying flow applications where precise outlet temperature control is required.

Flameproof Cast Line Heaters
ATEX approved Ⓔx II 2 G
ATEX, IECEx, CSA
IP65 Flameproof rated terminal enclosure
Thermally insulated aluminium or stainless steel cladding
Maximum working pressure and temperature rating of 300bar.g at 100°C
Internal control thermostats and over-temperature thermostats (PT 100 or thermocouple type K available)
Wall or floor, vertical or horizontal mounting
Multiple heating elements allow for step control or alternatively thyristor control can be employed
Standard stainless steel process path (other materials upon request)
Various process connections including industry standard flange or compression joints

TYPICAL APPLICATIONS

- Natural Gas
- Air, CO_2 and Nitrogen
- Instrument Air
- Solvent
- Steam Generation
- Paint Heating
- Pasteurisation
- Lube and Heat Transfer Oils
- Adhesives & Resins
- Inks, Coatings & Paints

Control Systems

Control systems are manufactured at our factory in the United Kingdom to comply with each and every standard demanded by our clients. The operation of an electric heater is only as good as the system which controls it. EXHEAT specialise in the control of electric heaters and heating systems. The systems can range from the simple on/off control, to the most sophisticated burst fire/single cycle thyristor control.

EXHEAT has extensive experience in the design of large heater control systems and requirements for 'load splitting'. Loads can also be divided into stages to give multi-thyristor control and in addition combinations of thyristor and contractor control can be supplied to provide a fully synchronised system and limit impact on power generation system.

Control systems can be certified to UL standards 508A & 698A, for Class I, II and III, Division 1 and 2 hazardous locations and safe areas.

CONTROL SYSTEM SERVICES

- Thyristor control system design
- Step contactor sequence control
- PLC programming
- Engineering planning
- Manufacture
- Factory testing and quality control
- On-site commissioning
- Spares and after sales service
- SIL level reports/verification

IN-HOUSE TESTING

- Full load/heat soak testing
- Harmonic analysis
- RF interference testing
- Waveform recording

Hazardous Area Purged Panels

EXHEAT can provide Hazardous Area purged Exp control panels to IEC/EN60079-2.

Exp control panels are ideal for heating systems where the heater is controlled locally via a skid mounted control system

Flameproof Control Panels

Heater control and instrument display panels can be engineered and supplied to enable local control of EXHEAT Hazardous Area heating products and the local visual display of process temperatures; these control panels provide an effective solution.

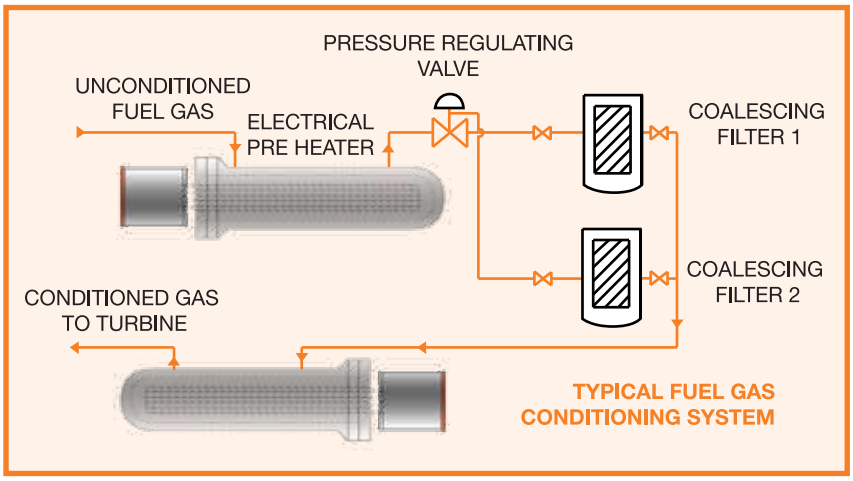
For applications with large electrical power requirements we would always advise that the control system is installed in a safe area. However, for small step or thyristor controlled loads the use of a Flameproof control system can reduce installation costs.

Hazardous Area Purged Panels	Flameproof Control Panels
ATEX certified Expx suitable for Zones 1 and 21 CSA certified Class I and II, Div 1	ATEX approved Ⓔx II 2 G
	CENELEC, IECEx, CSA
ATEX certified Expy and Expz, Zones 2 and 22 CSA certified Class I and II, Div 2	Exd or Exde IIB or IIC T1 to T6
Where thyristor control is deployed, the forced fan cooling system is replaced by vortex coolers	Suitable for Zones 1 and 2
	Certified weatherproof to IP66
EXHEAT has range of purge kits suitable for pressurizing enclosures with volume up to 12.7m^3	Ambient temperatures from -20°C to +40°C
Stainless steel 316 or painted mild steel, IP66 (Type 4X) enclosures are available	Marine grade aluminium cast alloy or stainless steel

Product Applications

FUEL GAS

Fuel gas is commonly used in the power generating industry as an energy source for turbines. Before the fuel gas is burned in the turbines it needs to be treated to ensure the removal solid, liquid and gas contaminants. A fuel gas conditioning system commonly consists of the following components, a pre heater, a pressure regulation valve, two high efficiency coalescing filter elements and a super heater.



The pre heater is used to prevent the formation of hydrate due to pressure and temperature drop across pressure regulator.

The pressure regulating valve is then used to maintain a constant gas pressure to the turbine in the event that the gas supply pressure exceeds an acceptable level.

The coalescing filter is used to remove the solids and liquids. The system will commonly include two such filters so that one can be replaced without shutting down the fuel gas conditioning system.

Finally a Super heater is used to ensure that superheated gas enters the turbine at the correct temperature.

SEAL GAS

Dry gas seals are used in process gas centrifugal compressors. It is necessary to have shaft sealing to prevent the process gas from escaping to atmosphere. Dry gas seals can be applied to accomplish the required shaft sealing and although available in a variety of configurations, a tandem style seal is typically applied within a process gas service.

Tandem seals consist of a primary seal and a secondary seal. During normal operation the primary seal absorbs the total pressure drop to a vent system and the secondary seal acts as a back-up should the primary seal fail. Dry seals are basically mechanical face seals, consisting of a mating (rotating) ring and a primary (stationary) ring. During operation grooves in the mating ring generate a fluid-dynamic force causing the primary ring to separate from the mating ring and creating a running gap between the two rings. A sealing gas is injected into the seal, providing the working fluid for the running gap and the seal between the atmosphere or flare system and the compressor internal process gas.

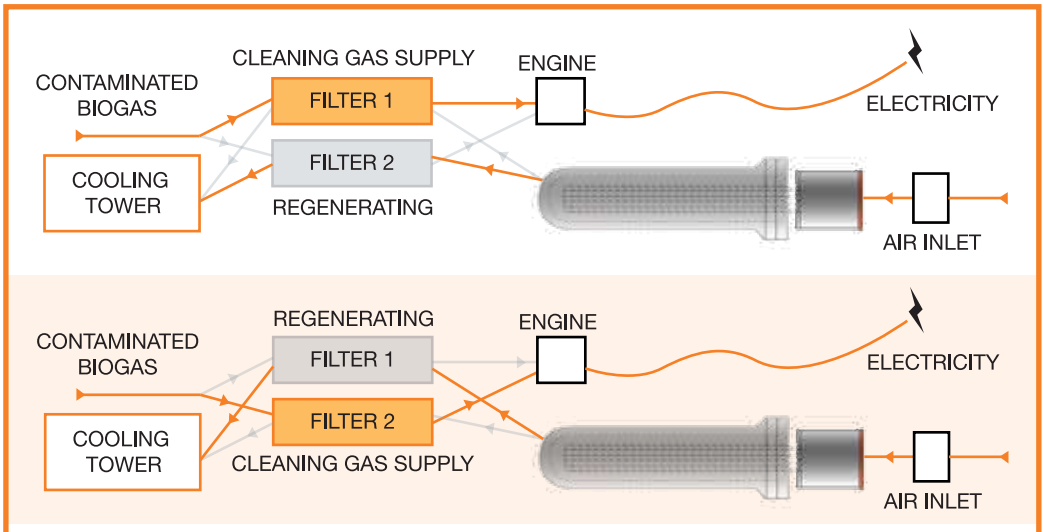
It is necessary for the high pressure seal gas to be heated to ensure the removal of moisture and prevent condensation within the seal. EXHEAT heaters are typically used within this generally high pressure application.

BIO GAS

BioGas is the result of biological breakdown of organic matter in the absence of oxygen. Comprising mainly of Methane and Carbon Dioxide the gas is produced by the anaerobid digestion of biodegradable materials. BioGas captured from Landfill and Sewage plants is either used to generate electricity with gas powered engines or upgraded to be injected into national grids.

Captured BioGas in its unrefined state is heavily contaminated with Siloxanes, these Siloxanes convert into silicon dioxide on combustion. The silicon dioxides combines with other elements in the gas and lubrication oils forming a hard compound that accumulates on the combustion surfaces. As a result engine efficiency is compromised and unburned fuel contaminates the exhaust gases increasing emissions. This also causes severe damage to valves, pistons, piston rings, liners, cylinder heads, spark plugs and turbochargers of gas engines.

The solution is to use a Siloxane Removal System; an integral part of the process is an electric process heater to provide a clean efficient and controllable solution for process heating.



TYPICAL BIOGAS CLEANING AND FILTER REGENRATION CYCLES

HEATING MEDIUM

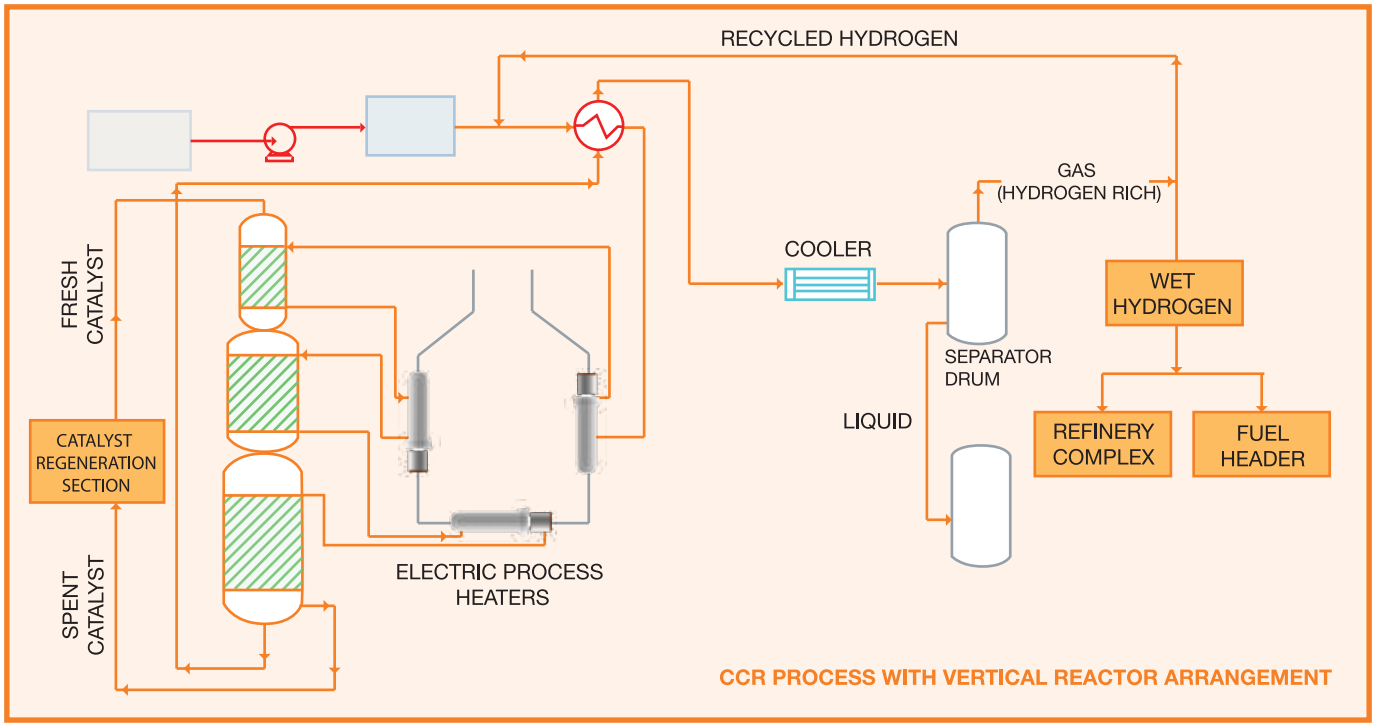
Heating medium is any solid or fluid (such as water, steam, air, or flue gas) which is used to convey heat from a heat source (such as an electric immersion heater) to a process or space being heated. Electric heat is often used as a temporary or permanent solution to the heat the medium which is then used in various types of heat exchangers throughout the plant.

When electric heat is used permanently to heat the medium which in turn is used in a process, we ask our customers: “could you use electric heaters directly in the process?” The positive answer usually reduces the overall cost of the process design.

CONTINUOUS CATALYST REGENERATION

The Continuous Catalyst Regeneration (CCR) process is part of a process used in the petroleum and petrochemical industries, which produces aromatics from naphthenes and parafins commonly used as motor fuel.

In this process, hydrotreated naptha is combined with recycled hydrogen gas, heated to the desired reaction temperature (496°C - 524°C) and sent through a series of reactors (vertical or side by side). Because the reaction is endothermic, interstage heaters are required between each reactor section to attain the required reaction temperature. In order to attain the desired reactions and high product yield, a metal catalyst such as platinum is used. The catalyst moves from reactor to reactor and the feed mixture flows radially across the catalyst beds.



CCR PROCESS WITH VERTICAL REACTOR ARRANGEMENT

MOLECULAR SIEVE REGENERATION

A molecular sieve is a material containing tiny pores of a precise and uniform size that is used as an adsorbent for gases and liquids. Molecules small enough to pass through the pores are adsorbed while larger molecules are not. A molecular sieve can adsorb water up to 22% of its own weight.

Often they consist of aluminosilicate minerals, clays, porous glasses, microporous charcoals, zeolites, active carbons, or synthetic compounds that have open structures through which small molecules, such as nitrogen and water can diffuse.

Molecular sieves are often utilised in the petroleum industry, especially for the purification of gas streams and in the chemistry laboratory for separating compounds and drying reaction starting materials. Due to the mercury content of natural gas being extremely harmful to the aluminium piping and other parts of the liquefaction apparatus - silica gel is used in this case.

Methods for regeneration of molecular sieves include pressure change (as in oxygen concentrators), heating and purging with a carrier gas (as used in ethanol dehydration), or heating under high vacuum. EXHEAT electric heaters are commonly used to heat the carrier gas, for example, Nitrogen that is used to regenerate the molecular sieve bed.

KO DRUMS

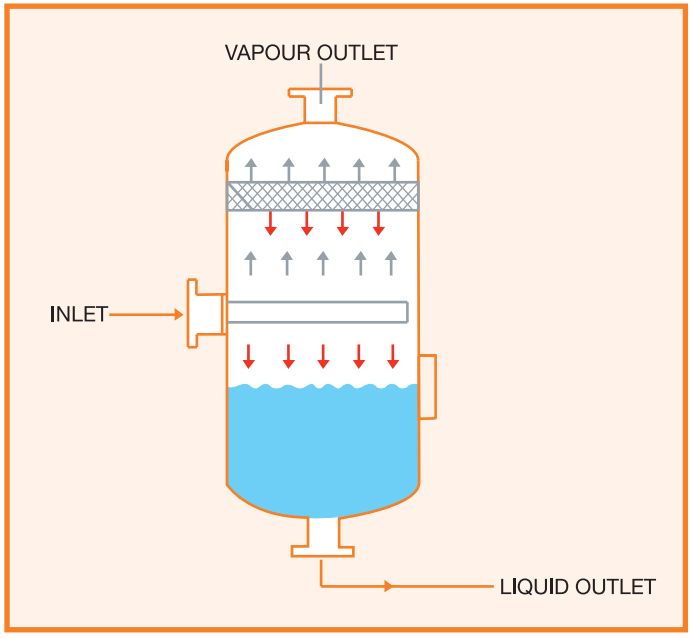
A vapour-liquid separator is a vertical vessel used in several industrial applications to separate a vapour-liquid mixture. Gravity causes the liquid to settle to the bottom of the vessel, where it is withdrawn. The vapour travels upward at a design velocity which minimizes the entrainment of any liquid droplets in the vapour as it exits the top of the vessel.

The feed to a vapour-liquid separator may also be a liquid that is being partially or totally flashed into a vapour and liquid as it enters the separator.

A vapour-liquid separator may also be referred to as a flare KO drum, flash drum, knock-out drum, knock-out pot, compressor suction drum or compressor inlet drum.

When used to remove suspended water droplets from streams of air, a vapour-liquid separator is often called a demister.

EXHEAT electric heaters are used as a means of increasing the temperature of the liquid which has been separated. EXHEAT core heater elements allow for the removal and replacement of the elements without the need to drain the process a feature which is particularly useful in this application.



CRUDE OIL

Heavy crude oil or Extra Heavy Crude oil is any type of crude oil which does not flow easily. Heavy crude oil has been defined as any liquid petroleum with an API gravity less than 20°, meaning that its specific gravity is greater than 0.933 (g/ml).

Production, transportation, and refining of heavy crude oil present special challenges compared to light crude oil.

Physical properties that distinguish heavy crudes from lighter ones include higher viscosity and specific gravity, as well as heavier molecular composition. Generally a diluent is added at regular distances in a pipeline carrying heavy crude to facilitate its flow. However EXHEAT electric heaters can be used to reduce viscosity in order to improve flow of heavy oils in a pipeline or within a storage tank.

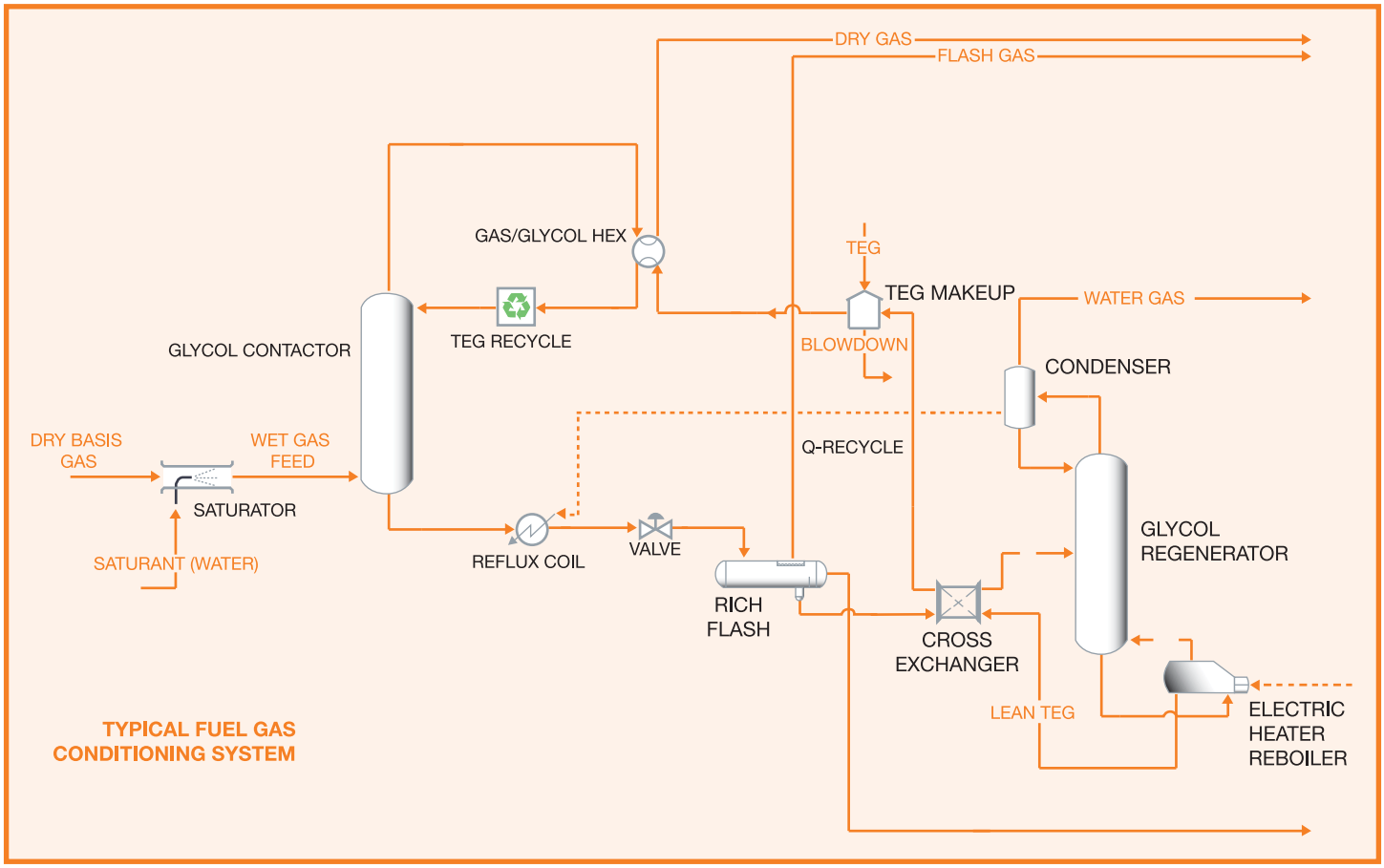
GLYCOL REBOILERS

Lean, water-free glycol (purity >99%) is fed to the top of an absorber where it is contacted with the wet natural gas stream. The glycol removes water from the natural gas by physical absorption and is carried out the bottom of the column. Upon exiting the absorber the glycol stream is often referred to as "rich glycol". The dry natural gas leaves the top of the absorption column and is fed either to a pipeline system or to a gas plant.

After leaving the absorber, the rich glycol is fed to a flash vessel where hydrocarbon vapours are removed and any liquid hydrocarbons are skimmed from the glycol. This step is necessary as the absorber is typically operated at high pressure and the pressure must be reduced before the regeneration step. Due to the composition of the rich glycol, a vapour phase will form when the pressure is lowered having a high hydrocarbon content.

After leaving the flash vessel, the rich glycol is heated in a cross-exchanger and fed to the stripper (also known as a regenerator). The glycol stripper consists of a column, an overhead condenser, and a reboiler. The glycol is thermally regenerated to remove excess water and regain the high glycol purity.

The hot, lean glycol is cooled by cross-exchange with rich glycol entering the stripper. It is then fed to a lean pump where its pressure is elevated to that of the glycol absorber. After raising the pressure, the lean solvent is cooled again with a trim cooler before being fed back into the absorber. This trim cooler can either be a cross-exchanger with the dry gas leaving the absorber or an aerial type cooler.



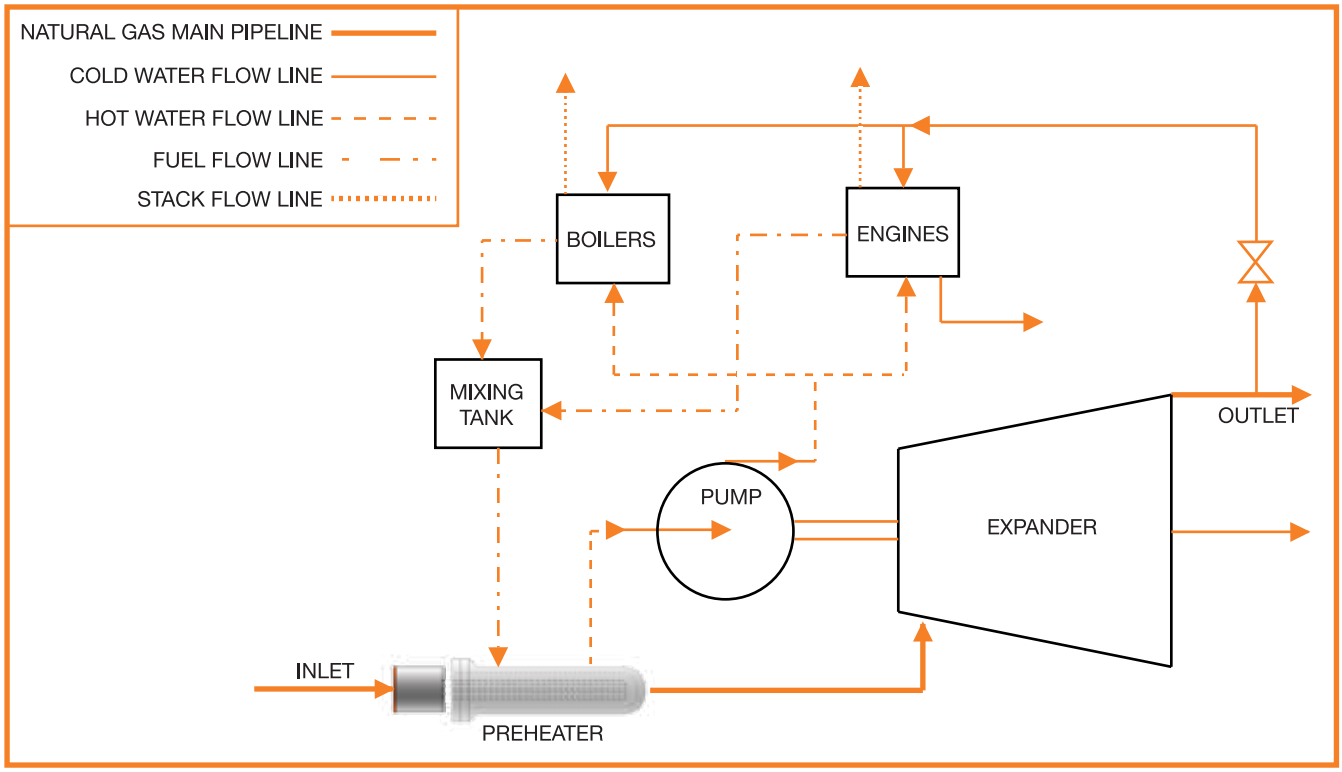
TYPICAL FUEL GAS CONDITIONING SYSTEM

EXHEAT electric heaters can be used within the Reboiler to thermally regenerate the Glycol, providing a clean, efficient controllable heat source with controlled sheath temperatures so as not to burn the Glycol.

NATURAL GAS

Natural gas is transmitted through long distance pipe lines under high pressure.
However, this pressure is not suitable for local gas distribution networks supplying customers for use in domestic and industrial gas appliances. Usually, a pressure reduction valve (PRV) ie a throttle valve (also known as Joule-Thomson valve) is used at a Pressure Reduction Stations(PRS) to reduce natural gas pressure before supply to local gas distribution network. This pressure reduction in a PRS by a throttle valve results in reduction of both pressure and temperature of natural gas.

For example, natural gas throttled from 25 bar.g and 10°C to 3 bar.g would be cooled by about 6.5°C ie will be at about 3.5°C after pressure reduction. It is a normal practice to have provision for heating natural gas at PRS, preferably before throttling, so that its temperature is maintained at an acceptable level after throttling to avoid operational and material integrity problems in local gas distribution network that can be caused by low gas temperature. It is estimated that 22kJ of heat would be required per kg of natural gas to preheat it to 16.5°C before throttling which will leave the gas at 3barg and 10°C after throttling.



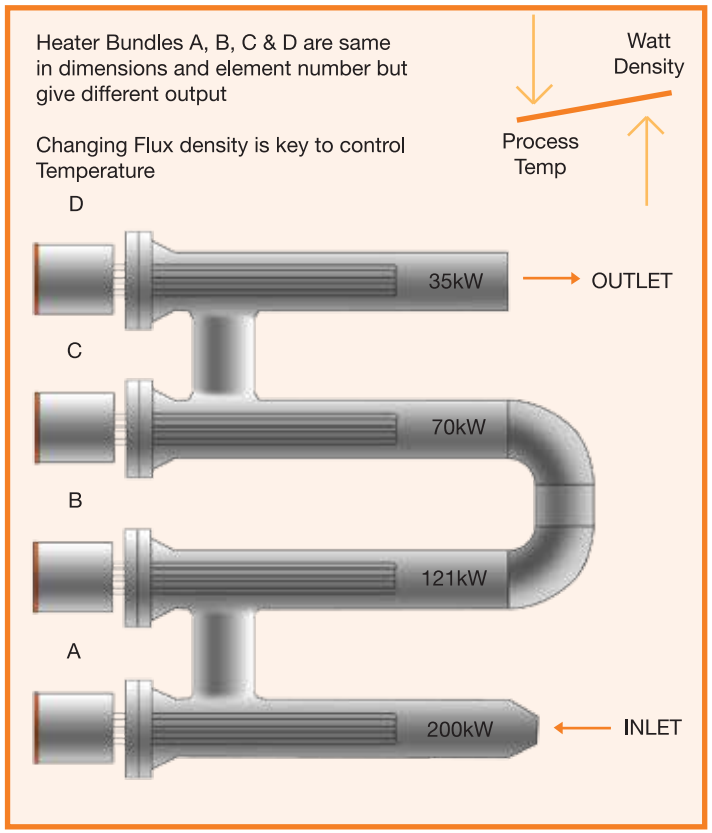
HIGH TEMP/LARGE DELTA T APPLICATIONS

EXHEAT, with its knowledge gained over the years, uses variable watt densities to achieve different heat transfer in various stages of the heater. This ensures the elements are at the correct temperature and will not exceed the thermal cracking temperature of the media flowing through.

Multiple heaters are connected in a series of vessels for optimal heat transfer and allow for varying heat input across the required load. Our design includes heat shields and insulation discs for terminal box temperature protection and the use of rod-type baffles to meet heat transfer requirements, whilst ensuring a very low pressure drop.

This system can be used for many processes such as;

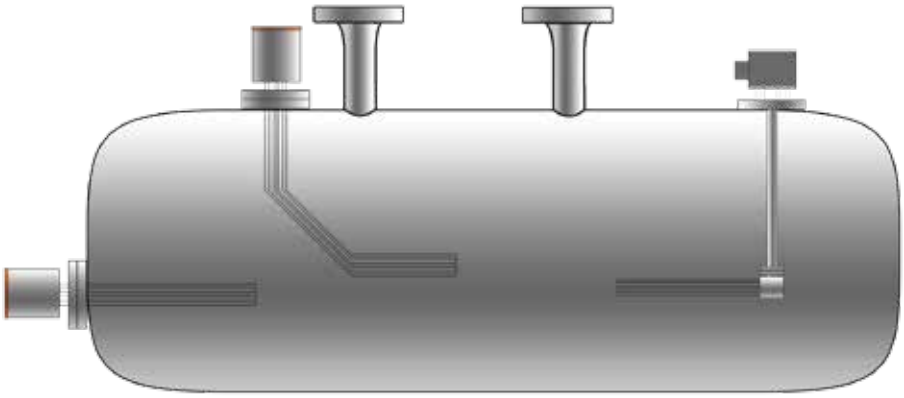
- Catalyst reduction, hot H2 stripping, oxidation and reactivation
- Continuous catalyst regeneration
- Reactivation burning
- Gas regeneration



TANK HEATERS

EXHEAT core and cartridge element immersion heaters are used in many applications requiring tank heating, and with precision control of liquid temperature and virtually 100% energy efficiency they are ideal in industries requiring a reliable and fast heat up time.

EXHEATs preferred method for tank heating is pocketed elements to allow maintenance without tank draining. Tank heating is used for heating liquids in large tanks where low levels are commonly experienced and also used to heat materials such as water, solvents, molasses, syrups and many petroleum products.

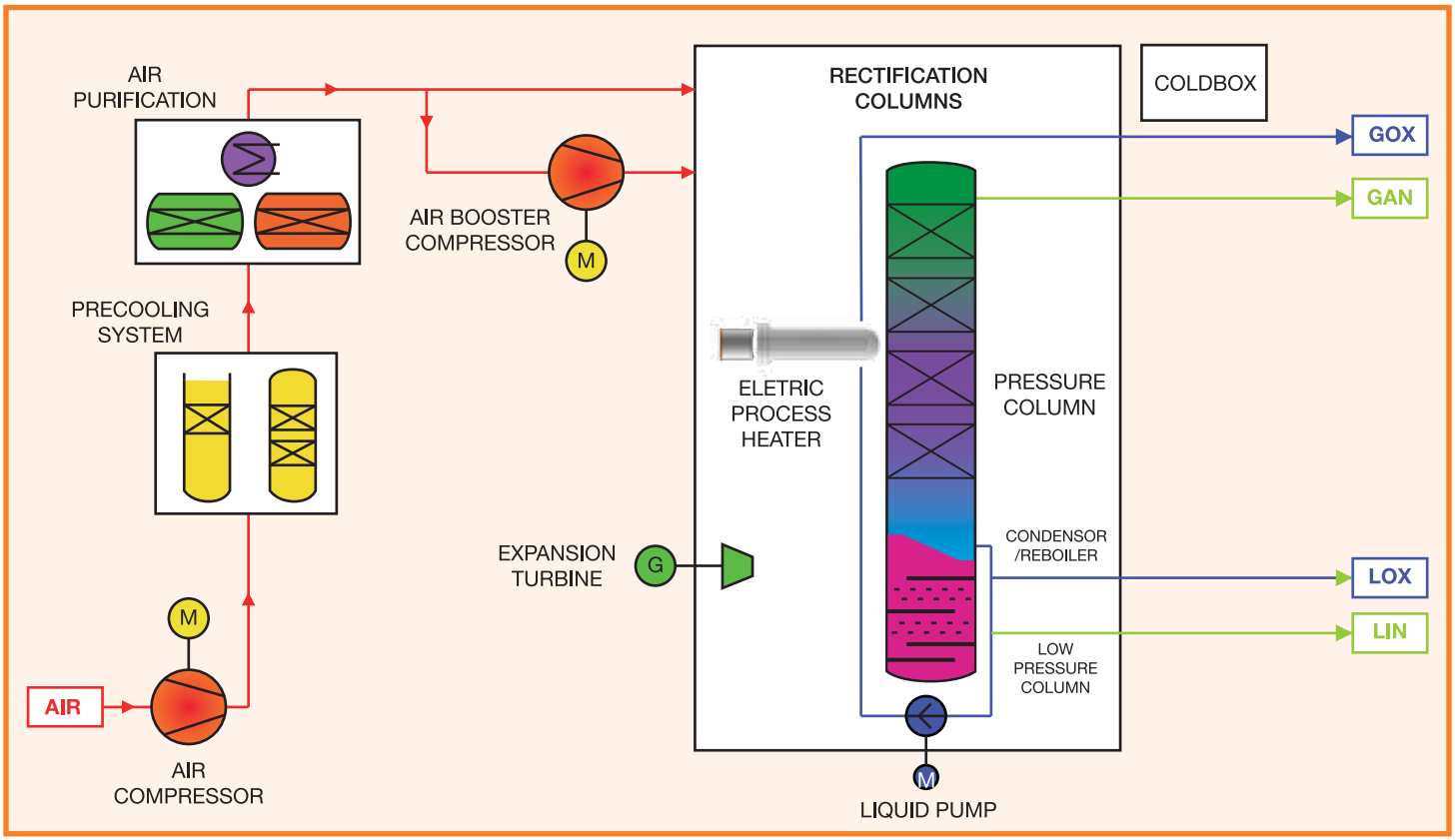


AIR SEPARATION

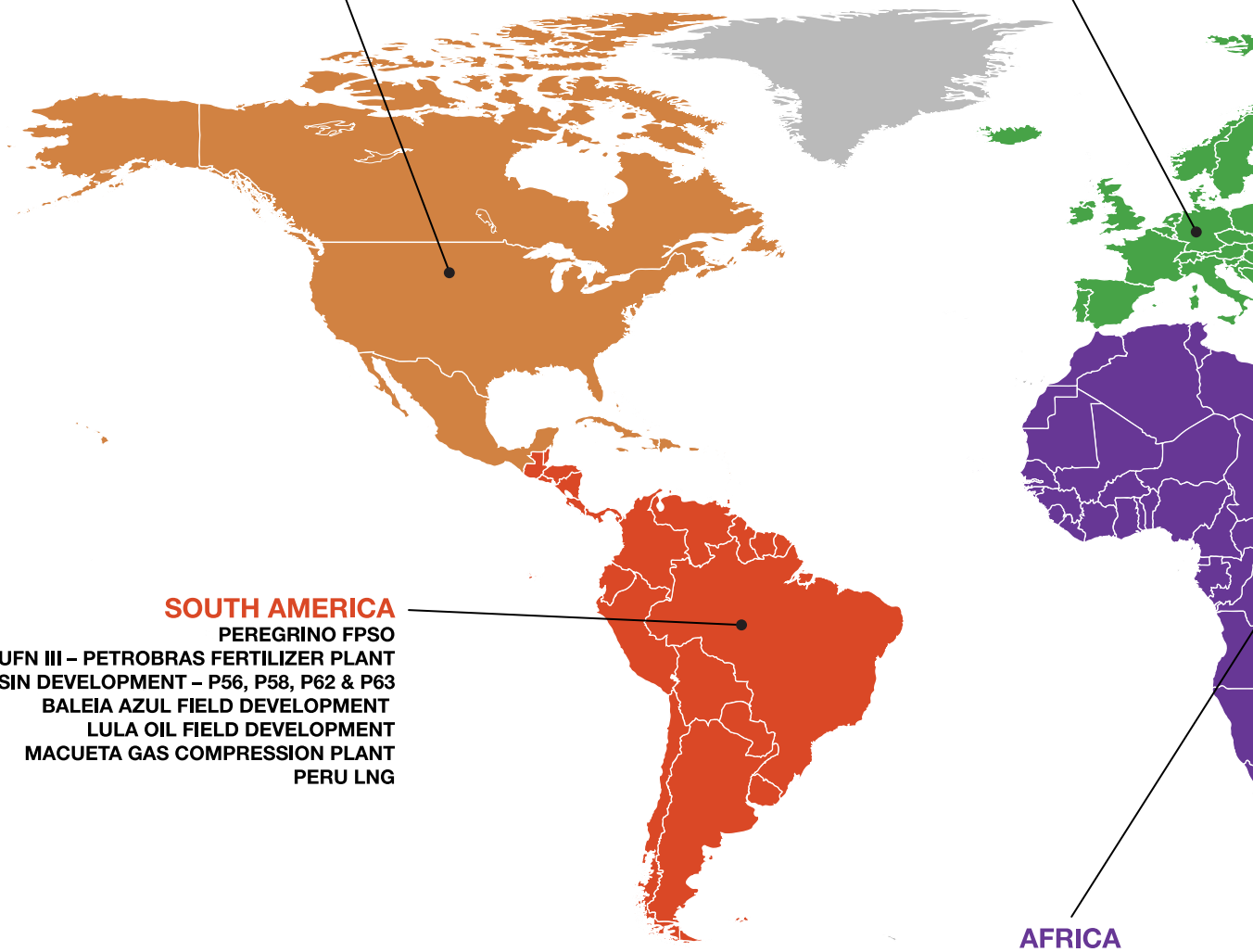
Air separation is a common process to extract gases from atmospheric air. The main gases extracted are Nitrogen and Oxygen.

Cryogenic air separation unit (ASU) utilises the varying condensing/boiling points to enable separation by distillation at cryogenic temperatures. Liquefying and distilling air provides a process to successfully separate the Nitrogen, and Oxygen

Modern ASUs utilise a Prepurifier Unit (PPU), which removes moisture, CO2 and most hydrocarbons from the air to prevent ice and dry ice forming later in the process. A PPU is typically made up of a chiller to cool the air to 40-55F, a condensate separator to remove free water and 2 vessels filled with desiccant and mole sieve material, which adsorbs the contaminants while allowing the air to pass through. The desiccant and molecular sieve bed is regenerated by passing heated waste Nitrogen to remove accumulated contaminants. Electric heaters are used to heat the waste Nitrogen.



Major Projects Experience



EUROPE
ADRIATIC LNG
ORMEN LANGE
GJOA
PAZFLOR SRU
SKARV & IDUN DEVELOPMENT
MILFORD HAVEN REFINERY
BUZZARD FIELD
SULLOM VOE OIL AND GAS TERMINAL
HOLFORD GAS STORAGE
LEMAN PLATFORM
HOLE HOUSE II GAS STORAGE FACILITY
JASMINE DEVELOPMENT
REVOLUTION GAS STORAGE

NORTH AMERICA
WHITE ROSE OIL FIELD DEVELOPMENT
TERRA NOVA FIELD DEVELOPMENT
WHITING REFINERY NORTHWEST INDIANA
HIBERNIA GAS FIELD DEVELOPMENT

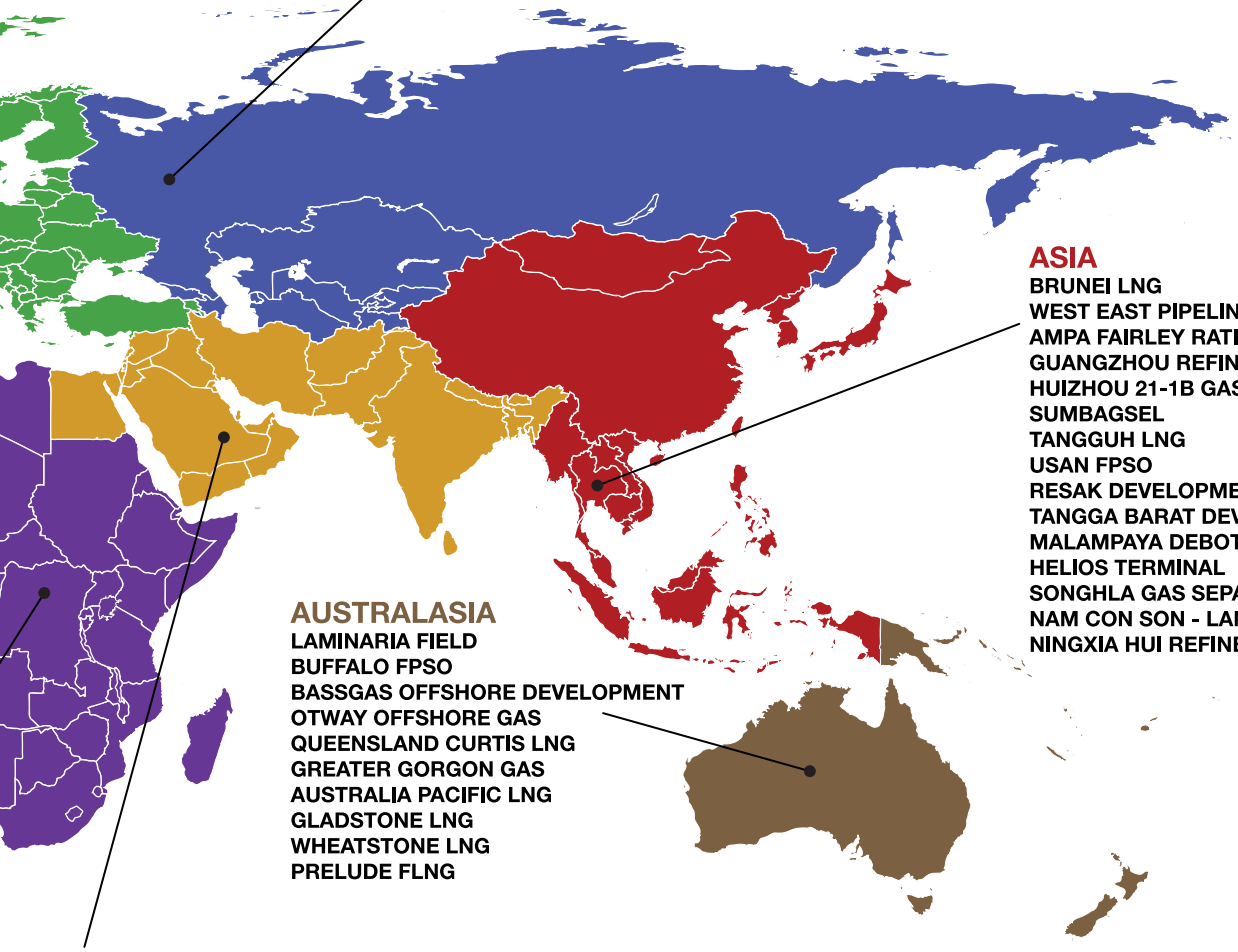
SOUTH AMERICA
PEREGRINO FPSO
UFN III – PETROBRAS FERTILIZER PLANT
CAMPOS BASIN DEVELOPMENT – P56, P58, P62 & P63
BALEIA AZUL FIELD DEVELOPMENT
LULA OIL FIELD DEVELOPMENT
MACUETA GAS COMPRESSION PLANT
PERU LNG

AFRICA
IN SALAH GAS FIELD
HUNGO AND CHOCALHO DEEPWATER OIL FIELDS – KIZOMBA FPSOS
ANGOLA LNG
OLOWI DEEPWATER OIL FIELD
WESTERN LIBYA GAS PROJECT (WLGP)
NIGERIA LNG (BONNY ISLAND DEVELOPMENT)
DIFFRA FPF AND FLOWLINES
MELUT BASIN OIL

FORTIES FIELD REDEVELOPMENT
GOLDEN EAGLE AREA DEVELOPMENT
QUAD 204 FPSO
CLAIR RIDGE HEAVY OILFIELD
WEST FRANKLIN
MONTROSE BLP GREENFIELD
SOLAN TOPSIDES
GUDRUN
TEPES NOVA GAS PROCESS STATION
GREATER EKOFISK AREA DEVELOPMENT
KVITEBJORN PLATFORM
EDVARD GRIEG
VALHAL

RUSSIA/CIS

SHAH-DENIZ PROJECT
CHIRAG PLATFORM
ATYRAU REFINERY
AGT PIPELINES PROJECT
KARACHAGANAK FIELD DEVELOPMENT
KASHAGAN FIELD DEVELOPMENT
KASHAGAN BARGES
KHARYAGA FIELD DEVELOPMENT
SAKHALIN
TURKMENISTAN BLOCK 1 GAS DEVELOPMENT



ASIA

BRUNEI LNG
WEST EAST PIPELINE
AMPA FAIRLEY RATIONALISATION PROJECT
GUANGZHOU REFINERY
HUIZHOU 21-1B GAS PROJECT
SUMBAGSEL
TANGGUH LNG
USAN FPSO
RESAK DEVELOPMENT
TANGGA BARAT DEVELOPMENT
MALAMPAYA DEBOTTLENECKING
HELIOS TERMINAL
SONGHLA GAS SEPARATION PLANT
NAM CON SON - LAN TAY PLATFORM
NINGXIA HUI REFINERY

AUSTRALASIA

LAMINARIA FIELD
BUFFALO FPSO
BASSGAS OFFSHORE DEVELOPMENT
OTWAY OFFSHORE GAS
QUEENSLAND CURTIS LNG
GREATER GORGON GAS
AUSTRALIA PACIFIC LNG
GLADSTONE LNG
WHEATSTONE LNG
PRELUDE FLNG

MIDDLE EAST & INDIA

KHUFF GAS DEVELOPMENT
BOROUGE 2
EMIRATES ALUMINIUM SMELTER COMPLEX
SOUTH PARS
ESFAHAN GASOLINE PRODUCTION PLANT
AROMATICS COMPLEX KUWAIT
OMAN LNG
SATH RAWL OILFIELD
MUKHAIZNA POWER PLANT
HARWEEL CLUSTER DEVELOPMENT
AL-SHAHEEN

YANBU REFINERY
HAWAIYAH LNG
SK OLEFINS PLANT
RIYADH POWER PLANT
HABSAHN GAS COMPLEX
YEMEN LNG
AMAL
QARM ALAM
JUBAIL EXPORT REFINERY
SAHIL & SHAH FIELD DEVELOPMENT
SHAYBAH NGL

PEARL GTL
BHATINDA REFINERY
TISCO JAMSHELPUR
ICP-R PROCESS PLATFORM
ZAMZAMA GAS FIELD
VEDANTA ALUMINIUM
JAMNAGAR REFINERY
UCH GAS FIELD
SANGU DEVELOPMENT

SERVICES

EX Services, backed with 20 years of experience serving Operators and EPC contractors in the design and manufacture of Hazardous Area electric process heaters and control systems give us the expertise to ensure your systems are maintained by highly qualified experienced engineers.

EX Services deliver services designed to lower costs, reduce risk, and improve product longevity by eliminating problems before they arise. Dedicated teams in strategic global positions allow EX Services to offer fast technical support or emergency site visits anywhere in the world.

Whether you require Training, Technical Support or a fully comprehensive Preventative Maintenance Service Contracts EX Services is here to maintain and keep your Heating and Control Systems running.

SERVICE CONTRACTS

Our maintenance solutions help you maximise the performance of your heating system.

Correctly maintained equipment helps ensure performance is improved to – and sustained at – design specifications.

The best way to ensure proper maintenance is through an EX Services contract. We offer several service contract options that are tailored to suit your business and maintenance needs.

Available Service contract options include:

- 6 month Routine Maintenance
- 12 month routine Maintenance inc Heater Terminal Enclosure Inspection
- Spares Discount
- Labour Discount
- Spares Stock Check
- Site Survey
- 24hr Telephone Technical Support
- Maintenance Days Included
- Inclusive Repairs Spares
- Bundle Removal & Inspection

TRAINING

EX Services are able to provide structured training covering Operation, Basic Maintenance and Problem Solving for your EXHEAT equipment.

Tailored to suit your staffing needs and providing your team with the knowledge to get the best performance from your equipment daily. This certified training can be conducted on site or at our training facilities in the UK.

TECHNICAL SUPPORT

EX Services are proud to provide a comprehensive Technical Support service.

This service is provided via our main offices in the UK & Singapore ensuring support is available when it is needed most.

With access to the design, manufacturing and Site Services team you can be assured of a prompt and appropriate response to assist you with your technical enquiry.

COMISSIONING & START UP COVER

Guaranteeing your EXHEAT equipment is installed right first time can be vital to ensuring timely completion of a critical project and providing a stable base for equipment performance.

EX Services can supply on & off shore Commissioning Engineers to complete all Commissioning & Start Up checks. Giving you the confidence that your equipment has been installed correctly and is operating within its design parameters.

Using EX Service Engineers to commission your EXHEAT equipment will also provide instant validation of the EXHEAT Warranty.

PREVENTATIVE MAINTENANCE

In any stream of life, prevention is always better than cure. Never has this been more prevalent than within a Process or Production environment.

Our preventative maintenance programmes provide the foundations for optimum performance and asset longevity. Each preventative maintenance programme is tailored to suit the customer.

Part of the preventative maintenance schedule includes ongoing diagnostics performance monitoring of your equipment to ensure optimum performance at all times throughout the lifecycle of your Heater.

ON & OFFSITE REPAIRS

EX Services are able to provide ongoing engineering support through our internationally based team of EX Services Technicians.

With many years of experience our team can provide remote support, on site/off shore and return to base repairs on all EXHEAT systems ensuring the right solution for our customers.

SITE SURVEYS & CONDITION REPORTS

Our team of engineers will conduct a full site survey and provide condition reports for all EXHEAT equipment.

The site survey also includes a review of customer training needs; spares stock levels and onsite documentation ensuring you are perfectly equipped to get the most from your heating equipment.

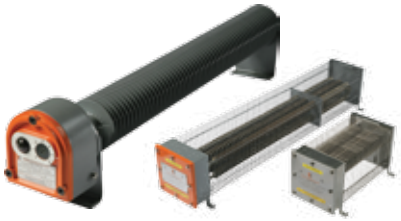
For more information about EX Services:

Email: contact@exservices.com
Telephone: +44 (0) 1953 886200
or visit: www.exservices.com

EXHEAT Standard Products

EXHEAT Industrial Division offers fast track solutions to industry's wide and varied requirements for electrical heating systems. All heaters manufactured by EXHEAT for use in Hazardous Areas are supplied fully certified to meet the latest requirements of the IECEx Scheme, CSA, or the European ATEX Directive as appropriate.

All heaters are manufactured and stocked in the UK, a selection of stock is also kept at our regional office in Singapore to facilitate faster delivery time.



Air Heaters

- Hazardous Area Exe air warmers and convector heaters. 500W to 3kW
- Flameproof Exd air warmers. 500W to 2kW
- FLR Radiator style Exd heaters designed for dust environments. 1kW, 2KW & 3kW
- Exd & Exe Anti-condensation and frost protection enclosures heaters. 30W to 500W
- Flameproof Fan assisted unit heaters. 9kW to 30kW
- Industrial Safe Area CE approved convector heaters. 1kW – 3kW

A selection of air heaters currently in stock and available for despatch within 2-3 working days. Our heaters can be controlled from the EXHEAT Industrial range of thermostats listed below.

Line Heaters

Flameproof and Industrial Safe Area line heaters available from 500W to 150kW subject to the application and medium.

An indirect method of efficient heating for bulk liquid flow applications.

Alternative material available and designed for a variety of mediums such as water, oil, air and corrosive materials.

Immersion Heaters

Our standard range of Flameproof immersion and tank heaters are available on short lead times and can be designed to meet your specific requirements.

Selection of heating elements including low watts density standard rod/hairpin type and withdrawble ceramic core and cartridge type. Our robust Exd terminal enclosure protects the connections and is fitted with a process control thermostat and over-temperature protection.

Duties from 100W to 150kW subject to process requirement within the design parameters.

Any electrical supply up to 690V

Industry flange connections or a threaded boss in a variety of materials

Thermostat/Transmitter Enclosures

Dual certified Flameproof Air Sensing Thermostats and a Safe Area equivalent all available ex stock

The HFT is a tamperproof 316L Stainless Steel construction or the AFT with it's externally adjustable design made from Cast Aluminium.

The HIH Flameproof Transmitter/Instrument 316L Stainless Steel Enclosure designed to accommodate most makes of head mounted transmitters such as WIKA, Siemens & Rosemount

EXHEAT Industrial Ltd

Threxton House
Threxton Road Industrial Estate
Watton, Thetford, Norfolk, IP25 6NG, UK
Tel: +44 (0) 1953 886210
Fax: +44 (0) 1953 886278
Email: industrial.sales@exheat.com

Experience List

- ABB LUMMUS GLOBAL (CB&I)
- ADCO
- ADGAS
- ADMA-OPCO
- ADNOC
- AGIP
- AIBEL
- AIR LIQUIDE
- AIR PRODUCTS
- KVAERNER (AKER)
- AKER SOLUTIONS
- ALFA LAVAL
- ALSTOM
- AMEC
- HESS (AMERADA)
- ARCO
- AXENS
- BASF
- BAYER
- BCPL
- BECHTEL
- BEMCO
- BHP
- BLUEWATER
- BOC
- BOUYGUES
- BP
- BRITISH GAS
- BUMI ARMADA
- BW OFFSHORE
- CAMERON
- CB & I
- CHEVRON
- CHIYODA
- CLOUGH
- CNOOC
- CONOCO
- COSTAIN ENGINEERING
- CPCL
- CPECC
- CREST
- CTCI
- CUEL
- CUULONG
- DAELIM
- DOW
- DRESSER-RAND
- DSME
- EIL
- ENCANA
- ENI
- ENPPI
- ESSAR
- ESSO
- EXXONMOBIL
- FLUOR
- FORMOSA PLASTIC
- FOSTER WHEELER
- GAIL
- GASCO
- GAZPROM
- GE INTERNATIONAL
- GNOPC
- GSPC
- HALLIBURTON
- HHI
- HITACHI
- HYUNDAI ENGINEERING
- IKPT
- INDIAN OIL CORP
- J RAY MCDERMOTT
- JACOBS COMPRIMO
- JGC
- JOHN CRANE
- KAZMUNAIGAZ
- KBR
- KENCANA HL
- KOBELCO
- KOC
- KOGAS
- LARSEN & TOUBRO (L&T)
- LINDE
- LPEC
- LUKOIL
- MAERSK OIL & GAS
- METKA
- MITSUBISHI
- MITSUI
- MMHE
- MODEC
- MOSS GAS
- MURPHY OIL
- MW KELLOGG
- NALCO
- NAM
- NEWFIELD
- NEXEN
- NIGC
- NORSK HYDRO
- OCCIDENTAL
- ODEBRECHT
- OGC
- OMV
- ONGC
- OPWPC
- ORIGIN
- PAE
- PARSONS
- PDO
- PERTAMINA
- PETRECO
- PETROBRAS
- PETROCHINA
- PETROFAC
- PETROJET
- PETROKEMYA
- PETROM SA
- PETRONAS
- PHILLIPS PETROLEUM
- POSCO
- PRAXAIR
- PROSAFE
- PTSC
- PTT
- PTTEP
- PUNJ LLYOD
- QATAR GAS
- QATAR PETROLEUM
- RAMUNIA
- REKAYASA
- RELIANCE
- REPSOL
- ROMPETROL
- S.M.O.E
- SABIC
- SAIPEM
- SAMSUNG ENGINEERING
- SATORP
- SAUDI ARAMCO
- SBM
- SDE
- SEI
- SHAW GROUP
- SHELL
- SHI
- SINOPEC
- SK ENGINEERING
- SNAMPROGETTI (SAIPEM)
- SNC LAVALIN
- SOLAR TURBINES
- STATOIL
- TALISMAN
- TANKER PACIFIC
- TECHINT
- TECHNIP
- TECNICAS REUNIDAS
- TEXACO
- TOTAL
- TOYO
- TRANSCO
- TURKMENGAZ
- UHDE SHEDDEN
- UOP
- VEDANTA
- WINTERSHALL
- WOOD GROUP
- WOODSIDE
- WORLEY PARSONS

www.exheat.com

EXHEAT Ltd

Threxton Road Industrial Estate
Watton, Thetford, Norfolk, IP25 6NG, UK
Tel: +44 (0) 1953 886205
Fax: +44 (0) 1953 886278
Email: sales@exheat.com

EXHEAT Pte Ltd

11 Chang Charn Road (off Hoy Fatt Road)
#04-03, Shriro House, Singapore 159640
Tel: +65 6496 4600
Fax: +65 6496 4601
Email: sales.asia@exheat.com.sg

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