your plant needs roots...

OIL-FREE ROTARY-LOBE GAS COMPRESSORS

ROOTS SYSTEMS

GAS BLOWERS **API 619** **VACUUM BOOSTERS**

ROOTS SYSTEMS

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COMPANY OVERVIEW

Roots Systems is the world's leading manufacturer of gas blower and vacuum booster packages for process industries using **DURAGAS** API 619 rotary-lobe gas compressors manufactured in our factory in the UK.

The rotary-lobe compressor is a variant of rotary-type positive displacement compressor. It is more commonly known as a 'roots-type' blower, named after Philander Higley Roots and Frances Marion Roots, the brothers who invented it.

TYPICAL APPLICATIONS

- Acidic and Sour Gas Service
- Air Scouring (Offshore)
- Catalyst Bed Regeneration
- De-aeration of Seawater (Offshore)
- Desalination
- Flare Gas Recovery
- Gas Drying
- Gas Stripping
- Glycol Regeneration
- High-pressure Circulation
- Inert Gas Conveying
- Pressure Swing Adsorption (PSA)
- Purging
- Start Up
- Steam Compression
- Vacuum Boosting
- Vacuum Swing Adsorption (VSA)
- Vapour Recovery

HISTORY

The company's origins can be traced back to the 1930s when one of the early manufacturers of roots-type machines located near Stonehouse in the UK was designing and supplying blowers, particularly to the gas industry.

Following a major re-organisation, a team of engineers with many years' experience in blower design and application formed *Roots Systems Ltd* in 1974 to meet growing demand. Based on original proven designs and with new innovative ideas, the company was soon supplying blowers to many process industries.

In June 1984 *Roots Systems Ltd* was purchased by *Rotolok (Holdings) Ltd* and, whilst continuing to operate independently, now has the substantial financial backing of this large engineering group of companies.

OFFSHORE OILS AND GAS

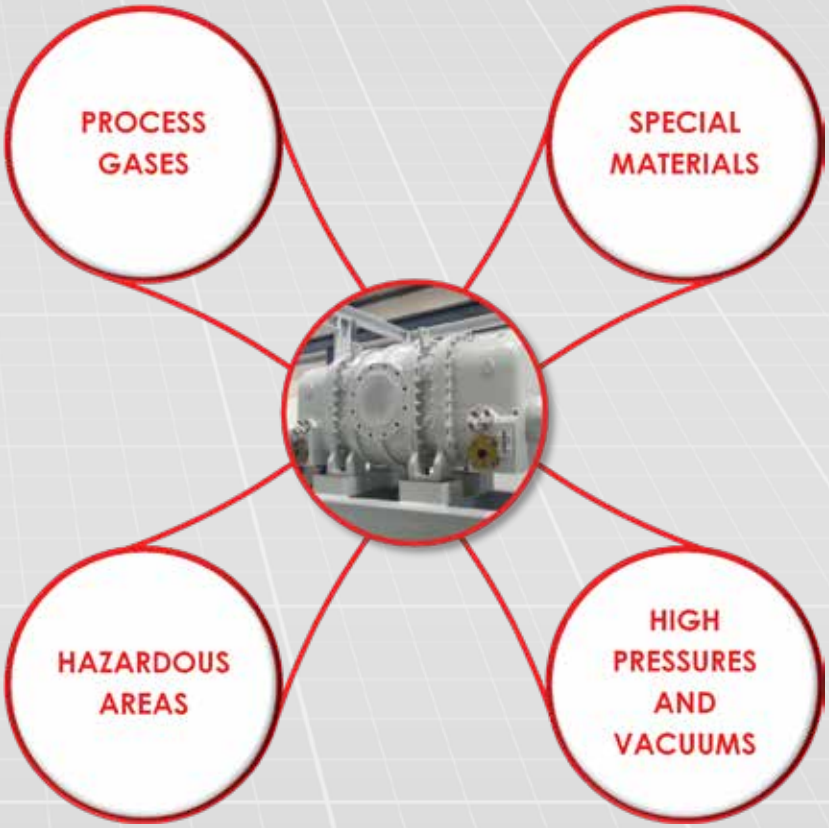
CHEMICAL AND PETROCHEMICAL

ENERGY / POWER GENERATION

PRINCIPLE AREAS OF EXPERTISE

1) Our oil-free **DURAGAS** machines comply with API Standard 619 and can handle corrosive, flammable, radioactive and toxic gases for process applications both onshore and offshore.

2) We offer a wide range of materials and paint systems which we can recommend according to the corrosiveness of both the process gas and the surrounding atmosphere, combined with your operating temperatures and pressures.



3) We can supply equipment that conforms to the *Equipment for Explosive Atmospheres Directive* (ATEX), ANSI/NFPA 70 'National Electrical Code', CSA C22 'Canadian Electrical Code' or the IECEx System.

4) We can manufacture machines that can operate at pressures from a high vacuum to over 150 bar (2175 psi). Our single-stage **DURAGAS** machines can handle differential pressures up to 4½ bar (65 psi). We supply multi-stage packages for higher differential pressures.

API 619

SOUR SERVICE

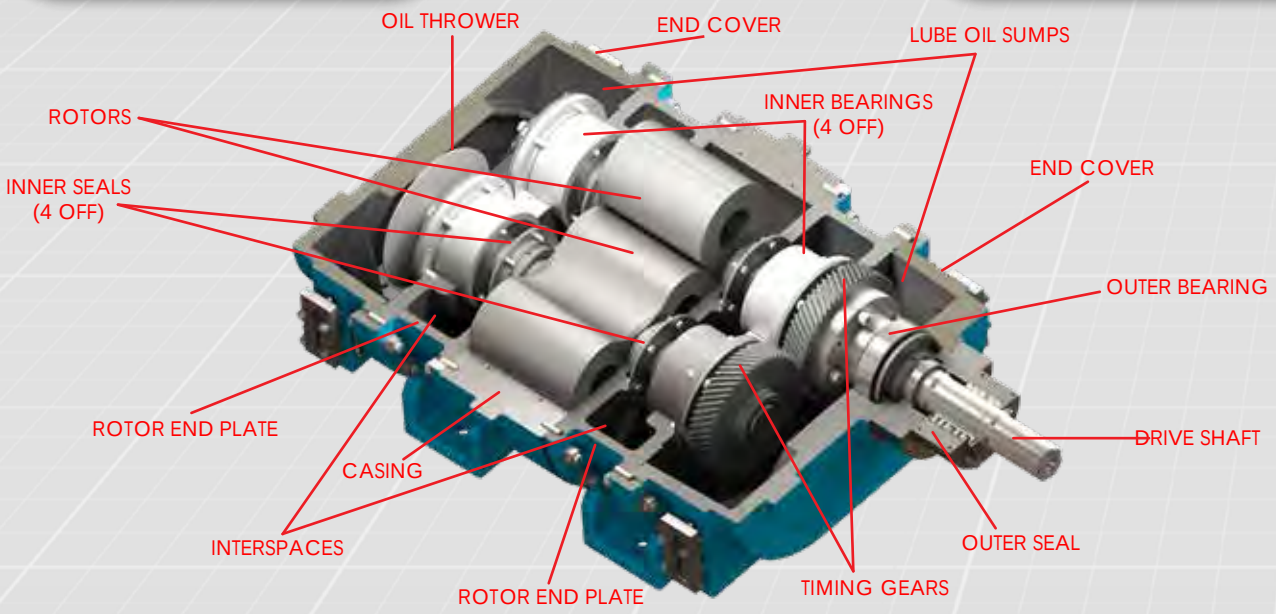
THE DURAGAS SERIES

OIL FREE

Our **DURAGAS** machines are splash lubricated as standard but include a wide 'interspace' between the inner gas seals and the bearing lube oil seals. This acts as a catch pot, preventing lube oil from migrating into the process gas stream.

API STANDARD 619

Roots Systems is one of the few manufacturers of rotary-lobe gas compressors in the world that comply with API Standard 619, making our **DURAGAS** series the first choice for the petrochemical, oil and gas industries, both onshore and offshore.



WIDE FLOW RANGE

The **DURAGAS** series covers a range of flows from 5 to 50,000 m^3/h (3 to 30,000 cfm).

HIGH PRESSURES

DURAGAS machines can operate at elevated inlet pressures over 150 bar (2175 psi).

HIGH VACUUMS

DURAGAS machines can operate at inlet pressures down to a fraction of a millibar (a fraction of a torr) absolute.

HIGH DIFFERENTIAL PRESSURES

DURAGAS machines can handle differential pressures up to 4.5 bar (65 psi) in a single stage.

API 619 **OIL FREE** **STAINLESS STEEL**

GASES HANDLED

Our **DURAGAS** machines can handle any gas, on request. Types of gases handled are shown below.

Hydrogen Dryer Circulator

- Acidic / Sour
- Corrosive
- Flammable / Potentially Explosive
- Hydrocarbon (Organic)
- Inert
- Low Density
- Low Temperature
- Oxidising
- Radioactive
- Reducing
- Refrigerants
- Toxic
- Vapours (Liquid at Room Temperature and Pressure)
- Volatile Organic Compounds (VOC)

Acid Gas Blower

HYDROCARBON (ORGANIC) GASES

Examples include: acetic/ethanoic acid, acetylene/ethyne, acrylonitrile, alkanes (methane, ethane, propane, butane, etc.), benzene, boil-off gas (BOG), but(yl)ene, coke oven gas, ethanol, eth(yl)ene, ethylene glycol, flare gas, formaldehyde, landfill gas, mercaptans, methanol, methyl acetate, natural gas (known as 'LNG' in its liquid form), off gas, petroleum gas (known as 'LPG' in its liquid form), prop(yl)ene, propylene glycol, R-134a, toluene, vent gas, vinyl chloride monomer (VCM), xylenes.

INORGANIC GASES (NON-HYDROCARBONS)

Examples include: ammonia (NH_3), air, argon (Ar), carbon dioxide (CO_2), carbon disulphide vapour (CS_2), carbon monoxide (CO), chlorine (Cl_2), chlorosilanes, fluorine (F_2), helium (He), hydrogen (H_2), hydrogen chloride (HCl), hydrogen sulphide (H_2S), nitrogen (N_2), oxides of nitrogen, oxygen (O_2), steam (H_2O), sulphur dioxide (SO_2), tritium ($^3H_2$), water vapour (H_2O).

HYDROGEN **H_2S** **STEAM**

SPECIAL MATERIALS

NON-FERROUS

- Aluminium Bronze
- Nickel-Aluminium Alloy
- Titanium

Aluminium Bronze

CAST IRON

- Flake Graphite Iron
  Grey Iron
- Spheroidal Graphite Iron
  Ductile Iron
  Nodular Iron

STEEL

- Carbon Steel
- Austenitic Stainless Steel
  ASTM A351 CF3M
  AISI/SAE Grade 316L
- 22% Cr Duplex Stainless Steel
- 25% Cr Superduplex Stainless Steel

AISI 316L Stainless Steel

NICKEL SUPER ALLOYS

- Alloy C-4, C-22 or C-276 (Hastelloy®)
- Alloy 600 or 625 (Inconel®)
- Alloy 825 (Incoloy®)
- Alloy 400 (Monel®)

Duplex Stainless Steel

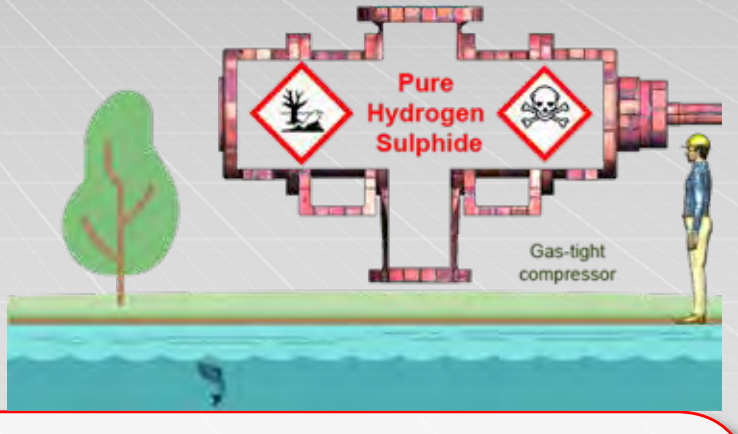
ALUMINIUM BRONZE **STAINLESS STEEL** **NACE**

SEALING

We can recommend a sealing system according to your requirements.

Our **DURAGAS** machines can be fitted with a combination of the following seals. Seals can generally be either single or dual.

Two independent sealing systems can be deployed for hazardous gases.



- **WET MECHANICAL SEAL**
  (Water or Oil Lubricated)

  We can offer a pressurised barrier system in accordance with API 682, seal plan 53B (self-circulating), or plan 54 (pumped) if required.

- **MAGNETIC DRIVE COUPLING**

  A hermetic seal is formed by the containment shell (can/membrane/shroud) of the magnetic drive coupling. The machine is said to be 'sealless' at the drive shaft. Compliance with API Standard 685 is available.

- **DRY MECHANICAL SEAL**
  (Gas Lubricated)

  We can offer a pressurised barrier system in accordance with API Standard 682, seal plan 74.

- **CARBON RING SEAL**
- **LABYRINTH SEAL**
- **LIP SEAL**

Seal Oil Supply System to API Standard 682, Plan 53B

GAS-TIGHT OPTIONS

API STD 682 SEAL PLANS

'SEALLESS' OPTIONS

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CUSTOM PACKAGES

Roots Systems excels in the design and assembly of custom packages for challenging environments.

Our packages are designed with the protection of your process, personnel and equipment in mind. We can supply you with all the necessary safety features and instrumentation for monitoring, control, alarm and shut-down.

OPTIONS

- Sound attenuation
  - Silencers
  - Acoustic enclosures
- Seal fluid systems
  - Gas purge
  - Gas barrier (Seal Plan 74)
  - Liquid barrier (Seal Plan 53B/54)
- Pumped lubrication
- Heat exchangers
  - Air-blast coolers (fin fan)
  - Plate heat exchangers
  - Tubular heat exchangers
- Instrumentation
- Condition Monitoring
- Controls
- Mounting plates and other structures
- Painting and other surface treatments
- Fire-suppression Systems (FSS)
- Classification Society
  - American Bureau of Shipping (ABS)
  - Bureau Veritas (BV)
  - DNV GL
  - Lloyd's Register (LR)

SILENCERS **ENCLOSURES** **PAINTING**

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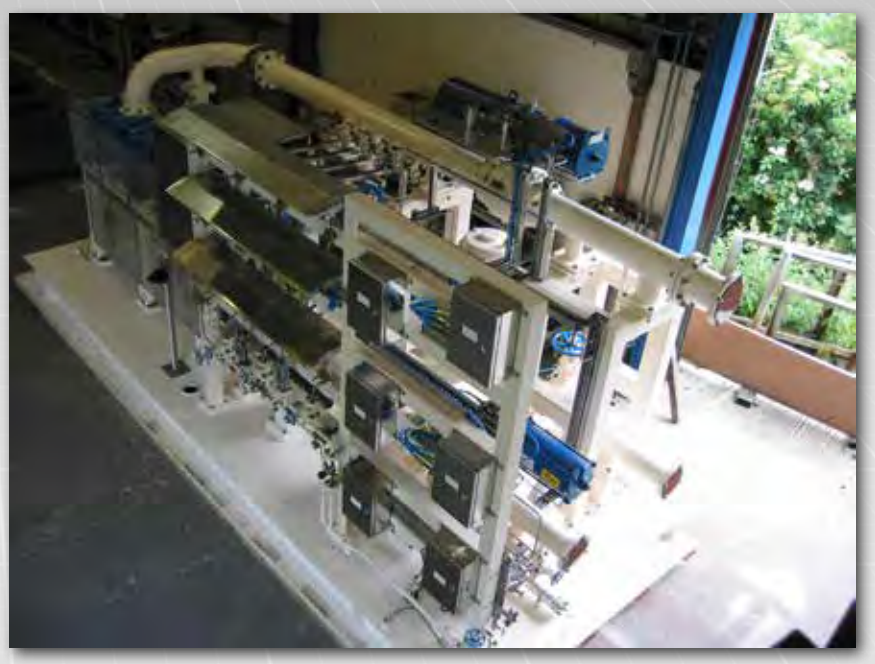
CUSTOM PACKAGES



Flare-gas Recovery Package

We are conversant with the standards and practices of EPCs such as Bechtel, Fluor, Jacobs, Technip, Wood Group (AMEC Foster Wheeler), etc. and those of oil and gas producers such as BP, ExxonMobil, Petronas, Royal Dutch Shell, Statoil, Total, etc.

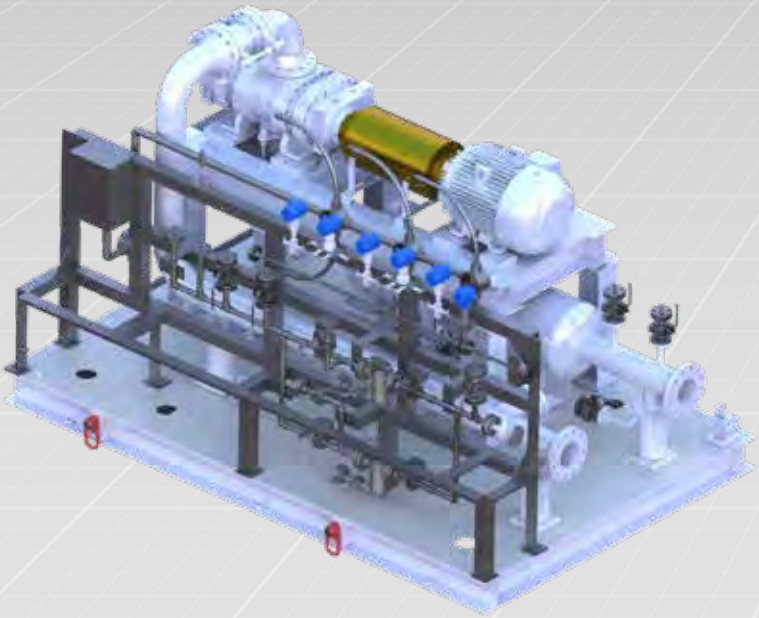
H_2S Acid-gas Blower Package with Fire-suppression System

STANDARDS AND LEGISLATION

- American Welding Society (AWS)
- American Petroleum Institute (API)
  - Std 614 (Oil Systems)
  - Std 619 (PD Compressors)
  - Std 671 (Couplings)
  - Std 682 (Seal Plans)
  - Std 685 (Magnetic Drives)
- ASME Boiler and Pressure Vessel Code (BPVC)
  - Section II (Materials)
  - Section III (Nuclear)
  - Section V (NDE)
  - Section VIII (Vessels)
  - Section IX (Welding)
- ATEX Directive
- Canadian Standards Associations (CSA)
- CE Marking
- The Euro-Asian Council for Standardisation, Metrology and Certification (EASC)
- GOST
- IECEx System
- ANSI/NFPA 70 National Electrical Code (NEC)
- Any required motor standards:
  - ANSI/NEMA MG 1
  - API Standard 541
  - API Standard 547
  - IEC 60034
  - IEEE 841
- NACE
  - MR 0103 (ISO 17945)
  - MR 0175 (ISO 1516)
- Norsok
- Pressure Equipment Directive (PED)
- Tubular Exchangers Manufacturers' Association (TEMA)

ASME VIII **CE MARKING** **PED**

DESIGN CAPABILITIES



3D CAD

Our qualified engineers design the compressors and packages using computer selection programs and the latest 3D CAD technology. This ensures optimum selection of compressors and ancillary equipment and the prompt submission of correct documentation.

Regeneration Blower Package

3D CAD

PIPING

STRUCTURES

FACILITIES

MACHINE SHOP

Modern CNC machine tools produce components for the compressors.

FABRICATION AREA

Our qualified MIG and TIG welders fabricate skids and other structures, pipework, silencers and pressure vessels.

GRIT-BLAST BAY AND PAINT SHOP

We can provide coating systems to meet international standards and project-specific requirements.

PACKAGE ASSEMBLY AREA

Packages are assembled in our up-to-date workshops.

PRESERVATION AND PACKING

We can preserve equipment for storage and build sturdy packing to provide protection during transit to your site.

CNC

PAINTING

10,000 m² (100,000 ft²)

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INSPECTION AND TESTING

INSPECTION AND TESTING

We have full inspection capabilities using 3D co-ordinate measuring equipment and manual inspection equipment.

We carry out a wide range of mechanical and electrical testing in our test bay. All compressors are tested in accordance with ASME PTC 9.

All instruments are calibrated to nationally accepted standards.

OPTIONS

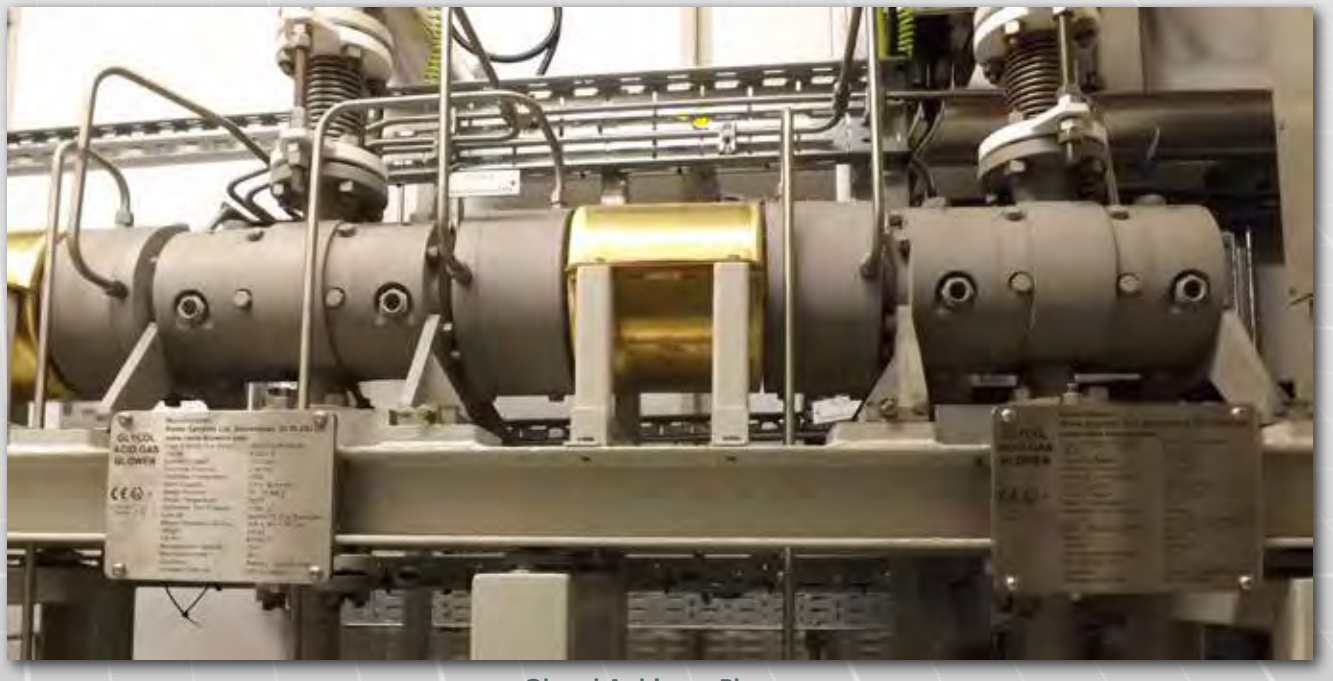
- API Standard 619 tests
- Positive material identification (PMI)
- Type 3.2 Inspection of Materials (EN 10204)
- Non-destructive examination (NDE)
  - Radiography
  - Magnetic Particle
  - Ultrasound
  - Dye Penetration
- Frosio coating inspection
- NACE coating inspection
- Helium leak testing
- High-vacuum leak testing
- Endurance testing
- Third-party inspection agency (TPIA)
- Classification Society

API 619 **OIL FREE** **STAINLESS STEEL**

QUALITY ASSURANCE

As would be expected from a leading manufacturer supplying many companies worldwide, we have established rigorous quality controls. Regular audits ensure that products supplied are of high quality and every compressor is performance tested before despatch.

Our quality management systems are certified to **ISO 9001** for the design and manufacture of blowers and custom-built packages.



Glycol Acid-gas Blower

PROVEN **ISO 9001** **SAFE**

PREVIOUS PROJECTS

Tritium Vacuum Circulator
(Nuclear Fusion Prototype)

Air-scour Blower
in Corrosion-resistant Materials

Vapour Recovery Vacuum Booster

Brown Coal Gas Degasification
Inlet 225°C (437°F); Design 280°C (536°F)

Nitrogen Start-up Blower

Glycol Regeneration

ONSHORE **NUCLEAR** **OFFSHORE**

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AFTER SALES

SPARES

Our well-stocked spare parts department is ready to process your order with the minimum of delay thereby ensuring rapid turnaround.

Requests for emergency supply of parts can often be fulfilled within one working day (subject to availability).

Contact: **spares@roots-blowers.com**

REPAIRS

Repairs and routine overhauls can be carried out on site, at our extensive manufacturing workshops and testing facilities at Stonehouse in the UK, or at the premises of one of our worldwide agents.

Contact: **services@roots-blowers.com**

ON-SITE SUPPORT, WORLDWIDE

Our qualified, experienced team of service and commissioning engineers are also available to travel worldwide to your site.

Routine service visits to site to ensure maximum efficiency of your plant are available and we also offer individual service contracts to suit the particular requirements of your site and process.

As well as on-site servicing, our engineers can assist with installation and commissioning and support you with your programme of operator training.

Our growing network of worldwide agents and associated companies provides local backup and knowledge.

Contact: **services@roots-blowers.com**

SPARES **REPAIRS** **SERVICES**

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CONTACTS

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www.roots-blowers.com

ENQUIRIES

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Repairs, factory overhauls and on-site support: **services@roots-blowers.com**

For all other enquiries, please contact one of our offices.

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