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TURBO MACHINARAY

Comprehensive Capabilities Ensuring The Highest Availability
& Efficiency For The Entire Life Of Your Equipment.



Tomorrow needs Innovation.



—
*Tomorrow
needs Innovation.*
—



HAVAYAR
Tomorrow Needs Innovation.



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*The Innovation you
need, to win.*

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Havayar as a pioneer in the design and manufacture of rotary equipment, with more than 20 years' experience in the Iranian industry market has a strategy to develop the products and services market, in a method that the quality of the product promotes simultaneously. Honesty, respect, security and order are the Havayar's organizational codes of behavior. We also make our best efforts by doing our social responsibilities to turn into a good sample in the country. Our machines in continuous operation anywhere with full 100% service and high efficiency.

We strive to be your partner of choice to maximize your operating performance—and we have all the tools, technologies, and expertise needed to deliver the solution that's best for your situation. Through robust capabilities we are committed to providing you with a flexible and tailored solution that results in the highest availability, reliability, and efficiency for the entire life of your equipment.

Our Products has been registered on below vendor list:
NPC, NIGC, NIOEC, POGC, NISOC, MOP and etc.



HAVAYAR

Our goal is to provide the best solution by considering the special condition of different industries focusing on Oil and Gas, Glass, Power Plant, Steel, Mineral, Automotive Industries.

Our Responsibility

/ 01

We design and manufacture all major compressor technologies, so can give impartial advice on their suitability for specific situation.

/ 02

We take a systems approach and have amassed considerable expertise in vitality very compressor application, enabling us to alert customers to issues and avoid pitfalls.

/ 03

We offer on unequivocal commitment to support, spares and service for the lifetime of every compressor we sell.

/ 04

Our others of providing the best possible life-time value, introducing new technology through retrofit and enhancements where appropriate, offers severity and pace of mind.

/ 01

Innovate for Tomarrow

/ 02

Take up challenges

/ 03

Have a passion for excellence

/ 04

Be generous in what we do

/ 05

Respect and empower our people

/ 06

Act with integrity



Applications & Solutions

With more than a 22 years of applications experience and a range that covers every major technology, we can advise on, design and supply the right range of compressor for virtually any situation.

- 01 — Air Compressors
- 02 — Gas Compressors
- 03 — Expander
- 04 — Fan & Blower
- 05 — Screw Compressors
- 06 — Reciprocating Compressors



Market	Application	Air Compressor (API672)	Gas Compressor (API617)	Expander (API617)	Fan, Blower (API673)	Screw (API619)	Reciprocating (API618)
Upstream/ Offshore	Flash Gas, LP, MP		○				
	Vapor Recovery		○			○	
	Instrument Air	○				○	
Oil Refinery	Process Air						○
	Instrument Air	○				○	
	Hydrogen Reformer	○			○	○	○
	Sulfur Recovery				○		○
LNG	Boil Off Gas (Terminal, LNG Plant)		○				
	High Pressure Terminal		○				○
	Low / High duty (LNGC, LNG FPSO)		○				
	Thermal Oxide Air Blower				○		
Petrochemical	Recycle, Booster (PE, PP)		○				
	Refrigeration (Propane, Propylene)		○	○		○	
	PTA	○	○	○			
	Boil Offer Gas		○				○
	Instrument Air	○				○	
	Ethylene Furnaces & Fired Heaters				○		
	Ammonia & Methanol Plant		○		○		○
Power Plant	Fuel Gas Booster		○				○
	N ₂ Booster (IGCC)		○				○
	Syngas		○				
	Instrument Air	○				○	○
Air Separation	Main Air	○	○			○	○
	Booster Air or N ₂		○				○
	Cryogenic Expansion			○			
Fertilizer/ Gas Processing	Process Air	○	○			○	
	Process Gas (NG, NH ₃ , CO ₂)		○				○
	N ₂ Booster		○				○
	Instrument Air	○					○
	Urea Plant		○			○	○
	NGL	○	○	○			○
Others	Mechanical Vapor Recompression		○				



We stand by our responsibilities towards our customers, towards the environment and the people around us. We make performance stand the test of time. This is what we call — Sustainable Productivity.



— API 617, 672

Integrally-Geared Centrifugal Compressors

A wide range of centrifugal compressors according to API 617 and API 672 are supplied. These compressors with high degree of reliability and low maintenance cost are used in petrochemical and refinery industries, natural gas, steel and cement plants, food industries as well as transportation.

Our centrifugal compressors could be supplied with electro motors as well as turbines, equipped with complex control systems in order to meet projects requirements in various pressures, capacities and powers.

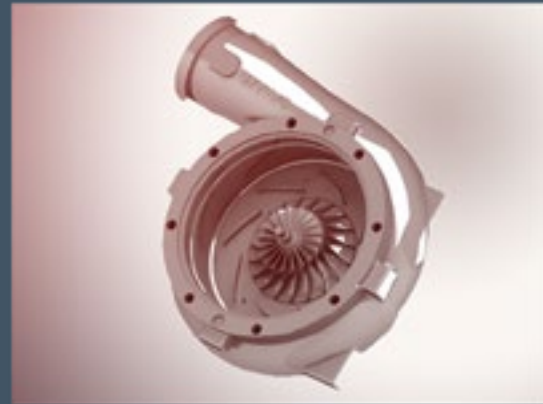
Spec.	Compliance with API 617, API 672, API 614
Gases	Air, Hydrocarbons and other such as N2 and CO2
Stage	Single and multi-stage (1-6 stages)
Range	up to 550,000 m3/h, 75bar
Power	up to 20MW
Drive	Turbine/ Electromotor



The goal :
To Ensure An Optimum Process For You

Our Centrifugal Compressors Feature A Very Compact Design,
This Greatly Reduces Your On-Site Footprint.
By Providing A Range Of Customization Possibilities, We
Can Also Focus On Your Precise Needs.

KEY TECHNICAL FEATURES



— Master Impellers & Inlet Guide Vanes

The master impellers are conceptual parent impellers from which various child impellers can be produced using aerodynamic scaling techniques.

Allows for scaling design over a range of size and applications

Realize high efficiency, state-of-the-art performance.

Inlet guide vanes (or Variable Geometry Diffuser) offer a wide operating range and excellent part load performance.

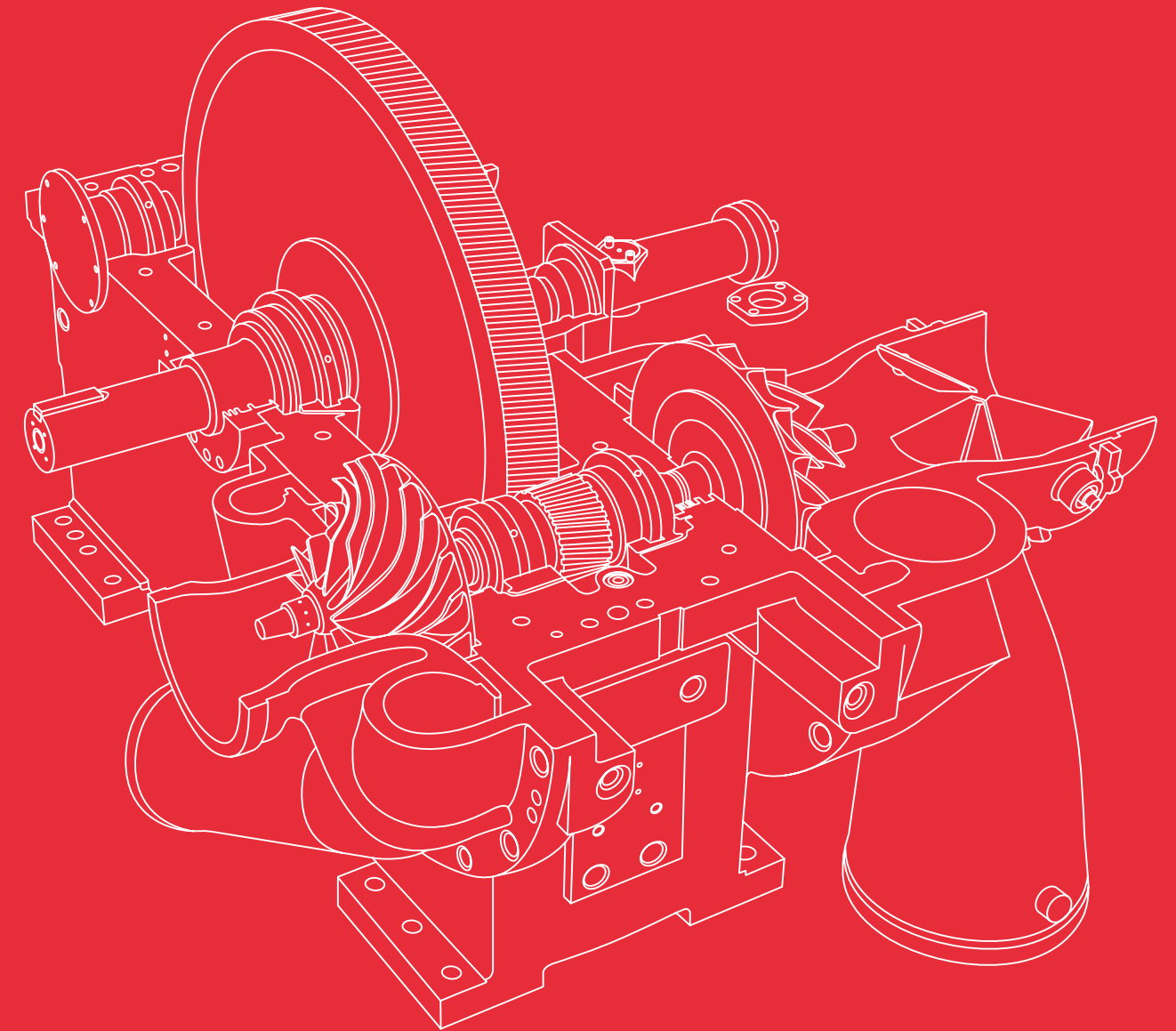


— High Reliability Bearing & Seals

5 Tilting pad journal bearing for high speed pinion, sleeve journal and taper land thrust combined bearing for bull shaft.

Thrust collars on pinion gear are designed to manage thrust loads and provide high reliability in a variety of applications.

The type of seal (Labyrinth/ Carbon Ring/ Dry Gas Seal) applied depends upon the process requirements.



KEY DESIGN FEATURES

1. Designed to API code requirements as well as customer specifications
2. Completely packaged, self-contained water to air cooling circuit
3. The use of water-cooled heat exchangers and closed-circuit water to air cooling system
4. Maintain high efficiency for operating economy
5. Meet client's recognized high standard of design and engineering
6. Low noise level of core design to allow uninterrupted access to the full skid without using sound canopy

— API 617

Single-Shaft, Multi-Stage Centrifugal Compressors

From standard processes to high-pressure applications, our single-shaft compressors are the ideal solution for a wide range of industries and process applications. They are designed to customer specifications and API 617 standards.

Compression solutions can be supplied in a variety of configurations from skid mounted, combining the compressor with its driver and auxiliaries, to single lift process modules where we can fully integrate compressors, drivers and process equipment such as coolers, scrubbers, separators, piping and wiring.

international Spec.	Compliance with API 617, API 614
Mass Flow	Up to 300,000 m ³ /h
Discharged pressure	Single and multi-stage (1-6 stages)
Power Input	up to 550,000 m ³ /h, 75bar





Features

- Dry gas sealing systems
- Up to four process stages
- Up to 10 impellers per casing
- Ultra-low temperature service
- Intercooling, side streams & extractions
- Optional adjustable inlet guide vanes (IGV)
- Standard oil lubricated or active magnetic bearings

Applications

- On- and offshore oil and gas Plant
- Natural gas distribution & storage
- Liquefied natural gas (LNG)
- Petrochemicals
- Olefins and PDH
- Refineries
- Methanol

Key Technical Features

— Horizontal Split Centrifugal Compressor

Multiple impellers are attached to a single rotating shaft, for a multi-stage structure. The gas enters through the Intake nozzle, and is compressed and pressurized by centrifugal force as it passes through the Impellers, which are rotating at high speed, before being ejected through the ejection nozzle. With this type of compressor, the outer casing can be split in the horizontal direction, facilitating the maintenance of internal ports. The red ports are the Critical shaft and impellers.

— Vertical Split Centrifugal Compressor

With this type of compressor, the outer casing is a single continuous cylinder, for a structure which is capable of withstanding high pressures of approximately 50 -700 barg. or 1000 barg in trials. The internal bundle (diaphragm and shaft) can be pulled out in the axial direction for maintenance.



— API 618

Reciprocating Compressors

Reciprocating compressors are the most widely used compressors in petrochemical complexes, refineries, natural gas and design base on API 618 standards with two types of oil free and lubricated compressors.

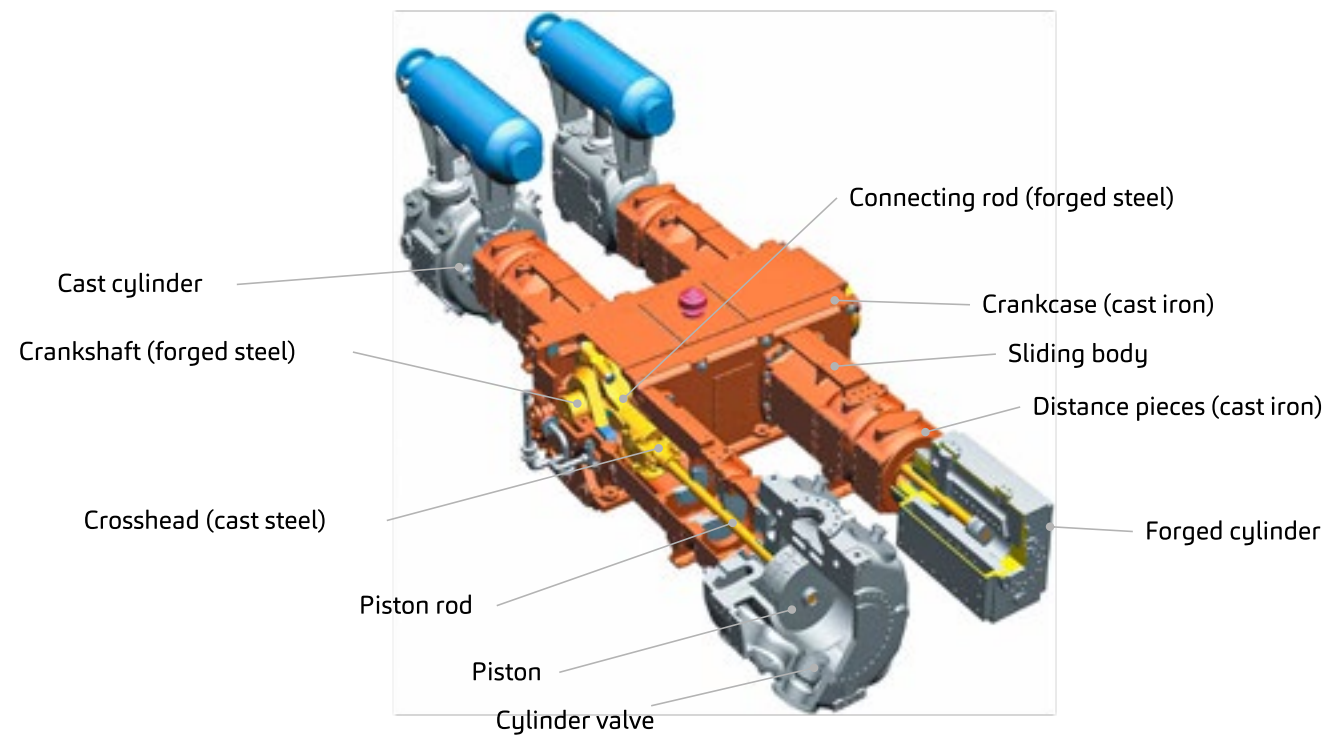
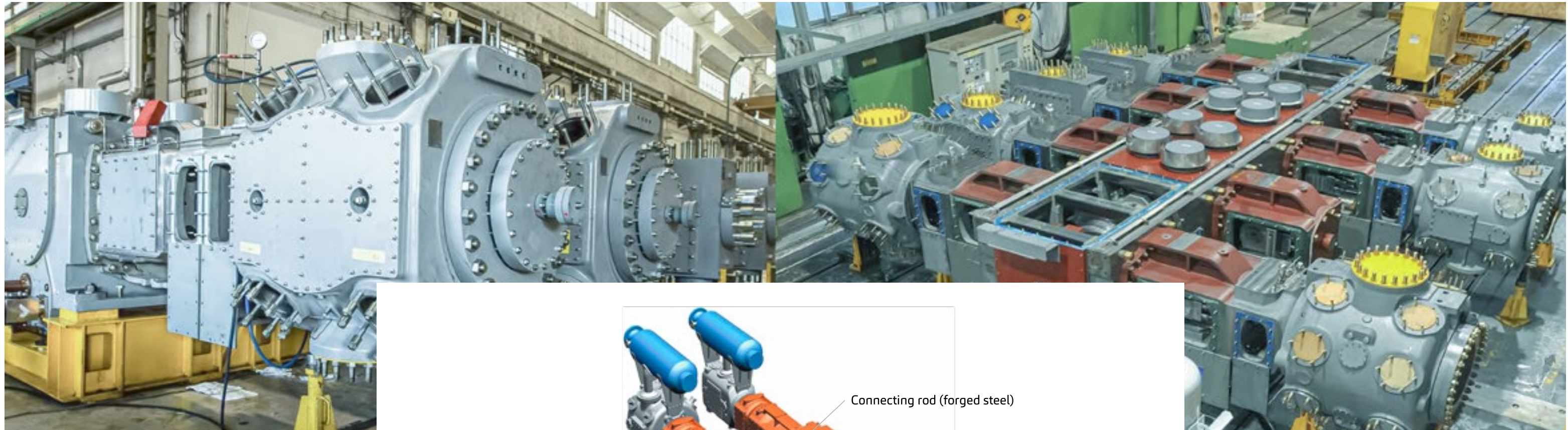
— API STANDARD 618

All compressors have been designed according to API standard 618, the latest edition recommendation. They also comply with many guidelines and international construction codes and customer requirements.

— Rigid Construction

The compressor crankcase is of the rigid type construction, and spacer blocks and cylinders are strongly bolted each other and auxiliary pressure vessels and heat exchanger are designed and locked strong angel and supported.

Spec.	Compliance with API 68
Gases	Hydrocarbons, Syngas, H2S & others (Air, CO2, N2, O2, AR)
Stage	Single & multi-stage with Scrubber & Inter After Coolers
Rang	up to 450,000 m3/h, 600bar
Power	up to 2 MW



Key Technical Features

— CRANK SHAFT

for The crank shaft designed without bearing between the opposed crank throws, which are moment applying on the shaft. The shaft is rugged one-piece forged steel.

— CONNECTING ROD

The forged steel connecting rods are also subjected to ultrasonic and magna-flux inspections. The big end bolts are of high tensile steel with polished stem.

— VALVES

For non-lubricated, the suction and discharge valves which determine the compressor performance operate with disc valve plates motion of the piston. Entirely devoid of any sliding part. For lubricated, the sliding valve plate is guided by a uniquely arranged center collar.

— PISTON & PISTON ROD

for The crank shaft designed without bearing between the opposed crank throws, which are moment applying on the shaft. The shaft is rugged one-piece forged steel.

Key Design Features

— NON-LUBRICATED TECHNOLOGY

The customer may require non-lubricated compressor where no lube oil is allowed in the process gas for reasons of taste, catalyst fouling or risk of explosion.

PTFE (Polytetrafluoroethylene) is used for piston/ rider rings, and also for the piston rod packing.

— HYDRO COM CAPACITY CONTROL

Hydro COM Capacity Control follows on intelligent concept: just the required amount of gas needed is being compressed (stable steeples control over a broad control range from (0) 10% to 100%)

— API 617

Turbo Expander Process Gas/ Air

Turbo-expanders, also referred to as expansion turbines, provide a way to capture the energy lost in several industries. Turbo-expanders have a range of applications, but this template focuses on the use of turbo expanders for energy recovery and power generation. Virtually any high-temperature or high-pressure gas is a potential resource for energy recovery.



How Turbo Expander Works?

— Expander Side

1. Gas enters through inlet guides vanes creating initial pressure drop and high velocity vortex.
2. Additional expansion takes place in expander wheel. A conical defuse is often used to recover remaining velocity.
3. Extracted power from the expander is transmitted through rotor, supported by oil or magnetics to compressor wheel.

— Compressor Side

4. Process gas enters the compressor where the pressure and temperature are raised by the compressor wheel.
5. Process gas exits the wheel through a vane less diffuser for enhanced operating range and reliability.

Main Parts:

- Variable Inlet Guide Vanes (IGV)
- Wheels
- Shaft
- sealing
- Bearing
- Labyrinth Seal
- Floating Carbon Seal
- Dry Gas seal
- Oil Seal

international Spec.	Compliance with API 617
Gases	Air, Hydrocarbons and other gas
Power	up to 10 MW
Configuration	Oil lubricated/ Active Magnetic Bearing Type

- Bearing
- Lub Oil System (for oil lubricated mechanical)
- AMB Panel (for magnetic tape machine)
- UCP



Key Technical Features

— Active Magnetic Bearing

Active Magnetic Bearing (no oil system Compressor loaded Expander customized to fulfill customers' requirements in terms of standards: API standard, local standards or customers' best practice standard can be applied when requested.

- No risk of process contamination by oil
- Elimination of vibration: the active bearings cancel synchronous vibrations by letting the shaft free to rotate around its inertia axis.
- No maintenance concept

— Oil Bearing

We offer horizontally-split, high-speed pinion bearings featuring five self-centering pads that ensure stable radiation. Horizontally-split bearings are especially easy to inspect and maintain. Tilting-pad bearings, which are used on high-speed shaft, and sleeve bearings, used on low-speed shafts, ensure reliable performance, efficiency and optimal speeds each process.

— Industrial Gas

These type of expander, use in Air Separation Unit (ASU) with low distillation temperature allowing the bulk production of O₂, N₂ and Ar.

Types are as below

- Expander with oil brake
- Expander with Compressor brake
- Expander with Generator brake

— Oil and Gas

Customer-engineered solution for the oil and gas industry are designed to meet a wide variety of customer requirements and provide many years of reliable service.

Application:

- Liquefied Petrochemical Gas (LPG)
- Natural Gas Liquid (NGL)
- Dew-Point Control (DPC)
- Liquefied Natural Gas (LNG)
- FPSO-FLNG
- Regasification
- Nitrogen rejection

— Energy Recovery

Driven by our integral-gear expertise, our turbo expanders can be configured with one to four stages on single gearbox to achieve the lowest cost-per-kilowatt power-train solution. Power generation reaches up to 10 per unit.

Application:

- Geothermal
- Organic Cycle
- Kalian Cycle
- Pressure Letdown
- Heat recovery
- Waste-heat recovery

— AMB Machines Pats

- AMB Cartridge
- Equipped with Radial and Axial Bearing
- Auxiliary Landing Bearing
- Control Loop

AMB control panel is equipped with a 14kHz digital control unit, 5 axis amplifiers, 3 x 50% AC/ DC converts

— MB Scope Software

- Live Monitoring / Snapshots
- Date logging
- Advance Graphic



The goal :
Building Productive Partnerships

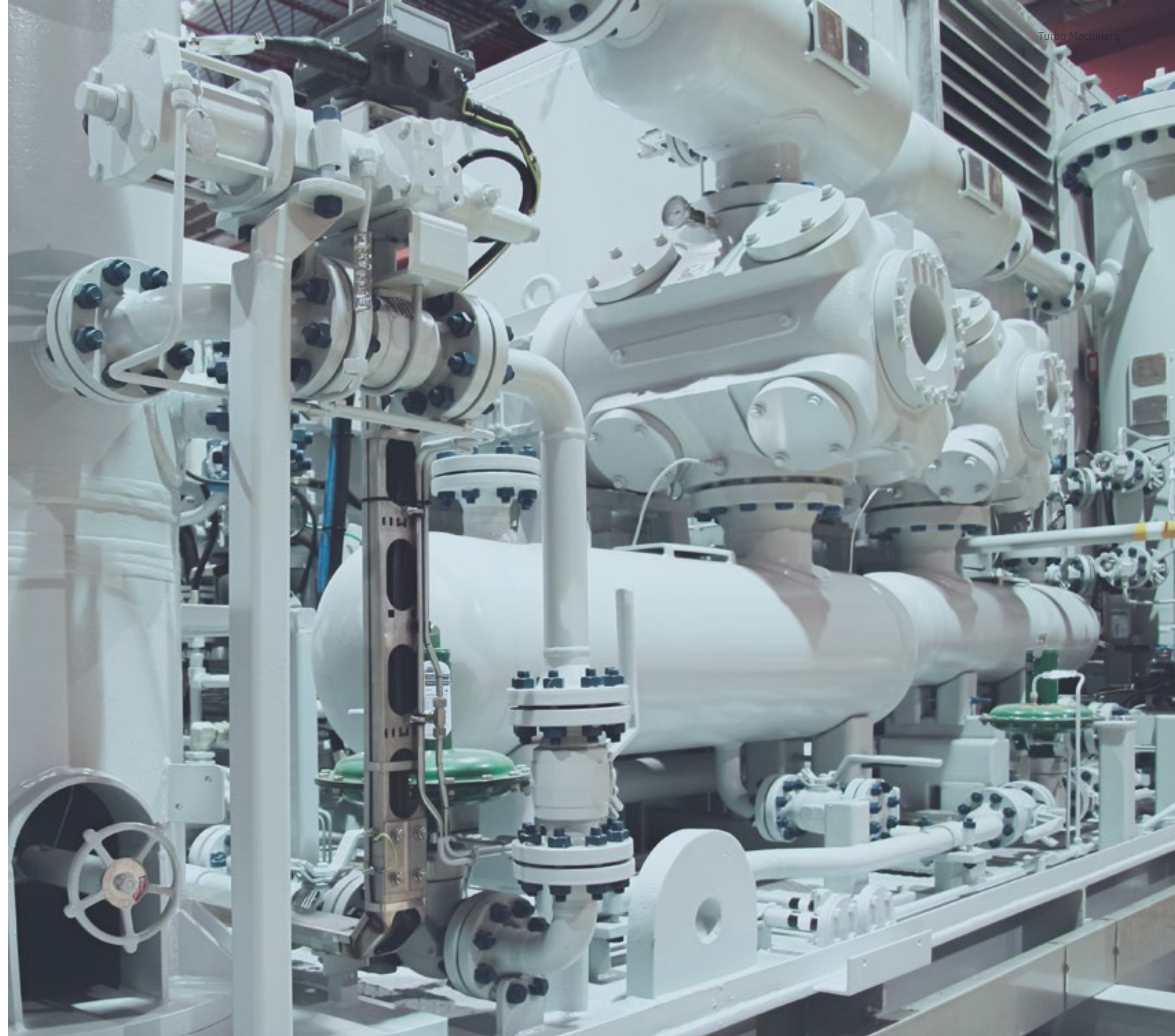
When You Choose HAVAYAR Turboexpanders For Your Process, You Initiate A Continuing Partnership That Extends Well Beyond Design, Delivery, And Installation. From Project Initiation Through Design, Delivery, And Commissioning, Total Quality Management Is Fundamental To Every HAVAYAR Project.

— API 619

Gas Screw Compressors

Screw gas compressors according to API 619 standard are designed especially for the high safety requirements of gas compression and process cooling in the chemical, oil and gas Industries. These compressors can be equipped with cast steel casings, maintenance-free tilting-pad thrust bearings and double shaft seals. Rotor position and sleeve bearing temperature monitoring systems ensure enhanced operational reliability.

international Spec.	Compliance with API 619
Flow Rate	Up to 24,000 m ³ /hr. (20.5 mmScfd)
Pressure	Up to 15 bar a (218 Pisa)
Power Input	Up to 4,000 kW (5,364 hp)
Speed	Up to 5,000 rpm





Key Design Features

Process gas screw compressor systems are customer designed for process-critical applications. We produce a range of oil injected units as skid-mounted packages which offer a number of advantages a cross orange of application that demand high efficiency and high discharge pressures.

Also we offer oil free screw compressors as bespoke designed, complete packaged system. Oil free screw compressor are capable of handling gases with high levels of liquid or particulate matter, and are eminently suitable for hazardous gases or in applications where contamination is an issue.

Key Technical Features

— Gas Screw Compressors

They are designed for the compression natural and synthetic refrigerants in process cooling as well as for the compression of process gases. Further applications are the compression of natural gas and gas mixtures: e.g., as compression stations in natural gas and biogas plants.

— Gases with low molecular weight

A screw compressor is a positive displacement compressor and, therefore, ideal for handling light hydrogen gases. The problem of an increasing number of stages required for low molecular weight—as is the case with centrifugal compressors—does not apply to screw compressor.

— Gases with varying molecular weight

As molecular weight has only a small impact on the achievable pressure ratio—different to centrifugal compressors—the screw compressor is ideal for use in processes with fluctuating molecular weights.

— Dirty and polymerizing gases

Screw compressors have low rotor tip speeds and a very rigid rotor and casing design. They can even handle dirty and dusty gases.



EPC Projects

Havayar has since taken major steps to become capable of rendering complete range of EPC service in our products of industries. Today Havayar incorporated with the sole objective of having an active and comprehensive works, training of customer's personnel warranty service and at the end maintenance, overhaul and revamping and spare part service.

We have achieved and Intend to keep this position with the help of employing high caliber professional staff, utilizing state of-the- technologies and striving rigorously to render excellent services to our clients.



Engineering
 Conceptual Design, Basic Design
 Front End Engineering & Design
 (FEED) & Field Engineering Service
 (FES)

E

Engineering

Conceptual Design, Basic Design Front End Engineering & Design (FEED)& Field Engineering Service (FES)

Havayar has been providing highly professional Engineering service for over 20 years to a wide range of industries. Our knowledge, vast experience, certified and expert engineers allow us to offer effective and cost saving solutions for all of your needs based on international standards. Our activities include reviewing the project scope, requirements elicitation, conceptual design, basic design, front end engineering & design (FEED) detail engineering, field engineering services (FES) and feasibility study.

Procurement
 Sonication Of Quotation, Purchase
 Order, Expedition, Inspection And
 Shipping.

P

Procurement

Sonication Of Quotation, Purchase Order, Expedition, Inspection And Shipping.

Havayar procurement team within HY Iran Office and affiliated Offices will carry out procurement of goods service for Project, supervising all phases of activities such as: sonication of quotation, purchase order, expedition, inspection and shipping. Havayar procurement team supports our customers by supervising all phases of activities, training and supplying spare part during the after-sales period.

Construction
 HSE, Field Engineering, QA/QC,
 Site Administration, Planning and
 control, Pre-com./ Commissioning

C

Construction

HSE, Field Engineering, QA/QC, Site Administration, Planning and control, Pre-com./ Commissioning

Construction team responsible for defining and monitoring the construction works, execution procedures, quality standards and quantity measurement requirements as well as defining HSE requirements. For construction Contracts sub-contracted, Construction team, Mobilizes/ hires and assigns qualified people for implementing the Construction Management tasks (in distinction from the site Management that oversees not only Construction per se but also material receiving/ control/ issue, HSE, Field Engineering, QA/QC, Site Administration, Planning and control, Pre-com./ Commissioning).

After Sales Service

1. Installation, Commissioning and startup
2. Overhaul & Emergency Repair
3. Inspection & Maintenance
4. Supply of Spare Part



— Installation & Commissioning

Our goal is to ensure that your new machine is working perfectly. We monitor the installation of your compressors. However, even more important than this is professional commissioning. That is 'Why you should place your trust in our trained and experienced service engineers from the very start. After all, they know 'What is important during commissioning. This enables you to achieve a performance-oriented machine function in continuous operation.

— Inspection & Maintenance

Compressors always have to give their best performance. Who could take better care of your Havayar compressors than our service technicians? We offer one-time or recurring maintenance. Maintenance contracts with individually agreed terms and conditions, maintenance intervals and revision periods for your system have proven useful. We make any necessary adjustments and replacements to wearing parts on schedule in order to increase the operational safety of your system.

— Repair & Overhaul

In our modern manufacturing plant, we repair or overhaul your compressors, bearings, couplings, wheels, casing and etc. as required. With cutting-edge technology, our experienced professionals make sure your machine is returned to a safe operating condition. Joint planning there by ensures fast, timely handling. You need repairs or professional maintenance. Get in touch with us!

— Spare Parts

The availability of your machines is influenced significantly by the quality of the components used. Benefit from Havayar original parts. This provides you with maximum performance and service life. We guarantee the ability to deliver spare parts for our machines and equipment for decades to come. We supply the original parts you need quickly and reliably. Call us: we will also be happy to advise you on a demand-oriented and reliable provision of spare parts.



We believe in our products, and in their capacity to provide long term, high value service. We are committed to maintaining and where possible enhancing their performance and extending their working life. All of our aftersales services are designed to offer our clients confidence, security, and peace of mind.