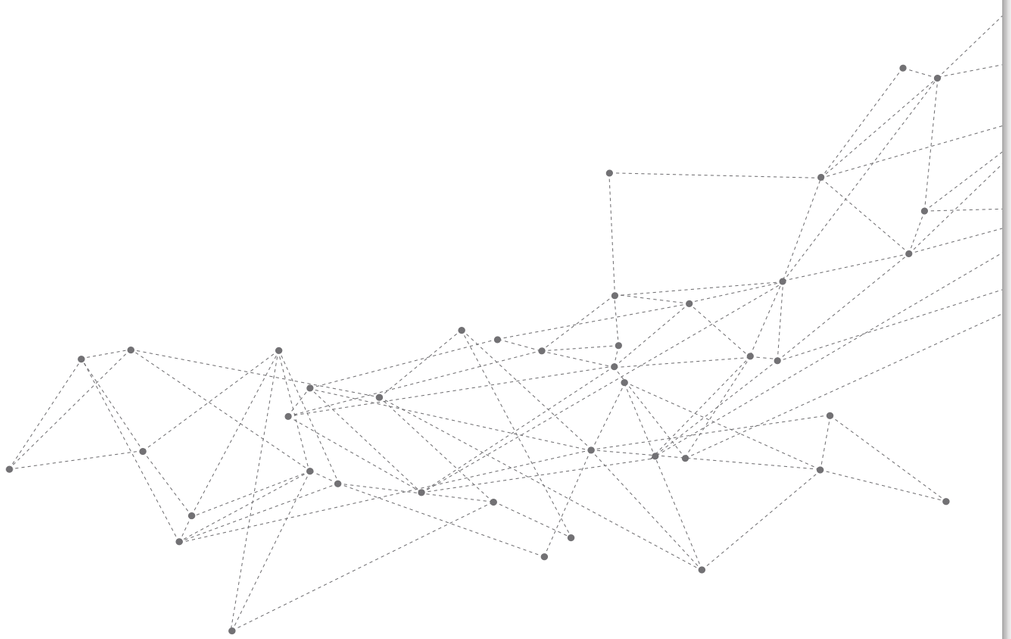
_ the steam takes power

industrial steam turbines
for power generation
and mechanical drive

FINCANTIERI
The sea ahead

_ steam turbines

the steam takes power



FINCANTIERI

The sea ahead

fincantieri _ seven seas, one company

Like a grand design in the stars, there
is a global network of interconnected
knowledge and expertise, on sea and
land, where day by day a group
is growing and adding fresh value all
along the chain, creating a whole that is
so much greater than the sum of its parts.
This is Fincantieri.
A global Group that is a cutting-edge
and active player in all the highest
added-value market segments, across
the water and around the world.

the fincantieri planet

SHIPYARDS AND DOCKS

_ europe

ITALY
TRIESTE
MONFALCONE
MARGHERA
SESTRI PONENTE
GENOA
RIVA TRIGOSO-MUGGIANO
ANCONA
CASTELLAMMARE DI STABIA
PALERMO

NORWAY
AUKRA
BRATTVAAG
BREVIK
LANGSTEN
SØVIKNES

ROMANIA
BRAILA
TULCEA

_ asia

VIETNAM
VUNG TAU

_ americas

USA
GREEN BAY
MARINETTE
STURGEON BAY

BRAZIL
SUAPE

SUBSIDIARIES

_ europe

ITALY
FINCANTIERI S.p.A. (Headquarter)
Orizzonte Sistemi Navali
Cetena
Seastema
Isotta Fraschini Motori
Fincantieri Oil&Gas
Seaf
Marine Interiors
Fincantieri SI
Fincantieri Infrastructure
IsselNord

NORWAY
Vard Group (Headquarter)
Vard Design
Vard Piping
Vard Electro
Vard Accommodation
Seaonics

SWEDEN
Fincantieri Sweden

POLAND
Seaonics Polska

_ asia

CHINA
Fincantieri (Shanghai) Trading
CSSC - Fincantieri
Cruise Industry Development

INDIA
Fincantieri India
Vard Electrical Installation
and Engineering (India)

BAHRAIN
FMSNA

UAE
Etihad Ship Building

QATAR
Fincantieri Services Middle East

SINGAPORE
Fincantieri Singapore R.O.
Vard Holdings
Vard Shipholding Singapore

JAPAN
FMSNA YK

_ americas

USA
Group Holdings
Fincantieri Marine Systems North America
Fincantieri Services USA
Fincantieri USA
Vard Marine US

CANADA
Vard Marine

BRAZIL
Fincantieri do Brasil Participações

_ oceania

AUSTRALIA
Fincantieri Australia

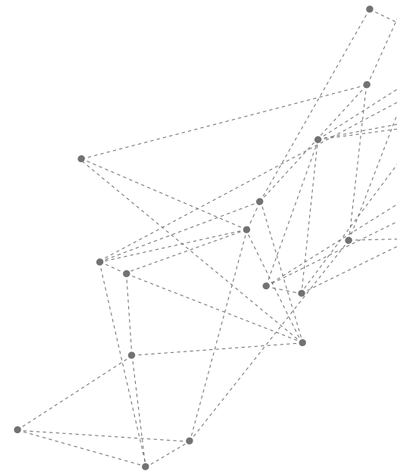
19,000
employees

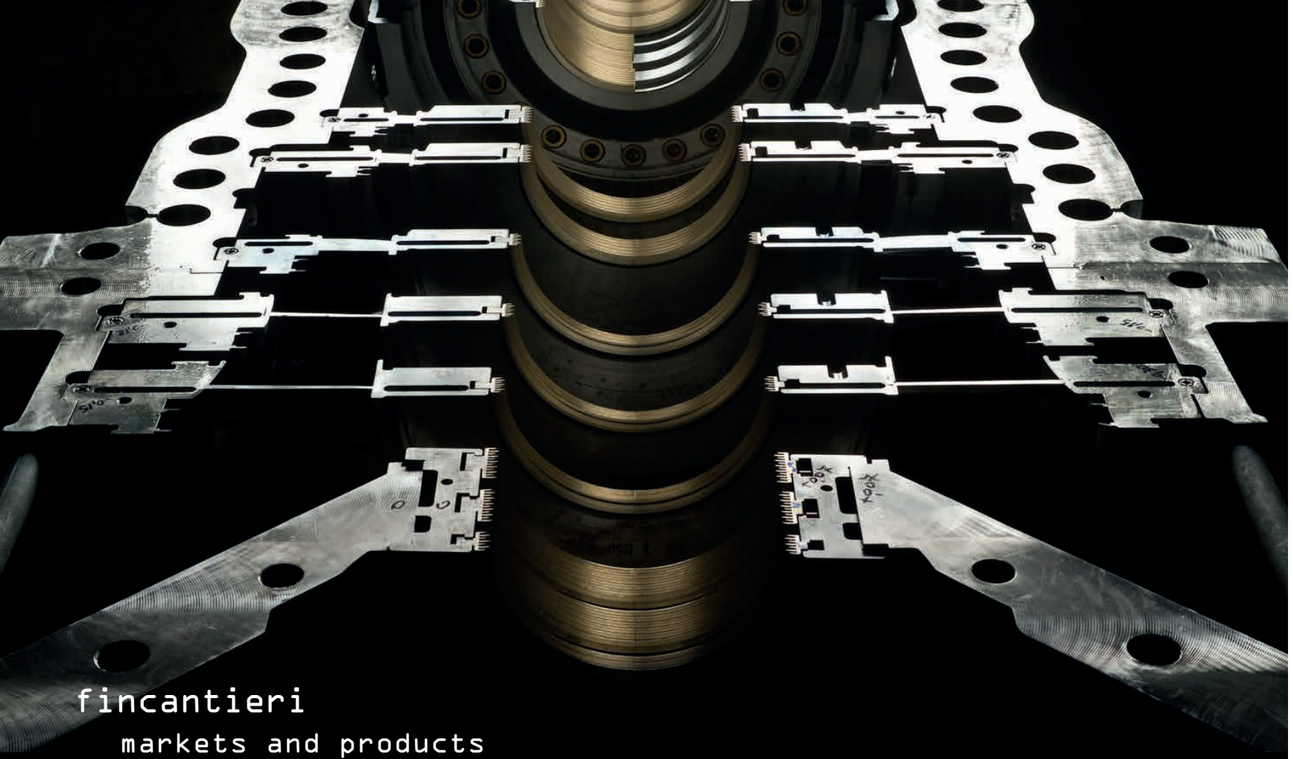
20
shipyards

4
continents

the world in one design

— Twenty shipyards across Europe, Americas and Asia. A workforce of more than twenty thousand people, 60% abroad. Revenues of four billion euros. These figures underscore our supreme competitiveness in the market.
We are a global multinational group.
And we are unique.
Because we are the only company in the world that can build all types of vessel, whatever their complexity. From cruise ships to mega yachts, naval vessels to high-tech offshore vessels.
We are Fincantieri.
Rooted in **Italy**, we operate worldwide.
We are an ecosystem that welcomes the shipowners and assists them at every stage, from construction and on through their unit's entire life cycle.





fincantieri
markets and products

SHIPBUILDING				OFFSHORE	EQUIPMENT, SYSTEMS AND SERVICES	
LEISURE	TRANSPORTATION	DEFENCE	LUXURY	OIL & GAS	LIFE CYCLE MANAGEMENT, MAINTENANCE, EQUIPMENT	
▪ Cruise ships - Contemporay - Premium - Upper Premium - Luxury - Exploration/ Niche	▪ Ferries - Cruise ferries - Ro-Pax - Dual fuel ferries	▪ Naval vessels - Aircraft Carriers - Destroyers - Frigates - Corvettes - Patrol vessels - Amphibious ships - Logistic support ships - Multirole and research vessels - Special vessels - Submarines	▪ Mega Yacht - Mega yacht > 70 m	▪ Offshore - Drilling units - Offshore support vessels: AHTS-PSV-OSCV - Special vessels - Fisheries/ Aquaculture - Wind offshore - Expedition cruise vessels	▪ Systems and Components - Cabins - Public areas - Electrical, electronic and electromechanical integrated systems - Automation systems - Entertainment systems - Stabilization, propulsion, positioning and power generation systems - Steam turbines - Steel structure for large scale projects	▪ Services - Ship repairs - Refitting - Refurbishment - Conversions - Product lifecycle management • Integrated logistic support • In-service support • Refitting • Conversions - Training and assistance

OTHER: Fincantieri S.p.A.

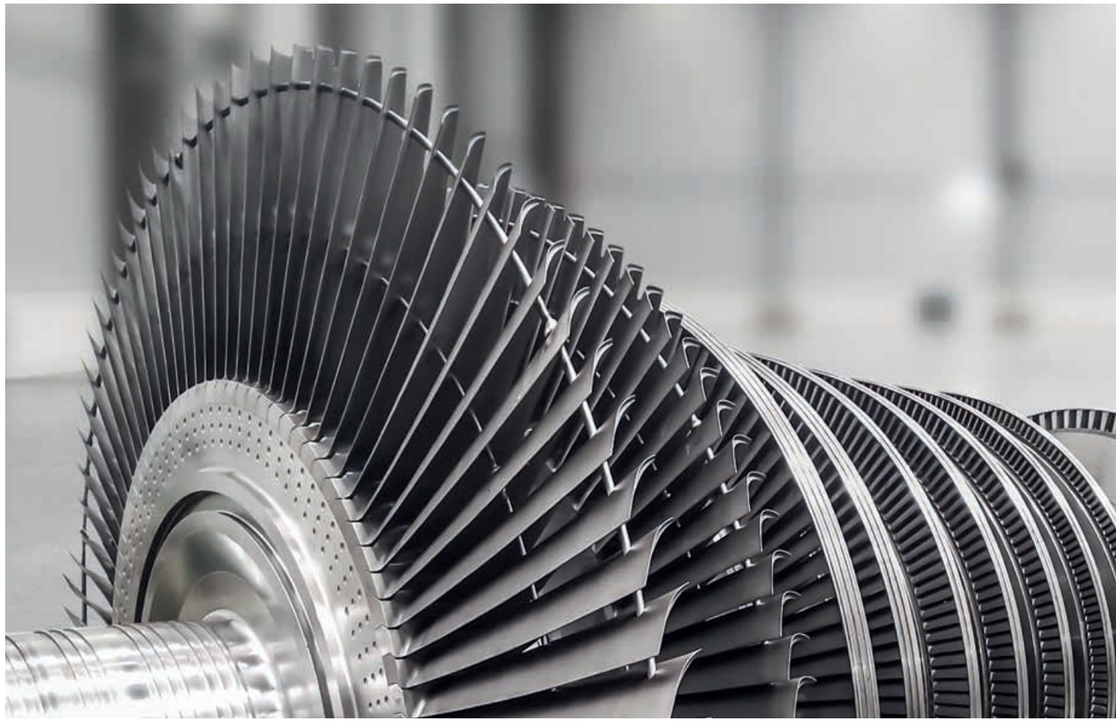
fincantieri
steam turbines

— Fully DESIGNED and BUILT in Italy in Riva Trigoso, Fincantieri Steam Turbines combine long experience, state-of-the-art technology and the continuous feed-back and support of our worldwide customers for a non-stop improvement.

The Steam Turbine design concept is modular, and design can be customized in each detail according to our customers requirements with constant support of our engineers and technicians.

It means:

- Our production is not a series production, but an ON DEMAND one
- All of our products could be «tailor made»
- We think quality is better than quantity.



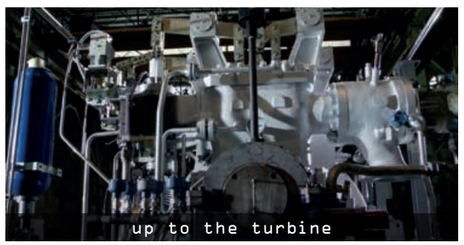
riva trigoso.
the special place where our steam turbines take shape.

— Engineering, Design, Expertise, Technology and Know-how. Fully Italian and excellent.


from steel


through design


to production

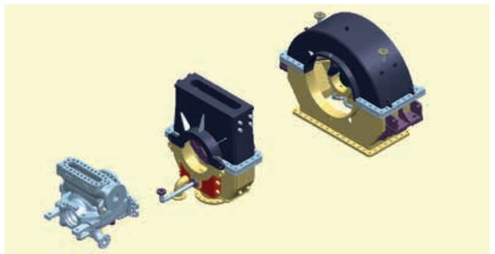

up to the turbine

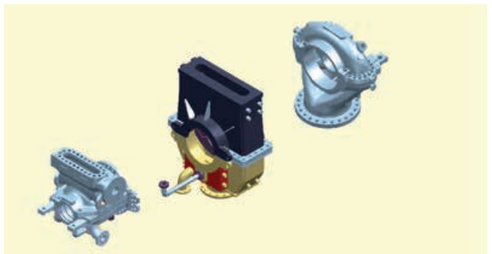
our people follow the line from the design up to the readiness for delivery and beyond.

different well proven solutions based on our customer needs and our experience

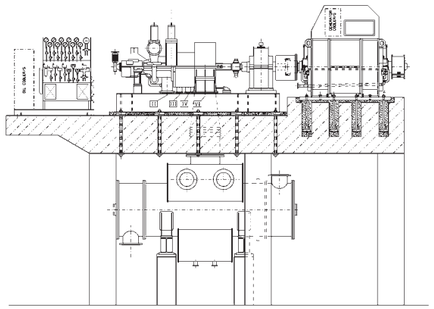
— Depending on the project and relevant features and/or constraints (existing installation or not, accessibility to the plant, time schedule, etc.) we study with the customer the most appropiate solution among a range of standard configurations: our solutions are modular and customised according to project requirements.

modular philosophy for turbine

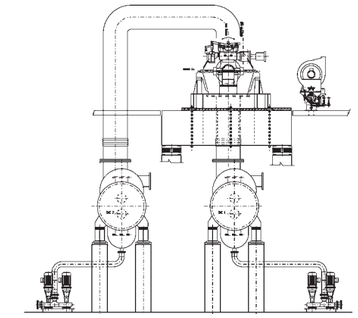




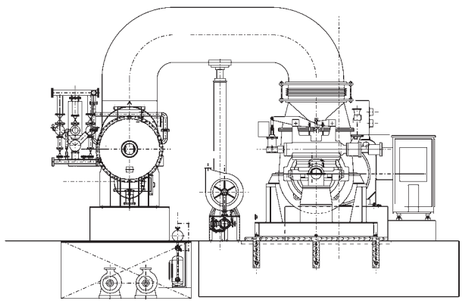
modular philosophy for arrangment



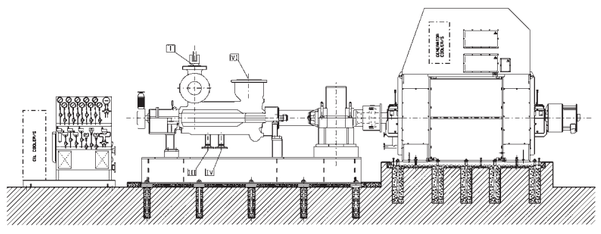
_ Mezzanine Installation



_ CHP - Combined Heat and Power Applications for District Heating Purposes

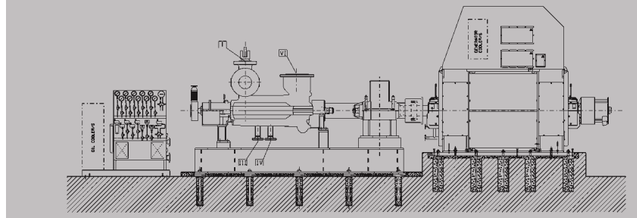


_ Ground Installation with Aside Condenser



_ Ground Installation

different layouts different goals

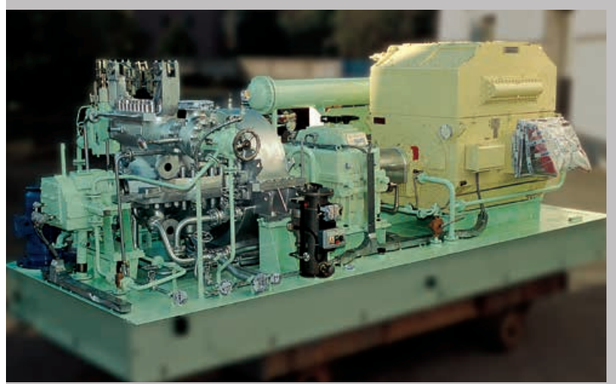


main plus

- Easy transportation and reduced lift capacity for installation
- Easy manoeuvrability during erection
- Easy access to components for operation and maintenance activities.

Welded steel baseplate common to:

- turbine + reduction gear with built-in oil tank (or separated one)
- Generator mounted directly on concrete



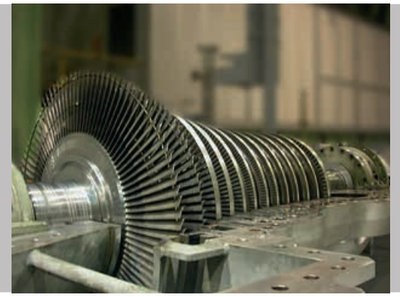
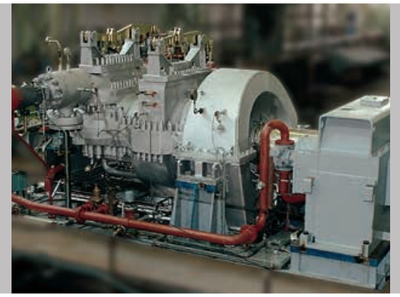
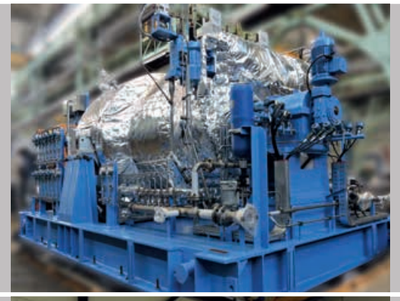
main plus

- Simplified design of columns and concrete
- Complete train alignment pre-arranged at manufacturer workshop
- Direct application on columns without concrete base
- Short erection time at site

Welded steel baseplate common to:

- the whole train (supported by spring boxes) with built-in oil tank (or separated one)

different scope of supply for different applications

What	How	Where
Steam Turbine		Mechanical Drive Revamping
Steam Turbine + Reduction Gear		Mechanical Drive Revamping
STG set		New Installation Revamping
STG set Mechanical BOP + DH exchangers/Condensers		New Installation Revamping

turn key solutions

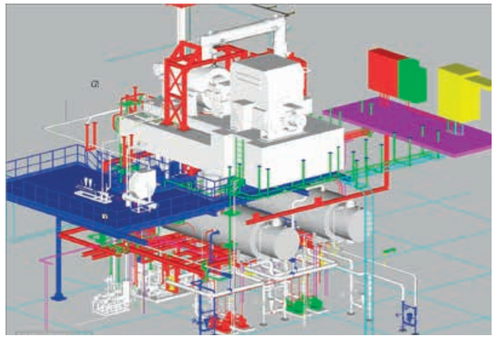
— Fincantieri offers and build different turn key solutions for different projects and applications.

— Fincantieri proposes and provides turn-key solutions for the whole STG Set.

Fincantieri's scope of supply starts from the basic engineering up to the delivery of the Plant to the End User.

_ STG set
erection activities
on site in USA

— Fincantieri can also supply the power island complete of the necessary mechanical and electrical components and fittings.



_ 3D design
of a power island
in Sweden

— A Fincantieri particular turn key Power Plant solution is based on 200 kW high efficiency micro steam turbine, developed by Fincantieri in particular for Cogeneration Biomass Power Plant.
Easy to build, the plant has modular design to minimize the installation time.

_ 200 kW
Biomass Plant

our product range

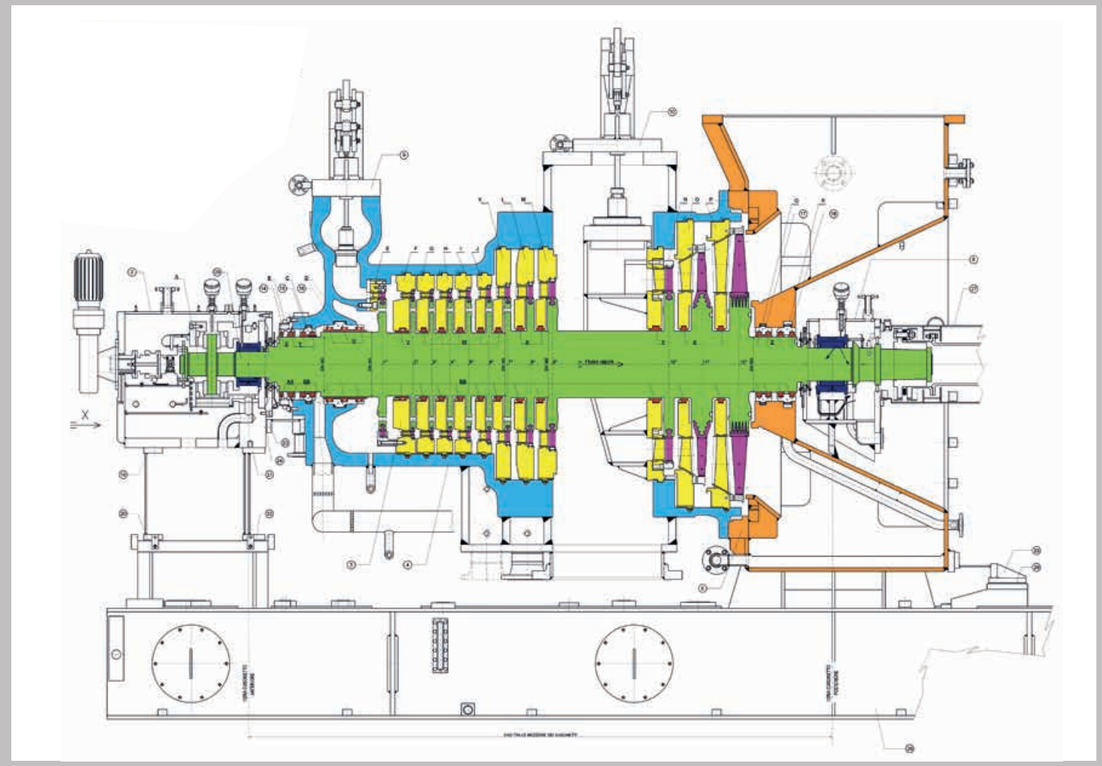
— Fincantieri production covers the following steam turbine categories:

- Microgeneration
- Single Stage
- Multistage
- Overhung
- in a wide power range:

steam turbines type	power range
XS	from 200 kW to 1 MW
S	from 1 MW to 10 MW
M	from 10 MW to 25 MW
L	from 25 MW to 50 MW

our technology

— Fincantieri steam turbine covers the complete power range from 200 kW up to 50 MW.
Applications are suitable either for power generation or for mechanical drive (single stage/multistage) i.e. pumps, compressors, fans driving.



- inlet steam conditions up to 140 bar and 540°c
- bearings with high damping capability, pressure type or tilting pads type
- rotor supporting system: "centerline" type
- labyrinth type steam seal rings, spring mounted also available with brush seals
- rotor disks integral with the shaft to maximise strength and reliability
- horizontally split casing of cast steel with fabricated or cast exhaust duct
- flow path based on impulse type construction and hybrid degree of reaction.

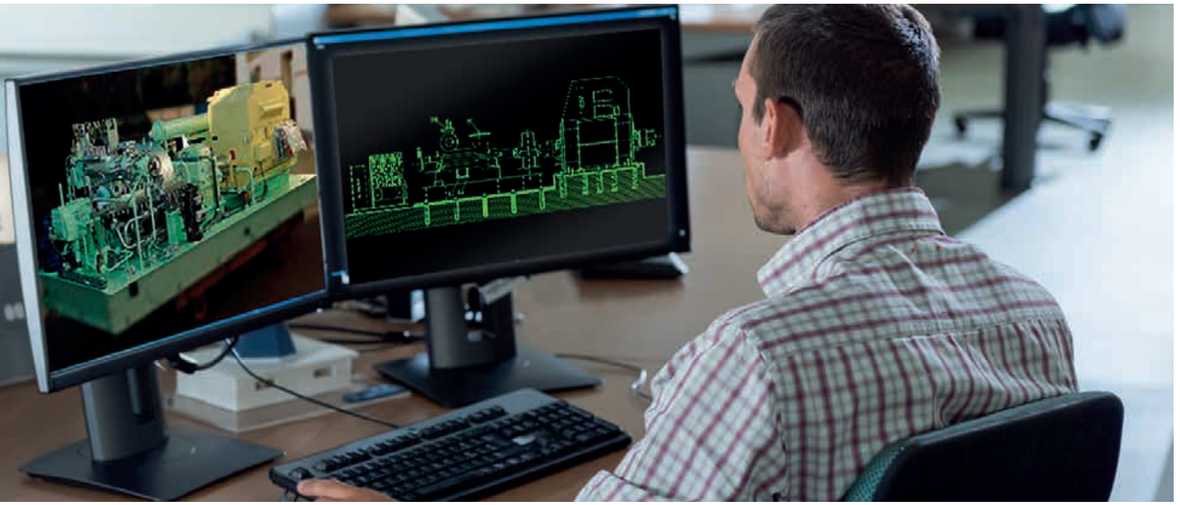
research and development

— Fincantieri is continuously investing large resources in Research and Development.

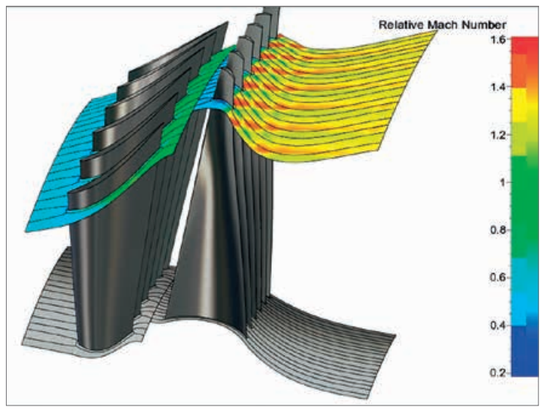
Innovative blading, designed in –house by specialized engineers, allow to achieve efficiencies at the top level. The design is carried out using state-of-the-art tools, validated through extensive experimental testing carried out by prestigious Italian and European facilities.

Fincantieri turbines successfully combine the impulse technology with the hybrid-reaction flow path concept. This combination provides very high performances, sustained efficiency over the time, and high reliability.

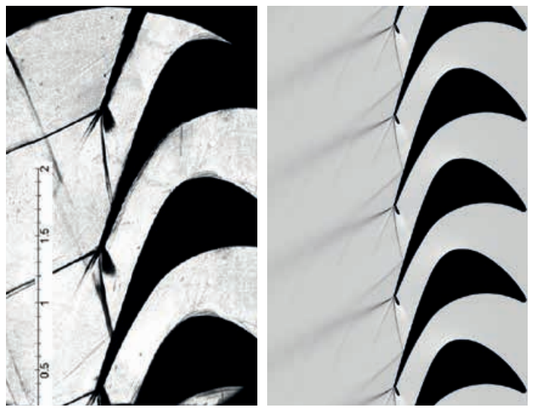
Strong effort is addressed to upgrade the existing models and to extend the production line in the field of XS and L power range too.



state of the art design tools



experimental validation of design



_ experimental output _ numerical output

microgeneration steam turbines

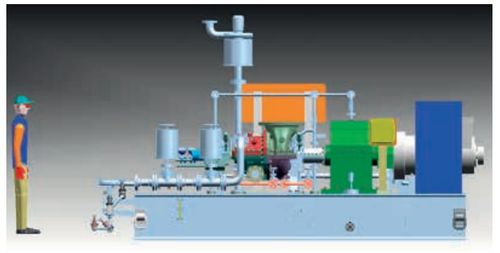
new item

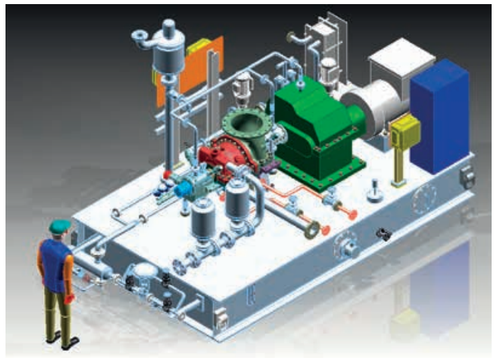
- Compact turbine: multistage/multivalve/high efficiency
- Condensing or Backpressure, with or without bleeding/2nd admission
- Rotor from forging with integral disks
- API 611-612 versions available.

Possible applications:

- CHP (Waste/Biomass/HRSG)
- Heat recovery plants (on/offshore) for electricity production
- Industrial projects
- Solar Plants
- Mechanical Drive.

Easy «Plug&Play» version on metallic baseplate (2,5 m x 8 m) including tube oil console and panels. Short erection time.





main features:

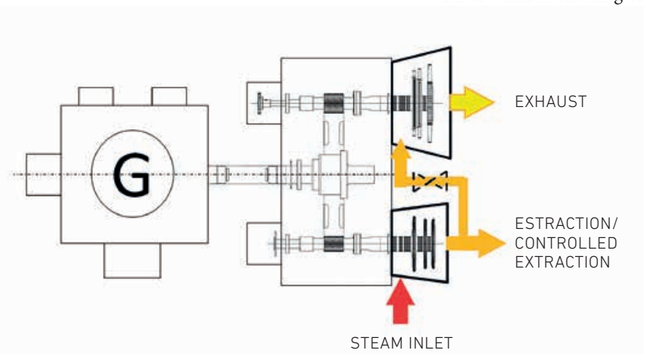
Inlet pressure	from 10 to 65 bara
Inlet temperature	from saturated to 450°C
Bleeding pressure	from 1 to 10 bara
Inlet steam flow	from 1 to 20 t/h
Exhaust pressure	from 0.05 to 10 bara
Speed	up to 19000 rpm
Electrical power	from 100 to 1500 kW
Skid length	6000 – 8000 mm
Skid width	2500 mm
Skid height	3000 – 3500 mm

overhung steam turbines

new item

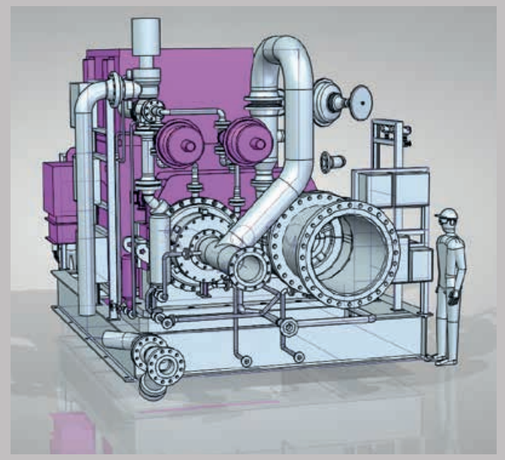
— Fincantieri has developed two solutions of overhung steam turbines:

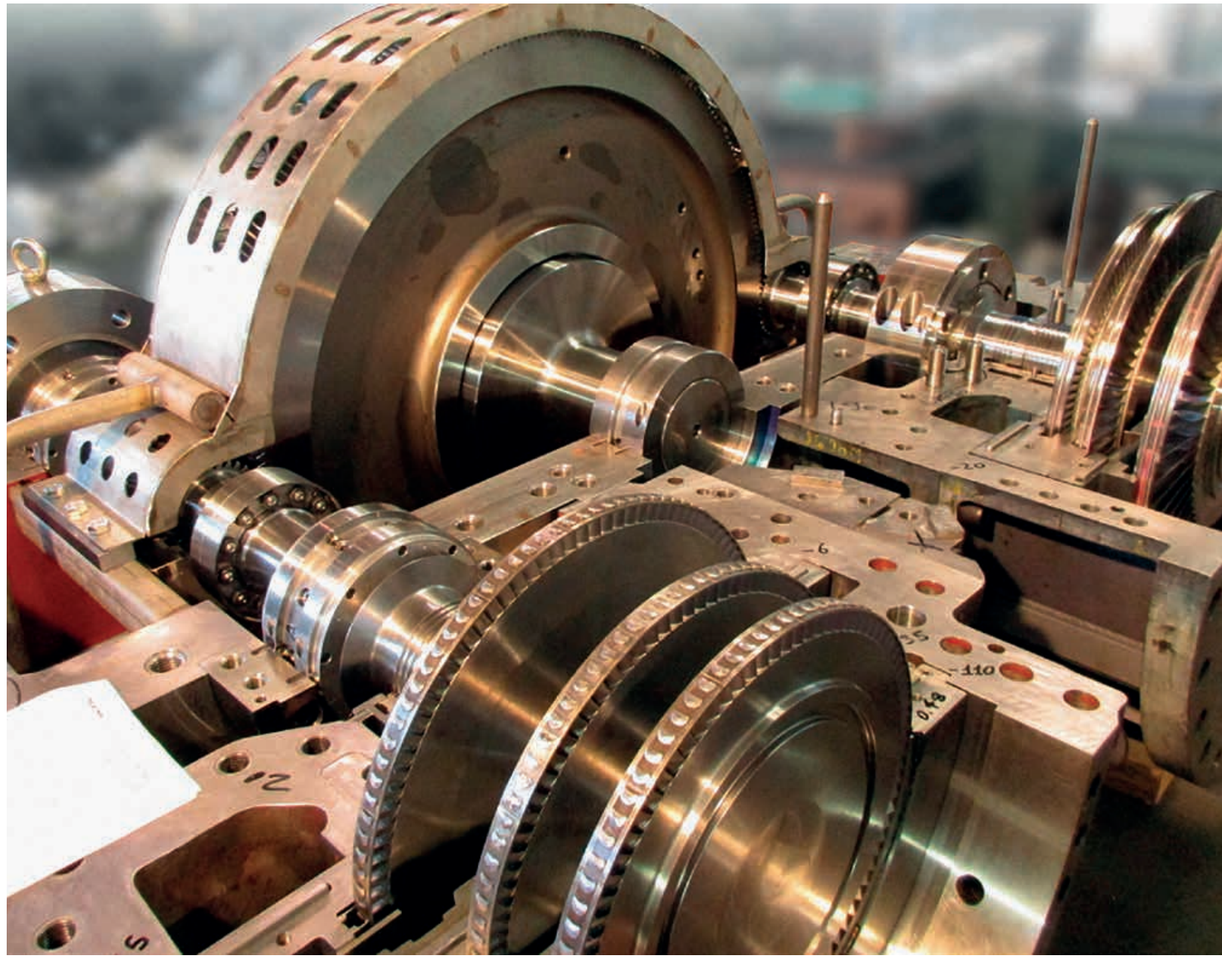
- Single overhung shaft
  - . Turbine shaft is directly flanged to the pinion and supported by the reduction gear journal bearings
  - . Single body casing mounted on the gear box
  - . Multistage and multivalve configuration
  - . Axial exhaust duct
  - . Suitable for condensing and back-pressure applications with or without bleeding.
- Double overhung shaft
  - . The two turbine shafts are directly flanged to two pinions geared on the same low speed wheel and supported by reduction gear journal bearings
  - . Two bodies casing mounted on the gear box
  - . Multistage, multivalve configuration with interposed controlled extraction or bleeding
  - . Axial exhaust duct
  - . Suitable for condensing and backpressure applications with or without bleeding or controlled extraction.



main characteristics:

- Integral disks with the rotor
- Compact solution
- High efficiency thanks to multistage/multivalve construction
- Turbine, reduction gear, oil console and electrical panels supplied on a common skid
- Short time for erection and commissioning
- Easy start and stop managing
- Low operational cost
- Low maintenance cost.





— If overhung deviation is accepted by customer ST can be provided in compliance with API 611/612 rules.

possible applications:

- CHP (Waste/Biomass/HRSG)
- Heat recovery plants (on/offshore) for electricity production
- Industrial applications (chemical processes, petrochemical, food plants, etc)
- Solar Plants
- Mechanical Drive.

main features:

Inlet pressure	from 3 to 50 bara
Inlet temperature	from saturated up to 450°C
Bleeding pressure	from 1 to 10 bara
Exhaust pressure	from 0.05 to 10 bara
Speed	13300 rpm
Electrical power	up to 8000 kW
Skid length	4000 – 7700 mm (with generator)
Skid width	3500 – 4000 mm
Skid height	3000 – 3500 mm

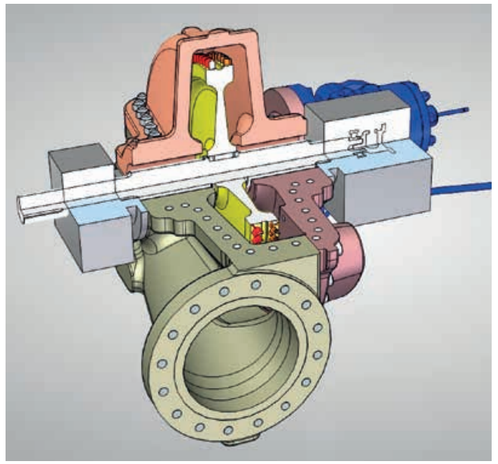
single stage steam turbines

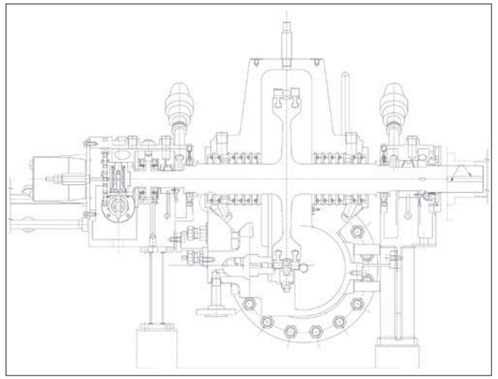
new item

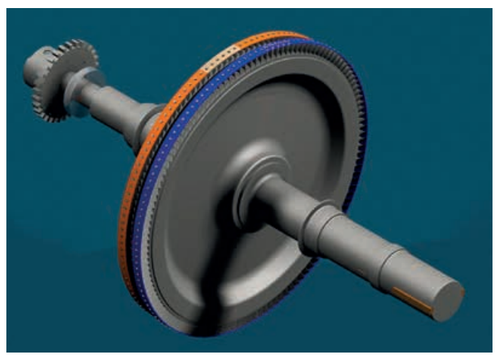
— The FX-Series is studied for mechanical drive applications suitable to move pumps, compressors, fans, generators in the Oil&Gas, refining, petrochemical and other markets. The turbine is compliant with API 611. FX-Series turbine: reliable and cost effective solution derived from the well proven Fincantieri F-Series single stage turbine.

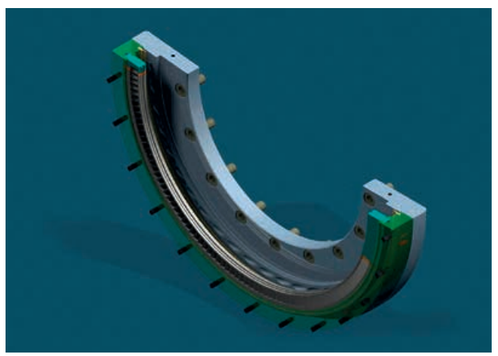
main characteristics:

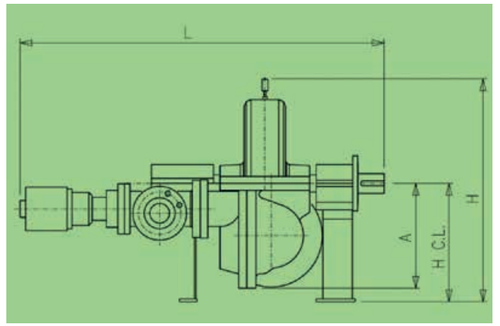
- Turbine casing horizontally divided in two parts, in steel casting with metal to metal steam joint. Steam rozzle box located in the lower half casing
- Rotor disk machined from alloy steel solid forging and keyed to the shaft
- Rigid rotor shaft as per API 611
- Impulse blading machined integral with rotor disk. Advanced profiles suitable for very efficient supersonic flows
- Drilled nozzle specifically studied for high pressure drop and supersonic flow
- Thrust bearing roller type or tilting pad (in option)
- Mechanical and electrical overspeed trip protection
- Mechanical type trip valve with manual reset, fail safe fast closing
- Pneumatically operated control valve
- Over load valves manual or automatic in option
- Removable steam strainer, built in the inlet valve
- Steam seals carbon type or labyrinth type in option
- No need for control oil plant.

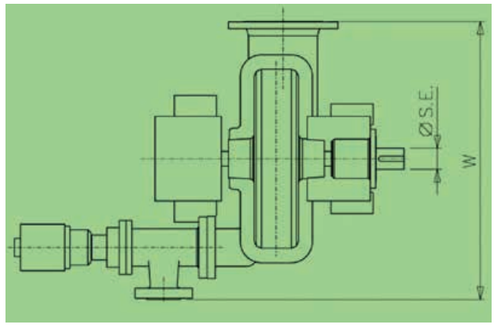












fx-series

functional features:

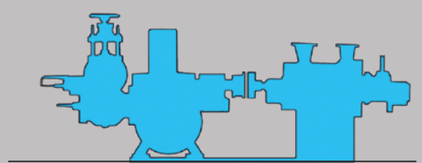
Power (kW)	Speed (RPM)	Inlet Press. (barg)	Inlet Temp. (°C)	Outlet Press. (barg)	Inlet connection	Discharge connection
2000	6000	54	430	2	4"/6" ANSI 600	12" ANSI 300

dimensional features:

L (mm)	H (mm)	A (mm)	H C.L. (mm)	W (mm)	Ø S.E. (mm)
1815	1150	530	600	1185	80

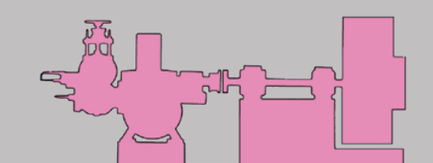
pump drive

for driving every type of pumps: feed pumps, circulating pumps, oil pumps, processing pumps for petrochemical plants, water pumps etc. for every duty for which is requested: reliability, easy use, low cost service.



fan-compressor drive

for driving fans: boiler, flue gas extractor, centrifugal compressors, conditioning. for every continuous and heavy duty application.



L steam turbine

new item

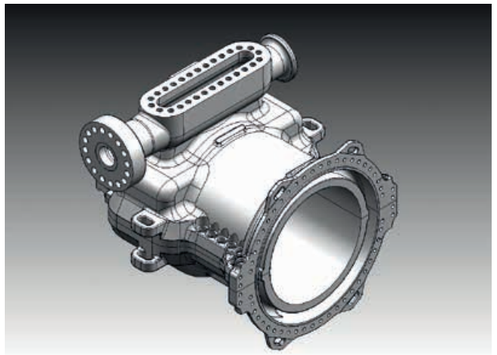
— The new L model is the largest steam turbine in Fincantieri production line.

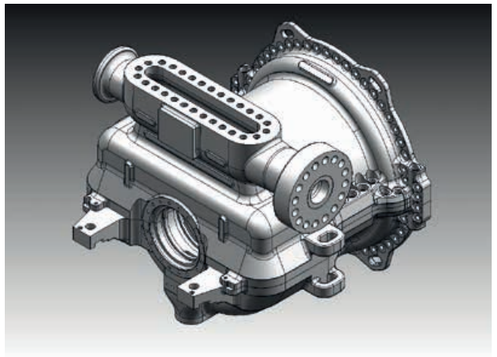
It is dimensioned for power output up to 50 MW in condensing mode and up to 65 MW for district heater application.
The turbine is designed based on the best and well –proven technology developed by Fincantieri in the last 10 years.
Single body, reliable impulse type construction, with top performances thanks to the hybrid reaction flow path design.

The turbine concept is very flexible to meet the customer needs for several type of applications such as combined cycle, waste to energy, Oil&Gas industry and many other industrial uses. Available with up to 6 uncontrolled extractions, up to 2 controlled extraction and possibility for second admission.

The design guide lines, based on API 612, ensure the highest reliability.
New discharge bladings internally designed and tested inside vacuum overspeed cell.

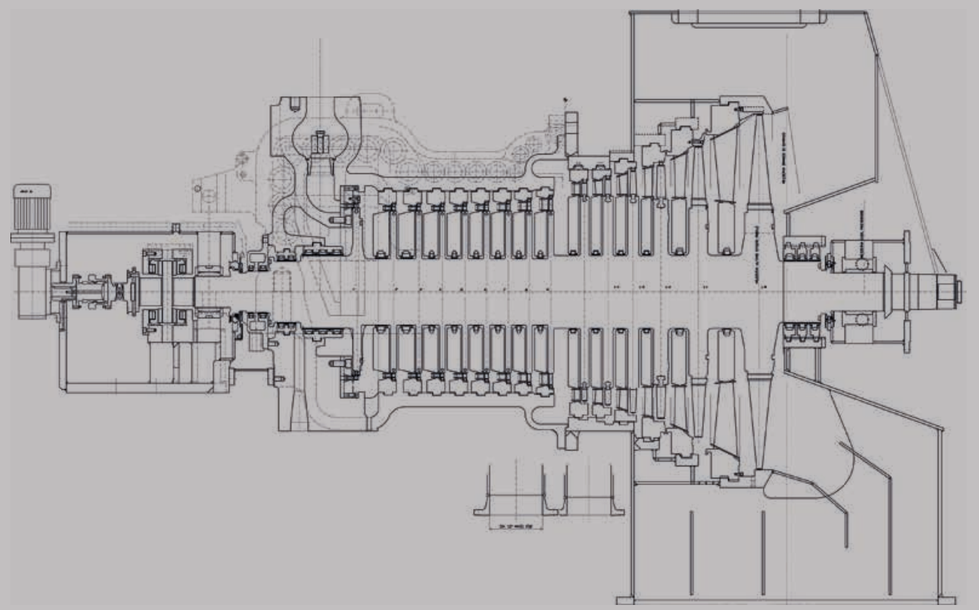
Compact layout can be provided with all the auxiliary components and systems mounted on the same turbine baseplate for easy, plug&play installation.





main characteristics

- single body steam turbine
- modular design with high flexibilty for customing
- impulse construction with hybrid degree of reaction, high performance, flow path design
- compact layout for easy installation and maintenance
- admission conditions: up to 140 bar - 540 °c
- speed: up to 4200 rpm
- exhaust size: up to 2.5 m²
- downward/upward inlet and exhaust.



together with our customer

fincantieri provides its customers with the following services:

- Predictive maintenance
- Preventive maintenance
- Corrective activities
- Diagnostic analysis
- Endoscopic inspection.

- Remote monitoring
- STG revamping to optimize the efficiency
- Power plant redesign for thermal cycle improvement
- Components or Turbine replacements
- Control and monitoring system upgrade.

customised maintenance plans:

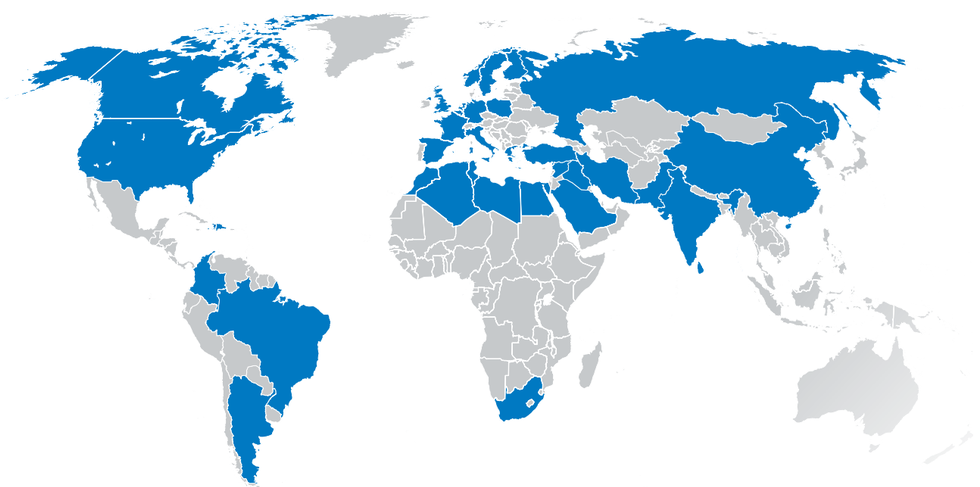
— Our maintenance plans are diversified and tailor made according to our customer requirements and each plants necessity.

This approach guarantees the maximum availability and reliability of turbine/groups, matching our customers requirements.

Customer satisfaction is achieved predictive inspections and scheduled maintenance activities improvements on turbines and auxiliares, allowing to minimize machine shutdown times and unexpected failures, plus maximizing the effect of cost/ benefit.

taking care of our customers worldwide

— We take care of our customers worldwide, answering in 24 h to any necessity, with our experience and know-how.
We operate on every kind of steam turbines for consulting, mainenance, revamping or modification.
Our people and consolidated partners can mobilize quickly to solve customer emergencies or technical necessities.



quality, safety and environment

— Fincantieri Steam Turbines Design and Manufacturing processes are carried out in compliance with ISO 9001 standard requirements (RINA certificate n. 69/93).

the quality system application allows:

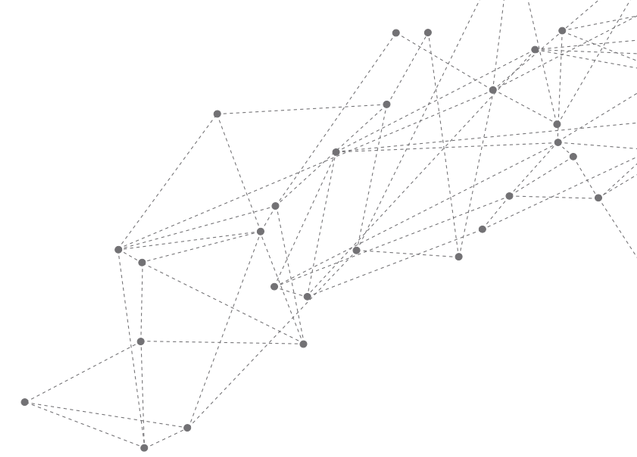
- understanding customer needs and expectations
- compliance with regulatory requirements
- design process control (inputs, outputs, verification and validation)
- suppliers' selection
- job planning and control
- manufacturing quality control
- customer satisfaction assessment.

the manufacturing quality control process includes:

- the procured goods control (incoming and at site inspections and tests)
- material mechanical characteristics checks
- heat stability tests
- NDTS
- cmm measurements
- rotor balancing
- runout and vibration analysis
- before shipment every ST is tested under steam in our factory in Riva Trigoso. During the test our customer can see its Steam Turbine running and check himself its proper working.

aiming to release a "defect free package" to our customers.

Moreover the Environmental and Safety Management System established and applied by Fincantieri is in compliance with the requirements of ISO 14001 and OHSAS 18001 standards and is certified by RINA.



FINCANTIERI
The sea ahead

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