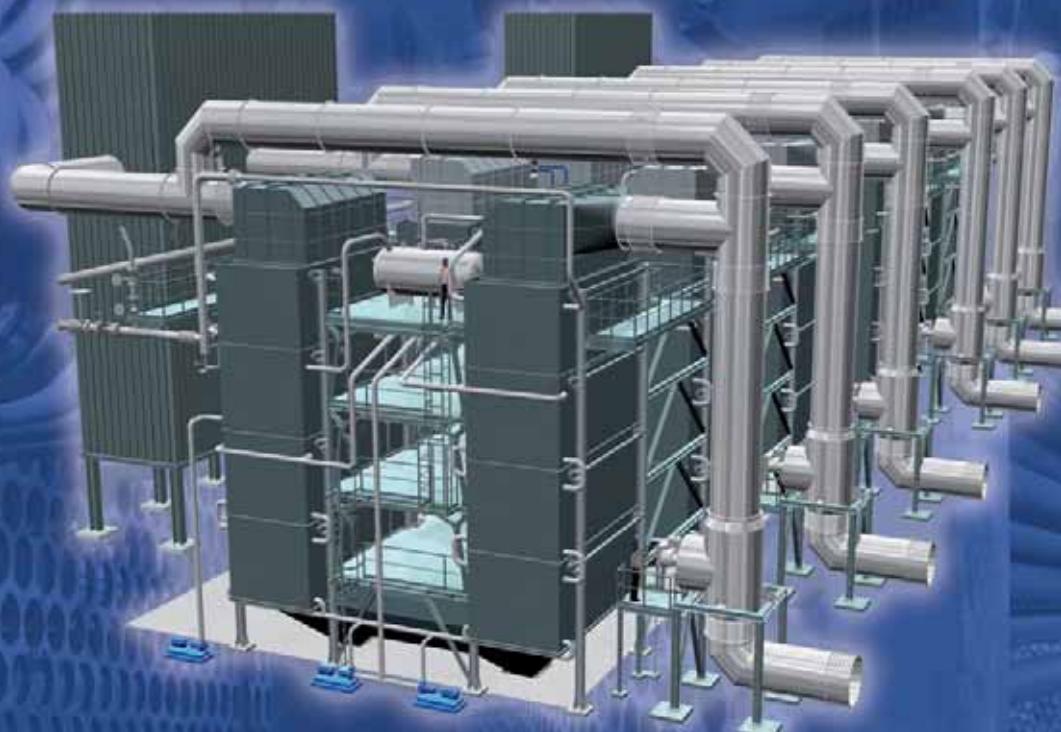


CLAJTUB

HEAT RECOVERY STEAM GENERATORS

SERIES

CTR



cannon
BONO ENERGIA

CLAJTUB

A TAYLOR MADE SOLUTION

Bono Energia's range of waste heat recovery steam generators are used for steam production or energy generation utilising the waste heat from gas turbines, medium speed diesel engines or recovering the waste heat of some industrial processes.

Bono Energia can provide cost effective and reliable heat recovery boilers for combustion turbines from **3 to 20 MWe**.

Bono Energia has a broad experience in heat and power systems, and is able to offer the best engineered solution for every application.

Besides the capacity to offer in-house built boilers, Bono is able to develop all the mechanical and thermal system design, thanks to the experience and know-how of the over **50** engineers in its staff. That allows Bono to offer **complete turn-key solutions**, from the gas turbine or engine outlet to the boiler exhaust stack.



FEATURES AND BENEFITS

The most common design of Bono Energia's heat recovery steam generators is a water-tube, bi-drum, natural circulation structure.

This boiler design presents several advantages:

- Modular package design, with the possibility to meet individual requirements
- Factory pre-assembled and tested boiler and economiser
- Simple, fast and safe site installation
- The compact design results in a compact layout
- Proven design with rapid start up capability
- Quick response of the steam output to load/heat input variations
- High thermal efficiency at all pressure levels
- Minimal maintenance and cost effective operation
- Ease of access for internal inspection



ALTERNATIVE SOLUTIONS

Bono's package offer can include: deaerators, boiler feed pumps, water treatment plants, piping, valves, control and instrumentation etc.

Moreover Bono Energia can provide other heat recovery solutions, such as:

- **Fire tube steam boilers:** for capacities up to **15 MWt**, steam pressures up to **15 bar** and temperatures up to **300°C**
- **Thermal fluid heat recovery systems:** multi-tubular design for capacities up to **40 MWt**, design pressure up to **40 bar**, able to work with gas turbines from **3 to 15 MWe**
- **Superheated water heat recovery systems:** design capacities up to **40 MWt** with post-combustion system, design pressure up to **40 bar**, able to work downstream gas turbines from **3 to 15 MWe**

Bono can also accommodate **supplementary firing** on the boilers, whenever the steam demand exceeds the one available from the exhaust heat.

The auxiliary firing of the heat recovery boiler can also be used to generate steam independently of the prime mover. These firing systems can be designed to operate with any liquid or gaseous fuel, including exhaust fuels.

PACKAGE SUPPLY

The **HRSG** are supplied with regulation equipment, instruments, safeties, accessories, flue gas system, and whenever possible, the main pressure parts are delivered in a **transportable package** execution.

Specialised after sales service technicians, located all over the world, can easily approach and solve any problem related to Bono's boilers operation.

Heat Recovery Steam Generators

MAIN APPLICATIONS

Bono Energia's heat recovery steam generators have found application in a wide range of industrial processes, where cogeneration of steam or heat and electricity are required.

The heat recovery boiler plays a strategic role in a Cogeneration Heat and Power system, allowing greater energy efficiency and reducing the overall thermal emission by recovering the waste heat of exhaust gases from gas turbines or diesel engines, and containing the overall energy costs, with a higher profitability of the industrial plant.

A correct design is of course a key point to realize the above statement, keeping in account the life cycle cost of the system. Bono Energia has a consolidated experience in CHP systems, all over the world and with the most demanding customers. A wide range of well proven solutions are available for any application focusing on all design and operation aspects based on its capability to handle complex turn-key systems.

Adopting the best plant design for each solution, Bono Energia heat recovery generators are suitable to recover waste heat from gas turbines flue gases whenever these are produced by combustion of natural gas or light oil. Diesel engines for power generation are as well possible sources of flue gases suitable for the heat recovery.

Besides these applications Bono Energia has acquired a high degree of specialisation in some very specific market niches, such as the vegetal oil fed power plants.



SPECIAL APPLICATIONS

Among these BONO can boast its expertise in the construction of **HRSG** from **diesel engines** fuelled with **vegetal oil**.

This opens new interesting perspectives for the development of power generation from more sustainable sources of energy.

The most outstanding project developed so far involves the supply of **6 HRSG**, each producing **11 t/h** of steam at **24 bar** and **370°C**, for a cogeneration plant of **115 Mwe**; the **largest power generation plant**, fed with vegetal oil, located in Italy.



ENGINEERING SERVICE

Bono's **know-how** is the result of over **50 years** of experience in engineering and manufacturing of boilers and heaters.

The **Integrated Engineering Service** can be supplied as part of the package offer for the **HRSG** units. The presence of a dedicated group of skilled specialists allows to produce stress analysis for the fluid lines and complete and detailed information and documentation for all the auxiliary equipment.

WORLDWIDE ASSISTANCE

Since the very beginning of its relationship with customers, in the pre-sales phase, Bono offers its **Technical Assistance Service** to help them to choose the best plant solution. Bono's **Technical Assistance Service** goes further, through the whole process management, until the erection and commissioning.

Bono Energia can provide a **worldwide customer support service** throughout the whole life of the plant, ensuring efficiency and reliability. Supply of spare parts, maintenance contracts, annual inspections and product training are part of the total commitment that Bono Energia can provide.



REGULATION SYSTEM

Bono's **CTR** heat recovery steam boilers can feature an integrated control system for their easy management. The workstation allows to perform control and supervision of the boiler, and is produced by **Automata**, a sister company of BONO ENERGIA, specialized in dedicated hardware and software production. More specifically, the control system allows for centralized management, i.e. control and supervision of the whole process. What is more, the operator can communicate in real time with the machine thanks to the video display. Finally, both hardware and software can be implemented according to the process needs.

MAIN FEATURES

• Graphics:

the system shows an animated synoptic-video, transferring to the operator all the information necessary for the plant operation - burner's ignition sequence, process variables, status, flow rates, hours of running, number of ignitions, etc.

• Safeties:

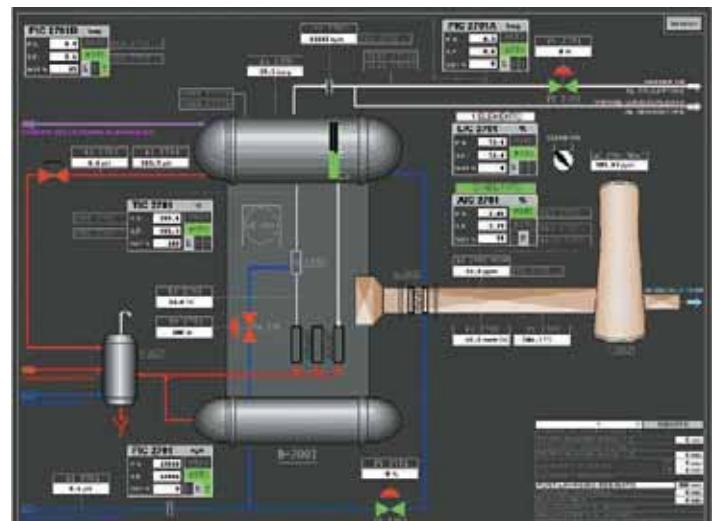
the system signals alarms and shutdowns, thanks to an **ISA** sequence with first-out and shutdown priority.

• Process variables:

the system displays and controls all the vital values, such as pressure, temperatures, flow rates, etc.

• Inner library:

a dedicated keyboard allows to accede easily to a library routine, where it is possible to retrieve any information, relevant to the plant - programmed maintenance operations, alarm list, technical data of the equipment, process fluids characteristics and the operating instructions of the system itself.



Heat Recovery Steam Generators



| TECHNICAL FEATURES | |
|-------------------------|-------------------|
| Gas Turbine Output | from 3 to 15 MWe |
| Exhaust Gas Temperature | < 900°C |
| Exhaust Gas Flow | from 5 to 60 kg/s |
| Boiler Output | from 3 to 45 MW |
| Boiler Capacity | from 1 to 60 t/h |
| Steam Pressure | from 5 to 70 bar |
| Steam Temperature | up to 450°C |





TECHNICAL STRENGTHS

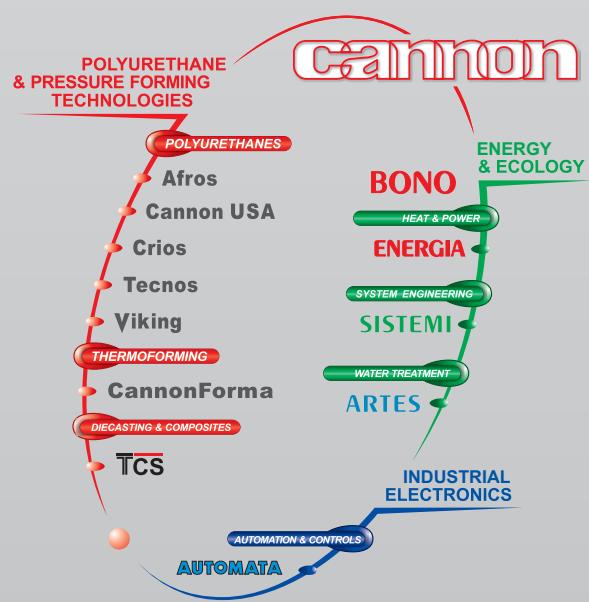
BONO ENERGIA, part of **CANNON GROUP**, is the Italian leader in the production of industrial boilers and thermal fluid heaters. A staff of **150 dedicated specialists**, with more than **30 engineers**, are distributed in three modern production facilities.

Bono Energia has more than **50 years of experience** in the production of industrial boilers. Its production includes both fire tube and water tube type designs.

From its birth in 1958, **BONO ENERGIA** committed itself to pursuing environmental protection by using traditional energetic sources in the most careful way and exploiting the alternative ones.

BONO ENERGIA operates according to ISO 9001:2000 and ASME Quality Systems.

Design, construction and testing are carried out according to the strictest international standards: PED, ASME, EN, DIN, GOST-R, SQLO, R.I.Na., A.B.S., Ukrsepro.



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Bono Energia S.p.A.

Via Resistenza, 12 - 20068 Peschiera Borromeo (MI) - Italy

Tel. +39/0255302848 - Fax +39/025471955

E-mail: sales.bono.en@bono.it

www.bono.it