Save Energy, with a Smart Technology!

"Conventional or renewable, the most convenient fuel is the one that you do not burn!" Simple concepts and clear words are basic components of the interviews with Giuseppe "Pino" Boschetti, the Managing Director of the Bono Group. His message is clear: the increasing prices and the decreasing availability of conventional sources drive any energy production process towards a major objective: efficiency. Whatever combustible you opt for, use less of it. If it's non-renewable fuel, it will last longer or cost you less. The more it's renewable, the better it will be. Be smart.

CN: Energy and water have been for centuries good reasons to make wars, and the current energy crisis is a reminder that oil, nuclear, biomasses, wind, water and sun are among the most used weapons in modern times and in the trade press. If more does apply the Energy & Ecology slogans in such a turbulent scenario?

GB: Talking of energy, we are well equipped both in terms of use of conventional and renewable fuels. We apply our conventional thermal plants the solutions that we have refined in the past 50 years on increasing their thermal efficiency. We develop new solutions for the use of renewable sources: one of our Divisions is 100% focused on the production of thermal and electrical power from biomasses. Since Bono is a well appreciated leader for more than 30 years in the diathermic fluid heaters technology, we have been able to achieve a record of excellence also in a specific field such as power generation from biomasses based on the ORC (Organic Rankine Cycle) system. Talking of water, we are witnessing an extraordinary growth of our water treatment Division in new fields of activity: the traditional Power Generation applications, such as desalination and condensate polishing, we have new added numerous advanced solutions for the Oil & Gas industry. Most of this development derives from the smart use of Membranes in EDI (Electro Deionisation) and Produced Water reenawm, but let me mention also the treatments for the effluent water from FGD (Flue Gas Desulphurisation) of the coal-fired power plants.

CN: How would you commend the results of the year 2010, the first that has generally shown signs of recovery after a tough crisis in many western countries?

GB: We are growing in all terms of number of contracts signed, size of our clients, technological difficulty, plant’s treatment capacity. Our Group last year targeted the 60 Million € turnover, a result achieved with four Divisions (Bono Energia, Bono Artes, Bono Sistemi and Bono Nerro) and 250 qualified people in three production sites in Italy. Note that our Companies are becoming appreciated training centres for young graduated engineers: more than 20% of our staff has a degree from a qualified technical University. In addition we also offer numerous stage-contracts to young people, already or almost graduated in all the disciplines intersecting our numerous activities, and a third of them get a permanent contract with us at the end of this training. This is rather extraordinary in Italy, with the current status of economy.

CN: The Bono Group is perceived as a strong player in the Italian market of medium-large industrial boilers. Does this image represent the real current status of Bono?

GB: Things are moving - fast. We have inherited from Cannon - our Holding Company since 1988 - an internationally oriented mentality and management. Only 20 years ago we used to export 20% of our turnover today we export more than 40% and will reach 60% in the near future. This tells you the story of a dynamic group of production people backed by a network of sales and after-sales, 40 years and more than 40 countries. Our international culture has grown, thanks to this "turbulence". Today we sell, install and service complex plants from Siberia to New Zealand, from Chile to Korea, covering most of the industrialised and developing countries. Including areas with a strong local competition, very effective in their own territories but not as innovative and internationally experienced as we are. We have developed, thanks to our parent Group, the synergies which allow us to make the thermal plants, the electrical and water treatments, in accordance with the most stringent international specifications and for the most demanding engineering companies operating worldwide. And "one under one" and "one under all" in the same time. It's a question of performance for the whole contract.

CN: What are you planning for the future of your Group, in view of the increasing demand for alternative energy sources?

GB: We have long recognised the potential for the renewable fuels, and got prepared for their extended use. The solutions that we have developed are very rewarding in terms of technical results but we will not, in the short-medium term, bring the major part of the revenues. We will probably still make most of our profits with industrial thermal plants and water treatment solutions for the Power Generation and the Oil & Gas sectors, where applications are becoming increasingly complex and require huge technological and manufacturing efforts. By using a smart technology we will save energy and - possibly - leave a cleaner world. We owe this to our kids and grandchildren, at the end!
Start it Up!

One of the most successful products of Bono Energia, the CT auxiliary boiler used in power and co-generation plants provides the necessary steam for plant start-up. The major advantages of this line of water-tube steam boilers are a very short start-up time, high efficiency and high availability. Today Bono provides much more than a simple auxiliary boiler: the deaerator supplied by Bono Artes and the electronic control made by Automata constitute a turn-key package that appeals the market!

First of all, let’s explain to those who do not know it what an auxiliary boiler does. In traditional or combined cycle power plants in which a steam turbine is installed, auxiliary steam is required for the turbine gland seal system during start-up and Hot Stand-by as well as for turbine start-up cooling. During start-up this steam cannot be derived directly from the main equipment but has to be specifically generated through an auxiliary boiler.

Auxiliary boilers have usually a steam demand from 10 to 60 tons/h being this sufficient to cover steam turbine gland seal heating; higher capacity are asked in case of further auxiliary steam request as for aqueous ammonia vapourisation for SCR systems.

Bono Energia CT auxiliary boilers are delivered in package configuration up to about 60 tons/h and require part of the assembly to be done onsite for higher capacity.

The in-house availability of fundamental auxiliary components, such as the deaerators designed and made by the sister company Bono Artes and a dedicated electronic control made by sister company Automata, brings added value to an auxiliary boiler contract and provides numerous advantages for the customer.

A single responsible for the performance, less interfacing problems among the different components of the plant, a proven efficiency and operating reliability under any climate characterise the supplies that Bono Energia have honoured in the past 20+ years of activity in this delicate sector.

Auxiliary Boilers
Around the World

Numerous auxiliary boilers have been supplied in the recent past by Bono Energia: here follows a short list of the most significant ones.

EDF (Electricité de France) is a loyal customer for auxiliary boilers: in addition to two auxiliary units installed in Vietnam, they recently ordered two water tube boilers to be installed in France and one 35 tons/hour unit to be installed in UK.

The Japan-based Mitsubishi Heavy Industries has a long record of orders for these large auxiliary boilers: they purchased in 2005 their largest unit, a 60 tons/hour for a power generation plant in Azerbaijan. For a Methanol plant in Brunei two 40 tons/hour machines were installed in 2009, and two similar machines are destined to a new integrated gasification combined cycle (IGCC) power plant for NUON, Holland.

ANSALDO ordered last year a fourth unit destined to Italian Aprilia Power plant, after having installed in 2008 two CT complete machines in Puglia and Lombardy, Italy and one in France.

Worldwide famous for their Nutella - and numerous other delicacies - FERRERO selected Bono Energia, back in 2006 and 2007, for two very large auxiliary boilers destined to their own electric power plant and for the municipal utility company generating power and district heating for their hometowns, Alba, Italy.

These 65 tons/hour machines are used for the start-up of the power plants and as a back-up solution in case of emergency.

In the past large thermal machines used in power and co-generation plants used to work at least 365 days per year, 24/24. Today the energy market’s dynamics dictate a very different timing to the producers, and very often these fuel-hungry machines are used only in peak demand periods, being switched on and off more frequently. The availability of a “fast starter” becomes a fundamental component of these large plants. Readiness times in the order of minutes and high availability are the features most demanded to nowadays auxiliary boiler.

Bono-Energia CT series, water tube generators, does this job efficiently. These boilers feature a starting time as fast as of few minutes, thanks to proven service hot stand-by solutions.

A careful design of combustion chamber volume in combination with new burner’s technology reduces the emissions well below the threshold of 70 mg/Nm³ of NOx and 50 mg/Nm³ of CO that will be dictated by the future European norms.

The design of these high reliable equipment requires dedicated engineering solutions involving stringent requirements similar to the main equipments; such a task could represent a problem for smaller suppliers, but Bono Energia is adequately staff to follow most client stringent requirements.

Bono Energia CT auxiliary boilers provide fast and reliable startup to large power plants.
Hot Problems & Cool Ideas: Bono Energia Power for Energy Networks

District heating and cooling provide several benefits to the community (energy cost saving and reduction of investment in individual household or building heating equipment) but it has always been considered as a long-term commitment. Cogeneration, power plants, networks have a high construction cost: the district heating/cooling system becomes profitable only after several years for the power operators. The profitability of these systems is higher in those areas with high concentration of large buildings (business centres, shopping malls, etc) or high density of population, due to the reduced cost of connection of the networks in comparison with that of single family houses in low density areas.

The above statements lead to the key market requirement of auxiliary equipment for heat generation plants having low investment costs, high availability, easy operation and maintenance; a fast response to the network load change, considering its high variability during the 24 hours, added to the fact that the peak demand cannot be covered by the main electrical/heating generators due to their inertia, is also a must.

Keeping in mind the above key point, Bono Energia has currently focused towards the supply of most of auxiliary boilers design suitable to be installed in CHP plants or traditional boiler houses.

This 40 MW plant for A2A Utility Company supplies hot water to the district heating network of Bergamo, Italy.

Hot or cool, Bono Energia has always the right solution!

High Capacity Hot Water Generators

In order to cover the peak demand of the network, high-capacity high-speed generators have to be installed as auxiliary heat source aiding the base load production. Having an intermittent operation, these machines must provide a high on-demand reliability and the possibility to be automatically operated by a remote control system (auxiliary boilers are usually located in a peripheral position to the main generation units).

Local flue gas emission of the auxiliary generation units must be kept to minimum since the installations are usually located near or inside high-density population areas.

Bono Energia has experienced several applications in this market segment having developed two types of generation unit design.

The first is based on a dedicated heater solution named CTH having a multi-tubular water tube design with power capacity up to about 60MWt; these heat generators can be installed directly on the district heating networks where network hot water circulates directly in the CTH tubes - or through heat exchangers, depending on water characteristics. Having no practical limitation on the pressure design, that can reach values higher than 40 bar, and on hot water inlet temperature, limited only for gas temperature consideration, the CTH have been extensively installed in most of large Italian district heating applications. The CTH design grants a reduced start up time permitting to stop the heater when the network load is on a low demand. Finally the CTH can reach very high efficiency as well as very low flue gas emission levels. With a very simple design involving a reduced number of components, the CTH generators have a competitive price for a wide threshold range starting from about 10MW.

This solution involves a more complicated network having the necessity of an exchanger installation, although this allows for high capacity demand (more than 60MWt) the possibility to handle very high flow rates of hot water. The efficiency of the CTD type is limited by the fact that the generator works with saturated steam temperature limiting the flue gas temperature and the achievable efficiency, although this can be solved with in-line flue gas heat exchangers. One critical aspect is the start-up-time of the system, due to the necessity to reach the saturation temperature of the steam before delivering heat to the network.

Although the decision of installing one single high-capacity generator instead of multiple lower capacity generators has to be analyzed according to several issues, Bono Energia experienced that the CTD solution becomes competitive for single generator installation starting from a required heat capacity of about 80MW.

Low Capacity Hot Water Generators

Up to a generation capacity of about 15MWt, traditional fire tube boilers have been extensively used in district heating installations. Although with some minor limitation, their reduced cost have lead to their commercial success.

In this market segment Bono Energia has experienced the supply of SG fire tube boilers series; these can produce hot water directly (SG-ASA models) or indirectly through a steam/hot water exchanger. This solution involves a more complicated network having the necessity of an exchanger installation, although this allows for high capacity demand (more than 60MWt) the possibility to handle very high flow rates of hot water. The efficiency of the CTD type is limited by the fact that the generator works with saturated steam temperature limiting the flue gas temperature and the achievable efficiency, although this can be solved with in-line flue gas heat exchangers. One critical aspect is the start-up-time of the system, due to the necessity to reach the saturation temperature of the steam before delivering heat to the network.

Bono Energia has matured significant knowledge about the diverse types of district heating/cooling networks, and provides valuable support to its customers in the decisional phase of a project, allowing them to compare different alternatives and to choose the most favourable one.

Hot or cool, Bono Energia has always the right solution!
Thermal plants for the Oil&Gas applications aren’t an amateur’s affair. Often used for more than 50 days a year, 24/24, these highly specialised boilers and ovens, true mission-critical machines, must guarantee impeccable performances under the most stressful environmental and weather situations, in remote areas where extreme heat or cold are everyday’s condition. Bono Energia’s Industrial Division specialises in these thermal machines, specifically designed in accordance with stringent specifications and able to cope with the most demanding expectations.

When dealing with Oil&Gas extraction, treatment, transportation, storage and distribution, no excuse is admitted the involved equipment must work flawlessly, around the clock and with a minimum downtime, scheduled well ahead for the programmed maintenance. Any malfunction would cause immense financial damages to the involved Companies, be it the extractor, the maintenance. Any malfunction would cause immense financial damages. Bono Energia’s Industrial Division specialises in these thermal machines, specifically designed in accordance with stringent specifications.

Thermal energy is used with abundance in this economy-critical sector of the energy industry, and each machine is designed to suit specific requests. Bono Energia boosts a long experience and a prestigious reference list in this delicate sector of the industry, providing the CLAJTUB series, water tube boilers designed for high-output steam production and suitable for:

- FGD (Flue Gas Desulphurisation) for the removal of toxic Hydrogen Sulphide (H2S) from natural gas obtained from oil wells and from coal-fired power plants. The Bono offer includes a range of dedicated water treatment packages.
- Polymerisation of Plastic resins, such as LDPE, HDPE and PVC, where steam is used for the process.
- Oil refining processes, where steam is used to crack oil into its various fractions.
- Recovery of refinery gas, the lighter fraction obtained by the distillation process, a precious but very impure and corrosive source of energy that too often is still wasted burning it into air polluting refinery torches.

Engineered using the most advanced systems, these guarantees the highest operating features thanks to Bono Energia’s experience on heat transfer, welding technology and pressure vessel calculations.

They are designed for high thermal efficiency (over 94%), liquid or gas firing achieved by means of a large furnace, correct heat release rate between radiant and convective sections, efficient burning system added to heat recovery system.

Available in a wide range of capacity, CLAJTUB series offers two different standard designs:

- PACKAGE BOILER: pressure part designed for a steam capacity up to 50 t/h and design pressure up to 80 bar. The Boiler is fully shop-assembled and hydraulically tested before delivery. Modular standard design or custom-made design are available for both pressure part and peripherals (burning system, air fan and controls).

- FIELD ERECTED BOILER: steam capacity up to 150 t/h and design pressure up to 80 bar. Boiler’s main component is shop modular manufactured to get a higher quality control standard. Auxiliary accessories and components are prepared to be ready for an easy on site erection.

In both cases furnace is a full “outer walls” type: one water wall is built as prefabricated panels. The result is that the furnace is gas tight and corrosion, due to the condensation of gasous leaks, is avoided, thermal efficiency is improved and the use of refractory is minimized, as a consequence maintenance expenses are lowered and the need of inspections is reduced. Designed to last and perform, their thermal units are installed in many refineries and petrochemical plants in Qatar, Iran, Bahrain and other oil-producing Middle East countries. Bono Energia offers a very high quality standard at a price that is competitive even with local suppliers of similar machines: the “plus” offered by Bono is represented by their capacity to deal with the most difficult specifications issued by very demanding international engineering companies, and by the availability of a skilled and numerous service staff, used to operate for a long time in the remote and unfriendly oil fields.

Each Oil&Gas application finds the proper solution, at Bono Energia!

Oil & Gas: A Specialist Job

Russia has the largest reserves, and is the largest exporter, of natural gas. Before being exported, the gas must be treated and consequently Russia hosts a lot of gas processing plants. Natural gas processing plants, or fractionators, are used to purify the raw natural gas produced from underground gas fields or extracted at the surface from the fluids produced from oil wells.

A fully operational plant delivers pipeline-quality natural gas used as fuel by residential, commercial and industrial consumers.

Bono Energia, through Thermo Design Engineering, supplied two water tube steam boilers for the TNK-BP Zaikinsky gas processing plant (Russia, Orenburg region).

This CTD generator supplies 60 ton/h of steam to the gas processing plant of TNK-BP in Zaikinsky, Orenburg Region, in Russia.

The knowledge and experience on special Russian rules and certifications has been of basic importance for Bono Energia in the award of the contract with TDE for the two package boilers, natural gas fired, with a net steam production of 30 t/h each, complete with auxiliaries. Bono Energia equipment has been designed in compliance with SNiP construction codes and obtained GOST-R as well as RosTechNadzor certification. The 60 t/h of steam are supplied with package CTD steam generators, high efficiency water tube boilers with natural circulation, suitable for firing both gas and oil fuels. The CTD model combines high performances with low emission levels, compliant with the most stringent environmental rules. Bono Energia, becoming one of the preferred suppliers of TNK-BP and applying its experience in oil & gas field jointly with certified equipment, added another important reference and enhanced their strength on the wide Russian market.

Site erected 150 ton/h steam production water tube boilers for oil refinery.

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TNK-BP, owner of Zaikinsky gas processing plant, is one of the big world giants of oil and gas and shares the Russian fields with the well known companies of Gazprom, Lukoil and Rosneft. Thermo Design Engineering, an engineering and fabrication contractor, based in and operating out of Canada, with many years of experience in designing and supplying equipment for many of the world’s biggest oil and gas companies, signed a contract with Orenburg Neft (a subsidiary of TNK-BP) to supply on a turnkey basis a Gas Processing Plant to process a maximum of 260,000 Ncu./h of natural gas and to complete the design services for the future phases of the plant expansion, including oil valorization and a mini refinery.

From the raw gas to the purified gas, which is pipelined to the end-users markets, several processes - such as gas removal, dehydration, Mercaptan removal, Nitrogen removal and NGL recovery - are performed. Moreover, a fractionation train and a sweetening process produces Ethane, Butanes, Pentane and Propane. Contaminants must be removed and long chain hydrocarbons captured for other commercial uses. All these processes are supported by utilities that need big amount of high quality steam.

In designing and supplying equipment for many of the world’s biggest oil and gas companies - signed a contract with Bono Energia, through Thermo Design Engineering, supplied two water tube steam boilers for the TNK-BP Zaikinsky gas processing plant (Russia, Orenburg region).

Site erected 150 ton/h steam production water tube boilers for oil refinery.
Heat Recovery Steam Generators (HRSG) - the name speaks for itself - are thermal machines that recover heat from flue gases generated by internal combustion engines or gas turbines. A specialty of Bono Energia, these HRSG are installed downstream engines firing renewable fuels like vegetable oils.

Dedicated technical solutions to improve the combustion efficiency, and the experience grown dealing for 50+ years with difficult fuels have contributed to establish a record of excellence for Bono CTR series of HRSG machines.

The most appreciated advantage, according to a vast number of end users, is the functional reliability and constancy of performance in the long term, backed by prompt and reliable technical service.

Bono Energia has been a pioneer in the field of HRSG working behind internal combustion engines, huge diesel-like motors that generate electricity burning palm oil.

An example comes from Monopoli, in Apulia - Italy, where Casa Olearia operates six 17 MW engines, fueled with imported palm oil, to generate electricity. The resulting fumes feed Bono CTR HRSG machines behind two 17 MW engines, also fueled with palm oil.

Why is Bono a preferred supplier of these generators?

Because their technical solution - well-separated bundles of smooth tubes, easy to be cleaned with automated systems - provide high thermal efficiency even with huge amounts of dust and ashes deriving from that specific fuel.

The know-how in burning diesel-like fuel, accumulated in decades of experience with traditional recovery boilers, has been applied to this specific case with success.

Talking of operation behind gas turbines, several examples - at least 30 complete units in the past 5 years and more than 100 installation in total - witness the functional reliability and constancy of performance in the long time range of Bono Energia’s HRSG units: their "mission profile" exceeds a stunning 99% score.

A good reason to select Bono is the continuity of service provided by this Group: present since 1958, it counts 60,000+ thermal machines installed in more than 120 countries, Bono technicians have assured for more than 50 years a reliable and fast technical and spare parts service to all their customers, no matter where they are located. And this - in a market full of smart competitors, attracted by what looks like a "simple application" but ready to disappear promptly when things get tough - is a sure "plus" for the Milano-based Energy & Ecology specialist.

Firing Non Conventional Fuels with Respect for the Environment

Non conventional fuels, "waste products" of the main petrochemical processes, generally represent a problem for plant owners and for the environment. Diapositive is expensive and special cares must be taken to ensure the respect for the environment. For more than 50 years Bono Energia has grown significant experience with boilers and heaters fired with these non conventional fuels.

With proper support from Bono Energia specialist it is possible to fire "waste fuels" - either in gas and liquid phase - to produce steam, hot water or hot oil with savings for plant owners and respect of the environment. One practical example?

A made-straight steam generation plant fired with refinery off-gas that Bono Energia has delivered on turn-key basis to StatOil (Mongstad Refinery - Norway).

The steam generation plant, designed according to oil & gas standards (Statoil & Shell specifications) and equipped with four Ultra Low NOx burners and flue gas recirculation, is capable of firing a variable mixture of off-gas (Hydrogen: 65.4 ÷ 33.8 %) on the same fuel ramp.

The off-gas generated in coking process is rich of Hydrogen and Methane but - due to low calorific value, high amount of water, presence of Sulphur and particulates - represents a technical hurdle that - managed with competence - can be turned into an opportunity for the customer to generate electric power.

On top of the revenues generated by selling electricity, the steam generation unit supplied for the Italian coke plant - being designed for unattended operation - granted additional savings reducing personnel costs.

While talking about Hydrogen, an important reference is represented by an 80 ton/h steam boiler supplied to Foster-Wheeler for ENOC where the sophisticated combustion system is suitable for firing pure Hydrogen, pure LPG and Natural Gas (in any kind of mixture) on the same fuel ramp.

Two steam generation plants for Mondson Coking Works (UK) and Nuova Italiana Coke (Italy) are important references in firing non conventional fuels generated in coking plants.

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With more than 6,000 plants - fired with conventional fuels such as natural gas, gasoline and heavy fuel oils, as well as with the above mentioned non conventional fuels - Bono Energia is the ideal thermal plants supplier for environment- and budget-conscious plant owners.

Their 50 years of experience and a full range of solutions for steam generation units supplied for all their customers, no matter how small or how large, represent the best possible reasons to chose Bono as partners for a difficult task.
Energy Efficiency Brings Profits to Pulp & Paper Industry

Characterised by a fierce competition, the Pulp & Paper industry is confronted with a continuous search for marginal savings in their production process, to maintain profits. The intense use of heat and steam, required by their sophisticated calendaring process, represents a major cost, and any innovation towards energy efficiency and fuel savings provides a fundamental help for reaching the goal of a positive end-of-year result. Bono Energia dedicated SG series of heavy duty steam boilers have contributed for the past 50 years to this achievement.

The paper industry represents a major field of activity in several areas of Italy and finds in Tuscany its top specialization in specific fields, like the production of “tissue” products - a variety of toilet paper-based products such as disposable handkerchief, facial tissue, bathroom tissue, paper towels, and toilet paper - and of corrugated cardboard. Numerous paper mills share the river’s water flowing from the Apennines down to the Tyrrhenian sea, fiercely competing for fraction of tons per kilos of processed paper.

A very sophisticated production equipment, their calenders - huge sequences of large steel rolls continuously rotating at incredible speed - allow for high hourly yield of thin, strong rolled paper. Hundreds of meters per minute are the normal speed in this field, and the rolls must be kept very hot, to extract all the water from the cellulose pulp until it’s completely dried out and has reached its final aspect and the desired robustness. A minimum inconvenience and the forming sheet of paper breaks, providing major headache to the production managers and to his team, plus substantial damage to the company. A critical point in the process is the precise control of the forming roll’s temperature: a modern average machine might require 10-20 ton/h of dry, saturated steam at 16-18 bar.

It goes without saying that the thermal machine required to fulfil this task has to be very reliable and efficient: not only it must provide the required steam at the top level of the market, whilst they provide repeatable, reliable and sustainable performances. These machines provide repeatable and reliable performances, their life cycle is at the top level of the market, their high thermal and combustion efficiency is particularly appreciated when the fuels’ prices are under continuous tension. The possibility to use different fuels and their low level of emissions are other very good reasons to select one of these thermal fluid machines for demanding applications.

Bono Energia has 50 years of experience in production and engineering of these boilers, and is a recognized market leader in this field, with more than 4,900 installed units. High quality control standards and stringent design standards (in accordance with ASME, API 560, EN, DIN norms), flanked by an ongoing research and development activity and automation technologies at top level, guarantee to the paper manufacturers customized solutions, short delivery time and competitive prices. Life cycle of these machines is at the top level of the market, whilst they provide repeatable, reliable and sustainable performances. High thermal and combustion efficiency is particularly appreciated in these days, when the gas prices are under continuous tension. The possibility to use different fuels and their low level of emissions are other very good reasons to select one of these thermal fluid machines for demanding applications.

These machines provide repeatable and reliable performances, their life cycle is at the top level of the market, their high thermal and combustion efficiency is particularly appreciated when the fuels’ prices are under continuous tension. The possibility to use different fuels and their low level of emissions are other very good reasons to select one of these thermal fluid machines for demanding applications. Siemens Water Technologies, for instance, selected Bono’s OMV thermal fluid heaters to dry the residual mud left in their municipal wastewater treatment plants. Several tons of this mud are treated in lots, feeding them in large, jacketed, drum-like barrels hot thermal fluid circulates at 280 °C in the outer chamber of the barrel, provides the heat required for the drying process and returns to the thermal fluid heater at 240 °C. High efficiency methane- or biogas-fuelled OMV Thermal Fluid Machines, rated 3 thermal MW, re-hear the oil at the desired temperature. Two of these machines operate in the wastewater treatment consortium of Churpno, near Vienna, they the positive experience - enshrined by a constructive cross-fertilization of technologies with the Bono Group, an expert in the same field of environmental treatments - has lead Siemens WT to order four similar units for a much bigger municipal plant supplied in Wroclaw, Poland. The efficiency of Bono Energia's OMV thermal fluid heaters derives from several factors: properly-sized pre-heaters to recover maximum energy from the combustion fumes, smart burners, generous dimensioning of the heater’s pipeworks, closed-loop control of the whole process through the proprietary OptiSpark electronic system, designed for Bono Energia by the sister Company Automatix.

Bono Energia OMV machines have been specifically designed for these applications and are the heaters of choice for both small, hyper-specialised and large, market-leading companies, worldwide.

Thermal Fluid Heaters?
You can rely on Bono!

Thermal fluid heaters are the preferred solution when high-temperature heating media are requested for process, instead of less controllable direct flame ovens. A constant flow of precisely temperature-controlled fluid provides the exact amount of heat requested by a chemical reaction, a petro-chemical stripping process, a plastic resin’s polymerisation.

Bono Energia’s SG series of boilers are the perfect solution for high temperature applications. In fact, the efficiency is particularly appreciated when the fuels’ prices are under continuous tension. The possibility to use different fuels and their low level of emissions are other very good reasons to select one of these thermal fluid machines for demanding applications.

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Economics of a Company and their “environmentally-conscious” image can be greatly improved by the implementation of a carefully planned “Thermal Efficiency Project”. Significant savings in fuel, electricity and manpower can be obtained using available technical solutions, with an important added value: emissions can be dramatically reduced, with obvious advantages in terms of environmental respect and related corporate “green” image. Bono Energia put in place a number of tools that help their customers to increase their competitiveness, through efficiency and sustainability: the economical and environmentally-rational use of energy sources represents the best possible corporate choice to achieve such an important result!

An increased environmentalist sensitivity — expressed in terms of greater attention towards the optimal use of conventional energy resources, with a definite preference for the renewable ones to safeguard the environment — is gaining positions throughout the consumers worldwide. This concern starts to influence the purchasing decisions of particular and companies towards common and investment goods, services, utilities and buildings. Recent market surveys demonstrate that all of us — as private consumer or as a purchasing decision maker in a Company — dedicate a growing attention to those suppliers able to meet the needs of the market economically and with respect for the environment, as a gesture towards the future generations. Energy efficiency and sustainability turned out to generate both an economical advantage for the Companies that applied them and a major positive influence on their potential customers: their brands acquire a higher perceived value: “green” efficiency pays — twice!

Within 2020 Italy — as well as the rest of the EU — committed to cut 20-20-20 energy efficiency project CO emissions: (reference 1995) must be cut by 20%, renewable sources must supply not less than 17% of the total consumed energy, and a target of 20% consumption's reduction should be achieved through Energy Efficiency. On the total amount of energy that Italy is committed to save, approximately 17% is used for thermal applications in Industry and Agriculture — a huge potential for Bono Energia, that since 50+ years supply thermal plants for these two end uses.

Bono Energia put in place a number of tools that will help their customers to increase their competitiveness, through efficiency and sustainability. Available through the Italian network of Technical Centres, which amounts more than 30 specialised Companies distributed on the whole nation’s territory — these optimisation tools have been designed to cover the wide range of possible interventions on existing and new thermal equipment.

Energy Efficiency Audit

In personal contact with the interested Companies, a Bono Agent — qualified in this specific Energy Efficiency activities — evaluates the savings that can be achieved through tailor-made interventions in various areas of the thermal plant. The Energy Audit of each Company is formalised issuing three certificates stating the savings for fuel, electricity and CO2 emissions. When the objectives for the project are set, a program of technical interventions is mutually agreed. The required hardware and software solutions are installed on the existing thermal equipment, or supplied as brand new material, working with special attention on the most critical issues:

- Fuel savings — obtained improving the generator's thermal exchange, that is maximized by the installation of a heat recovery system specifically designed for that thermal machine. Further savings are obtained by optimizing fuel consumption, using specific algorithms that improve the generator’s performances, and thanks to the closed-loop electronic control of the combustion: this system immediately corrects the air/fuel ratio in the combustion chamber if a value is detected that is outside the set parameters, restoring the theoretical curve.
- Electrical consumption — dramatically cut using inverters on the most consuming electric motors.
- CO emissions saving — obtained through specially designed burners, able to provide maximum yield and the lowest NOx and CO emissions.

The thermal plant is therefore fully renovated and is characterised by an increased efficiency:

- Fuel savings can be quantified up to 15%
- Electricity bill can be reduced up to 50%
- CO2 emission saving can be reduced up to 15%

White Certificates

A further economic advantage applies to renovated — and duly certified — thermal plants: they can be funded with White Certificates — also referred to as an Energy Savings Certificates (ESC), Energy Efficiency Credits (EEC), or white tags — an instrument issued by an authorized body guaranteeing that a specified amount of energy savings has been achieved. Each certificate is unique and traceable commodity, carrying a property right over a certain amount of additional energy savings and guaranteeing that the benefit of these savings has not been accounted for elsewhere. These White Certificates can be traded on the market, and Bono Energia — through reliable partners — offer to their customers full assistance to convert these certificates in additional profit, that adds to the already obtained savings. A significant plus, at this respect, is represented by the availability within the Bono Group of new Biomass-fuelled thermal plants, that can obtain White Certificates for the complete value of the supply, and not only for the difference in efficiency between the new and the old configuration! Bono Sistemi will be glad to provide all the required information to the companies interested in this very attractive solution!

Stoker’s re-qualification and retraining programs

Recent market surveys highlight the Italian law which regulates the management of thermal power plants fixed their owners from the obligation to keep a qualified stoker in place for the whole time of operations. Medium-large thermal machines are those turned with a steam capacity of more than 3 ton/h, can now be fitted with a number of options that allow for their unattended use for 24 or up to 72 hours, confirming their full usability without a man in place even throughout the whole week end. The existing stokers — still required for routine operations and maintenance — can be reconverted to other jobs or assigned to the control of more than one thermal power plant. The workflow for this re-qualification includes an audit of all the pressurized parts of the thermal plant, the installation of a package of hardware and software products suitable for unattended work cycle, the emission of a new certification for the heat generator. Bono Energia can supply all the above, including the required training to the personnel in order to exploit all the advantages of the newly fitted electronic controls.

Service Plus

One of the most appreciated “products” supplied by Bono Energia, is qualified Technical and Spare Parts Service follows each thermal machine for its whole life. A Preventative Maintenance Package is made available for all new and existing machines of all brands, allowing for periodic programmed interventions that usually prevent and avoids costly breakdowns. Genuine spare parts and the manpower provided by qualified personnel, and experienced in industrial thermal power plants, are a guarantee of well-executed interventions and safeguard of the investment. Any Bono Service Centre usually provides a thorough cost estimate in advance, and guarantees the quality of the work. Well distributed on the whole Italian territory, these Service Centres maintain a close relationship with all their customers. When a thermal plant is delivered overseas — and this happens more and more frequently, especially in the past few years! — the link with the customer and the control of its machine are kept via a modern Internet or phone line. Remote assistance allows for the visualisation of the current status of each critical component of the thermal plant, permitting the immediate correction of wrong settings. Optimal working conditions can be re-established in real time, allowing for the uninterrupted management of the plant's energy efficiency and emissions.

Revamping

One possible method to increase combustion efficiency of a thermal generator is its complete revaluation, especially when a old machine must be destined to another use, for instance a integration to a biogas combustion. Bono Energia evaluate each case and suggest the best technical solution to reconvert that old (and still good) boiler and to convert it to its new jobs. A 100% customised job, this Revamping Project is handled in strict cooperation between Bono Energia central Customer Service division and a local Bono Technical Centre.

Do you have an old industrial boiler — or a large thermal station — still in good conditions and would you like to bring it to new life? Ask Bono: a specialist will be happy to help!
Bono Sistemi, a division of the Cannon Group, specializes in Environmental Systems. They have been heavily committed to renewable energy sources, following the success of wind and solar power. The company focuses on the most efficient renewable sources of energy, maintaining their promises: the installed power amongst all the available technologies, with an emphasis on biomass. The availability and cost efficiency of plants are crucial.

**BF:** Renewable sources are the buzzword, today: everyone in this environment is the implementation of policies able to supply an energy from renewable sources, at reasonable cost, respecting the environment.

**CN:** Mr. Fierro, can you tell us what is today the main activity of your Company? Bruno Fierro: Bono Sistemi specialises in Environmental Systems. We have long followed - with adequate technologies and competent consultancy actions - the complex replacement of Ozone Depleting substances in accordance with the guidelines dictated by the Montreal Protocol.

Later on we have concentrated on the solutions demanded by the Kyoto Protocol to reduce the industrial emissions which can affect the Climate Change. This is still a very actual theme: our major focus, today, is the implementation of technologies able to supply an energy from renewable sources, at reasonable cost, respecting the environment.

**CN:** What do you mean, precisely?
**BF:** We should not burn biomass like premium wood or corn, that have been grown at the cost of a lot of work, water, energy. We must learn to burn something else, in other words. We must teach people to burn less noble materials, stuff that is more difficult to get rid of, so that they add an environmental value to the energetic one.

They can burn old wood only when it has reached its end of life and can’t be good anymore for another more valuable application. Or they must learn how to burn efficiently branches, bark, scrub wood, sandcast, old pallets and rejected furniture. Or oil-rich residuals from the processing of olives and grapes.

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**CN:** How can simple people, or financial investors, get such a specific skill when they want to invest in this sector of the energy production?
**BF:** We know very well that, being this a largely subsidised sector, it can become unattractive and uninteresting for many investors. We have a lot at stake in this field: it must be governed by clear rules, otherwise it will self-destroy. For instance we can’t allow the use of valuable raw material as biomass combustible!

**CN:** What is the reason why, Bono Sistemi, are heavily committed - as founding members of ITABIA, the Italian Biomass Association - for the definition of laws which can avoid speculations. We have a lot at stake in this field: it must be governed by clear rules, otherwise it will self-destroy. We know very well that, being this a largely subsidised sector, it can become unattractive and uninteresting for many investors. We have a lot at stake in this field: it must be governed by clear rules, otherwise it will self-destroy.

For solid biomass power the total installed capacity is 2 GW and the capacity of 5 GW versus 6,543 GWh produced. Bono Sistemi supplies a complete turn-key package.

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Green Energy in Italy with Bono Sistemi

The first full turn-key biomass co-generation plant made by Bono Sistemi has been inaugurated at Calenzano, near Florence, Italy, in May 2010. The plant, the first one in the centre-south area of Italy based on ORC (Organic Rankine Cycle) technology, supplies 800 electrical kW to the national grid and 3,500 thermal kW as hot water to the 5.2 km municipal district heating network of Calenzano. All the most important elements of the plant have been designed and made directly by Bono Sistemi: this is quite unique in this field of activity, where most competitors usually outsource either the boiler or the combustion grid. The fuel is supplied by the neighboring green areas: 12,000 tons of virgin wood, mostly agricultural residuals from farms and forest maintenance, will be reused every year!

The plant reaches two main targets: the valorisation of natural resources entirely available in the region (forest and green public maintenance as well as agricultural residuals) and the compliance with the Italian national program for a distributed power generation net through the realisation of many sustainable electrical efficiency ORC power generation plant, rated 1,000 KW (vaporised in the distillery). This means an average 70.5% of global efficiency, out of wet grape's marc's and wine's lees. The supplied “complex” is 17 meter high, 17 by 29 meter wide, weighs approximately 400 tons and is fully built in anti-seismic execution. A massive furnace, nesting a burning grate exclusively designed by Bono Sistemi for this natural fuel, is covered and hidden by the ancillary equipment required to let the plant go: the heat recovery boiler, a sophisticated de-aerator for the boiler’s feed water, a large pre-heater for the combustion air, a very large treatment system to capture and separate all the solid particles contained in the combustion flue gases. All these plants benefit of the special Italian “Green Tariff” (280 € for each MW conferred to the net) reserved to biomass energy plants sized within 1,000 kW/h of power generation capacity.

Don't you know what to do with your agricultural or wood residuals? Talk to Bono Sistemi, they can share with you a few smart ideas.
"Less is more, in water treatment technology: the secret is to reduce the amount of water and chemicals used in the process. This simple, logical approach drives the activities of Bono Artes, the Cannon Group’s Division active in this fundamental sector of the industry. Having developed specific technologies for the purification of primary water required for the process and for the treatment of contaminated water before reuse or discharge, Artes provides to an international array of industrial end users the best possible solutions, both in terms of performance and economics. Pasquale Punzo, the Division’s Managing Director, explains how Artes delivers its promises.

Cannon News: Mr. Punzo, how would you describe the philosophy that inspires Bono Artes’ technical solutions for the treatment of industrial waters?

Pasquale Punzo: Our main line of thought is simple: our customer must reduce the quantity of water utilized for a process. Use less, discharge less, release less pollutants, using less energy to achieve these results.

Less is more. We can’t afford to waste such a precious resource, human activities cannot interfere longer with the cycle of water, depriving the Earth and its inhabitants from this fundamental necessity of life. If we need more water, for processes that one century ago were not even conceivable, we must be able to re-use it intensively. Our treatment technologies go in this direction. Closed-cycle plants, with minimum refills.

CN: How do you achieve this result?

PP: We must avoid, as much as we can, to add chemicals to the water we treat, otherwise we become part of the problem, not of the solution. Using more physical and less chemical treatments we obtain pure and ultra-pure water for process.

We developed long ago the use of membranes for reverse osmosis technologies: it was a success, and after 30 years of positive experiences we have extended their use to a number of other technologies: it was a success, and after 30 years of positive experiences with membranes, we are now formally taking the licence, after several positive projects, for the HERO process, a membrane technology that allows for extremely high yield: imagine that we can recover more than 95% of fresh water instead of a conventional 70-75%!

Another field that we are approaching right now is a naval application: boiler water used to stabilise the ships are becoming more and more regulated by international authorities, to avoid the cross-contamination of seas through the exchange of alien micro-flora or micro-fauna. We must block and separate these micro-organisms or sterilize them before the boiler waters are released to the sea. A fascinating project!

CN: So, do you play all your cards on integrated membranes, then? Did you abandon all the other technologies?

PP: Not at all. Our conventional workhorses are still alive and healthy.

We are consolidating, with our traditional customers and with new ones, large degassing plants for power stations that use horizontal stripping devices that allowed us to produce plants able to treat boiler waters in excess of 3,000 m3/h.

For large condensate polishing plants - high-temperature and high-pressure applications, where we can’t use membranes - we use a integrated chain of treatments for the removal of salts, hydrocarbons, soluble salts, suspended wide and corrosive pollutants.

We remove all these pollutants - sometimes present in barely detectable amounts - using a mix of technologies including carbon adsorption, ion exchange demineralisation and accurate seawater filtration. It’s a specialists job!

And we invest heavily in another sector where the environmental awareness is rapidly growing: effluent water from power plants and Oil&Gas sites. Laws and regulations are strongly pushing - also with economic incentives - towards a more stringent reduction of emissions. This is a compulsory step for those companies approaching the ISO 14,000 and ISO 18,000 certification and a prerequisite to operate in the European market. This is Bono Artes’ commitment in terms of markets for the current and the coming year. With an excellent outlook in Oil&Gas applications, the Company wants to consolidate traditional applications and products. The strong commitment of Bono Artes for the specialised water treatment applications for the Oil&Gas field brings the Company from proven success in the past, to developments more than in the past, in traditional Oil-Est markets, such as the Middle East, Russia and neighbouring nations, and in emerging areas of South America.

Strong presence in Middle East and CSI, a lot of development work in South America, strict cooperation with international engineering Companies operating worldwide. In summary, this is Bono Artes’ commitment in terms of markets for the current and the coming year.

CN: Where do you apply these integrated membrane technologies?

PP: For instance in the demineralisation plants for boiler make-up waters. And in Oil&Gas applications, for pre-treatment, degassing and final polishing processes. We have achieved a deep know-how in this field, we can supply the whole process chain, from A to Z, taking complete responsibility for the supplied plant.

CN: What are your development projects for the membranes, in a medium term horizon?

PP: We’ve got more ambitious plans for the use of membranes. We are now formally taking the licence, after several positive projects, for the HER0 process, a membrane technology that allows for extremely high yield: imagine that we can recover more than 95% of fresh water instead of a conventional 70-75%!

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Middle East develops

In Qatar, after the positive experiences with QAPCO (Petrochemical) and QASCO (Petrochemicals) now also the major oil company QP (Qatar Petroleum) has admitted Bono Artes in their list of Suppliers. One ZeroGas thermo physical deaerator with a deaerated water capacity of 165 tons/h leaving less than 5 ppb (parts per billion) of Oxygen in the treated water and two demineralisation plants are currently under construction for Petroleum, UAE. This important contract, installed in a modern gas treating & Sulphur recovery plant, adds a prestigious reference to Artes’ customer’s list. Another very significant success in Saudi Arabia is represented by two contracts signed with Petroarco and Duhal, for two Saudi Aramco and Sahara Petrochemicals as end Clients respectively. Scope of supplies are filtration plant for cooling water and a large demineralisation plant (up to 240 m3/h of capacity) for electricity, water, to a major Chotive factory feeding a PVC polimerisation unit. Still through Duhal a complex demineralisation plant with a capacity of 140 m3/h - performing ion removal, fluidised bed demineralisation and mixed bed polishing - has been supplied to the KNPC (Kuwait National Petroleum Company) for a refinery designed in accordance with specific specifications. Furthermore ARTES consolidates its presence in the United Arab Emirates while supplying two large condensate polishing units and demineralisation plants to TAKKEER (Abu Dhabi Refining Co) and GASCO (Abu Dhabi Gas Co). For these projects Bono Artes has been contracted by Samsung Engineering and Hoeund Engineering & Construction respectively.

Russia and CSI confirm

Russia and CIS nations continue in their positive trend of orders for Bono Artes: a major achievement has been the supply of one oil removal plant with a 100 m3/h water capacity - operating through coagulation plants - for an Ammonia plant built in Turkmenistan, secured through the Japanese engineering Company Kawasaki Plant Systems. A continuing cooperation with Technip, France secured a contract for a 600 m3/h plant for make-up and side stream water filtration plant within the cooling water circuit of a large PV plant of Rustyniy (a SouthWatt company) in Nakhchi, Nogorod region, Russia. A ZeroGas™ Deaerator for the 350,000 tons/year Propane Dehydrogenation (PDH) plant that Maize Tecnimont built in Tobolsk, West Siberia - a Rosholn Polymer, LLC - is described in a separate article at page 12.

South American promise

The outlook is promising for future developments in various South American countries, for Bono Artes: As an example, a significant reference was achieved - through the North American based contractor Chicago Bridge & Iron (CBI) - with the installation at Refinaria in Caraguata, Colombia, of a cooling water’s side stream filtration system rated 720 m3/h of overall capacity. Intense technical office work is undergoing at this very moment to obtain the qualification from Brazilian Petrobras, a major reference name in the emerging South American oil industry.

Italy, last but not least

ENI confirms its presence as a leader in the refining technology by introducing the Eni Shiny Technology (EST) to convert heavy residue into pre-fuel light hydrocarbons. The first “industrial scale” EST plant is actually under construction at ENI’s Sanazzaro Refinery, close to Milan, and Bono Artes was honoured to be selected for the supply of a large 160 m3/h demineralisation plant and a 300 m3/h ZeroGas™ deaerator.
In an oil reservoir the crude oil normally lays on water, that is called "formation water". The drilling and extraction operations, that are aimed to maximise the production of oil, may be counterbalanced by huge production of contaminated water which is called "Produced Water". Apart from oil, main pollutants are heavy metals, dissolved and suspended solids, radio-active elements. Bono Artes is able to provide "state-of-the-art" technologies such as the STAGE 
hydrations and the HYDROFLOW™ Walnut Shell Filters, that create profitability from an environmental issue.

Effluent treatment plant serving a gas producing field in the Algerian desert.

Effluent treatment plant servicing an hydropneumatic processing refinery in the UAE.

Many oil reservoirs are aging nowadays being in production since a long time and, on the other hand, production of oil needs to be maximised under the pressure of high oil prices.

The natural desalination of produced water is injection back into the reservoir in order to move oil toward the extraction hole. Injection into the basin is normally done above the oil layer into the formation rocks. Since the rocks are highly porous the produced water to be injected must be free from solids, oil and scaling salts to avoid plugging of the formation zones.

The residual life of an oil reservoir is strictly related to the size of the solids particles still present in the injection water. Treatment of produced water is therefore mainly based upon a sequence of processes, according to the influent of oil and solid content. The first stage is characterised by a de-salting unit arranged on oil interceptors (waxing plates or tilted plates type) or flotation units. In order to achieve the maximum purity from solid particle, downstream the first stage an extremely accurate filtration process is employed. Walnut Shell Filters are particularly suitable for this application. In order to achieve the maximum filtration rate, deep bed filters with external media cleaning device are employed.

Bono Artes has been licensed by Absolute Filtration Industries Co. (Odessa, Texas) for the design and manufacturing of HYDROFLOW™ Walnut Shell Filters. A technology that enables great improvements to the conventional filtration. By using black Walnut Shell Filters as after filter it is always removal of up to 98% of the contaminants present in the feed water. The possibility of treatment is extended to more applications, thus creating a new market of services and technologies such as the "state-of-the-art" solution in produced water treatment.

Effluent Waters Treatments: A Good Investment

Oil refineries and chemical plants are among the largest industrial users of clean, fresh water. Their processes require huge quantities of this vital element, whose availability is dramatically diminishing. Therefore it is necessary to use all available means to reduce the quantity of fresh water used by the oil industry, and to minimise their environmental impact. When they are returned to the nature, Bono Artes specialises in the waste water treatment technologies that can help to solve this problem.

Integrated effluent treatment plant in a chemical factory. The clarifier is in evidence.

A rigorous water conservation and reuse policy in the oil industry is of paramount importance today, for evident ethical and economical reasons:

• fresh water - the first source of life - can't be wasted when humans need it for drinking, cooking and washing;
• the oil industry usually requires huge quantities of clean, fresh water in places - deserts, coastal areas and off-shore platforms - where it is scarce;
• this industry is increasingly held responsible for the quality and the quantity of effluents that are released into rivers, lakes and seas.

Complexity of Effluent Treatment Plants (ETP) in refineries and petrochemical plants depends on several factors: quality, quantity and flows of polluted waters are extremely variable. Waste water streams derive from numerous processes (condensates from cracking and distillation, blow-downs from boilers and cooling towers, waste water from demineralisation units) or from extraordinary maintenance, from predictable meteorological events or even - hopefully never - from emergency situations (fire fighting, neutralisations and decontaminations, etc.).

Quality of effluents is often very heterogeneous: oil, hydrocarbons, phenols, cyanides, hexane, toluene, xylene, and/or alkali salts, hydrogen sulphide, heavy metals… the ETP must be designed and built to remove any of these pollutants in any predictable concentration... and even more, if needed!

The design of these plants should foresee a sequence of several "unit operations" so that all theoretical conditions can be dealt with, without affecting reliability and performance.

In principle, a typical ETP must be arranged on four different sections: pre-treatment, oil separation, biological oxidation and tertiary treatment. Each section is, again, arranged on several unit operations.

Pre-treatment is normally featuring equalisation sections that collect waters of homogeneous chemical composition from different processes and cut any peak of flow and concentration, even applying pH neutralisation and salinity adjustments the goal here is to allow for a regular condition downstream.

Oil-separation is in principle focused on the difference in density between oil, water and mineral sediments, to achieve the highest and fastest rate of physical separation. Oil droplets of larger diameter rise to the top of the API separators, where oil is skimmed off, while heavier sediments settle at the bottom of the tanks, where they are removed by a chain scraper and a sludge pump. Wastewater is extracted at the middle layer and sent to the next process. Here Tilted Plates Interceptors (CPI) or Corrugated Plates Interceptors (CPI) are used to separate finer oil droplets packs of closely-positioned parallel metal plates float the liquid to a laminar way and in a very thin liquid section, enhancing the efficiency of the phase separation. Oil droplets enlarge and rise to the surface of the separation basin, where they are skimmed off, while the finest solid particles coagulate and sink to the bottom where they are removed as sludge. Dissolved Air Flotation (DAF) and Induced Gas Flotation (IGF) units are employed to remove suspended particle - using a gas that adheres to the suspended media and flows to the surface, where it is skimmed; air or natural gas can be used for the process, according to the potential risk of explosion deriving from the presence of Oxygen in the flotation media. Downstream the flotation units, the Hydraulic Flow Walnut Shell Filter technology, for which Bono Artes has been licensed by Absolute Filtration Ind. Co., enables removal of up to 98% of the contaminants present in the feed water: while the liquid flows through the layer of finely-ground walnut shells, oil and solid particles gets trapped within it. Periodically, an automatic back-washing cycle removes all the contaminants from the filtration media and regenerates it for further use.

Waste water treatment plant catering an oil field in Libya.

Biological oxidation is one of the fundamental treatments for these waste waters. It converts by oxidation all organic pollutants into CO₂ and water: the process is performed by specifically selected bacteria that literally "eat" all the organic matter and "digest" or break them down to elementary compounds (Carbon DiOxide, Nitrogen, Water). Nitrogen-containing elements are duly controlled and regulated at this point, to meet the required limitations at the discharge.

Membrane Bio-reactors (MBR) are often employed to improve treated water quality and reduce the volume of the oxidation basins. Biologic Aerated Filtration (BAF) provides an excellent solution for effective removal of residual unsoluble matter from an effluent treatment system, thus meeting tight requirements and allowing for the re-use of effluents water. Within the biological filter bacteria and organic matter adhere on Granular Activated Carbon (GAC) soaking the adsorption phenomena to the biological degradation performed by the microorganisms. Because of the focus of water recovery, tertiary treatment is now very important: re-use of treated waste water from ETP can be implemented thanks to the progress in Membrane Technology: Nanofiltration (NF), Micro-filtration (MF) and Ultrafiltration (UF) are the most suitable solutions when quantitative removal of bacteria, fungi and suspended solids is mandatory. Recovered water from membrane process can be further desalinated on Reverse Osmosis (RO) allowing for complete demineralisation. The concentrate stream from the RO can be fed into an evaporator crystalliser within a Zero Liquid Discharge (ZLD) philosophy.

Why choose Bono Artes as a preferred supplier for ETP? Although complexity of Effluent Treatment Plants can be an headache, Bono Artes is sure a reliable partner when comprehensive and challenging solutions are required.

There are at least three good reasons supporting this statement:

• In nearly 50 years experience in waste water technologies Bono Artes has generated numerous proprietary solutions, patented and proven in the most demanding oil fields and petrochemical sites.
• Bono Artes can handle complex specifications, providing a prompt and competent answer to the demanding requests originated by engineering companies and end users to fulfill all the steps from feasibility studies and front-end engineering to construction and commissioning. Internal, fully-integrated production of all the required components allows for a responsible and quality-oriented manufacturing, certified with ANSI/UL and ASME-S stamps.
• Bono Artes is already qualified in the Vendor’s List of numerous major players in the Oil&Gas sector, and its presence is growing further in this field, thanks to an impressive number of awarded contracts.

"Use less, discharge less, and less pollutant" is the winning philosophy pursued by Bono Artes for all its processes let’s apply it together.

The 3D model of an integrated Effluent Treatment Plant delivered to a mining and processing site in New Caledonia.
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**Artes Membrane Technology in the Heart of Europe’s Energy**

A milestone in Bono Artes’ history is this the feeling after the successful start-up of a demineralisation plant to SPE-Luminus, Belgium. This is just the outcome of a project triggered when Artes was contracted by SPE in 2009 on a lump-sum turn-key basis, to perform engineering, procurement and construction of a demineralisation plant completely based on membrane technology.

**SPE-Laminus** is the second largest player in the Belgian energy market, with gas-fired electricity plants, wind farms and hydroelectric plants in Wallonia, Flanders, and with more than 1,600,000 customers and approximately 1,000 employees.

For their Angleur single cycle power plant in the vicinity of Liège, demineralised water was a critical issue because of the necessity to provide high-purity water to improve the performance of the gas turbine by “water fogging” and to enable cleaning of the fuel gas filters.

A “summa” of membrane technology, the demineralisation plant supplied by ARTES stars Ultrafiltration, Double pass Reverse Osmosis, Membrane Degassing and the final Polishing Unit.

The demineralisation plant supplied by ARTES to SPE, Belgium; the reverse osmosis section is highlighted.

**The main challenge for Artes’ engineers was to achieve production of deionised water while handling the plant being fed with water from the Meuse river and the Ourthe channel. Notoriously surface water quality is in fact unpredictable in terms of particles, microorganisms, presence of organics and bacteria. This is the reason for which Ultrafiltration was used as a pre-treatment in a compact solution, quantitative removal of pollutants and steady water conditions at the inlet of the Reverse Osmosis section. Moreover the plant has been designed to deal with the most stringent environmental regulations concerning water waste production. Let’s not forget the demineralisation system has been designed to be remotely controlled from SPE’s main controlled cycle plant in Seraing, 110 km away. Through the same web-based platform Artes’ engineers will have the chance to perform engineering, procurement and construction of a demineralisation plant completely based on membrane technology.**

Siberia, which was once a punishment destination for former USSR dissidents, is now a much-sought-after target area for top ranking Companies capable to supply equipment and technology—one of the world’s largest petrochemicals plants in the world operates in that remote and chilly land.

Bono Artes was in fact contracted by Maire Tecnimont to supply a ZeroGas™ deaerator to be installed into the 5,100 tons per year Propylene Dehydrogenation (PDH) plant. Tecnimont was building in Tolbok, West Siberia for Tolbok Polymer LLC, a company belonging to JSC Sibur Holding Maire Tecnimont, a leading engineering and main contractor Group operating worldwide in the oil, gas & petrochemicals, power, and infrastructure services sectors. The project involves the construction and in more than 30 countries and has over 40 operating companies and about 3,100 employees.

Scope of Artes’ supply was a 540 ton/h ZeroGas™ deaerator, one of the largest ever built by Artes in its own workshop in Oliveto Citra, Italy. It is characterised by a deaerating tower, arranged horizontally in order to accommodate the huge mass and heat transfer section, and, at its feet, a 4.5 m diameter by 20 m long storage tank capable to contain more than 200 m³ of boiler feed water. In boiler feed water a high level of iron in the water is desired, such as Oxygen and Carbon Dioxide, must be reduced to the lowest level in order to prevent boilers and steam circuits from corrosion.

**ZeroGas™** is the second largest player in the Belgian energy market, with gas-fired electricity plants, wind farms and hydroelectric plants in Wallonia, Flanders, and with more than 1,600,000 customers and approximately 1,000 employees.

**Bono Energia lists the most prestigious—and demanding—customers, for any equipment supplier: their safety standards are as challenging as their quality assurance controls. When dealing with potentially hazardous processes and emissions, they automatically operate a natural selection of the potential suppliers: only the best—and the bravest—pass the test!**

**Follow their example, follow the leader!**

Pharmaceutical companies are among the most demanding customers, for any equipment supplier: their safety standards are as challenging as their quality assurance controls. When dealing with potentially hazardous processes and emissions, they automatically operate a natural selection of the potential suppliers: only the best—and the bravest—pass the test! Bono Energia lists the most prestigious—and demanding—international pharmaceutical groups among its customers…. there must be more than a good reason! Keep on reading.

Heat is a fundamental ingredient in a chemical reaction, and pharmaceutical companies make no exception to this rule. Be it for synthesis, distillation, concentration, sterilization, or simply to keep their employees warm, all pharmaceutical plants typically occurring after a therapy with antibiotics.

Gnosis is able to manufacture several APIs in large scale through biotechnology. As it is well known, biopharmaceutical products are typically obtained with continuing R&D activity, ingenious ideas and excellent manufacturing processes and sites. Their safety standards are among the most stringent, and they must be very careful with their emissions. Bespoke solutions are often engineered and tailored upon their specific needs, while the increasing cost of fuel represents one more problem even for these high-added value companies.

**Bono Energia has supplied since its first days of activity: back in 1958, the pharmaceutical industry with dedicated lines of fire tube boilers - the SG and SM series - able to provide the highest thermal efficiency and the lowest emissions, using different fuels. Several prestigious names trust their reference list; the latest orders from this sector have been obtained by DOLON, formerly Azioneuph - based in Rodano, near Milano - Italy, a major supplier of intermediates and finished products for the anti-bacterial and the anti-viral industry, such as high potency drugs, anti-epileptic esters, and beta lactam antibiotics. Steam is used here for their process, to heat the reaction vessels.**

**Two methane-flued SG boilers - rated for a steam production of 10 t/h - have been supplied last year. Their low NOx emissions and high thermal efficiency makes them a preferred choice when high-volume processes are the daily concern. These machines are part of a turn-key plant which includes two water treatment plants using reverse osmosis membranes, a ultra-pure water production system, degassing unit for the leader’s water, a complete monitoring and control electronic system. Gnosis Bioresearch is a biotechnology company specialized in the manufacturing and sales of fermentation raw materials and medicinal products used in the pharmaceutical, nutraceutical, cosmetic, veterinary, and agricultural industries. Biopharmaceutical products are active pharmaceutical ingredients (APIs) derived from yeasts and bacteria produced using biotechnology. Gnosis is able to manufacture several APIs in large scale through biofermentation and to modify the structure of natural metabolites obtained by synthesis and semisynthesis.**

**Their competences include fermentation, purification and chemical synthesis: to provide the heat required by these core processes, one brand new SG fire tube boiler (featuring a steam-producing capacity of 15 t/h) and a complete Ultrapure water system and accessories has been recently supplied by Bono Energia to their modern plant in Fernandina, near Pozenza, Italy. Sunolco-arvecina is a global healthcare leader that offers a range of essential healthcare products, including a broad-based product portfolio (disposition medicines, generics, consumer healthcare) and animal health. A world leader in human vaccines with a remarkable worldwide presence. Sunolco-arvecina employs more than 100,000 employees in 100 countries and declares sales in excess of $30 billion in 2010. These figures put them at the first place in Europe – if a worldwide – in the pharmaceutical industry.**

**Their Origo plant, 20 km north of Milano – one of the six Italian R&D and production sites - specializes in the manufacture of very popular medicines, such as Malosi™ - that neutralise stomach acid - and Enterogermina™, an oral suspension of bacteria spores that restores the bacteria balance in case of an intestinal disorder, typically occurring after a therapy with antibiotics. Their leading position in such an important segment of today’s pharmacy is obtained with continuing R&D activity, ingenious ideas and excellent manufacturing processes and sites. For their steam they rely on two Steam-Matic SM boilers rated 5 t/h, that are suitable for both continuous and batch operation. Thermal efficiency is achieved in these popular Bono machines by using a large furnace, a very efficient burner system, correct heat release rate between radiant and convective sections, a symmetrical position between furnace, plates and tubes, which assures a good water circulation. Efficient and reliable on the long term, the Bono Energia thermal machines are the ideal partner for companies that cannot accept a compromise for one of the key components of their process.**

Follow their example, follow the leader!