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100 MAC®

IN THE WORLD

C O N T

E N T S

Germany

The first dry bottom ash handling system in Germany at the new Walsum #10 Power Plant will be supplied by Magaldi

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The new Walsum Block 10 will be one of the most advanced hard coal-fired power plants in Europe. The first MAC system awarded in Germany will be there.

Fig.1
Cogeneration Plant Duisburg-Walsum (photo: courtesy Evonik Steag GmbH)

The last time a new hard-coal fired power plant was put into service in Germany lies more than a decade in the past. In November 2006 at the existing 600 MW co-generation plant location Duisburg-Walsum, close to the river Rhine, the new hard coal-based unit entered the construction phase. The plant will have an installed capacity of about 790 MW, as well as the capability of providing district heating and process steam. With a net plant efficiency of over 45%, the Walsum Unit 10 will be one of the most efficient hard coal-fired power plants in Europe, some five percentage points higher than in other more recent hard coal fired power plants in Germany.
The new block is a joint venture of STEAG - now the Energy Business Area of the new Evonik Industries - with a 51% stake and EVN AG, the energy and infrastructure company based in Maria Enzersdorf (Austria).

Fig. 2
Total view of the power plant including existing unit (illustration: courtesy from HPE)

Main Technical Data (Source: Hitachi Power Europe GmbH)	
Nominal Power (Gross)	790 MWe
Nominal Power (Net)	750 MWe
Live steam /	
RH steam temperature	600°/620°C
Live steam pressure	264 bar
Condenser pressure	35 mbar
Turbine speed	3000 min-1
Plant net heat rate	7.807 kJ/kWh (46%)
Generator rated power	962 MVA
Power factor (cos _)	0,825
Availability	92%

For over ten years Evonik has been planning, financing, building and operating hard-coal-fired power plants outside Germany. Evonik's first foreign power plant was erected in Paipa (Colombia) and has been in operation since 1999. In 2004 the hard-coal-fired power plant Iskenderun (Turkey) was officially opened. The hard coal-fired power plant Mindanao on the Philippine island of the same name was put into commercial operation in November 2006.

All Evonik's foreign power plants have been outfitted with the Magaldi dry bottom ash handling systems leading to a wide on-field experience. The advantage of having valuable know-how available in-house has been the foundations on which Evonik kept the Magaldi dry systems included in the conceptual design of the new block. Moreover, when the power plant goes into operation the new unit will benefit from the cutting edge process of the bottom ash recirculation to the furnace chamber which will simplify the overall plant ash management.

The Duisburg-based Hitachi Power Europe GmbH (HPE) has booked the order for the first German turn-key construction of this new unit, scheduled to go into operation in 2010.

Compared with other hard coal-fired power plants, the new unit for the same electricity production needs less fuel and such contributes to the conservation of resources and the CO2 emission reduction. Also the Magaldi dry bottom ash system contributes to this with its heat recovery from bottom ash which is cooled by air instead of using water with the need of additional treatment.

The new supercritical steam generator will be equipped with the MAC (Magaldi Ash Cooler®). The coarse ash falling down and leaving the furnace through the boiler hopper throat is collected, air-cooled and transported by the Magaldi Superbelt® stainless steel conveyor. After discharge from the Magaldi Superbelt®, the ash size is drastically reduced in a single roller crusher. The further cooling and transportation of the bottom ash is obtained by means of another mechanical conveyor: the Postcooler, having a design similar to the MAC® extractor.

The cooled bottom ash finally is discharged into a dedicated silo, able to store the entire ash quantity of one day of operation. From the storage silo, furnace ash will be recirculated onto the coal conveyor belt thus leading to the possibility of a complete bottom ash conversion into more valuable fly ash.

The MAC system will be delivered in August 2008 and its commissioning shall be completed in 2009.

This new order from Hitachi Power Europe GmbH for the supply of the first dry bottom ash removal system in Germany represents another sign of confidence for Magaldi's competence and huge experience gained from 100 installations word-wide.

Fig. 3
Walsum #10, supercritical boiler view with dry bottom ash handling system (illustration: courtesy from HPE)

Germany

Alstom awarded Magaldi the contract for four dry bottom ash removal systems on RWE's new build projects in Hamm/Westfalen (2x800 MW) and Eemshaven /NL (2x800 MW)

by **Günter Baur** *Magaldi Power GmbH General Manager* guenter.baur@magaldi.com
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Fig. 1
RWE's Power Plant Locations in Germany
(Illustrations: RWE Power)

This important contract is over No. 100 on Magaldi's long reference list

RWE Power is Germany's biggest power producer and a leading player in the extraction of energy raw materials. RWE relies on diversified primary energy mix of lignite and hard coal, nuclear power, gas and renewable sources to produce electricity in the base, intermediate and peak load ranges.

RWE is investing some four billion euros in the construction of two by two new hard coal fired units at the existing power plant location Hamm, Westfalen in Germany and at Eemshaven in Netherlands on a site measuring 49 hectares by the port, whose eastern basin is to be extended for this and other planned projects.

The new units will be the most modern plants of their kind worldwide and reach a net plant efficiency of 46%. While generating the same power, they will need 20% less hard coal. Per kilowatt hour of electricity they will emit lower greenhouse gas amounts: some 2.5 million tons of CO2 less per year and location compared with older systems.

The two 800 MW units at Hamm/Westfalen site will be operated with hard coal and petcoke and shall start commercial operation by mid and end of 2011. RWE applied in February 2007 for the construction and operation permission at the responsible authorities.

The new units at Eemshaven can also be fired with a share of biomass and are to go on stream after 2011/2012. The authorities in charge at the Eemshaven location in Groningen province are currently processing the request for approval (MER) for building the plant. RWE submitted the records already in January 2007.

Main Technical Data of the Boiler
(Source: RWE Power)

Nominal Power (Gross)	2x800 MW
Nominal Power (Net)	2x765 MW
Net plant efficiency	Approx. 46%
Hard coal consumption	2x240 t/h
Live steam	2x2.160 t/h
Live steam pressure	285 bar
Live steam temperature	600°C
RH steam temperature	610°C

The Magaldi Power scope of supply includes the design of the dry bottom ash handling system from the boiler's throat up to a small storage silo. The MAC® extractor, which is the core of the system, is used as ash extractor and cooler at the same time; the bottom ash is extracted with the Magaldi Superbelt®, a stainless steel belt conveyor. The Superbelt® is enclosed inside a metallic sealed casing, in which a controlled air flow comes into from the external environment due to the negative pressure present in the boiler. The air flow induces the cooling of the ash streaming in counter-flow along the conveyor and reaches the boiler furnace recovering a considerable quantity of energy from the radiant flux of the boiler and the heat removed from the ash. The dry technology represents an excellent solution when biomass and secondary fuel is burnt with coal since the cooling air is able to promote post combustion of unburned carbon yet present in the transported ashes. The MAC® extractor is followed by a crushing stage, where ash grain size is reduced, and by a Postcooler conveyor further cooling and transporting the ash to a buffer bin.

Magaldi is very pleased being selected for this important order and thanks Alstom for the confidence into our capabilities and experience.

Main Technical Data of the MAC© System

Fuels	Hard coal, petcoke, biomass
Normal ash rate	5 – 8,7 t/h
Maximum ash rate	21,1 – 25,6 t/h
Cooling air flow	max. 1 % of combustion air
Final ash temperature	< 100 °C

Fig. 2
Westfalen #D, E total view power plant
(Illustration: RWE Power)

Australia

Australian business takes off

by **Peter Siers** *Magaldi Power Pty Ltd General Manager* peter.siers@magaldi.com
by **Celestino Agresta** *Area Manager* celestino.agresta@magaldi.com

Magaldi Power Pty Ltd has signed on December 2007 the second Contract in 8 months for the turn key supply of 2 units at Millmerran Power Station.

Millmerran Power is an 850 MW power station near the town of Millmerran on the Darling Downs in southern Queensland. Among the most energy efficient and environmentally advanced coal-fired projects in Australia, the power station became fully operational in early 2003. Coal for the power station comes from the adjacent open-cut Commodore mine, and ash produced by burning that coal at the power station is returned to the mine site. Millmerran uses supercritical steam cycle technology which requires about 10% less fuel than an equivalent conventional unit, saving coal and reducing carbon dioxide emissions by 400,000 tonnes per year when compared to conventional coal-fired power stations producing similar amounts of electricity. Low NOx burners are also employed which cut NOx emissions by 50-70%. Millmerran combines engineering technology and effective water conservation techniques to reduce daily water consumption by 90% compared to conventional coal fired-power projects. Measures employed by Millmerran to protect surface and ground water resources include:

- Air cooling technology, which reduces water consumption by 90%.
- Using waste water from Wetalla Sewage Treatment Plant at Toowoomba as production water.
- Taking no water from surface water or groundwater resources.
- On-site retention of all run-off water with a system of drainage channels and dams and use of that water for dust suppression and watering vegetation.
- Fully enclosed conveyors over creeks, which reduce fugitive dust emissions and spillage into Back Creek.

Magaldi Power Pty Ltd, the wholly owned Magaldi Group company operating in Australia and the surrounding region, has entered into a contract to replace the existing Submerged Scraper Chain Conveyor system with a MAC Magaldi Ash Cooler® - system. Magaldi Power S.p.A (Italy) will be subcontracted to Magaldi Power Pty Ltd and will provide the layout and mechanical design, and will manufacture the MAC® components. Magaldi Power Pty Ltd will carry out the civil and structural engineering design, the electrical and control system design, and will supply and erect these components as well as installing the Italian manufactured components and carrying out preliminary commissioning. For the final stages a commissioning engineer will be sent from Italy. The SSC will be replaced with a MAC® extractor fitted with bottom doors. The bottom ash will be transported via a crushing stage and a 132 metre long Postcooler to a 430 cubic metre silo. Economiser grits will also be discharged onto the MAC® and then conveyed to the silo as part of Magaldi's scope of work. Works for the first unit will start at site in April 2008 and the erection will be completed during a 21 day outage in Spring. The project to covert the second unit will commence about twelve months later. This project features a very long and high postcooler, a large silo, and a very challenging window for completing the project during a plant shutdown of only 21 days.

Chile

An efficient and environmental ash handling choice in Endesa Chile Bocamina P.P.

by **Vincenzo Quattrucci** *Sales Manager* vincenzo.quattrucci@magaldi.com

Chile is today one of the most active and modern countries in South America, having an economical pace growth at a good rate of + 5 % per year.

This rapid growth is also reflected in the need for increased and stable sources of energy, with a growing concern over the environmental load that energy production infrastructures could mean to the country. Environmental regulations context is therefore asking for more and more strict requirements from energy utilities in order to reduce the polluting load from power plants effluents. In the neighbours of Conception, a sunny city located approx. 600 km south of Santiago, Chile capital, Endesa Chile has a 38 years old power station, Bocamina, located in the bay of Coronel (VIII region, of Bio-Bio river), close to the sea. Many efforts have been dedicated by Endesa to reduce the emissions coming from the plant, particularly for gaseous ones. As matter of fact, a brand new system of gas filtration has been recently installed, replacing the old electrofilter used in the past. Liquid effluents as well have to be taken under control and possibly reduced.

To cope with such new standard of requirements the MAC® technology has been also applied to the station, in particular with the wish to eliminate completely the use of water in bottom ash handling by retrofitting the existing sluice wet bottom ash system.

As part of their scope, Magaldi will also provide a fly ash collecting and transport system up to dedicated storage silos.

Bocamina Thermal Plant uses imported coal, coming from the coal handling jetty located in the proximity. The unit 1, object of this retrofit project, is a 128 MW power rated system, with a Franco Tosi natural circulation boiler.

The ash project in Bocamina Power Station has been focused on the following main benefits and operational improvements:

- elimination of the water in the bottom ash process;
- increase of bottom ash system reliability;
- improving of boiler efficiency;
- possible reuse of pulverized bottom ash;
- potential CO_2 emission saving.

Initial conditions of the wet bottom ash handling at the power plant were analysed and compared with the expected performance of the dry technology. The results obtained were evaluated by the client management, leading to a “green light” decision for the project. From the environmental point of view, the elimination of any water discharge and treatment and the increase of ash marketability, by avoiding ash disposal, will give an invaluable contribution to environmental improvement in the coastal area where the station is located. Other decisional factors for this project were also given by the boiler efficiency increase and from MAC® system expected improved reliability, reduced auxiliary power consumption and maintenance costs. Magaldi’s MAC® dry technology is expected to improve plant operations, reduce the overall cost for ash handling, eliminating the use of water and making Bocamina a better place to work and the surrounding locations a better place to live.

Mexico

Pacifico project, 1x700 MW

by **Celestino Agresta** *Area Manager* celestino.agresta@magaldi.com

On March 2007 Magaldi Power S.p.A. signed with Mitsubishi Heavy Industries Ltd the contract for the supply of the dry bottom ash, economizer ash, air heater ash and mill rejects for the new 700 MW supercritical boiler in Mexico Pacifico Project. The end user is CFE – Comision Federal de Electricitad.

The plant is going to be installed under the new coal fired unit that is the extension of Petacalco Power Station located in the state of Guerrero, along the Pacific coast. The Specification where prepared by CFE requesting the dry bottom ash handling and pyrites systems, because since 2001, 2 MAC® units are operating on units #1 and #2 with the typical benefit of the dry bottom ash handling (water saving, environmental protection, efficiency increase, safety in operations, lower O&M costs).
The system is one of the largest ever supplied by Magaldi in terms of number of machines. In fact the complete system includes:

Mechanical Seal Bottom ash hopper Bottom doors MAC® Pre crusher Primary Crusher Postcooler Silo Vibrating feeders Ash humidifier	BOTTOM ASH
2 lines of Ecomag conveyors at the Economiser hoppers	ECONOMISER ASH
Pressure vessels and pneumatic line for the Air Heater hoppers	AIR HEATER ASH
Complete Mill Rejects System	PYRITES
230 mt Rubber Belt lines for the transportation of all the collected materials to the final bottom ash storage silo.	MATERIAL HANDLING

All the supply is fully automatically controlled by the Magaldi Integrated Supervision System (MISS®).
Pacifico will be the first project where all the ashes and pyrites will be handled with the Magaldi systems with the exclusion of the fly ash.
For the first time Magaldi directly negotiated with Mitsubishi Heavy Industries Ltd., one of the largest Boiler Manufacturers and EPC contractors in the world, after this first project hopefully there will be a deeper cooperation on other projects.

The Magaldi system is designed according to the following specification:

	Bottom Ash	Economiser Ash Line 1	Economiser Ash Line 2	Air heater Ash	Pyrites
Normal Rate	8,68 t/h	1,74 t/h	1,74 t/h	1,74 t/h	1,2 t/h
Maximum Rate	26,04 t/h	5,32 t/h	5,32 t/h	5,32 t/h	1,62 t/h

Spain

Gesa Alcudia #1 and #2 retrofit project

by **Vincenzo Quattrucci** *Sales Manager* vincenzo.quattrucci@magaldi.com

GESA –Gas y Electricidad SA (Endesa Group) is the Baleari Island (Spain) power and gas utility, having a total of 1,767 MW electrical production facilities installed in the islands.

GESA production comes from 7 power plants, distributed all over the Baleari Islands and located in Mallorca, (the biggest island of the group), Minorca, Ibiza and Formentera.
The majority of these plants are producing power from fuel and gas, but the power station of Alcudia, with its 510 MW, is the only one using coal.
The great care of GESA towards the environment and the high attention of Mallorca authorities to the pollution control are reflected in the choices made for Alcudia Power Station, located in Porto Alcudia, some 50 km north of Palma, the biggest city on Mallorca island. This station has been supplied with state-of-the-art environmental control equipment, and, for the bottom ash handling, GESA has decided to have a Magaldi MAC® dry bottom ash system on the unit 1 & 2, after the positive results they got from the installation of the same technology on units 3 & 4 since the year 1994.
The hot ashes, falling from the boiler, will be transported and cooled down by the MAC® extractor; ashes will then be crushed, milled and transported to a storage silo by mean of a vacuum pneumatic transportation system. The dry ash could then be discharged in trucks, for a potential sale as by product in the cement industry.
The application of the MAC® system in all four units of Alcudia will allow the achievement of the following benefits:

- Use of a dry process for the bottom ash, in line with the power station environmental criteria.
- Operational cost savings in terms of improved efficiency of the boiler and bottom ash system reliability; this improvement will consent also a reduction of CO2 emission from the plant.
- Complete automation of the system and elimination of some manual intervention caused by the old system.

Magaldi Power will supply the two MAC® units to Gesa having as schedule the start of operation for the first unit in March 2008, while the second unit will be installed after few weeks, in April 2008.
The order from Endesa/GESA is marking a confirmed trust of Endesa in Magaldi MAC® technology and their good overall evaluation of all the other MAC® systems supplied by Magaldi to them, serving many of their coal fired units in Spain.
The first MAC® installation, in that country was made in 1994 right at the unit 3 and 4 of Alcudia, followed the year after by Almeria # 2. After almost 23 years from its first commercial operation in ENEL Pietrafitta PP, the MAC® system is now considered worldwide as a new standard set for modern power stations in terms of bottom ash handling.

SUPERMAC™: Magaldi System for High Ash Content Coals

by **Vincenzo Cianci** *R&D Engineer* vincenzo.cianci@magaldi.com

The SUPERMAC™ system is a patented technology developed by Magaldi for the applications where, due to high ash content coal or high coal feed rate or both circumstances, the bottom ash rate is considerably high, compared to the cooling air flow that is allowed to enter the boiler.

The SUPERMAC™ system is a patented technology developed by Magaldi for the applications where high ash content coal or high bottom ash rate or both circumstances are present. Poor coals having high ash content, indeed, in case of traditional wet systems require very large quantities of water for bottom ash cooling and, at the same time, yield to considerably high thermal power losses due to the ash enthalpy, ash chemical energy and radiation leaving the boiler to the water pit. Poor coals therefore require specific cooling capabilities and special system configuration. The SUPERMAC™ is the solution for dry bottom ash handling for those cases where the tertiary air rate necessary for bottom ash cooling is considerably high compared to the total combustion air. Highest availability, steady control on the dry bottom ash handling process and safe running, still remain the same benefits for the SUPERMAC™ system today as well as for the first MAC®. Moreover, water saving, boiler efficiency improvement,

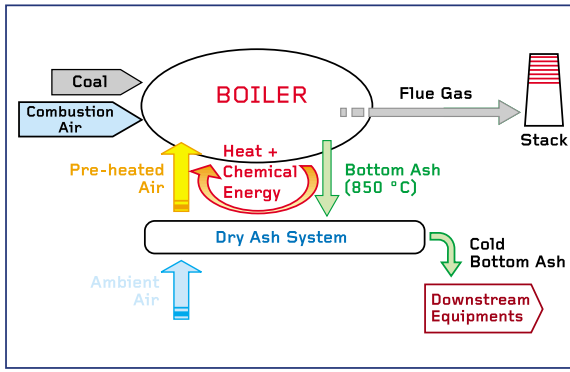

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Figure 1
Basic MAC system concept

Figure 2 – Dry system data with two different coals

TYPE OF COAL	COAL *A*	COAL *B**
Total Moisture	10	10
Ash [%w]	15	38
Coal feed rate [t/h]	126	201
Bottom Ash rate [t/h]	2.8	16
UBC in Bottom Ash [%w]	5	3
H.H.V. [kJ/kg]	25,700	12,000
Total Combustion Air [t/h]	1145	1255
Average Cooling Air [t/h]	8.5	56
% of Total Combustion Air	**0.74**	**4.5****

* Typical Indian coal; ** More than 2.0% of total combustion air

2

Figure 2
Dry system data with two different coals

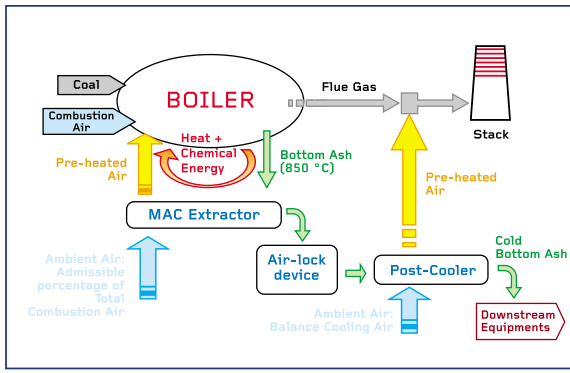

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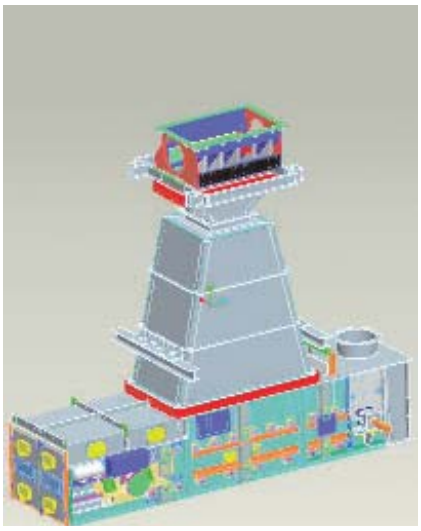
Figure 3
Basic SUPERMAC™ system concept

Figure 4
The air-lock device

Figure 5
SUPERMAC™ system performances vs. traditional MAC® system with poor, high ash coal

Figure 6
First SUPERMAC™ system layout



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TYPE OF COAL	COAL B*
Total Moisture	10
Ash [%w]	38
Coal feed rate [t/h]	201
Bottom Ash rate [t/h]	16
UBC in Bottom Ash [%w]	3
H.H.V. [kJ/kg]	12,000
Total Combustion Air [t/h]	1255
Average Cooling Air [t/h]	56
Total Cooling Air to Combustion Air ratio [%]	4.5**
Type of Dry Bottom Ash system	**SUPERMAC™**
Cooling Air Entering the Furnace [t/h]	25
Cooling Air Entering the Furnace to Combustion Air ratio [%]	2.0
Boiler Efficiency Improvement:	**+ 0.68 %**

* Typical Indian coal

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power consumption reduction, in case of SUPERMAC™ become much more remarkable.

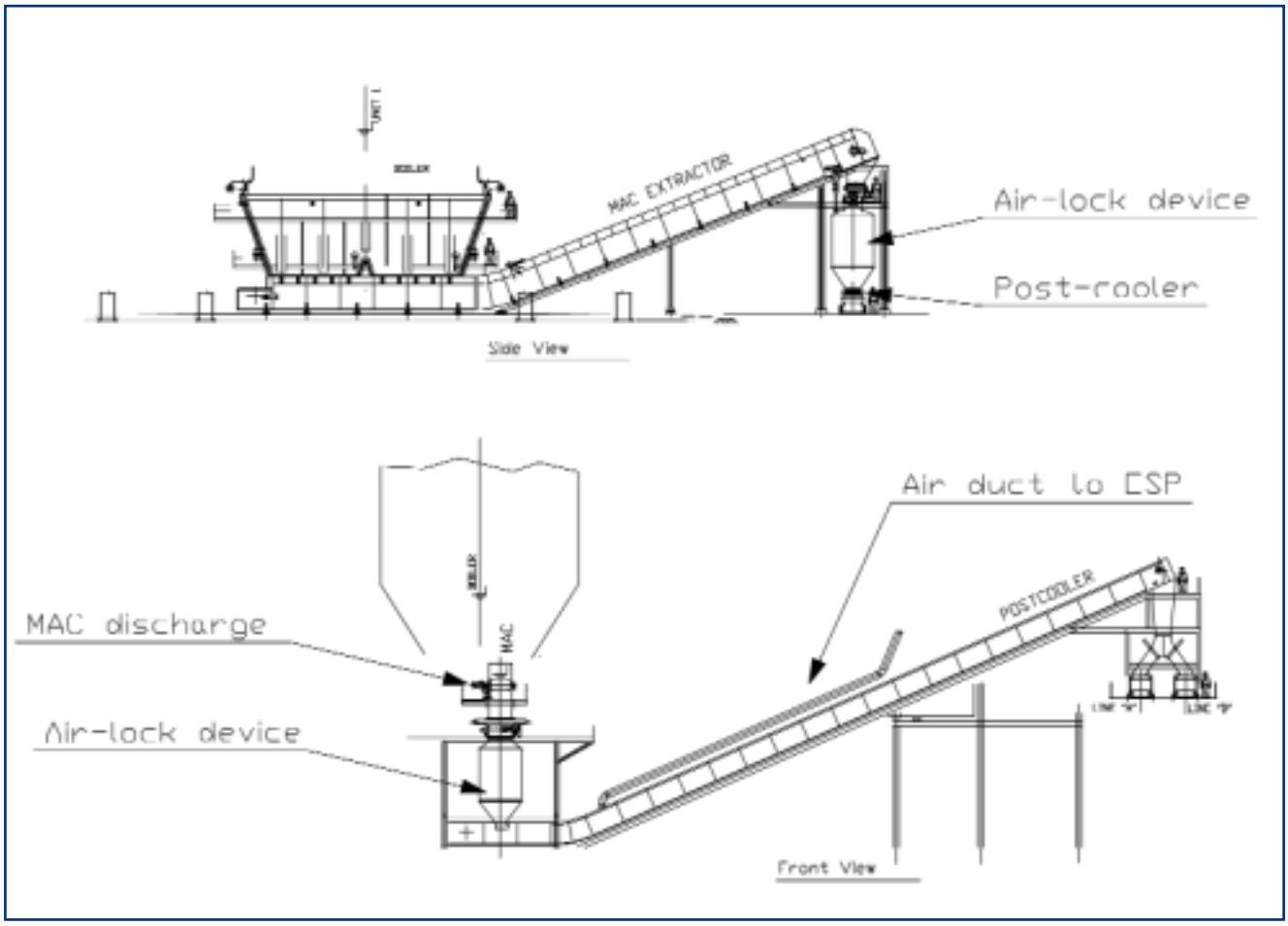
Figure 1 traces the basic concept of MAC® system for dry bottom ash handling, widely and successfully installed with 100 applications all over the world. The principle is very simple: ambient air, naturally drafted by the negative pressure inside the boiler, cools bottom ash, provides the hot combustive for the post-combustion of the unburned carbon and finally, when crossing the boiler throat, refunds the boiler most of the enthalpy and the chemical energy of bottom ash. The entire process for dry bottom ash cooling is performed – according with field tests results and boiler manufacturers assessment – with "no influence on coal combustion and NOx formation in the combustion chamber".

Thanks to the possibility of heat and chemical energy recovery from bottom ash and radiation from boiler's throat, the dry bottom ash system allows a boiler efficiency improvement[1] normally ranging from 0.1-0.3% (typical values with MAC® applications in case of good bituminous coal) but increasing up to 0.6-0.8% in case of SUPERMAC™ with poor, high ash content coal.

The coal ash content is the basic parameter that needs to be carefully evaluated. Assuming a fixed coal feed rate to boiler, as the coal ash content increases, indeed, the bottom ash rate increases and a bigger quantity of ambient air needs to be drafted into the dry bottom ash handling system in order to perform the ash cooling down to acceptable temperatures at the discharge. Typically, with an ash content in coal exceeding the 30% approx. it becomes more and more difficult to ensure an effective bottom ash cooling with less than 1.5% approx. of the total combustion air. Figure 2 reports the dry bottom ash system basic data in case of a good bituminous coal compared with a poor - high ash coal. As we can see from the last row in Figure 2, with the poor - high ash coal, the cooling process requires a 4.5% approx. of the total combustion air. Such amount of cooling air cannot be introduced into the boiler otherwise the combustion process can be altered and boiler efficiency improvement decreased.

The SUPERMAC™ overcomes such limitation by keeping the benefits achieved by a traditional MAC® system and ensuring, in addition, huge water savings and high boiler efficiency improvement for the most critical applications. The SUPERMAC™ basic concept is to split the total necessary cooling air flow by the use of an innovative "air-lock" device. Figure 3 shows the SUPERMAC™ working con-

[1] Boiler efficiency improvement is evaluated as per AMSE PTC code 4-1998 guidelines



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cept. The bottom ash is collected by the MAC® extractor and then, after the primary crushing, accumulated in order to achieve the air-lock (in Figure 4, a dedicated device performing the air-lock). The bottom ash is therefore progressively extracted from the air-lock and cooled by the ambient air down to acceptable temperatures. The air-lock is designed in order to maintain always a controlled and fixed level of material into the feeding hopper downstream the primary crusher. The bottom ash accumulated provides itself the disconnection between the MAC® extractor and the Post-cooler, acting like an air-lock. The MAC® extractor is naturally connected with the boiler's throat, while a further duct for cooling air connects the Post-cooler with a flue-gas duct section downstream the boiler (at negative pressure). In this way the total cooling air entering the system can be split into two separate flows: one entering upstream the air-lock and therefore the boiler and one entering downstream the air-lock and by-passing the boiler. The two air flows are kept separated by the presence of accumulated bottom ash acting as an air-lock. In this way it's very easy to displace the ambient air ports along the system in order to have no more than the percentage acceptable (usually 1.5-2.0%) of total combustion air entering the MAC® extractor, while the balance air, needed to accomplish the bottom ash cooling down acceptable temperatures at discharge, by-passes the boiler. Maximum energy recovery to boiler and bottom ash cooling are therefore guaranteed at the same time. In Figure 5 the performances of the SUPERMAC™ system are evaluated for a high ash content coal application (typical for Indian coals). As we can notice, fixed the cooling ambient air flow, only the admissible fraction of it enters the boiler as tertiary air and allows a boiler efficiency increase of 0.68%.

The SUPERMAC™ therefore represents an upgrade of the MAC® system performances to the high ash content coal applications, thus providing a full coverage by Magaldi technologies to bottom ash handling with every plant size and every coal quality.

The SUPERMAC™ ensures a continuous control on the bottom ash process for the most critical applications and allows to achieve the highest boiler efficiency improvement where other traditional systems could negatively affect boiler's operations.

With the SUPERMAC™ Magaldi hits the mark once again with "zero water usage".

Italy

MAR – MAGALDI ASH RECYCLING, Fiume Santo Project Experience

by **Vincenzo Cianci** *R&D Engineer* vincenzo.cianci@magaldi.com

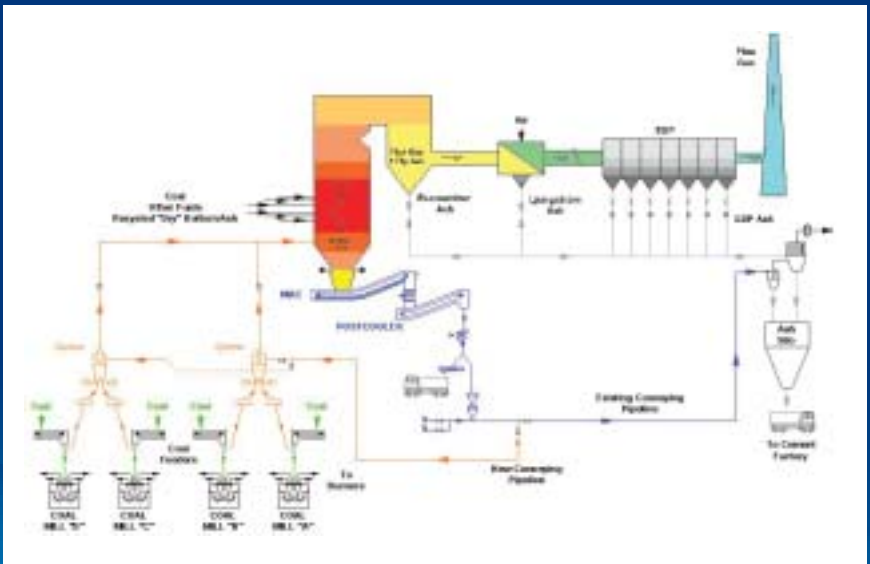


Fig 1
Flow diagram representing the MAR system in Fiumesanto PP

The MAR system is a patented technology developed by Magaldi for dry bottom ash recycling into the combustion chamber in order to convert all the bottom ash into fly ash.
The MAR system is an improvement and an evolution of the MAC Magaldi Ash Cooler® for dry extraction, cooling and handling of bottom ash from solid fuel fired boilers.
The present article summarizes the results from the first industrial application of the MAR system in Fiume Santo power plant (Endesa Italia), started in May 2007.

The operation of MAR system, interlocked with MAC® System, has shown that it is possible to achieve a definite improvement on the coal waste product management, allowing a complete conversion of all the bottom ash into saleable fly ash.
Several attempts have been done in the past in order to give the bottom ash a higher aftermarket value. Possible bottom ash reuses can be recognized in road constructions as inert material (in compliance with EN 13043), filler or aggregate in concrete industry (in compliance with EN 12620), mine filling, etc. All the mentioned bottom ash managing strategies lead to low-profit industrial processes while, as Fiume Santo experience assesses, recycling bottom ash into fly ash means turning a coal costly-waste product into the most valuable product in the concrete industry (in compliance with EN 450-1) thus leading to the highest economical benefits. Further improvements derive from the wear rate reduction for bottom ash milling systems, milling equipments spare parts savings and lower costs for bottom ash handling equipments maintenance. Last but not least, mixing fly ash with cement lead to a CO_2 emissions decrease in terms of fuel savings for cement production, thus meaning an environment protective choice.

Fiume Santo PP has two units with 330 MWe nominal power each. The boiler is provided with tangential burners and with six burners floors. The coal is a medium-high ash content grade (e.g. south-african) with an average LHV of 6˙000 kcal/kg. The bottom ash grain size distribution downstream the MAC® system depends from the secondary mill pulverization efficiency but we can certainly assume an ash grain size distribution with 100% < 5.0 mm. The maximum bottom ash rate is estimated to be app. 2.5 t/h @ MCR, the maximum ash content in the coal ranges around 15% and the bottom/fly ash split fixes at 15%/85%. During sootblowing cycles (3 times per day) the maximum bottom ash rate increases up to 3.0 t/h. The bottom ash recycling system MAR is basically compound by the following equipments:

- **Pneumatic conveying system** with basalt lined pipes, feeding the reception bins.
- **"Reception bin"** for temporary recirculated bottom ash storage, placed at the end of the pneumatic conveying line. The bin venting is connected with the combustion chamber allowing a direct recirculation of the finest fraction of bottom ash (particles with diameter < 100mm, < 5% by weight of total bottom ash). Each bin is provided with two separated discharge ducts, one per single coal mill, feeding the vibro-feeders.
- **Vibro-feeders** for coal mill ash dosing process. They are installed downstream the reception bins discharge ducts and they can be automatically adjusted in order to dose the ash feed rate into the coal mills.
- **Pneumatic valves** for interception at each vibro-feeder discharge point and on the venting ducts downstream the reception bins.

Figure 1 shows the flow-diagram where is represented in detail the bottom ash recycling system adopted for Fiume Santo PP.

After the MAR system installation in Fiume Santo PP, some experimental activities have been carried out with the aim of evaluating the coal mill wear rate and the possibility of fly ash certification (produced with MAR system bottom ash recycling) according with the European standards. The test procedure has successfully been developed with the following results:

- The bottom ash recycling into the coal mills has a negligible impact on coal mill wear rate.
- The pulverized bottom ash conversion into fly ash increases the total fly ash total quality, in fact there is a UBC content reduction thanks to the dilution effect of bottom ash.
- The bottom ash conversion into fly ash has no negative impact on fly ash properties. It has been possible to recognize all fly ash and recycled bottom ash as a valuable product for cement and concrete industry in compliance with the European standard UNI-EN 450-1:2006, thus meaning that by the MAR system, the bottom ash has not to be considered as a coal combustion waste product anymore but as a marginal benefit product as long as fly ash.

The fly ash production is increased by the bottom ash recycling and the fly ash has the possibility be certified CE according with European standards, that means no-restriction transportation through UE member countries.

Fig 2
"Reception bin" and vibrofeeder displacement

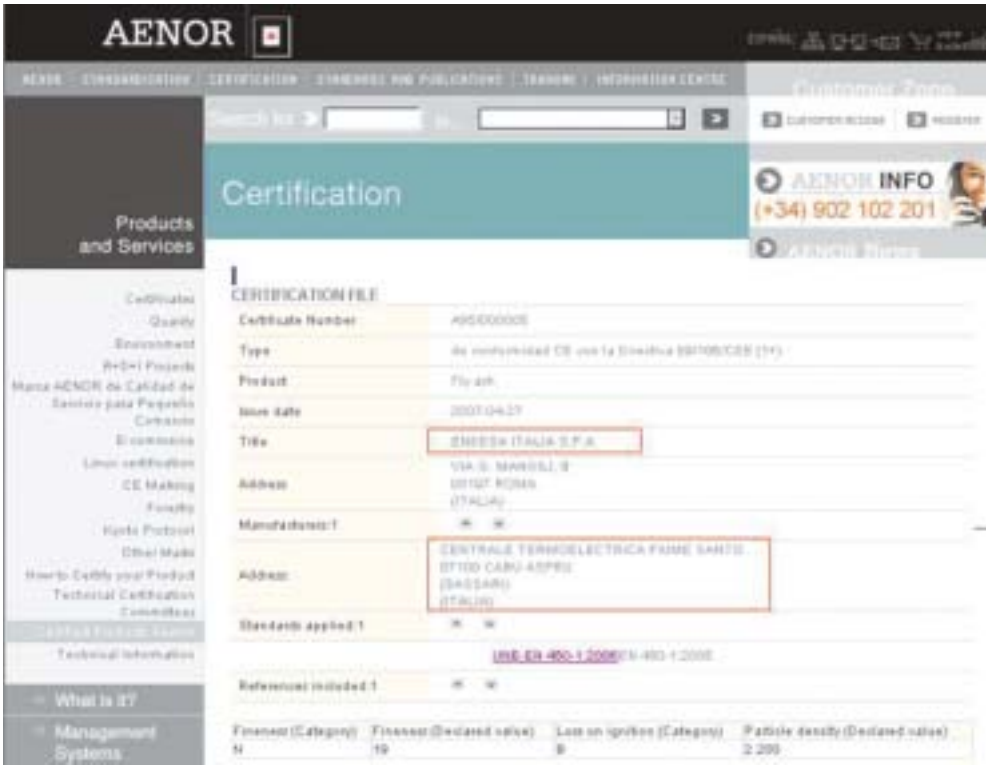


Fig 3
Certificate gained by ENDESA Italia for Fiume Santo PP in compliance with the European standard UNI EN 450-1:2006displacement

Italy

ENEL S.p.A. has confirmed its trust on Magaldi dependable technologies installing a Magaldi MRS® mill rejects handling system in Torrevaldaliga Nord Power Plant

by **Alfonso Pirro** *Sales Engineer* alfonso.pirro@magaldi.com

ENEL S.p.A. has decided to assign to Magaldi Power S.p.A. the contract award for the patented Magaldi MRS® Mill Reject System for the new 3x660 MWe coal fired Units of Torrevaldaliga Nord Power Plant (municipality of Civitavecchia). The Client has confirmed the trust for Magaldi in Torrevaldaliga Nord Power Plant after the previous installations of three Magaldi MAC® dry bottom ash system in 2005 and Magaldi fly ash storage silo systems in 2006.

After the successful installations in Spain (no. 2 in ENDESA Almeria PP and no.1 in ENDESA Los Barrios PP) and in Portugal (no. 4 in CPPE Sines PP) at the beginning of 2008 Magaldi received a "turn-key" project from ENEL S.p.A. for the mill reject handling system thanks to its patented, well proven and dependable Magaldi MRS® (**M**ill **R**eject **S**ystem) technology. The MRS® is a patented system designed for dry conveying of pyrites and other rejects from coal mills. The new plant of Torrevaldaliga Nord, owned by Enel Produzione S.p.A., includes three coal fired units 660 MWe gross capacity each (Unit #2, #3 and #4). The works for Unit #4 will start at site in the middle of 2008 and the erection will be completed in September. The second installation (servicing Unit #3) and the third (servicing Unit #2) will start respectively on November 2008 and March 2009.

Each boiler is equipped with six mills for coal pulverization. Foreign materials, mixed with the coal, that cannot be grinded are rejected by the mills and discharged in no. 6 "pyrites boxes" (PB) needed to separate the coal mill pressure (positive) from the conveyor pressure (atmospheric) passing through a 8" duct and a couple of pneumatic slide gate valves. The pyrites boxes will be discharged sequentially on preset time and / or thanks to the level sensors located in each pyrites box.

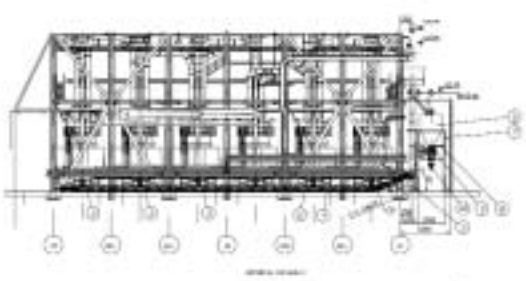
No. 6 Magaldi MRS® extractor conveyors, located on the bottom of PBs, will discharge the pyrites on a Magaldi MRS® collector feeder. The conveyor will transfer mill rejects in a Magaldi Tsubaki bucket elevator; the latter will feed subsequently a storage collecting bin of 15 m^3 placed in the boiler area. Then, a vibrating feeder will extract the pyrites from the collecting bin and will feed an open truck through a telescopic chute. The MRS® system will be designed considering a pyrite flow rate of 0,6 t/h in normal condition, 2,4 t/h in worn mills condition and 4,5 t/h in design condition corresponding to 5 mills running (5x0,4 t/h worn condition) plus one mill in emptying stage at 2,5 t/h. Since the rejects from the mills, conveyed by the MRS® system, will be contaminated by coal dust, Magaldi has carefully evaluated the presence of coal dust inside the MRS® conveyor casing designing it "not encased" to avoid the risk of creating explosions conditions in compliance with ATEX implication and equipping it with an efficient de-dusting system to avoid the dust dispersion in the environment and to reduce the explosive atmosphere formation probability around the pyrite belt and the bucket elevator.

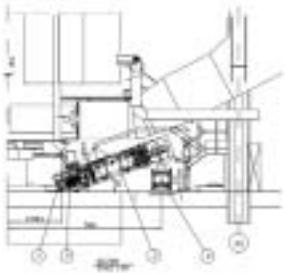
The de-dusting system will be basically compound by:

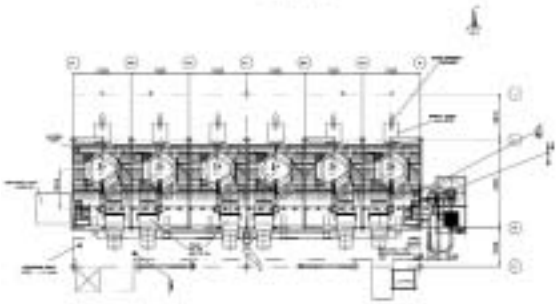
- aspiration hoods for each extraction unloading point;
- aspiration hoods for each pyrite extraction belt at mill reject tank
- loops of piping connecting the hoods and the dust filters;
- filters for coal dust separation, in compliance with the ATEX regulation;
- exhauster fan.

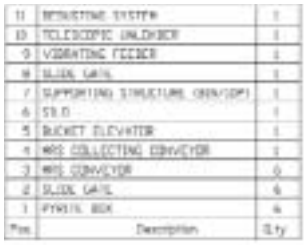
The whole supply will comply with ATEX Directive 94/9/CEE and will include systems and components necessary to meet the requirement of the Italian authority (VVF). Each MRS® system will be equipped with a fire and explosion protection system compound by:

- Fire and explosion detection (temperature probe, CO probe, thermo sensitive wire);
- Safety system activation like as relief panels on bucket elevator and storage silo in compliance with the NFPA 61-68 regulations and water spraying system on the pyrite belts served by a water spraying fire-extinguish system in compliance with the NFPA 15 safety regulation.









Client	Enel S.p.A.
Power plant name	Torrevaldaliga Nord
Power plant owner	Enel Produzione S.p.A.
Units	#2, #3, #4
Capacity	3x660 MWe
Pyrites flow rate – normal condition	0,6 t/h
Pyrites flow rate – worn mills condition	2,4 t/h
Pyrites flow rate – one mill in empting stage	4,5 t/h
Pyrites design temperature	150 °C
Contract awarded to Magaldi	January 2008 for #4
	June 2008 for #3
	October 2008 for #2
Start up of on site activities	June 2008 for #4
	November 2008 for #3
	March 2009 for #2
Scheduled completion of activities	September 2009 (tentative date)

Magaldi Bulk Materials Handling Division celebrates the second contract in half a year for a fly ash handling system

by **Alfonso Pirro** *Sales Engineer* alfonso.pirro@magaldi.com

Among its other activities, Magaldi excels in the field of ash handling equipment, supplying solutions ranging from the single components to turn-key system for fly and bottom ash pneumatic systems. Magaldi has confirmed its experience in ash handling supplying complete fly ash pneumatic systems specifically designed to meet the special requirements of its Customers with full respect of the most recent environmental regulations.

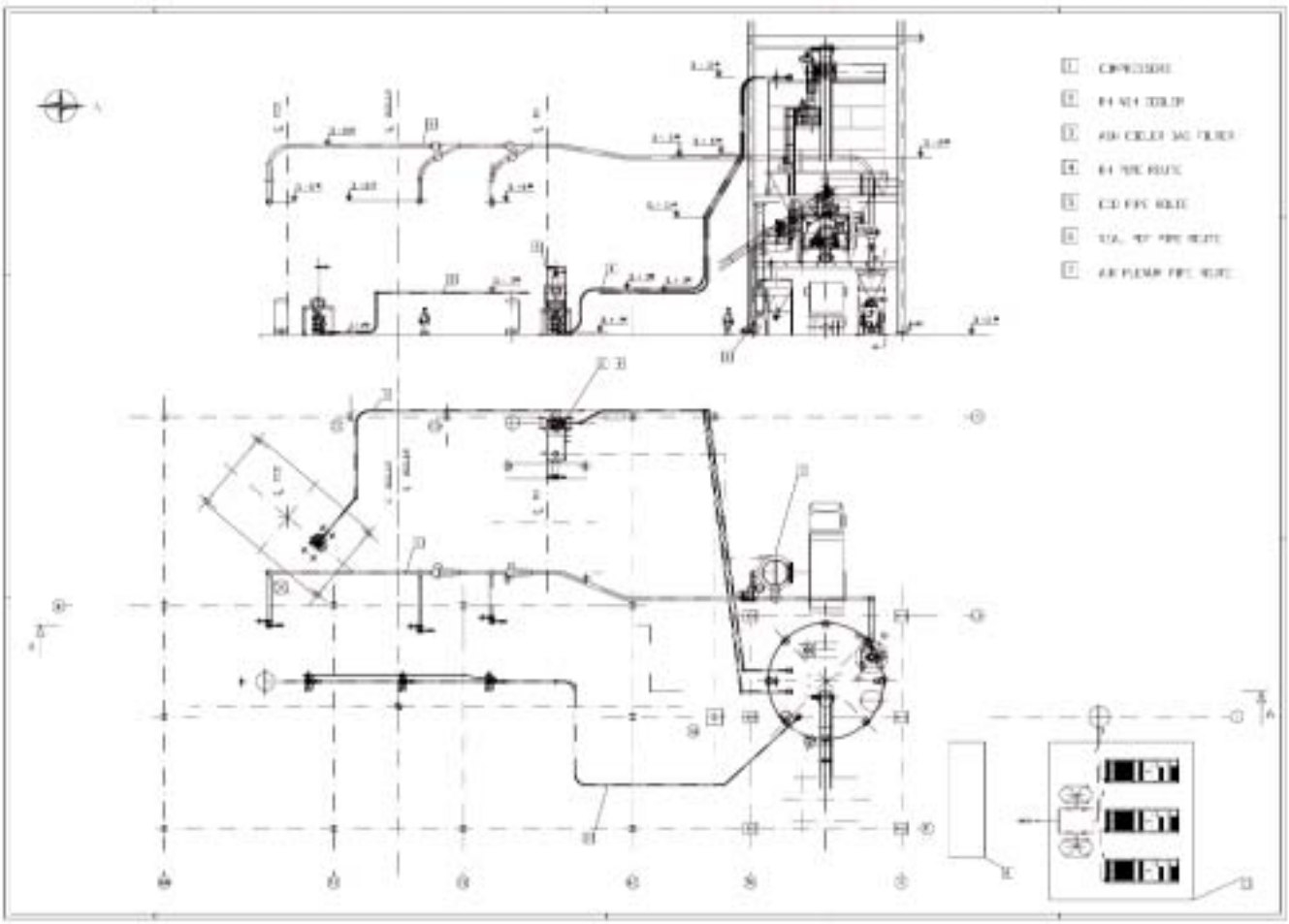
Enel Sulcis Power Plant Experience

ENEL S.p.A. has awarded in the middle of 2007 to Magaldi Power S.p.A. the contract for the installation of a complete fly ash pneumatic system in Sulcis Power Plant.

Sulcis Power Plant is located in the municipality of Portoscuso at about 80 km from Cagliari (Italy) in Sardinia. The existing plant includes one conventional thermo electrical unit (Unit #2), 320 MWe rated, designed to fire national coal and one CFB (Circulating Fluidized Bed) unit (Unit #3), 340 MWe rated, designed to fire national coal and biomass fuel.

From Unit #2 the ash coming from the furnace external beds (ECO and RH beds) is conveyed to a 400 m^3 ash storage silo. The ash is discharged by a screw conveyor inside a buffer hopper and then passing through a pressure vessel the ash is cyclically pumped inside the furnace for the refilling of the furnace fluidized bed. Thanks to dense-phase technology,

Client	Enel S.p.A.
Power plant name	Sulcis
Power plant owner	Enel Produzione S.p.A.
Units	#2
Capacity	1x340 MWe
Ash flow rate from ECO and RH externals bed	10 t/h
Ash flow rate from silo discharge	56 t/h
Contract awarded to Magaldi	June 2007
Start up of on site activities	January 2008
Scheduled completion of activities	March-April 2008



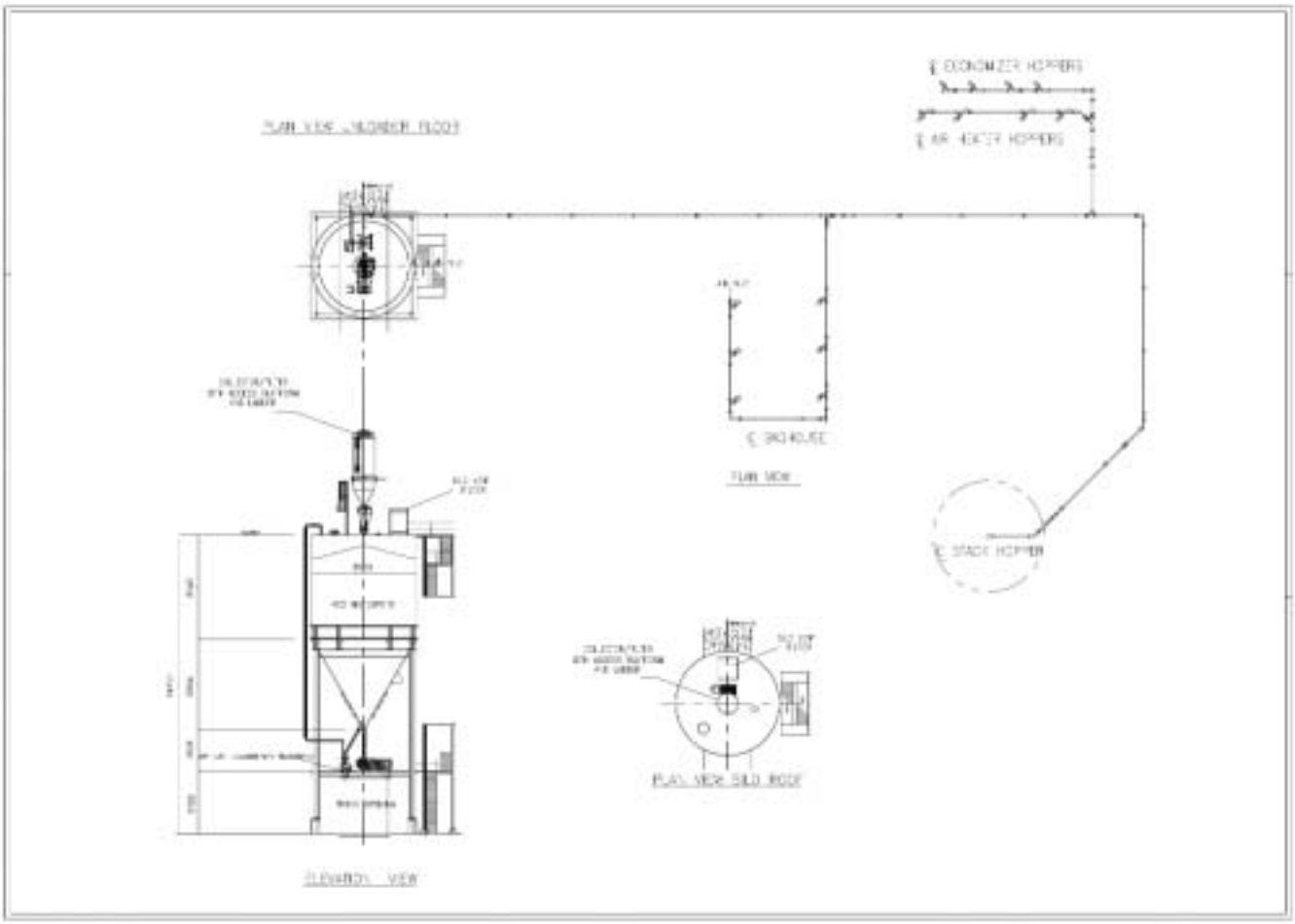
the new ash pneumatic system will allow to automatically discharge the ash from the external furnace beds (ECO and RH beds) during the furnace maintenance activities and emergency operations. The system will also automatically refill the furnace bed at furnace start up, after the emptying due to its outage. Nowadays the above mentioned operation are manually made by plant personnel so thanks to Magaldi's ash handling technology is expected to improve plant operations, reduce the overall cost for ash handling, and making Sulcis a more safe place to work. The dense-phase pneumatic conveying system will be ensuring low transportation air consumption saving energy cost, low average material velocity preventing pipe wear and ability to handle wet materials.

Endesa Bocamina Power Plant Experience

Magaldi Bulk Materials Handling Division of Magaldi Power S.p.A. is pleased to announce that it start 2008 in the same successful way in which the year ended, with another significant contract for ash handling equipment. ENDESA CHILE in Santiago awarded the Bocamina ash handling retrofit project to Magaldi Power S.p.A. in January 2008. This contract is for the retrofit of the original ash handling equipment at the existing 1 x 128 MWe Power Plant located in Conception (Chile). The contract is a complete turnkey package, which includes the design supply, manufac-

On the left
Mr Alfonso Pirro (Magaldi Power S.p.A. - Sales Engineer)
and on the right
Mr. Jorge Orlando Advis Neira (Endesa Chile - Subgerencia Aprovisionamientos).

Client	ENDESA CHILE
Power plant name	Bocamina
Power plant owner	ENDESA CHILE
Units	#1
Capacity	1x128 MWe
Fly flow rate - design	19 t/h
Fly ash design temperature	150 °C
Contract awarded to Magaldi	January 2008
Start up of on site activities	May 2008
Scheduled completion of activities	October 2008



ture, mechanical and electrical installation of all the materials handling equipment as well as the blowers, the filter collectors, pneumatic valves, the conveying piping and the carbon steel conical bottom storage silo, its steel structure and related stairtower.
The equipment will be operated from the Main Control Room, located in the auxiliary building.
All the other auxiliaries related systems for ash transportation such as blower units, valves, MCCs and switchgears will be placed in a proper area located at ground level, below the silos. The new pneumatic fly ash vacuum system will convey ash from the existing baghouse hoppers and the existing economizer, stack, and air heater hoppers.
The ash collected from the hoppers will be conveyed to a new fly ash storage silo and its accessories.
The total handling rate for the vacuum system will be 19 t/h and the silo capacity will allow enough space for 36 hours of fly ash storage.
Besides Magaldi will be supplying the necessary heating elements at the hoppers to maintain a temperature sufficiently high at all times to prevent the formation of moisture which would occur if the temperature is allowed to drop below the dew point.
In order to ensure the very tight deadlines can be achieved Magaldi personnel will start work on site in May 2008 removing unnecessary items of plant and installing new equipments and pipelines in advance of the boiler outage that starts in October 2008.

Italy

Recycling from heavy oil fly ash at ENDESA Fiume Santo and Tavazzano Power Plants

by **Alfonso Pirro** *Sales Engineer* alfonso.pirro@magaldi.com

Magaldi Ricerche e Brevetti S.r.l. in the middle of 2005 and at the beginning of 2006 received two"turn key" projects respectively from ENDESA – Fiume Santo Power Plant and ENDESA – Tavazzano Power Plant for a recycling system from heavy oil fly ash.

Thanks to continuous developing new technological solutions by Magaldi Research & Development Dept., the innovative heavy oil fly ash recycling system will allow to reduce the environmental impact, to increase the boiler efficiency, to cut off the costs for the ash disposal and to improve the material handling inside the plant and to meet ENDESA special requirements.

The projects refer to the engineering, procurement, construction, erections, start-up and commissioning of 2x150 kg/h and 1x150 kg/h heavy oil fly ash recycling systems.

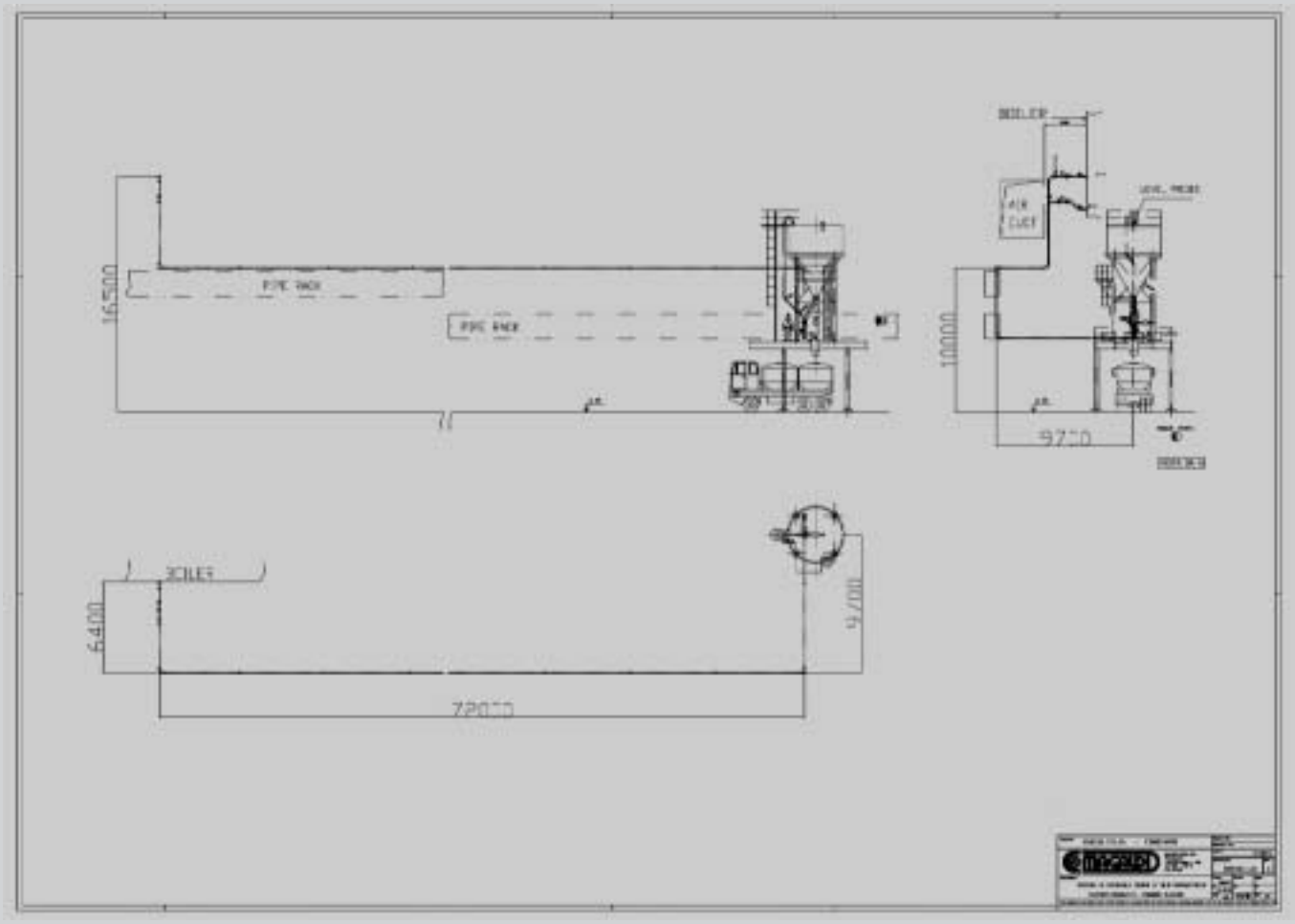
Fiume Santo Power Plant Experience

Fiume Santo Power Plant is located in the north-western part of the Sardinia Island (Italy). There are No. 2x320 MWe coal fired Unit (Group #3 and #4) and No. 2x160 MWe heavy oil fired Unit (Group #1 and #2).

For the group #1 and #2 the fly ash is intercepted by the ESP and it is sent to the relative silos for a temporary accumulation.

Periodically, the ash accumulated in the silo is discharged by truck with elevated costs of handling and disposal. Furthermore, the accumulated ash has a high percentage of unburned carbon which causes a loss of the boiler's efficiency.

These problems have been solved by installing per each Unit an ash recycling system that endows continuously or in-continuously the ash accumulated into the silo and transported through a pneumatic conveyor system directly into the boiler near the burners area. This process allows a complete burned-out of the unburned carbon increasing the boiler efficiency with positive effects on the environment and eliminating ash disposal and handling costs. The system is com-



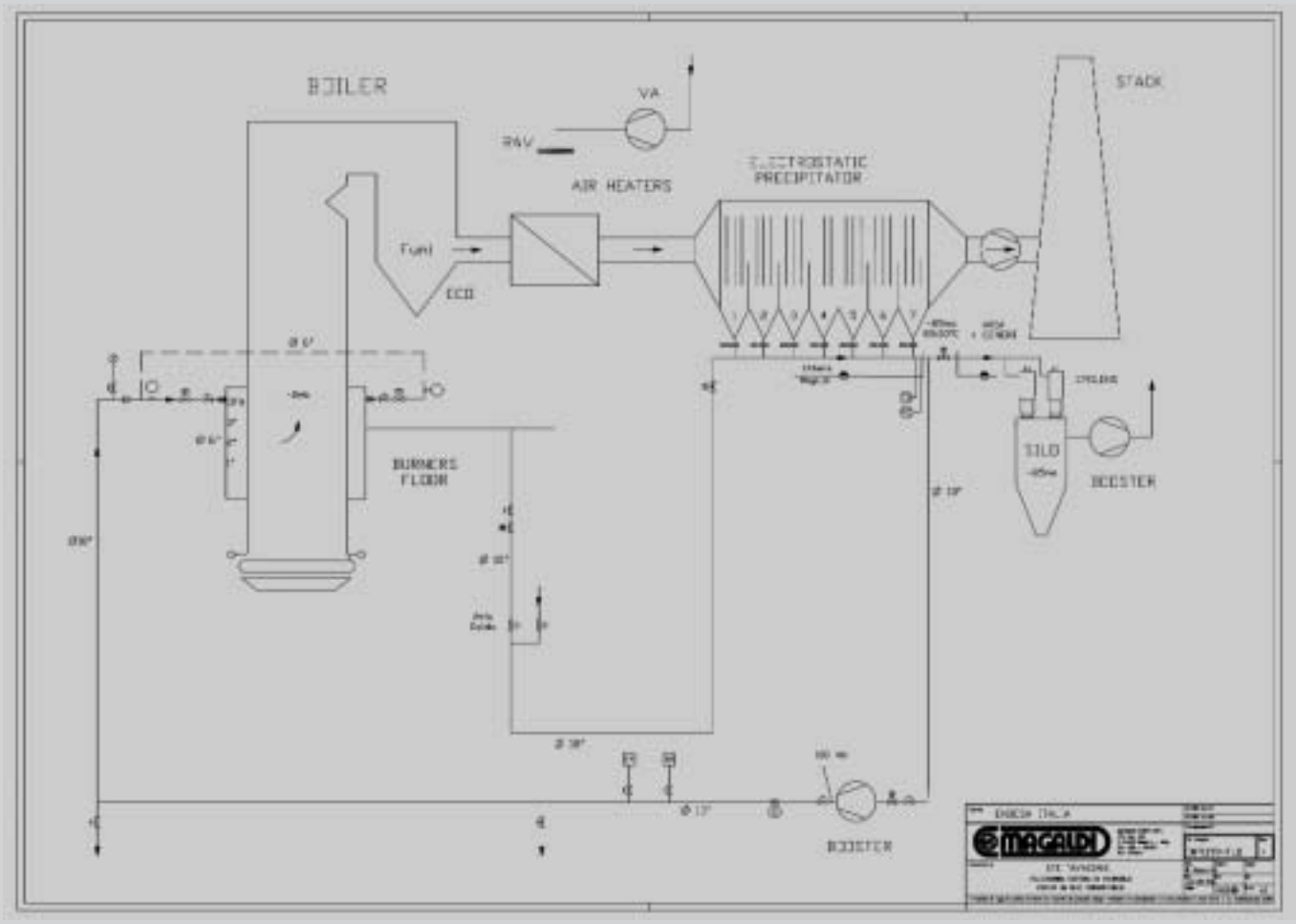
Equipment and process data

Item	Unit	Value
Transportation system		Pneumatic with ejector
Conveying line length	m	88,00 horizontal
10,00 vertical		
Conveying pipe diameter	inch	2" 1/2
Inspection door	n	2
Material		Recycled heavy oil fly ash
Capacity	kg/h	150
Conveying air	Kg/h	310
Conveying air pressure	barg	1,5
Ash temperature	°C	40

posed by a rotary valve located underneath the storage silo which feeds and transfers ashes continuously on the pneumatic line. The pneumatic conveyor mainly consists of an ejector which is able to convey the ashes directly into the boiler through inspection doors located by the burners area.
The boiler inlet have been selected to obtain the maximum level of complete burned-out by taking consideration Temperature, Environment oxidizing, and Residence time, as main parameters. The installed system is completely managed by an automatic PLC which has a control instrumentation for the acquisition on-line of the operating conditions.

Tavazzano Power Plant Experience

Tavazzano Power Plant is located in the municipality of Lodi in the north-western part of Italy. The existing plant includes No. 3x250 MWe most recently installed gas turbine and No. 2x320 MWe thermo electrical units (Group #7 and #8) designed to fire both gas and heavy oil fuel.
Each unit consists of one steam generator, one steam turbine, one alternator and related step-up transformer and one electrostatic precipitator installed in the flue gas path before the stack.
For the group #8 the fly ash is intercepted by the ESP and it is transferred to the relative silo having a storage capacity of around 80 m^3 for a temporary accumulation by means of an existing cyclones/booster system installed on silo roof and an existing vacuum



Equipment and process data.

Item	Unit	Value
Transportation system		Pneumatic with booster
Conveying line length	m	115,00 horizontal
25,00 vertical		
Conveying pipe diameter	inch	10"
Inspection door	n	2
Material		Recycled heavy oil fly ash
Capacity	kg/h	150
Conveying air	kg/h	6600
Conveying air pressure	barg	0,1
Ash temperature	°C	120

conveying line. Periodically, the ash accumulated in the silo is discharged on a truck with elevated costs of handling and disposal. Furthermore, the accumulated ash has a high percentage of unburned carbon which causes a loss of the boiler's efficiency.

In order to avoid these problems Magaldi has installed for the Group #8 the ash recycling system that endows continuously or in-continuously the ash accumulated into the silo and transported through a pneumatic conveying system directly into the boiler near the burners area.

This process allows a complete burned-out of the unburned carbon increasing the boiler efficiency with positive effects on the environment and eliminating ash disposal and handling costs.

The recycling conveying system mainly consists of a booster (centrifugal type) located underneath the storage silo which is able to convey the ashes directly into the boiler through inspection doors located by the burners area. The boiler inlet have been selected to obtain the maximum level of complete burned-out by taking consideration temperature, environment oxidizing, and residence time, as main parameters. The installed system is completely managed by an automatic PLC which has a control instrumentation for the acquisition on-line of the operating conditions.

Magaldi Superbelt in 2007

by **Alberto Lalia** *Sales Engineer* alberto.lalia@magaldi.com

The 2007 was a brilliant year for the sales of the Magaldi Superbelt conveyor. Many customers from all over the world have chosen our technology for conveying hot, heavy and abrasive material.

INDIA

A big success came from India, a country where the economy is growing very quickly. Indian foundries need "state of the art" equipment in order to meet the specification of the international investors (mainly automotive groups) that are sourcing more and more castings from this part of the world because of their good quality and low cost.

A total of seven conveyors has been supplied to some companies among the biggest Indian foundry groups like AMTEK, RICO AUTO, TEXMO, TURBO GROUP.

The Magaldi Superbelt conveyors in these foundries are mainly used for castings cooling, castings transportation, shootblasting loading, casting sorting and degating, with a very high level of satisfaction from all of them.

SPAIN

Also the Spanish customers confirmed their trust in Magaldi with two Magaldi Superbelt conveyors supplied respectively to NISSAN FOUNDRY and FAGOR - VICTORIO LUZURIAGA TAFALLA.

The latter has already bought two Magaldi Superbelt conveyors over the past 4 years, therefore their choice is based on their complete level of satisfaction.

HOLLAND

The FINNISH COMPONENTA group decided to replace the existing traditional apron conveyor in the foundry of Hoensbroek (Holland) for a more dependable and reliable Magaldi Superbelt conveyor.

This conveyor is 1200 mm wide and 38 meters long and it is used for casting degating and sorting right after the shake-out.

The operators degates the castings with hydraulic wedge and a manipulator sorts the castings over the sprues working directly on the belt.

For this heavy duty application the pans of the belt are in Hardox 400 steel.

ITALY

In Italy the customers ILVA Spa, O\CAVA and CMV RONCONE have chosen the Magaldi Superbelt conveyor for completely different applications. ILVA decided to install a weighing feeder based on the Magaldi Superbelt technology in the Taranto steel mill. O\CAVA installed a Superbelt conveyor 14 meters long, 1400 mm wide with the pans in Hardox 400 steel for casting degating.

The manipulator works on the belt that has to withstand the heavy shock load generated during the degating operation.

CMV RONCONE will handle with a robust Magaldi Superbelt conveyor the heavy iron plates that could not be handled with a weak rubber belt.

P.R. of China

Magaldi Casting Cooler for Georg Fischer Kunshan

by **Fabio de Feo** *Area Manager* fabio.defeo@magaldi.com
by **Alberto Lalia** *Sales Engineer* alberto.lalia@magaldi.com

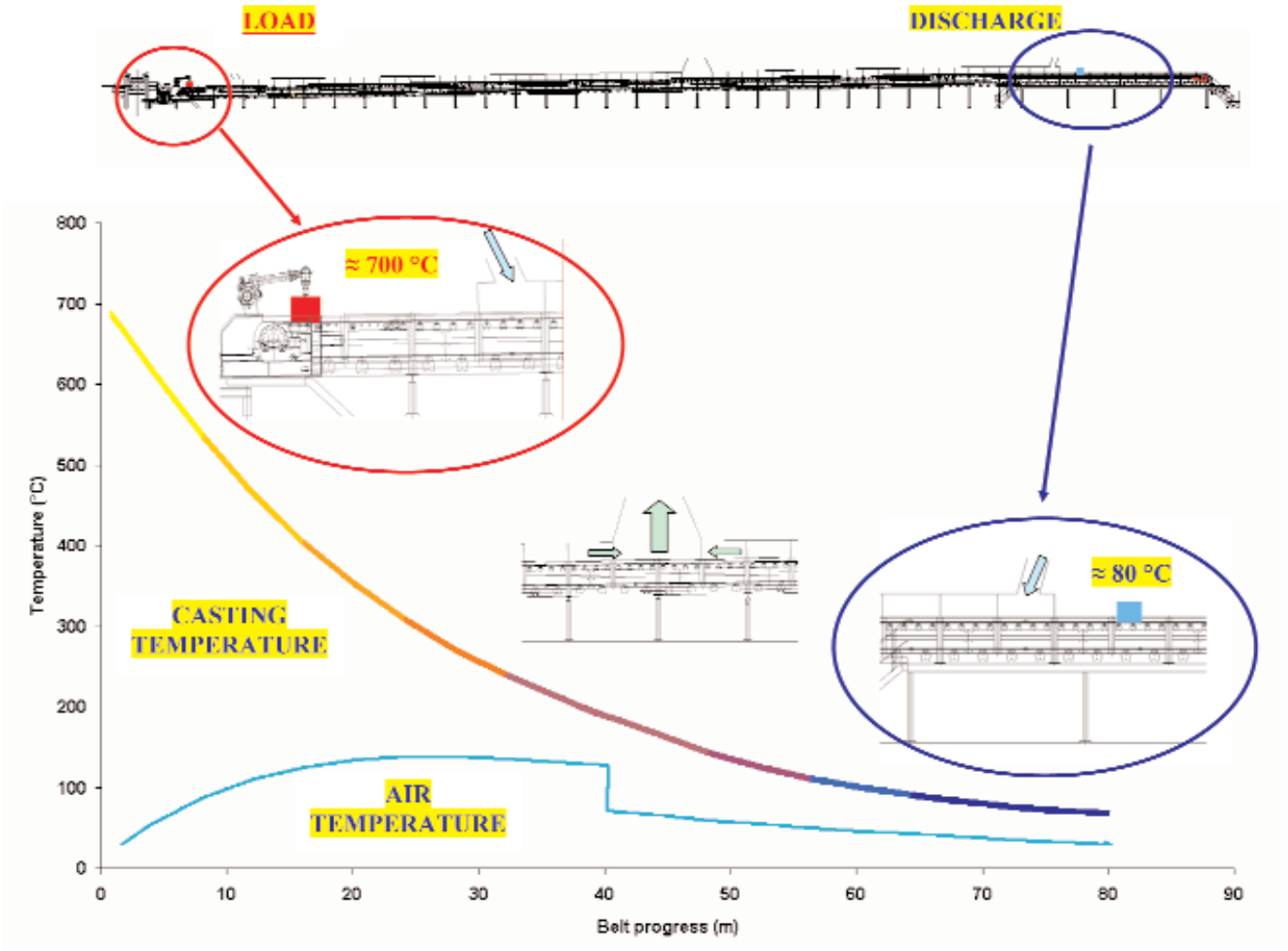
Project description

After the successful installation of two Magaldi Casting Coolers in the Singen foundry in 2004, the Georg Fischer group decided to renew its trust in Magaldi technology.

This is the confirmation of the dependability and the high quality of the Magaldi products.

In fact in a big project of expansion of the business, the Swiss Georg Fischer AG decided to build a complete new foundry in China, few kilometres far from Shangai in the industrial area of Kunshan. The philosophy was to build a foundry for automotive components in a convenient location, maintaining the European standard of quality and efficiency.

The new foundry will work 6 days per week, 3 shifts per day and 7,5 hours per shifts, this means that all the installed equipment must have a high dependability (required 99.5%) in order to ensure the expected productivity.



Process description

The moulding line will be a HWS with a mould size of 1050 x 900x 640 produced at a max. rate of 160 molds/hour.
After the shake out, the castings will be loaded onto two Magaldi Casting Coolers. They will be equipped with a cooling hood maintained under negative pressure that will force a stream of air at a controlled speed to cool the castings.
The inlet temperature of the castings will be 690°C and the required outlet temperature is less than 80°C. The cooling media will be forced air introduced at the extremities of the cooling tunnel and sucked out from the centre.
The two Magaldi Casting Coolers will have a length of 95 meters each, a useful width of 1200 mm and a cooling tunnel of 78 meters long.
At the end of the cooling tunnel the clusters will be de-gated using hydraulic wedges, just before loading them manually on the hooks of the continuous shot-blasting.
Magaldi is in charge of the complete project, including engineering, supply, erection of the system and will be responsible for its performance both in terms of production and cooling effect.
In fact the Magaldi's research and development engineers have made a detailed cooling simulation in order to evaluate the temperature differential of the castings along the tunnel, calculating all the heat dispersions and the main parameters for the control of the process.
The start-up of this new "state of the art" foundry is scheduled to be beginning of 2009.

Italy

Magaldi Weighing Feeder for ILVA Taranto

by **Alberto Lalia** *Sales Engineer* alberto.lalia@magaldi.com

At the beginning of 2007, ILVA SPA, the biggest European steel mill company, contacted Magaldi in order to replace the existing vibrating weighing system for dosing the fines, coming from the sintering process.

The request was to have a higher accuracy in the weighing process in order to improve the recovering efficiency of the fines coming from the screening (MDRI), and a dependable system for the transportation of this material that is very abrasive. The solution has been found in the Magaldi Weighing Feeder, an assembly of the dependable and patented Magaldi Superbelt steel belt conveyor, and a weighing system made by four loading cells that will continuously weigh the layer of the material transported by the conveyor. The speed of the Magaldi Weighing feeder will be controlled through a frequency converter. The actual feed rate is determined by integrating the belt speed, which is taken from a tachometer and the weight signal which is given by the load cells. The controller compares the actual feed rate with the desired feed rate and it adjusts the belt speed in order to deliver an uniform and controlled feed rate. Magaldi will be in charge for the complete supply and erection of the weighing feeder, integrating the electrical signals coming from the weighing in the existing PLC of the ILVA control system. This equipment will have the dependability of the Magaldi Superbelt conveyor, the resistance to the abrasiveness given by the pans in Hardox 400 steel and the weighing accuracy of +/- 3% as requested by the customer.

Further advantages of the Magaldi weighing feeder compared to the existing system

- Reduction of the noise (the Magaldi Superbelt has a noise level under the 65 dB).
- Elimination of the dust in the environment.
- Reduction of the wearing parts.
- Lower maintenance and operational costs.

Technical data sheet of the MAGALDI Weighing Feeder

Capacity:	400 t/h
Length:	2500 mm
Useful width:	1400 mm
Positioning:	Horizontal
Accuracy:	+/- 3%
Belt type:	PD/MN 1408.108 (Hardox 400 steel pans)

Material characteristics

Application:	MDRI transportation
Grain size:	0-10 mm
Abrasive:	high
Temperature:	400 °C
Bulk Density:	1,6 t/m^3

MOW - MAGALDI OPEN WEEK

by **Raffaele Ciotta** *Marketing Manager Asst & Service Manager Asst* raffaele.ciotta@magaldi.com

The Magaldi Open Week is an open forum of discussion that was held from September 30th to October 4th in the wonderful scenario of the Amalfi Coast and Sardinia Island.

The aim of the event was to launch and to introduce the latest Magaldi innovations in Dry Bottom Ash Handling Systems in order to create a link between Magaldi personnel, clients and potential users and above all to have an exchange of information and a better understanding of customers needs and requests.

The attendees were sixty-eight people belonging to all major worldwide Utilities, Architectural Engineering companies and Magaldi Licencees.

During the event all potential clients benefited from the meetings increasing their knowledge in Magaldi Dry Bottom Ash Handling Systems, by having all their questions satisfactorily answered at the end of technical sessions and a site visit to Fiume Santo Power Plant where are installed MAC/MAR systems.

The first two mornings of the event have been spent in the Hotel Raito (Amalfi Coast) and dedicated to technical sessions, where Magaldi personnel and testimonials introduced Magaldi systems.

The afternoons were dedicated to cultural visits to the most interesting local beauties such as Amalfi Cathedral, the ancient villas in Ravello, the Roman ruins in Pompeii and the artistic ceramic handcrafters.

In the afternoon of the 1st of October we arranged a tour to Magaldi manifacturing facilities to show the technological and quality level obtained by Magaldi over the years.

On October 3rd, all the group went to Sardinia for a tour to Endesa Italia Fiume Santo Power Plant (2 x 320 MWe), where Magaldi engineers showed to the attendees the MAC/MAR systems in operation.

This Endesa Power Plant features a number of Magaldi systems and installations:

- MAC Magaldi Ash Cooler®
  The unique system for dry extraction, cooling and handling of bottom ash from pulverized coal-fired boilers.
- MAR®, Magaldi Ash Recirculation
  The innovative Magaldi system to recirculate the bottom ash back into the boiler to transform them into fly ash, completely eliminating the bottom ash handling and storage.
- Fly Ash Silos
  Their installation has improved the material handling inside the plant and optimized the management of ash disposal, with full respect of the most recent environmental regulations.
- Coal reclaiming systems
  An efficient, cost effective method of reclaiming stockpiles and feeding material.
- Control systems
  To maintain the main production process equipment operating efficiently and constantly, with the scope to increment system reliability and to reduce risks of damages.

The event ended with a gala dinner at Melìa Olbia Resort with the greetings of Paolo Magaldi, where the guests tasted the local food and enjoyed a jazz band performance.

100 MAC® IN THE WORLD

by **Fulvio Zubini** *Managing Director* fulvio.zubini@magaldi.com

On March 19th 2008, Magaldi has signed a contract with Messrs. SES TLEMACE, the renowned boiler manufacturer from Slovakia, for the supply of a MAC® System that will be installed in the new ENDESA Bocamina 2 Power Plant in Chile.

OK - good to know, but what's new? - may you ask?

Well, all our contracts are important to us, but it happens that this MAC® system will be MAC® #100.

The concept of dry bottom ash technology was first introduced in mid-80s by Mr. Mario Magaldi, and this is a typical case of cross-breeding as we study in the books.

At that time Magaldi Industrie was a small company with a large experience in the design of steel belt conveyors capable of handling high temperature materials in cement plants and foundries.

Mr. Mario Magaldi had the idea of applying his well proven technologies to a completely different field – the handling of the bottom ash of coal fired boilers.

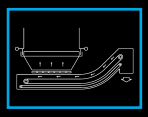
And thus the MAC® System was born.

The over 20 years of continuous development have dramatically improved the process and refined the equipment, but the basic design has remained the same – rugged and reliable. Those features are appreciated by our Customers and have helped in building the reputation that Magaldi brand and products enjoy all over the World.

In the global economy market we can proudly state that our Company's most valuable asset is the satisfaction of our Customers. And our score card witnesses our success – if it took almost 20 years to install the first 100 units, at the current pace we expect to reach the 200 tag within 2009.

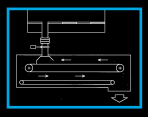
But this is another story – for the time being let us celebrate our MAC® System #100 together with all our Customers who believe in us and to whom we are committed.

MAGALDI
Dependable technologies

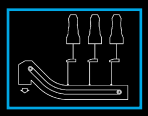


MAC – Magaldi Ash Cooler
Dry bottom ash extraction system

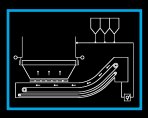
SUPERMAC
Extraction and air/water cooling system
for large quantities of heavy ashes



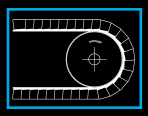
Magaldi Fluimac
Dry ash extraction system for fluid bed boilers



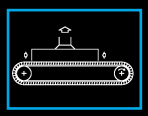
MAGALDI MRS – Magaldi Mill Rejects System
Dry coal mill rejects handling system



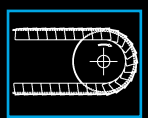
MAR – Magaldi Ash Recycling
Dry extraction and recycling of bottom and fly ash



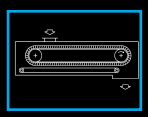
Magaldi Superbelt
Dependable steel belt conveyor



MCC – Magaldi Casting Cooler
Magaldi Superbelt for forced air casting cooling

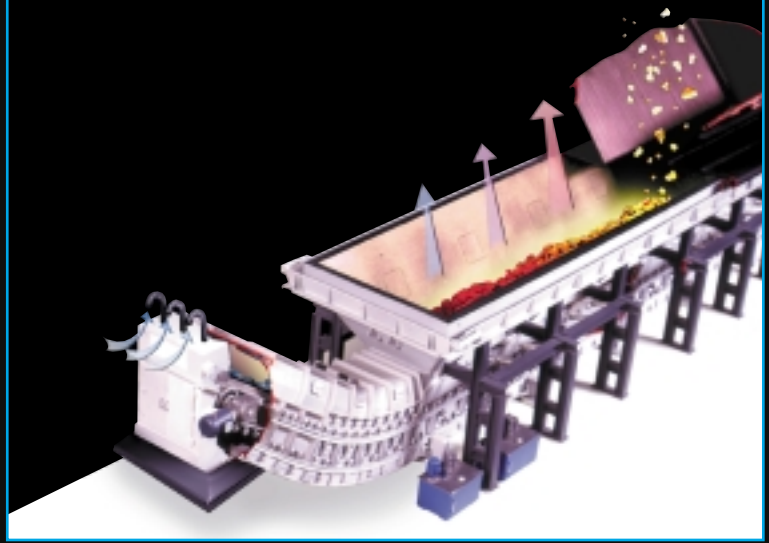


Magaldi Superbelt PR/PRZ
Magaldi Superbelt for casting sorting over sprues



Magaldi Ecosuperbelt
Dust proof Magaldi Superbelt conveyor

Dependable by innovation since 1929



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