

MAGALDI NEWS

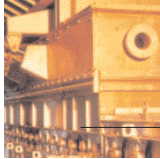
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LOOKING AHEAD
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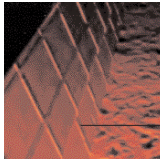


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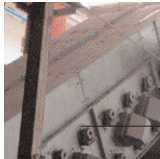
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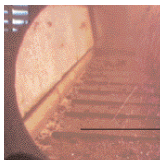
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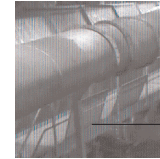
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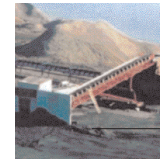
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Los Barrios (Spain)

A 550 MW Retrofit in Southern Spain

by Romolo Carrieri Area Manager

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ENDESA is one of the largest private electrical groups in the world, with a total installed capacity of 42,000 MW, 133,600 GWh distributed capacity and more than 20.5 million customers in 12 countries. It is the principal electricity company in Spain, Chile, Argentina, Colombia and Peru and has strong presence in Brazil, Italy, France, Portugal and the Dominican Republic. Endesa's headquarters are in Madrid, Spain.

Endesa Generación's Los Barrios Coal Fired Power Plant is located in the Algeciras Bay, close to Gibraltar's Rock in a beautiful landscape between Spain, Africa and the Atlantic Ocean. The power plant was delivered in 1985 and comprises one sub-critical forced circulation boiler rated at 1831 MTPH of steam @ 168 bar / 540 °C for a net electricity production of 552 MWe. The coal is imported mostly from South Africa and Colombia.

For the bottom ash and pyrites han-

dling, the unit was originally equipped with a wet sluice system.

In order to reduce its environmental impact, the system used a 'closed loop' for water treatment and recirculation. This way of operation, however, led to high operating & maintenance costs due to the high power consumption, the need for manual operation and the rapid wear and corrosion of the equipment. Furthermore, the wet process resulted in increased boiler heat losses, a relatively poor saleability of the ash and at one occasion even to a forced boiler outage due to system failure.

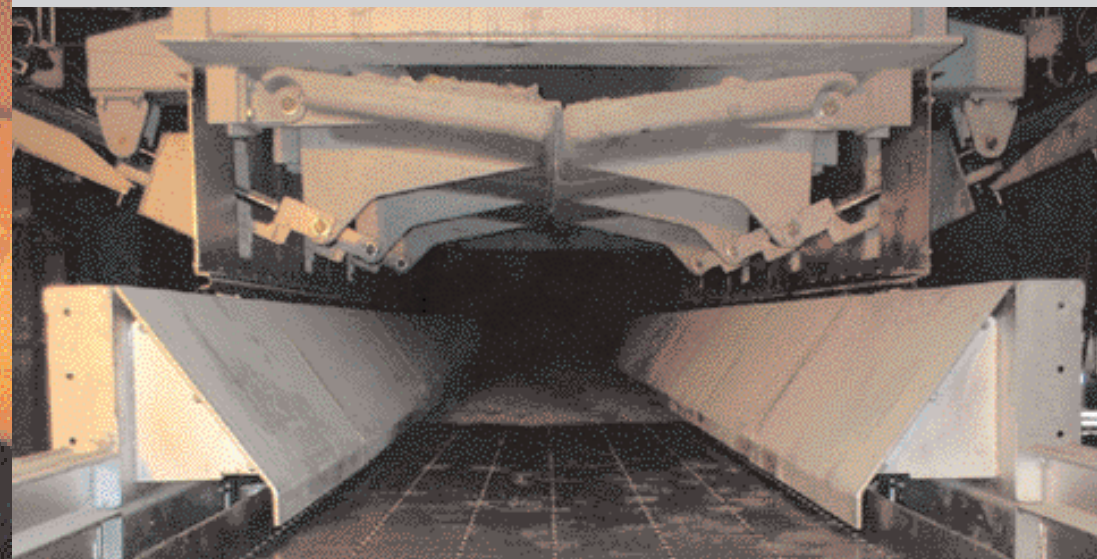
Endesa, thus, decided to commission to MAGALDI POWER S.p.A. a complete retrofit of the wet bottom ash and pyrites handling system in Los Barrios. Despite the relevant erection works, an outstanding 35 day installation was achieved during July and August, 2003. The MAC® system in Los Barrios consists of a refractory lined hopper, having on its bottom hydraulically controlled doors, a 42 m MAC® extractor, a

single roller crusher and two bucket elevators, one working and the other in stand-by, discharging the bottom ash into the existing silos. Bottom ash is then humidified and discharged onto trucks. For the mills reject handling a 50 m steel belt conveyor has been provided, feeding a bucket elevator, that discharges into an existing silo, which was relocated.

The whole system, for both bottom ash and pyrites handling, is completely automatic.

At the moment, the system has been operating for 16 months and the results of the project are definitely fulfilling the expectations: the plant's performance has been increased and environmental conditions improved. In particular, the following benefits have been obtained:

- The complete water recirculation and treatment system for both the bottom ash and mills reject handling has been eliminated, as well as fresh water use and waste water production;



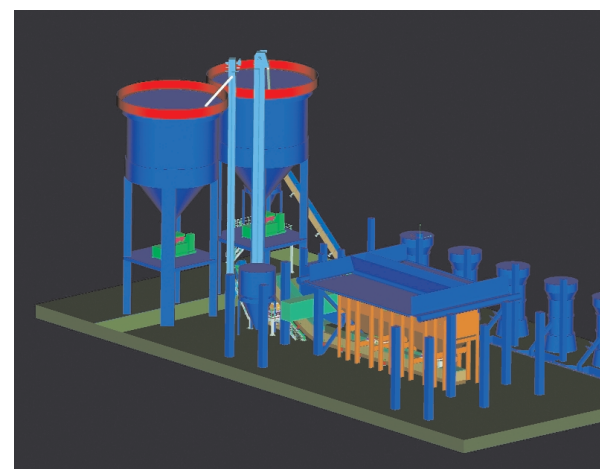


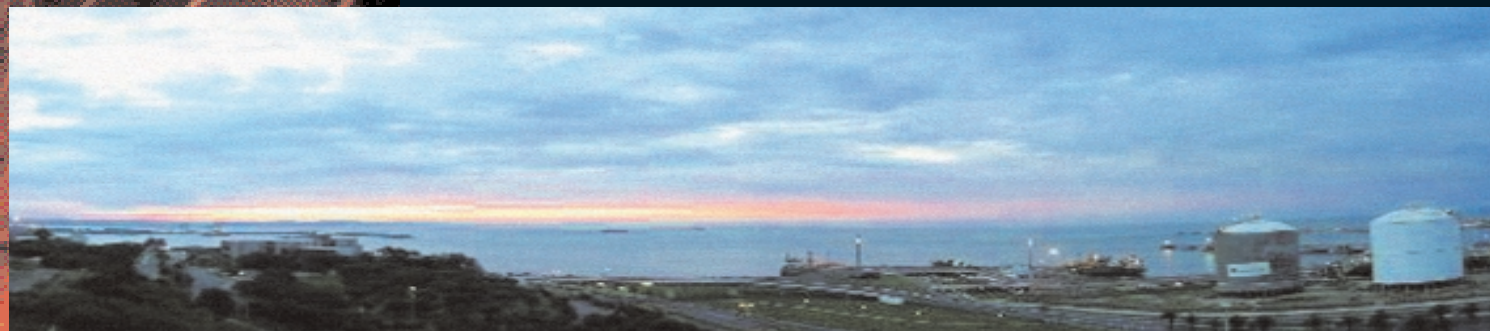
- Operating and maintenance costs have been reduced drastically, thanks to the saving on operational workforce, materials and labor for maintenance and on electrical power consumption. Total O&M costs of the MAC® system are estimated to be only 22% of those of the previous sluice system;
 - A significant reduction of the boiler's heat losses has been obtained. Unburned carbon content in the bottom ash has dropped from an average 12% to less than 4%, and around 1000 tons of coal are recovered by the dry mills reject system. The total heat recovery corresponds to a coal saving of app. 5500 tons per year, equivalent to a reduction of the CO₂-emissions by 12,000 tons per year;
 - The saleability of the dry bottom ash has been improved thanks to the low unburned carbon content and the dry state. The re-use of the bottom ash in the local cement industry leads to economical benefits as well as a further reduction of CO₂-emissions of app. 60,000 tons per year.
- To these figures, additional benefits are added:
- A significant increase in space availability in the plant thanks to the elimination of the ash settling ponds, settling tanks and related water recirculation equipment;

- A cleaner and safer working environment, thanks to the inherent safety of the MAC® system and the disappearance of water, mud and puddles on the working floor.

At present, a feasibility study is under way for the extension of the MAC® system with a pulverization station and a pneumatic conveying system to the fly ash silos. This would further increase the ash sales revenues and also reduce total ash handling costs by simplifying the overall ash management.

A detailed paper is available at the following link:
www.magaldi.com/main/papers.asp





Sines (Portugal)

An Environmental Friendly Choice in Sines P.P.

by Giacinto Giubileo *Project Manager*

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MAGALDI Power, member of MAGALDI Group, has received an order from Electricidade de Portugal for a turn-key retrofit installation of the Magaldi Ash Cooler (MAC®) on the first unit of the Sines power station (4 x 314 MW), located 150 km south of Lisbon.

The Sines P.S. boiler was equipped with water impounded hopper systems discharging bottom ash in SCC (Submerged Chain Conveyor), which were causing high operation and maintenance costs. Wet ash was sent to landfill for disposal. The water content of the ash, as received on the rubber belt conveyor, was in order of 35 – 40 per cent in weight or more.

A hydro sluicing system was also used for removal of mill rejects. The MAGALDI supply is composed of three main systems:

Bottom ash system (MAC® extractor, primary crushers, bucket elevator, hammer mills, vibrating screen, vibro-feeder):

The ash is extracted and cooled by the

MAC® extractor and crushed by the primary crusher. Downstream a bucket elevator is installed that conveys crushed ash to hammer mills in order to reduce ash size to 1,5 mm max.

To guarantee the max ash size vibrating screens are used to separate oversized material, that is recirculated into the hammer mills through the bucket elevator.

Pneumatic conveying system:

The pulverized bottom ash is pneumatically conveyed to the final destination and mixed with fly ash. Economisers ash is pneumatically conveyed and mixed with fly ash as well.

Mills reject system:

The mills rejects are temporary stored in surge tanks and subsequently con-

veyed to the final silo.

The conveying system is composed of vibrofeeders, special SUPERBELT conveyor and bucket elevator.

The special conveyor is very compact (width: 410 mm, height: 1165 mm), equipped with the SUPERBELT, therefore with exceptional properties in terms of wear, temperature, fire resistance. It is forecast to install the same MAC® system for the other 3 units within the end of 2007.

MAGALDI's MAC® dry technology is expected to improve plant operations, reducing at the same time O&M costs, eliminating the use of water and making the Sines facility a safer place to work. Further economical benefits deriving from the possibility to sell bottom ash mixed with fly ash, are also expected.



P.R. of China

MAGALDI in China

by Simone Savastano *Area Manager*

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As the world's most rapidly developing country, China is playing a dominant role in nowadays power industry. In the next twenty years an impressive new 600 GW will be added to the national power generation capacity, taking it to a total close to 900 GW and making China the first nation of the world in terms of installed capacity.

More than 60% of this immense power generation will be based on coal. An environmental friendly use of this energy source will be compulsory in order to reduce the impact of its effluents. Power generation in China today means burning 1.2 billion of tons of coal per year, a number that will grow up to 2.3 billions in 2030. Roughly 3% of this coal will become bottom ash. On average, wet systems use 6 tons of

water to remove 1 ton of bottom ash. Today this means wasting 216 millions of tons of water per year: the amount of water necessary to fill up a cylindrical reservoir with base diameter of 1 km and a height of 275 meters! An entire sea of water dispersed because of bottom ash conveying. MAGALDI is willing to be in the first row helping China making its energy development sustainable while saving the larger amount possible of this water: the MAC® system for conven-



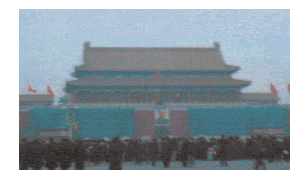
tional coal fired boilers and the FLUIMAC® system for CFB boilers make it possible to extract the bottom ash without the use of a single drop of this precious element.

The now well-established presence of MAGALDI in China dates back to 1997, when the first MAC® system was installed in unit 1 and 2 of Sanhe Power Plant.

Since then the growth has been stable and progressive: Tuopai, Changchun, Datong are only some of the steps which lead MAGALDI to its current role as the only supplier of referenced dry system for bottom ash extraction. And a particular note must be stressed for the outstanding results of the FLUIMAC® system installed in Jiawang units #1, #2, #3 and #4 (see page 15).

MAGALDI REFERENCES IN CHINA

1997	Sanhe	Unit #1, #2
2001	Tuopai (CFB)	Unit #1, #2
2002	Jiawang (CFB)	Unit #1, #2
2003	Changchun	Unit #1, #2
2003	Datong	Unit #6
2003	Jiawang (CFB)	Unit #3, #4



P.R. of China

FLUIMAC® System in Jiawang Power Plant

by Rocco Sorrenti *R&D Manager*

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The mostly used conventional method to remove and cool bed ash from Fluidized Bed Combustion (FBC) boilers is to drain it by water-cooled screw coolers.

The most critical element of screw coolers is the rapid wear of both the shell and the screw, leading to high maintenance costs. A second drawback of screw coolers is that the heat contained in the ash is usually lost in the cooling water. Another conventional method to cool the ash is to drain it into so-called fluidized bed coolers, in which the ash is cooled by pressurized air flowing through the ash. Although with fluid

bed coolers the heat from ash can be recovered by sending to the boiler the hot air leaving the coolers as combustion air, the system is sophisticated and expensive to operate, and usually requires a lot of space. MAGALDI's innovative FLUIMAC® system for dry bed ash extraction from FBC boilers is able to overcome the drawbacks of the conventional bed ash handling systems. The FLUIMAC® technology has been developed from the successful MAC® (Magaldi Ash

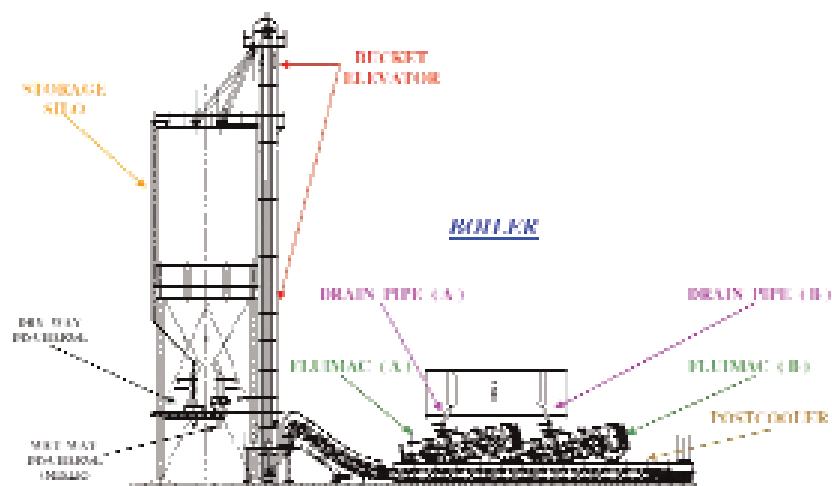


Figure 1
Lateral view of Jiawang
FLUIMAC® System

Table 1
Jiawang Boiler Data

Item	Unit	Value
Capacity	MWe	135
Bottom ash rate per boiler (max normal)	t/h	6.1
Bottom ash rate (design)	t/h	12
Bottom Ash Temperature leaving the boiler	°C	900
Number of drain pipes per boiler	-	2
Bottom ash Temperature (at discharge)	°C	150
Maximum furnace operating pressure (at drain pipe inlet)	Pa	12,700
Furnace operating pressure (at secondary air inlet)	Pa	5000
Boiler downward expansion (at drain pipe level)	mm	206
Boiler Lateral expansion (at drain pipe level)	mm	33
Diameter of drain pipes	mm	200

Cooler) system for dry bottom ash extraction from Pulverized Coal (PC) boilers.

MAGALDI RICERCH E BREVETTI S.r.l. has developed the innovative FLUIMAC® system for dry bed ash extraction from FBC boilers in order to provide a better alternative to the conventional bed ash handling systems. The main characteristics that MAGALDI provides with the FLUIMAC® system, include the following:

1. A conveying system that does not

suffer from heavy wear and that guarantees a high dependability, to minimize maintenance costs and to prevent boiler production losses;

2. The possibility to recover the bed ash significant heat content in a simple way to the boiler, in order to improve the boiler efficiency, using air only;

3. A compact system that is relatively easy to fit into the boiler design and that is user-friendly in its operation.

The FLUIMAC® system's basic concept is to extract the ash from the boiler

drain pipe with the MAGALDI Superbelt® steel belt conveyor and cool it with a small quantity of air.

The second full-scale application of the FLUIMAC® system is in operation in the Jiawang Power Plant (JIANGSU ELECTRIC POWER D.I.) in Jiangsu province (China). In this new Power Station four FLUIMAC® systems are installed. The first system was started-up in March, 2004.

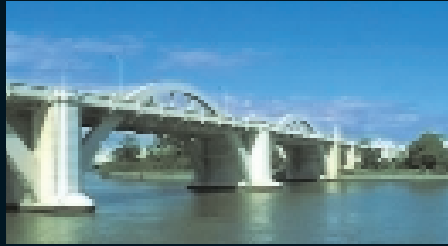
Some boiler data are given in Table 1. The Jiawang FLUIMAC® system lay-out



is represented in figure 1. This lay-out shows a standard configuration of FLUIMAC® systems; the equipment for each boiler consists of two FLUIMAC® systems, one for each drain pipe, that feed a Postcooler downstream. A bucket elevator transports the ash into the silo.

The FLUIMAC® system is able to extract, convey and cool the bottom ash up to final ash silo. FLUIMAC® benefits can be summarized as follows:

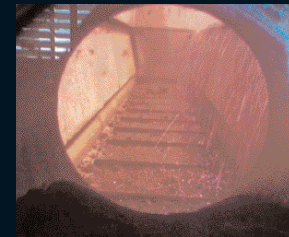
- Maximum dependability: no boiler forced outage due to the FLUIMAC® system.
- Low Maintenance Costs: the few regular maintenance activities that are needed can all be carried out from the outside of the system in operation.
- No use of water: the FLUIMAC® system does not use any water in the ash processing. It means that it does not suffer from any of the water-related problems of other systems:
- No consumption of water.
- No use of heat exchangers.
- No cooling water to be re-circulated or discharged.
- Recovery of energy: the FLUIMAC® system allows to recover to the boiler at least 900,000 Btu/h (low ash rates) up to 3,000,000 Btu/h (high ash rates).



Callide (Australia)

Obtained First Aussie Dry Bottom Ash

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



The first installations of the MAC® system in Australia are at CS Energy's Callide B Power Station in Queensland. The MAC® systems replaced the previously existing water impounded hopper to sluice systems at the 2 x 350 MW Units. Callide Power Station of CS Energy Ltd is the first "Zero Discharge" Power Station in Australia and comprises Station A B & C. Callide B ash dam was designed for Callide B only, but after the advent of Callide C the ash dam began to fill up at twice the rate. Evaluation of their ash storage needs led to three options:

- Extend the existing ash dam: Found to be expensive and a risk to the

water table. Callide area is a significant aquifer.

- Disposal of ash in an alternate location: Alternative locations, like voids, were not available.
- Using a High Concentration Slurry Disposal (HCSD) system which does not need a dam to hold up the ash. For feeding into the HCSD system CS Energy had two options for the bottom ashes:
 - A SCC system followed by dewatering or
 - The Dry MAC® System

In addition to savings in water and elimination of a lot of operational & maintenance costs, the MAC® system could provide direct answers to existing operational problems like clinkers and high temperatures. Dismantling of the old wet systems and erection of

Mindanao (Philippines)

MAC® Landing in Philippines

by Vincenzo Quattrucci *Sales Manager*

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On the northern coast of the island of Mindanao in the Philippines, the German IPP STEAG and a local partner have developed a 2x105 MW net bituminous coal-fired power plant. Kawasaki Heavy Industries, as the general contractor, will construct both power plant blocks, expecting the plant to start operations in 2006, following a 36-month construction period. This power plant is intended to

cover the growing energy needs of the Mindanao island and thus significantly contributes to the development of the infrastructure of this island. The necessary coal will mainly come from Indonesia and from the Philippines as well. The plant meets all local statutory environment requirements and the standards of the World Bank, including a dry bottom ash system supplied by MAGALDI, which will allow the water saving and a recovery of boiler effi-

ciency. The construction of the plant began at the end of November 2003. The Mindanao plant will be STEAG's third power plant project abroad, following Termopaipa in Colombia (165 MW) and Iskenderun in Turkey (1,320 MW). All these coal fired boilers have been equipped with the MAGALDI MAC® system, as a confirmation of STEAG satisfaction for this environmental friendly and highly efficient dry ash removal system.

the dry MAC® systems were performed with clockwork precision within the boiler outage period of 38 days.

Each MAC® system comprises the patented Magaldi Ash Cooler (MAC®) to collect, cool and transport the hot bottom ash and discharge it into a primary crusher to effect the first size reduction.

The MAC® is located below a refractory lined hopper fitted with bottom doors. The hopper is connected to the boiler bottom through a mechanical expansion joint allowing for the boiler expansions and ensuring that no false air enters the system.

Downstream of the primary crusher is located the Post Cooler conveyor, which is similar in construction to the MAC® conveyor. This carries the ash to a set of hammer mills for further reduction of particle grain size making them suitable for pneumatic and HCSD conveying.

A surge bin receives the ash from the hammer mills. The pneumatic ash pressure vessel is located at the bottom of the surge bin and conveys the ash to the final silo through the requisite pipelines and fittings. Each Unit is provided with a dedicated pneumatic conveying system.



Sulcis (Italy)

Revamping of a Coal Conveying System from the Coal Yard to the Boiler's Bunkers

by Simone Savastano *Area Manager*

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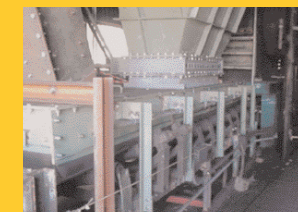
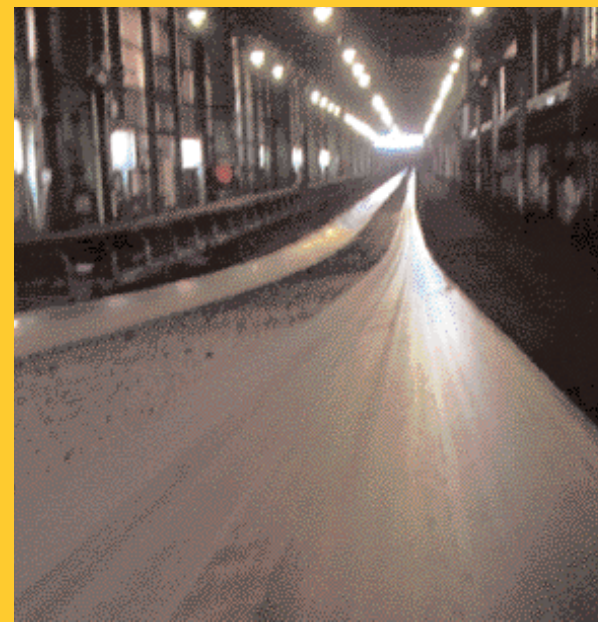
At the beginning of 2003, ENELPOWER decided to revamp the coal conveying system from the coal yard to the boiler's bunkers of Sulcis Power plant in Sardinia (Italy). The project's aim was to increase the capacity and the reliability of the mechanic conveying system, in view of the start up of the new Fluid Bed Unit #2 (340 MWe) foreseen in 2006.

The conveying system was composed of two underground hoppers loaded by a bulldozer in the coal yard.

Coal was extracted from hoppers by means of two vibro-feeders, onto a 1200 t/h rubber belt conveyor. Coal reached then a junction tower to be loaded onto two 600 t/h conveyors, either through two vibroscreens, each equipped with a crusher for over-size material crushing, or through an emergency by-pass.

The head of the two 600 t/h conveyors was equipped with two trippers for coal bunkering.

Thanks to MAGALDI's activities, the capacity of the coal conveying system passed from around 600 to about 1200 t/h. As a consequence a considerable time reduction for the boiler's bunkers loading operation was obtained.



The system's reliability and the on-site safety dramatically improved, maintenance time is reduced to 1/3, coal dust dispersions in the environment are efficiently suppressed and noise eliminated in the working area.

MAGALDI performed a full plant overhaul. The activities concerned the replacement or, where possible, the reuse of the grids and of the bunkers hoppers in the coal yard, the replacement of the 2 old vibrofeeders with new apron feeders, the complete revamping of the two 600 t/h belt conveyors, the remake of the coal screening equipment.

The equipment, that before got clogged up creating a bottleneck, such as vibrofeeders, vibroscreens and trippers, has now been completely revamped or replaced.

Furthermore the system has been

equipped with a state-of-the-art fire detection and fighting system and with a dedusting system.

The electric and I & C plants have been completely revamped by RRS, a MAGALDI Group company, and an automated system has been introduced. The old semi manual control system has been replaced with a new one allowing a remote control of the plant in a fully automatic way.

Inductive limit switches and related logics allow the trippers automatic positioning onto each bunkers.

During loading operation the system is able to detect the most correct filling sequence for the bunkers and, as a consequence, trippers are now moved automatically.

Bunkers are also provided with level indicators to allow a completely automatic coal bunkering.

Belt scales, take-up sensors, tilt switches, safety rods have been installed on the belt conveyors.

The new supervision system, through user friendly synoptic panels, allows to get real time detailed information about the plant status, as for example the level of the coal inside each bunker (with relevant evaluation of residual bunker capacity), the functioning status of each equipment, the fire detection and fighting system status and the actual coal rate on the belts.

Last but not least, the automatic adjustment of apron feeders coal rate allows to control the blending of the two different kinds of coal used by the Power Plant to feed the bunkers.

Singen (Germany)

Automotive Casting Cooling and Sorting

by Fabio de Feo Area Manager

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George Fisher is a leading development partner and system provider for industrial applications. One of the core business is GF Automotive, that among other facilities, owns a number of foundries to supply automotive components. In August 2003 George Fisher Lincoln, Great Britain, decided to replace its vibratory casting cooler with a MCC – Magaldi Casting Cooler.

This cooler, 60 meters long and 1,8 meters wide, was installed in order to eliminate the downtimes caused by the old vibratory conveyor and to eliminate the production losses of the 135 molds/h +GF+ molding line, producing 40 t/h of automotive castings. In 2004, after one year of trouble-free operation, the Lincoln's moulding line was dismantled and re-installed in the Singen Foundry, Germany. The Magaldi Casting Cooler was re-engineered in order to fit with the new layout that has basically seen the original 60 meters long conveyor split in two sections, 32 and 35 meters long

each. The two new cooling tunnels have been thus connected with the centralised venting system in order to cool the castings with 140.000 Nm³/h of air, before reaching the continuous shotblasting. After shotblasting, castings are discharged onto a Magaldi Sorting Conveyor, 26 meters long and 1,4 meters wide, where the operators can sort castings over sprues in an amazingly silent and dustless environment.



MAGALDI Customer's Satisfaction



Montebelluna - Martinsicuro (Italy)

The MAGALDI Superbelt® PR

by Matteo Carfagno Sales Manager

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Since when the new MAGALDI Superbelt® PR has been designed and engineered, a significant number of European foundries have been able to appreciate its advantages and features.

Fonderie del Montello in Montebelluna (Italy) installed the first one in 2003, Veco Fonderie Smalterie in Martinsicuro (Italy) the second one since 2004.

Both foundries have replaced the original vibrating conveyor downstream the continuous shotblasting with this new version of the well known MAGALDI Superbelt®.

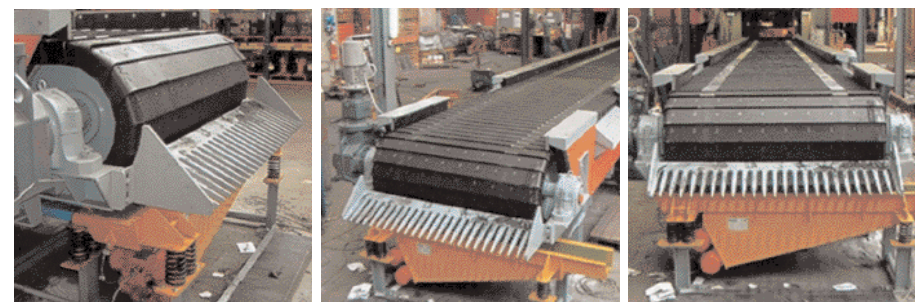
The MAGALDI Superbelt® PR has repre-

sented the ideal solution for the safety and operational problems that the foundries were facing during sprue removal and casting sorting operations. Compared to the continuous movements caused by the vibrating conveyor, the MAGALDI Superbelt® PR smooth operation has allowed a higher efficiency during the sprue removal and sorting operation.

Furthermore during operation the noise level is well below 65 db, the

conveyor is so silent that it is difficult to see if it is working or not.

Thanks to our customers' satisfaction, shown by written reference letters, we are now promoting this new product to foundries using continuous shotblastings. Recently one of the biggest shotblasting producer has shown its interest in our system, a sales agreement is currently under negotiation.



Fiume Santo (Italy)

Two Fly Ash Storage Systems at Endesa Fiume Santo Power Plant

by Livio Russo *Project Manager*

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MAGALDI Group got a “turn key” project from ENDESA - Fiume Santo Power Plant for a new fly ash storage silo.

The order refers to the engineering, procurement and construction of a 3000 tons storage silo, including civil works and the loading and unloading system.

The steel storage silo will be 28 meters high and 13 meters in diameter, designed to be self-supporting in order to be installed directly on the ground without steel structures. Fluid slides installed under the silo will transfer the fly ash to a bucket elevator that feeds the double lanes truck loading system, made of four articulated arms (4 x 140 t/h) equipped with telescopic spouts. Ash can be also discharged wet onto open trucks, by a paddle mixer. The fly ash will be transferred from the two existing intermediate silos to the new silo by extending the present pneu-

matic transportation system.

Furthermore MAGALDI will also convert an existing limestone storage silo in a second fly ash storage silo.

The storage capacity, will be 3000 tons. Fly ash will be discharged both dry, by means of 4 “chute loaders” (4x100 t/h unloading capacity) and wet, by means of a double-shaft paddle mixer (200 t/h unloading capacity). The new storage silo project and the revamping of the limestone silo intend to increase the ash storage capacity up to 3000 tons per each group, to improve the material handling inside the plant and to optimize the management of the fly ash dis-

posal, with full respect of the most recent environmental regulations.

The relocated Fly Ash Silos will also allow the feeding of a future ash transferring line to the Power Station dock for final ship loading.

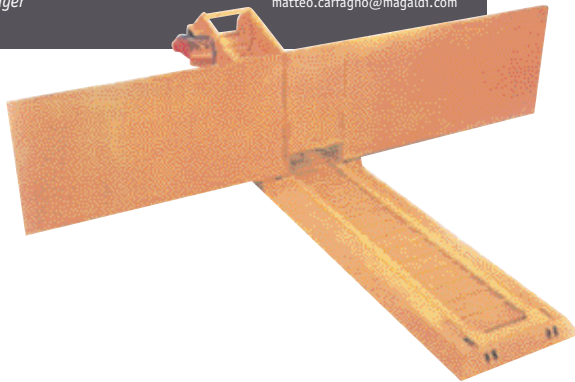
It is worthwhile to mention that the two silos will store fly ash mixed with the pulverised dry bottom ash produced by the Power station. Bottom ash is conveyed to the two intermediate silos by two MAC® systems already installed in 2003. In this way, there is no need for a separate bottom ash storage.

Fiume Santo (Italy)

Improving Coal Handling Efficiency in a Coal Yard

by Matteo Carfagno Sales Manager

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MAGALDI Group and Stamler have reached an agreement for the distribution of the Stamler Reclaim-Feeder in South Europe.

If a Company's target is the reduction of the management costs and the improvement of the material handling in a coal yard, the best solution is to install a Reclaim-Feeder as done by Endesa Fiume Santo Power Plant in Sardinia. This year Endesa requested us to supply a coal reclaimers to allow them to load the boiler's bunkers while the only stacker-reclaimer available was unloading the ship.

The customer needed to:

- Transfer over 800 coal t/h from the coal yard to the bunkers;
- Speed up the coal handling inside the yard;
- Avoid civil works causing considerable costs and relevant downtime;
- Keep the volume capacity of the coal yard unaltered.

MAGALDI engineering department designed a reclaiming system in order to solve the above listed requirements and after a deep investigation of the equipment available on the market, the use of a Stamler Reclaim-Feeder (the first in Italy) was decided.

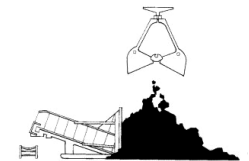
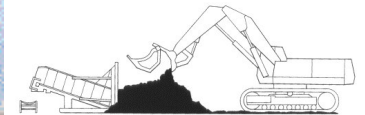
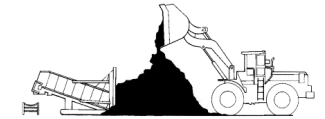
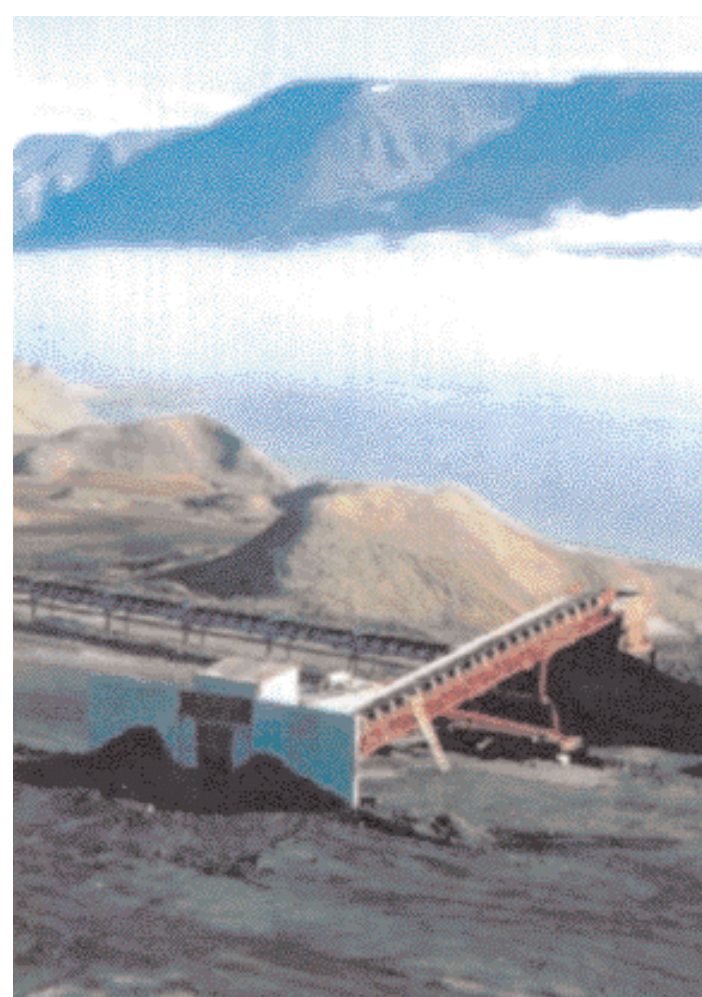
This Reclaim-Feeder is a compact and

sturdy equipment which offers multiple advantages:

- Easy installation
- Eliminate Costly Civil Work and Site Preparation

The hopper-less design allows material to be pushed by dozers or vertically discharged from front-end loaders, trucks, clam shell buckets and excavators directly onto the reclaim feeder - Efficiency and reliability

Several worldwide references show that the Reclaim-Feeder is built to suit heavy operating conditions, reaching a maximum capacity of 3200 t/h.





MAC* - Magaldi Ash Cooler
Dry bottom ash extraction system



Magaldi Flumac*
Dry ash extraction system for fluid bed boilers



MAP* - Magaldi Ash Post combustor
Bottom ash post-combustion system



Magaldi Superbelt*
Dependable steel belt conveyor



MCC* - MAGALDI CASTING COOLER
Magaldi Superbelt for forced air casting cooling

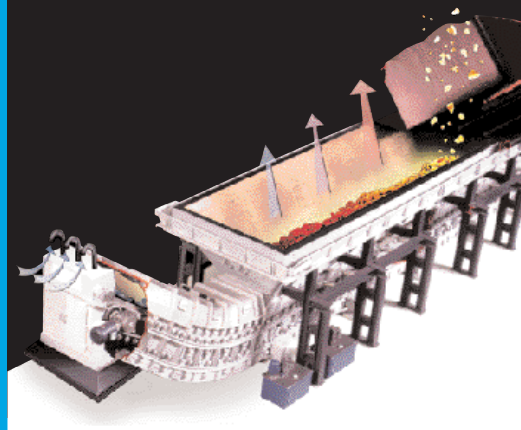


MAGALDI SUPERBELT PR*
Magaldi Superbelt for casting sorting over sprues



Magaldi Ecomag - Ecobelt*
Dust proof Magaldi Superbelt conveyor

Dependable by innovation since 1929



*Patents pending

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