

fans



BOLDROCCHI

HISTORICAL NOTES



Eng. Luigi Boldrocchi (1880-1949)
Founder of the Boldrocchi Company

On the 3rd of March 1909 **LUIGI BOLDROCCHI** established the activity with the first orders for the supply of ten centrifugal fans.
In **1911** the **Officine Termo Meccaniche BOLDROCCHI** was set up in Milano with an operating area of 3000 square meters.

In **1914** the first plant for air pollution control was produced.

The company offered a wide range of products including radial and axial fans, fire-tube boilers, coolers, dryers, ventilating and heat-exchange units and plants.

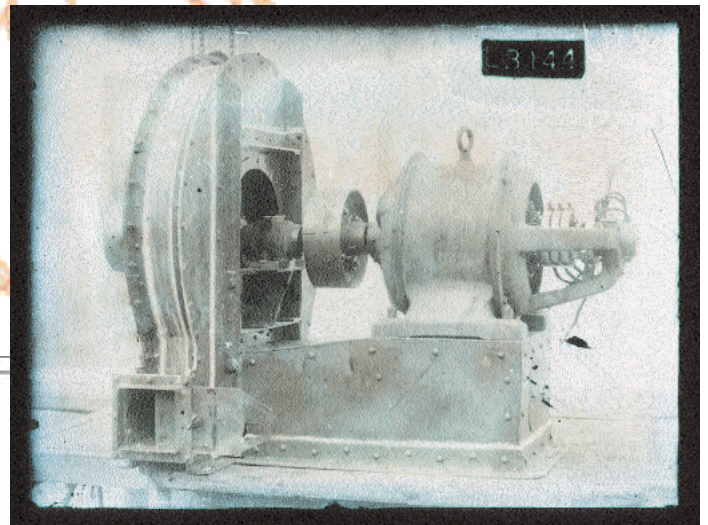
In **1926**, the licence for the manufacture of finned tubes was acquired in the USA and the manufacture of extended surface heat-exchangers was developed.

From then on, the product range has been enlarged, above all as regards air coolers and steam condensers, heavy duty and process fans, gas turbine ancillaries and diverters.

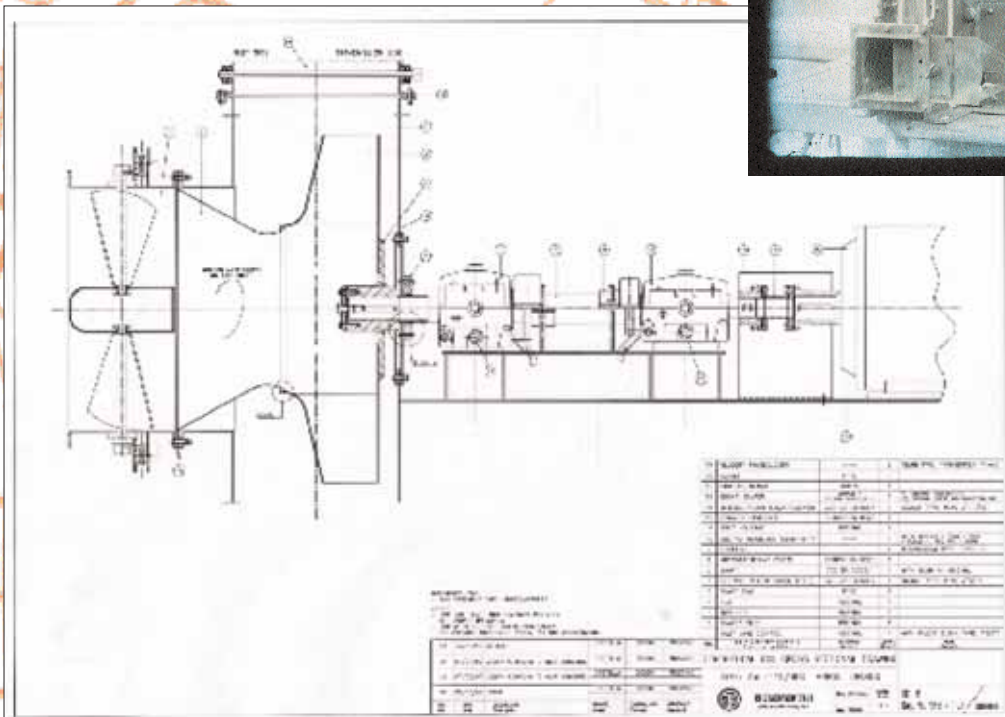
The recent acquiring and incorporation of several companies (**Aeroto**, **Marelli Ventilazione**, **De Cardenas**) allowed Boldrocchi to enter new market opportunities as supplier of air intake and exhaust

gas systems for gas turbine and large fans for any industrial application.

In 2006 a joint-venture manufacturing company has been set up in India.



D.I. high head centrifugal fan
supplied in 1915



Technical drawing of centrifugal fan

PRESENT SITUATION



C.A.D. Workstation in technical office

In three separate workshops with a total 27.000 square meter manufacturing area, Boldrocchi employs 300 staff, among which 100 are technicians.

The shops are equipped with thermal, acoustic and aeraulic test facilities.

Boldrocchi production is divided into four main lines: heat exchange (exchangers and coolers), fans, industrial noise protection and air pollution control. Today production is featured by highly specialised technical contents, many decades of 'on site' experiences, flexibility in design and in production together with high quality standards. Supplies are tailor made to fulfil all Customers' specific requests. Boldrocchi Quality system is certified according to ISO 9001 since 1993 and according to ASME Code since 1998.

A wide range of materials are usually used: steel and copper alloys, aluminium, titanium and plastic materials; more than 200 welding procedures have been qualified. The products are subject to intermediate and final testing, witnessed by the Customers.

EXCHANGERS

- Air coolers for refinery service and for other industrial purpose
- Shell and tube heat exchangers
- Surface condenser
- Gas heaters and coolers
- Air pre-heaters
- Finned tube coolers and heaters.

POWER TRANSFORMER COOLERS

- Oil to Air coolers
- Oil to Water coolers single tubes
- Oil to Water cooler double tubes
- Low noise fans
- Axial and radial pumps

MOTORS AND GENERATORS COOLERS

- Air-air coolers and air-water coolers
- Explosion proof and special equipment
- Complete equipment with coolers, hoods, fans, filters and silencers
- Hydrogen coolers
- Oil bearings coolers
- Heavy duty axial fans

RADIAL FANS

- For industrial application
- Flow rate : up to 600 m³/s
- Pressure : up to 80 kPa
- Shaft power : up to 8.000 kW
- Temperature : up to 850 °C
- Tip speed : up to 300 m/s
- Use of special materials
- Gas tightness for special fluids
- Wear and corrosion design

AXIAL FANS

- Variable pitch blades
- High efficiency
- Use of special materials

AEROTO DIVISION

- Gas turbine air intake
- Gas turbine exhaust systems with diverters, silencers and stacks
- Absorption and resonance silencers
- Silencers for gas exhaust of internal combustion engines
- Acoustic enclosures complete with auxiliary plants

ECOLOGIA DIVISION

- Fabric filters
- Electrostatic precipitators
- Scrubbers
- Mechanical collectors
- Gas coolers and conditioning towers
- Hot gas ducts
- Dust handling
- Bag filters and ESP revamping
- Gas cleaning plants enhancement
- Planned maintenance services

SERVICE DIVISION

- Problem solving
- Field measurements
- Rebuilds and upgrades
- Revamping of existing
- Component upgrade and overhaul
- Commissioning and erection supervision
- Periodic and preventive maintenance

FANS

Today **Boldrocchi** spans over a wide range of fan types, used in all industrial applications. The growing importance of these machines marked the steps of a continuous and quick technical evolution, to which **Boldrocchi** has perfectly adapted in terms of design and manufacturing capabilities. For instance, with the recent acquisition of the technical and production know-how of Aeroto, De Cardenas and Marelli Ventilation Companies, **Boldrocchi** became an outstanding supplier, not only in Europe, in the heavy duty fans field.

Synergies with **Aeroto Dept.** for acoustic treatment and with **Boldrocchi Ecologia** for gas dedusting are another strength point of **Boldrocchi** fan production.

DESIGN, CONSTRUCTION AND TESTS

The high performance fans, as requested nowadays, involve strict procedures throughout all stages of design, manufacturing and testing.

As regards fans materials and in particular for the rotating parts, **Boldrocchi** foresees high-yield materials and corrosion/abrasion protecting coatings. Impeller and steel works calculations are performed on stress analysis for a proper sizing of all the details.

Moreover the rotating parts are designed to avoid any resonance with the supporting structures.

Boldrocchi manufactures its fans using certified materials. All weldings are carried out according to proper specifications by pre-qualified welders and with pre-qualified procedures.

Stringent dimensional and ND tests are performed on all the portions and on the whole assembled fan. Impellers are carefully balanced on high-sensitivity balancing machines.



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1

Special products

Two axial fans for a battery of 14 for a wind tunnel

Diameter 1750 mm

Installed power 132 kW

Speed 990 rpm

2

Performance test

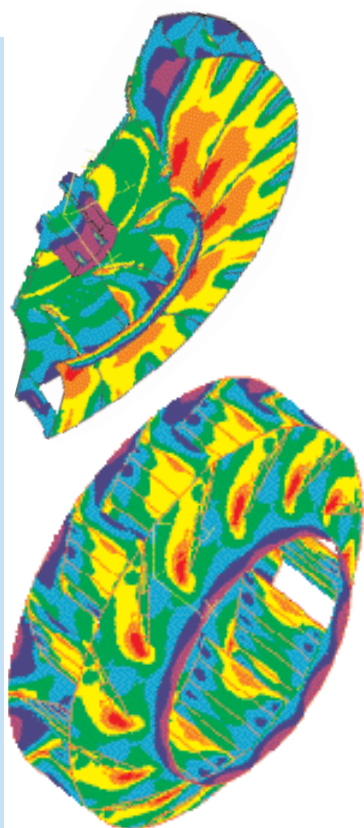
Test room in Biassono workshop as per AMCA 210

Fig.7 - Outlet duct setup



2

4



3

A deep search based on software finite element calculations allows **Boldrocchi** to choose the proper size and materials of the designed fan, in order to match the customers' requirements.

In our test room (the largest in Italy) tests are carried on in compliance with international standards, even on fan prototypes, in order to point out their performance curves : flow rate-pressure, flow rate-power, flow rate-noise level.

The experimental data are processed by the Engineering Department to optimize the fans series.

Special tests are performed, on case by case basis, to verify the fans performances, even assembling specific test rigs.

PROCESS ENGINEERING AND SERVICE

Thanks to an extended experience in the ventilation business, **Boldrocchi** is able to supply to customers a valuable and reliable engineering consultant service, on already installed fans, to increase performances, to comply with environmental rules, and to save energy, either on own production fans or on fans supplied by other manufacturers.

This service integrates the after sale service, dedicated mainly to periodic and predictive maintenance, mechanical troubles diagnostic and solution, dynamic balance of rotors in site and erection supervision.



4

Finite Element Analysis

Highly stressed impeller analysed with shell and brick element

3

Special test

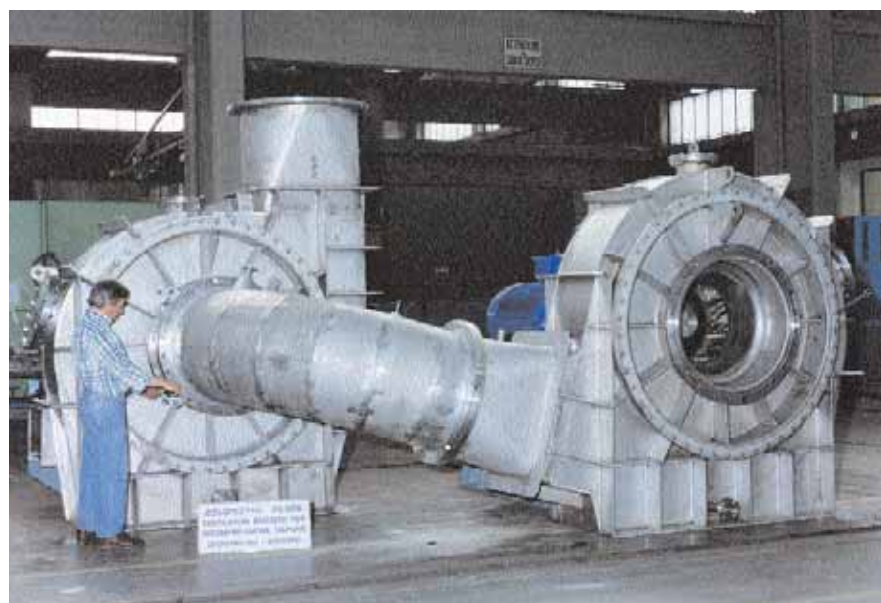
*Hot gas test for chlorination blower
Test performed at 500°C for 4 hours and 1 hour without lubrication unit*

4

New products

*Mechanical vapour recompression blower
Double stage blower with duplex steel impeller of 1420 mm running at 3600 rpm*

5



5

POWER

Forced draft fans, primary and secondary air fans, gas recirculation fans, induced draft fans for power boilers, deNO_x/deSO_x systems.

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1

Gas recirculation fan
Double inlet type,
during heat insulation
assembly
Flow rate 67 m³/s
Static pressure 9 kPa
Shaft power 850 kW

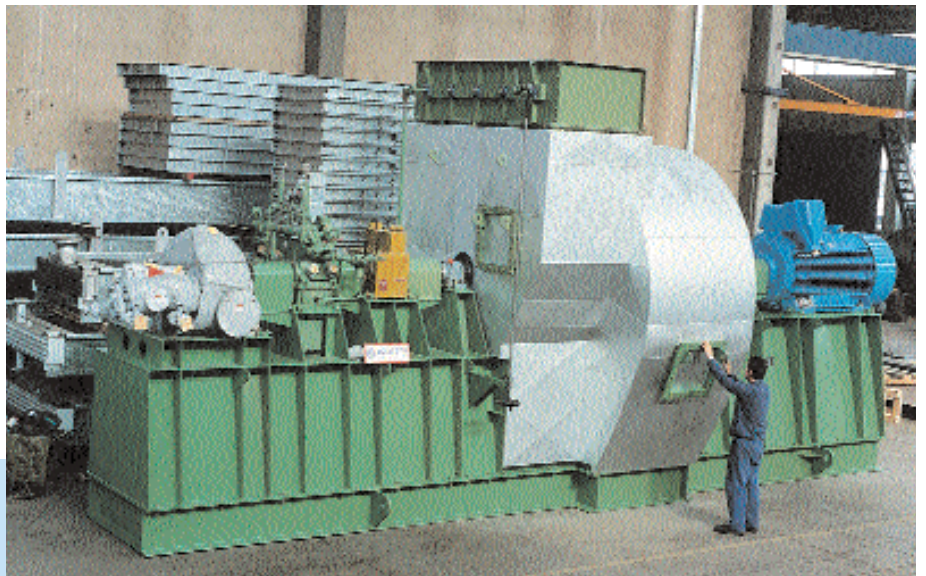
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Combustion air fan
Assembling in work-
shop for running test
Flow rate 341 m³/s
Shaft power 2420 kW

3

Forced draft fan
Double driven fan for
steam boiler
Flow rate 59.4 m³/s
Static pressure 8.3 kPa
Shaft power 600 kW

3



INCINERATORS

Forced draft fans, primary and secondary air fans, induced draft fans for incinerating plants.



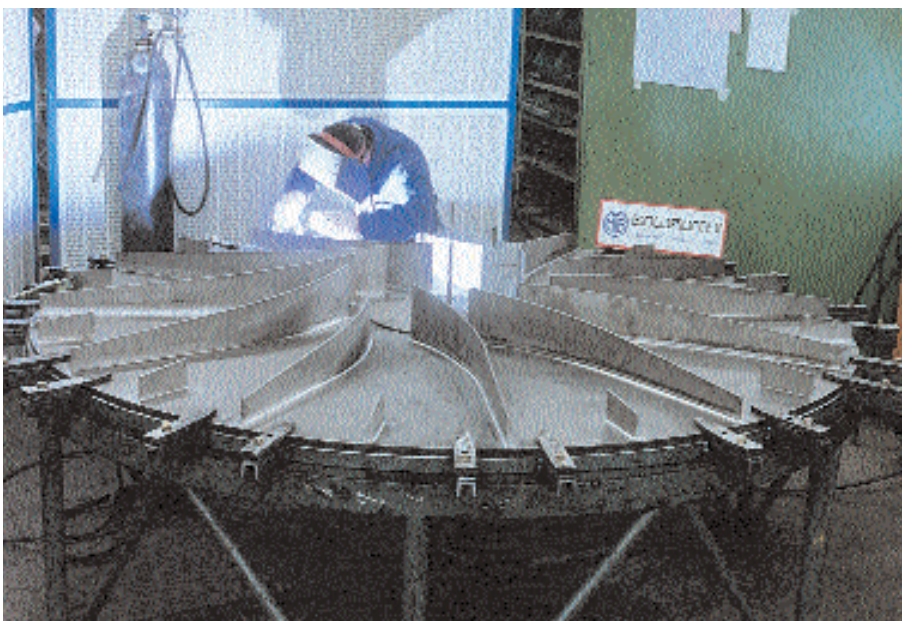
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5

Extraction fan
*For water saturated flue gas from refuse incinerator
Rubber lined casing with Uranus B6 impeller
Flow rate 16.5 m³/s
Static pressure 11.7 kPa
Shaft power 234 kW*

4



6

Induced draft fan
*For deSO_x application in an incineration plant
Flow rate 51.7 m³/s
Static pressure 11 kPa
Installed power 700 kW
Speed control by hydraulic coupling*

5

Induced draft fan
*Welding of titanium impeller for waste refusal gas
Impeller diameter 2500 mm
Static pressure 23 kPa*

6

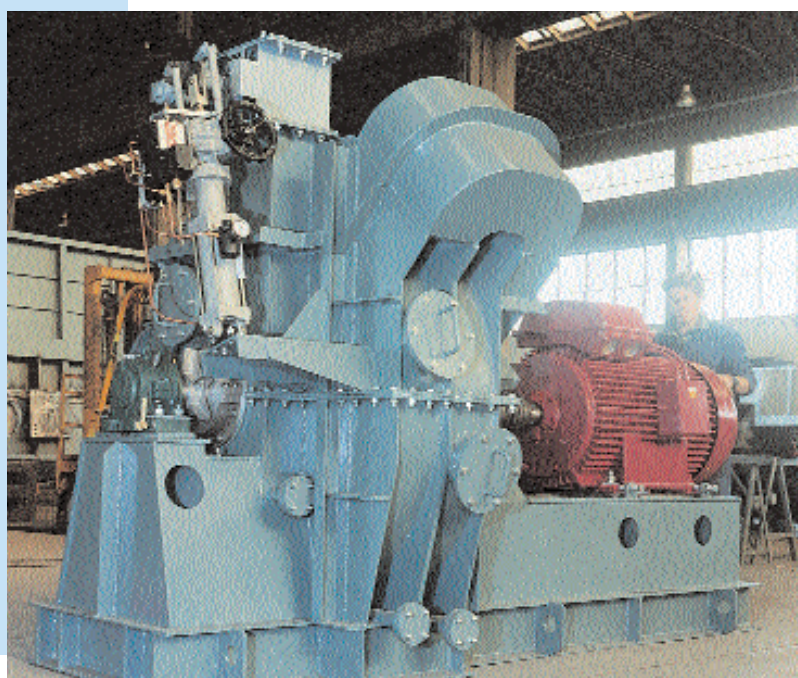
CHEMICAL AND PETROCHEMICAL

Fans for hydrocracking, ethylene, ammonia and urea, chlorination, methanol, allumina plants, etc.



2

1



1

Chlorination plant

*Dye penetrant test on plug unit
Operating at 500°C, the fan is manufactured in Inconel 600*

2

Fertilizer plant

*Double stage booster blower
Flow rate 2.4 m³/s
Static pressure 42.4 kPa
Shaft power 158 kW*

3

Hydrogen plant

*Forced draft fan installed on site, with air intake and Venturi duct
Flow rate 60 m³/s
Static pressure 5.9 kPa
Shaft power 1000 kW*

3

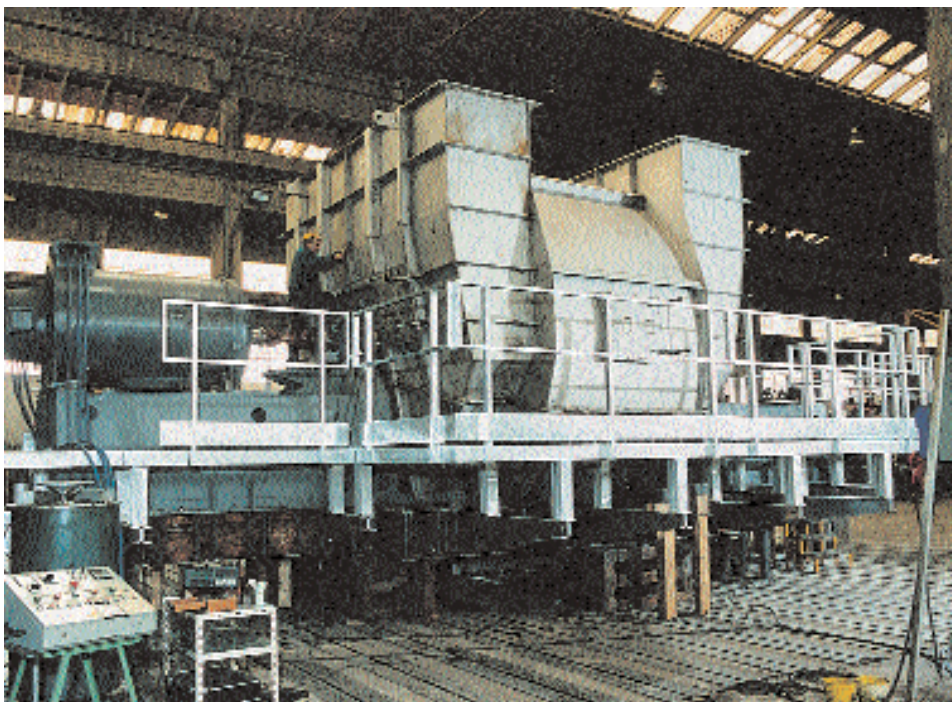


CEMENT



4

Raw mill fans, kiln primary air fans, kiln exhausters, filter exhausters, final exhausters, grate cooler fans, clinker grate exhausters, cement mill fans, coal mill fans, separator fans. Turn key plants and filters can be supplied in cooperation with **Boldrocchi Ecologia**.



5

Raw mill fan
Welding of double inlet impeller with radial tip blades and wear plates
Diameter 2050 mm



6

Exhaust fan after bag filter
Manufactured with stainless steel casing, during running test

Crane lifting of fan for positioning on foundations
Flow rate 228 m³/s
Static pressure 12 kPa
Shaft power 3002 kW
Double motor 2 x 1700 kW

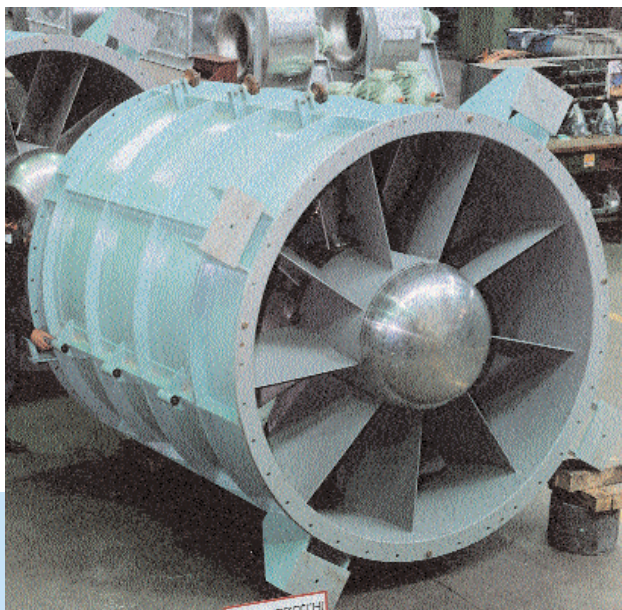
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MARINE APPLICATIONS

Supply and exhaust fans for compressor room, for evaporators room, for purifier room (combustion and cooling air), for diesel generator (combustion air), for propulsion electric motor, for battery room.



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1

Exhaust fans for P.E.M. room

*Axial type with variable pitch blades (at rest)
Impeller diameter 1700 mm
Flow rate 33.3 m³/s
Static pressure 0.85 kPa
Installed power 86 kW
Speed 1180 rpm*

2

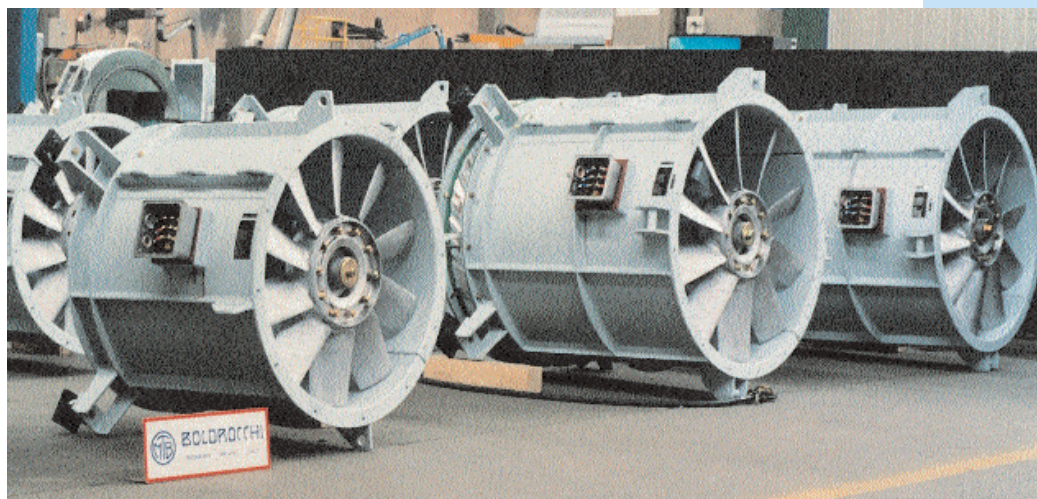
Main engine combustion air service

*Hot deep galvanised centrifugal fans
Flow rate 33.3 m³/s
Static pressure 1.5 kPa
Installed power 110 kW
Speed 1780 rpm*

3

Main engine combustion air service

*Axial type with variable pitch blades (at rest)
Impeller diameter 1000 mm
Flow rate 19.5 m³/s
Static pressure 0.7 kPa
Installed power 25/16 kW
Speed 1780/1180 rpm*

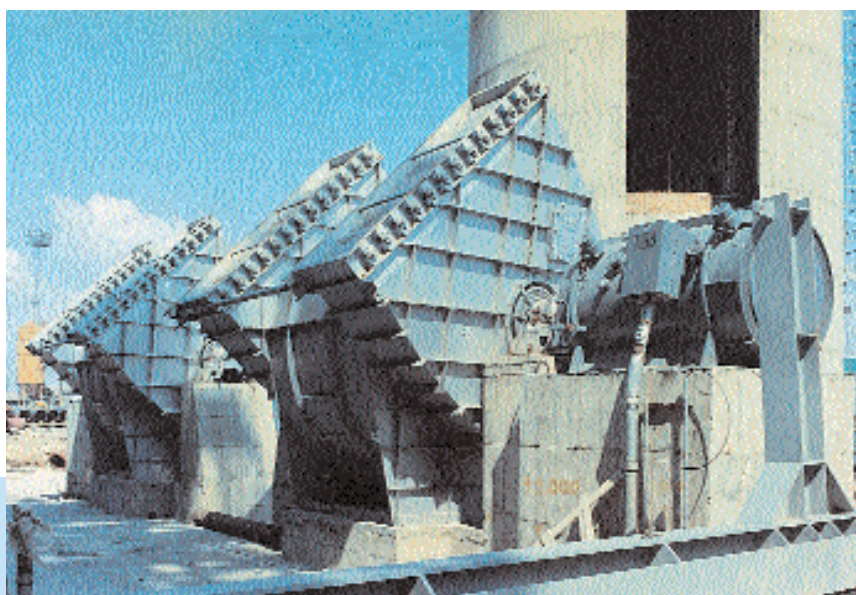


METALLURGY



4

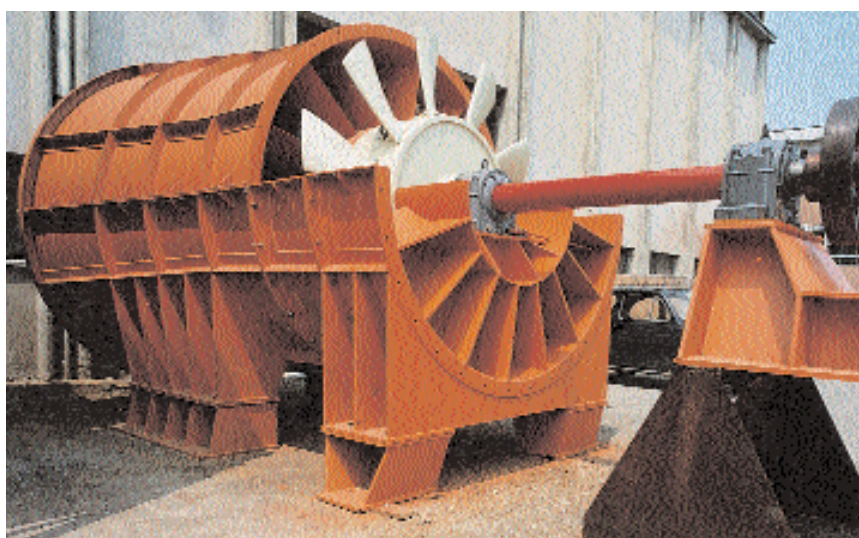
Combustion air fans, boosters, exhausters for: EAF, LD converter, sinter plant, stockhouse, continuous casting, Coluper, etc. Turn key plants and filters can be supplied in cooperation with **Boldrocchi Ecologia**.



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Sinter plant ventilation fan
Impeller diameter 4050 mm
Flow rate 236 m³/s
Installed power 3900 kW

4



6

Exhaust fans
Flow rate 216 m³/s
Static pressure 5.1 kPa
Installed power 1600 kW
Speed 980 rpm

5

Cooling air fan for sinter plant
Heavy duty axial fan with variable pitch blades (at rest)
Flow rate 125 m³/s
Static pressure 3.3 kPa

6



**BOLDROCCHI
FACTORY IN BIASSONO**



BOLDROCCHI FACTORY IN ARCORE

MAIN CUSTOMERS

POWER AND INCINERATORS

ABB Alstom Power | ACCAM | AEM Cremona | AEM Milano | Ambiente | Ansaldo | ASM Brescia | Aster | Babcock – Badcock Riley Power
Bono Energia | CEI | CCT | ENEL | Foster Wheeler | ISE | Larsen & Toubro | Lurgi | Macchi | Nooter | Eriksen | Nuovo Pignone

CHEMICAL & PETROCHEMICAL APPLICATIONS

ABB Lummus | BHPV | Caffaro | Callidus | Chiyoda | Dow Chemicals | Enichem | Fluor | Foster Wheeler | Idrotermici | ISAB | Koch International | KTI |
Larsen & Toubro | Linde | MAN Ferrostaal | SARAS | Silrtec Nigi | Snamprogetti | SNIA | Technimont | Technip | Heurtey | UHDE

CEMENT

Buzzi/Unicem | Calcia | CBMI | Cementir | Cementerie Merone | Ciments du Maroc | Colacem | Italcementi | LV Europe | Polcons Cement | Cementi
Rossi | Sacci | Vassiliko | Vulkan

NAVAL APPLICATIONS

Atisa | Cantiere Navale F.lli Orlando | Cantieri Navali Sestri | Carnival Cruise Line | Costa Crociere | Dalian Ship Yard | Disney Cruise Line | Fincantieri |
Gesco | Grimaldi Grandi Navi | Holland America | Minoan | Nuovi Cantieri Apuania | P&O Cruise | Sana | Snamprogetti | Tirrenia | Tor-Line

METALLURGY

AFS | Danieli | Demag Italmobiliari | Jindal | Nuova Samim | Riva | Stein Heurtey | Techint | Tunga | Voest Alpine

SPECIAL APPLICATIONS

Hamon Research Cottrell | Lurgi | Mussi | Saint Gobain | TMC Padovan

TRAIN

Ansaldo Trasporti | Firema | Marelli Trazione | Parizzi

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