

# **COST-EFFECTIVE ENVIRONMENTAL SOLUTIONS FOR A SUSTAINABLE STEELMAKING INDUSTRY**

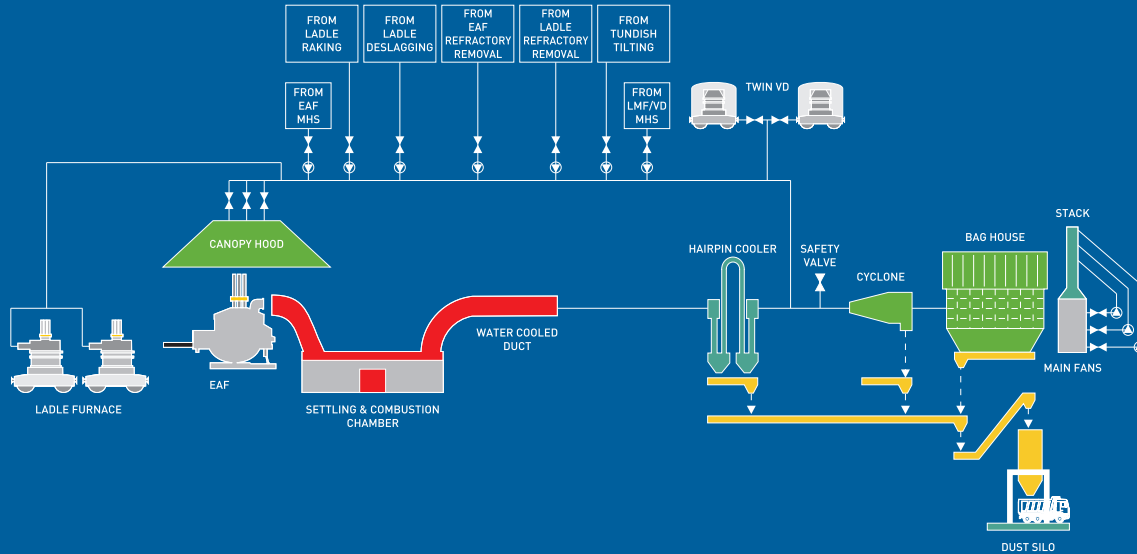


**DANIELI** ENVIRONMENT & SYSTEMS

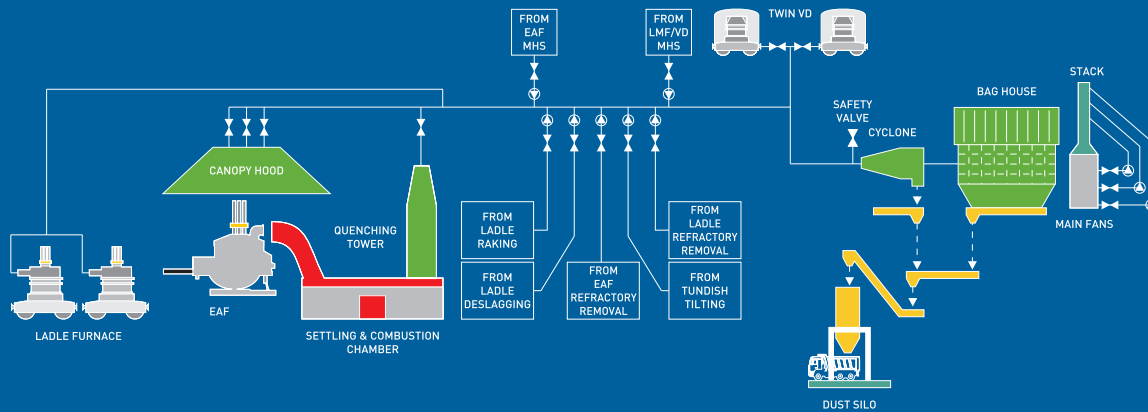


# FUME TREATMENT PLANT

## SOLUTION WITH HAIRPIN COOLER



## SOLUTION WITH QUENCHING TOWER



The design of FTP by Danieli Environment is always optimized with consideration of the following parameters:

- Occupational health and environmental rules;
- EAF capacity and melting profile;
- Type of charge;
- Site ambient conditions;
- Area availability.

The sizing of a secondary dedusting system depends not only on the EAF size and arrangement, but the specifications of the charge material also are crucial. The volume and temperature of fumes vary with the charge, which can include one or a combination of the following materials: heavy scrap, light scrap, contaminated scrap, DRI, pig iron, hot metal.

The EAF charging method also is important for the design of a fume treatment plant. For instance the continuous charge of DRI into the furnace is much less problematic than charging a bucket of scrap polluted by oil, paint and plastics. These considerations must always be taken into account and adequate information must be provided to make sure that the system performance will meet the expectations of the client and the more stringent local Environmental rules.

Depending on the requirements of the project, the process design can be based on one of the following alternative schemes:

- Independent primary and secondary fume lines;
- Treatment of mixed primary and secondary fumes.

### Fume treatment plant

The process design of a fume treatment plant for a steelmaking shop is made by Danieli based on the specific requirements of the project.

A scheme that is used often combines the primary fume line with the secondary fume line and includes a common filtering unit.

After cooling the primary fumes are mixed with the secondary fumes and processed by a cyclone for the abatement of coarse ignited particles that may damage the bags of the filter.

Various alternatives are available for the cooling of the primary fumes:

- Fume ducts and chambers cooled by water, hot water or water steam;
- Natural convection heat exchanger ("hairpin" cooler);
- Forced draft cooler with axial fans;
- Quenching tower with water injection cooling.

### Other fume sources

The EAF and ladle furnace are the main air polluting equipment of the steel meltshop, but there are other sources of fume and dust than often must be controlled, such as the stations where the following operations are carried out:

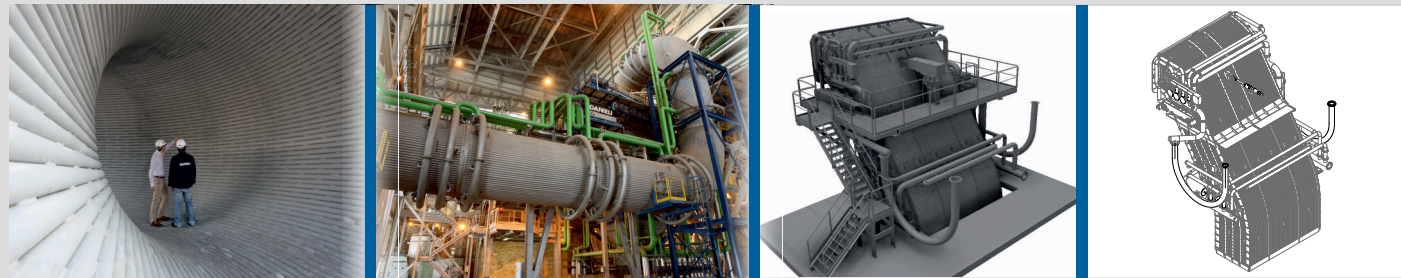
- Material handling (lime, coal and ferroalloys for EAF and ladle furnace);
- Ladle slag raking;
- Ladle refractory wrecking;
- Tilting of CCM tundish tilting;
- Refractory wrecking of CCM tundish.

Generally, it is preferable to convey to a centralized fume treatment plant all polluted air flows captured at the EAF, ladle furnace and above stations, because this design simplifies the entire dedusting system and makes its maintenance easier. In addition, these secondary fume flows are colder and thus they help in reducing the temperature of the EAF primary fumes.



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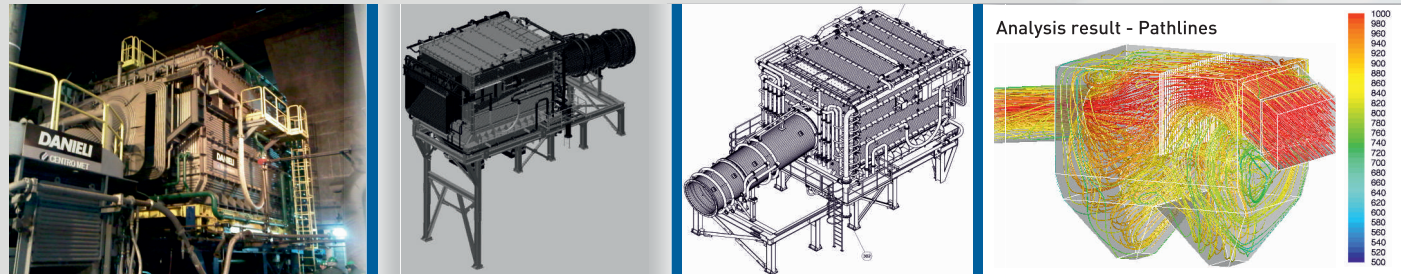
## E.A.F. Primary line water cooled equipments



Special design for Water Cooled Duct

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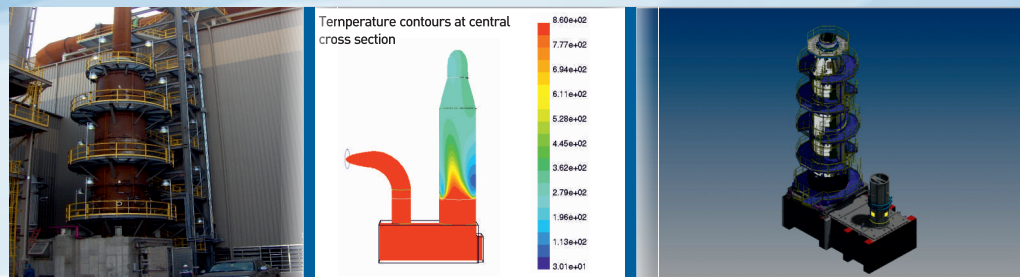
## E.A.F. Combustion Settling chamber



100% cooled with automatic dust removal. Easy maintenance. Full accessibility. Easy panels replacing.

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## Quenching tower



Compact system providing efficient and rapid cooling, preventing «de novo» formation of dioxins.

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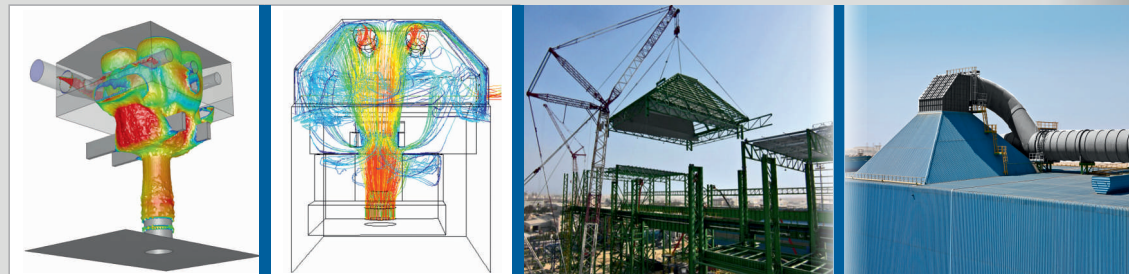
## Hair Pin Cooler



Special design for: free maintenance, automatic dust handling, easy inspection and full accessibility.

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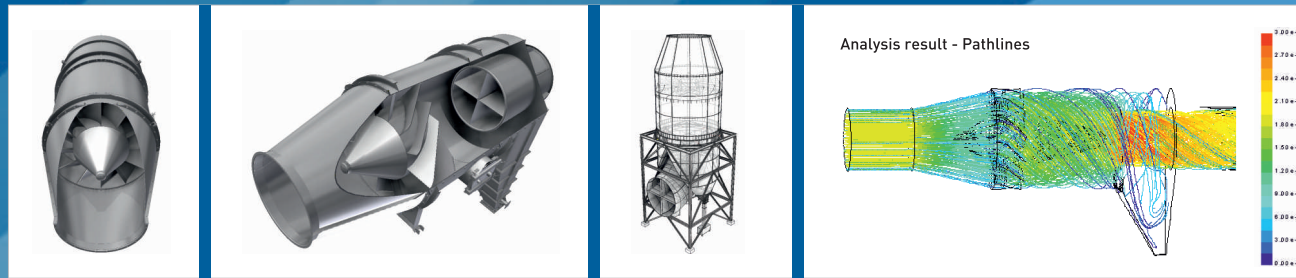
## Canopy Hoods



From CFD [Computational Fluid Dynamic Modeling - Danieli in house tool], to the erection.

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## Cyclone (Spark Arrester)

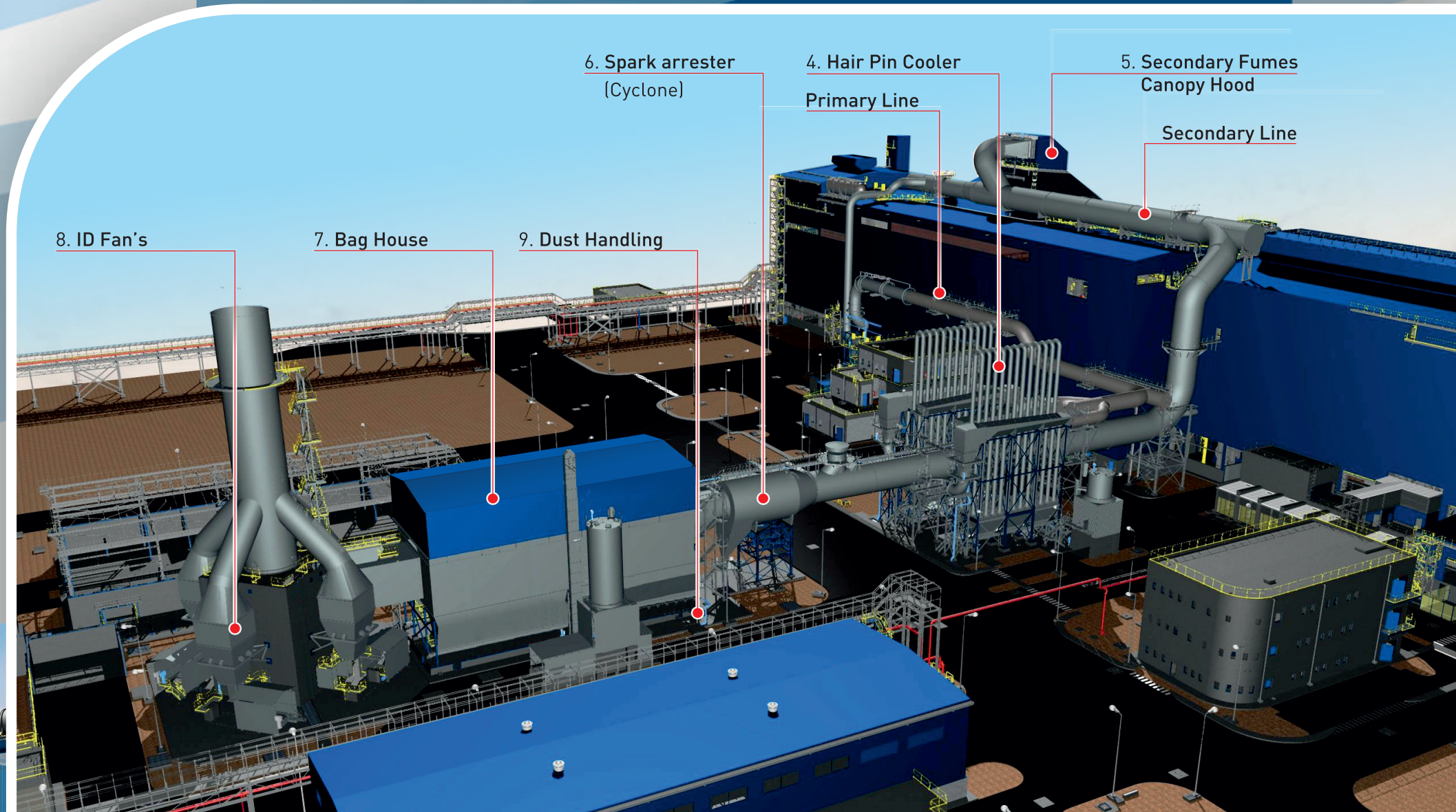


## Bag House



Standardized Pulse Jet Bag House with different configuration with range from 525 m<sup>2</sup> to 33.600 m<sup>2</sup> of filtering surface, to cover and optimize EAF fume treatment range from 50.000 to 4.000.000 m<sup>3</sup>/h.  
Reverse air Bag House - Clean gas dust content at stack up to 5 mg/Nm<sup>3</sup>  
Vacuum degassing textile filter.

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## ID.FAN



Qdrive MV Drives, hi-performance water-cooled vector controlled drives, developed with focus on hi-flexibility, operability and maintenance

Variable Frequency Drivers, also called inverters and manufactured by Danieli (Qdrive - MV Drives), are used to vary the fan speed over a wide range in order to adjust the flow rate of the treated fumes based on the operating requirements. Compared with flow adjustin dampers, the variation of the fan speed provides a significant savings on the electric consumption of the fan motors. Before proposing this advanced regulation system, the Danieli engineers carry out a feasibility study to make sure that the additional capital cost is compensated by the energy savings derived from the fan speed regulation.

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## Dust Handling



## Noise control



Noise modelling

Fan house

Dog House/ Elephant House

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## Hot Water High Pressure - Cooling system

Prevents condensation of chemically aggressive compounds on the water cooled ducts/panels inside surface thus corrosion is controlled and operating time is longer.



## Activated Carbon System

The coal powder is carefully dosed to mix with dust of the fumes in order to form a cake on the outer surface. The coal adsorption process which takes place mainly in this cake allows for the control of dioxins and odours. The process is also effective in controlling highly volatile heavy metals.



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