

Evaporative Cooling Systems

 **BoldEco**|Environment

Advanced Spray Cooling Systems

Introduction

Dedusting systems are installed in various industrial and utility applications either to recover valuable quantities of process material or to achieve low ambient dust emissions. Heavy industry in general has made valuable contributions to ambient air quality in recent years, in part to comply with environmental protection directives, in part to satisfy the demands of local authorities and neighboring communities.

Electrostatic Precipitators (ESPs), traditionally regarded as acceptable technology for reducing dust emissions from dust producing sources, are typically found on various processes such as cement and lime kilns, utility and recovery boilers, industrial and municipal waste incineration plants, as well as pulp and paper plants, among others. Still, many of these plants experience high dust emissions caused by transitory process conditions, mainly due to the precipitator's inability to respond quickly to the changing conditions of the process.

These emissions are easily avoided with the installation of add-on gas conditioning systems. However, the importance of proven experience and process knowledge in the application of evaporative cooling to control the conditions at the inlet of an ESP cannot be underestimated.

Evaporative cooling or gas conditioning systems upstream of fabric filters is equally difficult to properly implement. The wrong nozzle or undersized evaporative cooling chamber can result in over or under cooling, poor temperature control, blinded, or even worse, burned bags.

Choosing the right equipment type and design requires sophisticated methods of selection as well as provisions for efficiently operating those components, adapted to the prevailing construction, erection, operation, and environmental requirements. BoldEco possesses in-house know-how and experience in the selection, application and operation of most modern temperature control systems and can



MODERN CEMENT PLANT

A modern cement plant is required to be environmentally friendly — not only with respect to clean air and clean water — it must be esthetically pleasing as well.

be relied upon to choose the optimum solution from a variety of options.

After many years of advising, developing and supplying such plants to various heavy industries, we have found the proper complement of operational experience, process knowledge and advanced analytical tools, resulting in truly advanced and efficient systems designs.

BoldEco Solutions

Since BoldEco possesses proprietary nozzles designed in-house as well as the experience to design, fabricate and erect complete gas cooling systems, we are in a unique position to provide completely integrated, single responsibility solutions.

Due to our vast collective experience in the field of gas cooling, our temperature control technology is continually being updated to meet current and future requirements, and, by implementing newly developed technological improvements, achieves elevated efficiencies at a high level of reliability.

BoldEco Environment has supplied both new and retrofit installations in response to the various regulations calling for increasingly efficient dedusting plants, always conscious of the customer's need to cost-effectively achieve ever higher degrees of flexibility and reliability.

Project Execution

Projects can be carried out according to a client's wishes, based on the supply of system components only, on smart-parts and engineering for local fabrication and erection, or on complete turnkey projects, which may be more desirable due to sole-source responsibility. Since BoldEco manufactures and installs the main proprietary system components and large fabricated elements through cooperation with local partners, there is complete control over the entire project execution process.

Projects are executed by competent project managers and engineers, who oversee the engineering, manufacturing and logistics. As much as possible, BoldEco ships pre-assembled

components for ease of installation, as well as to maintain tight control over erection costs and installation schedules. Commissioning, acceptance testing and field service, completes our customer service regimen.

BoldEco Experience

Together with our specialized partners and its competent affiliates around the world, we bring valuable experience to each application demanding a high degree of technical competence in design and engineering. It is just this specialized knowledge, vast experience and breadth of market coverage that allows us to compete at a very high level internationally .

Already, a large number of systems are successfully operating in steel, power generation, cement, lime, incineration and other industries. BoldEco has proven that it can successfully execute large-scale, complex projects throughout the world and pledges to maintain its reliable partnership with industry and power by its continued investment in market expansion.

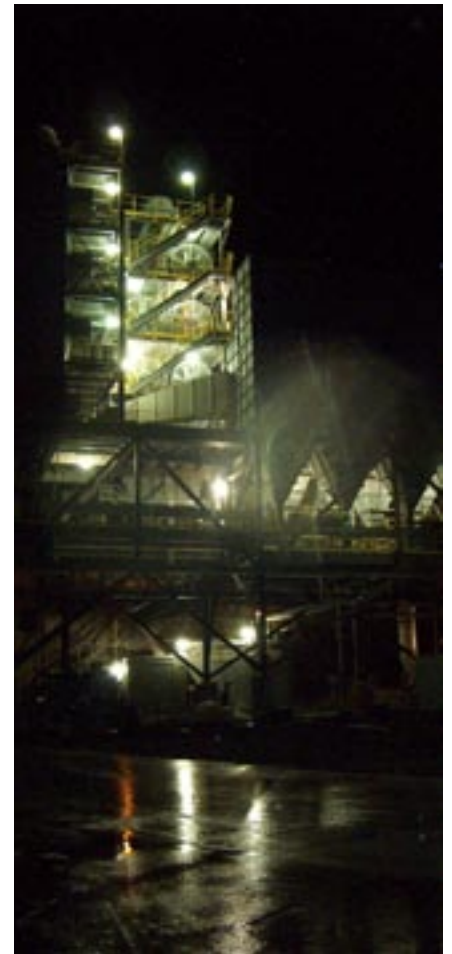
Ancillary Equipment and Systems

BoldEco is skilled in supplying more than just evaporative gas cooling systems. Our process experience allows us to enjoy the enviable reputation of being a good value while providing all of the efficiency and reliability expected from a top quality temperature control system supplier.

Engineering and Customer Services

BoldEco's in-house gas flow measurement tools, as well as its numerical modeling software, such as Computational Fluid Dynamics (CFD), pressure wave propagation, etc., allows us to provide timely expert field and engineering services to our customers at a reasonable price.

As part of our customer service regimen, we have qualified service and technical personnel ready for a variety of field services or to provide an on-site technical evaluation of any new or existing spray cooling and dust control improvement application.



EVAPORATIVE COOLING SYSTEMS



HYDRAULIC SPRAY TOWER CONVERSION
Mechanical to dual-fluid atomization



SPRAY IN ACTION
Dual-fluid atomization

Spray Cooling Towers

Cooling towers are used to cool and humidify hot gases in order to improve the efficiency of the dust collector or to allow the use of lower priced filter media.

BoldEco implements low maintenance dual fluid air / water injection systems to drastically shorten the evaporation time, resulting in dry bottom operation.

A sophisticated water regulation system coupled with rapid temperature sensors provides a quick response to temperature variations to achieve precise tower outlet gas temperatures.

Detailed analyses, including model studies and computer simulations of gas distribution and tower geometries are carried out to prevent gas turbulence or poor gas / water interaction.

Spray Nozzle Technology

BoldEco has recently developed a new nozzle that utilizes low air consumption and produces a range of droplet sizes that are designed to facilitate evaporation.



SPRAY SYSTEM VALVE RACK
For precise temperature regulation



SPRAY LANCE HEADERS
Water and compressed air distribution to the lances

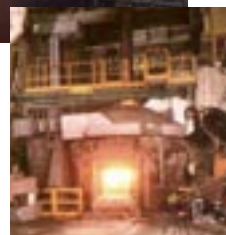
APPLICATIONS



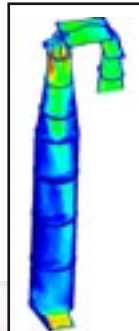
FOURTH HOLE
*Settling chamber on
an Electric Arc Furnace
Application*



SPRAY COOLER
*on an Electric Arc
Furnace Application*



COOLING TOWER
for cement preheater kiln



Applications

Steel

Spray coolers are being applied more and more to the various steel processes in order to reduce dioxin and furan formation as well as to avoid operational problems associated with traditional heat exchangers. Spray cooling towers can be designed to withstand high negative pressures, high temperatures and high dust loads, such as those found in the operation of steel mill furnaces.

A special gas cooling tower design is available that promotes uniform gas flow distribution to ensure that the sprays are well distributed with respect to the gas flow for properly balanced gas cooling and to maintain predictable performance throughout the melting process.

Thanks to new advanced technological advances, evaporative coolers can be installed in steel mill Electric Arc Furnace applications where previously it was thought that spray coolers were not practical.

BoldEco has numerous installations where the successful implementation of a spray cooling tower has resulted in capital and operational savings to the customer.

Cement

Spray coolers have been applied almost universally to dry process cement plants. This was due to the relatively high resistivity of the raw meal and to the steady-state conditions of the cement process.

The problem arises when the process transitions from compound operation to direct operation, and vice versa. Additionally, the need to reach lower temperatures in order to help existing ESPs function more efficiently has been difficult to accomplish with water-only mechanically atomized systems.

BoldEco evaporative gas cooling systems greatly improve the reliability of spray cooling as it applies to cement. Gone are the wet bottoms by way of improved gas flow, droplet generation and control algorithms. Low air consumption, one of the many favorable characteristics of BoldEco nozzles not only helps to improve emissions, but helps to save energy as well.

APPLICATIONS



IMPROVE ESP PERFORMANCE

*Spray cooling helps make poorly functioning
ESPs work better*



VIEW OF SPRAY COOLER

*Good gas distribution is a must in any
GCT application*

Incinerator Applications

Waste gases extracted from an incinerator must be treated with a gas cleaning system to remove the particulate by-products, as well as neutralize all of the acid gases and remove hazardous air pollutants.

In many cases, a waste heat recovery boiler is installed after the incinerator (or secondary combustion chamber), where any precursors to Dioxins and Furans (D/F) combine due to optimum formation temperatures.

A proven solution is the installation of an Evaporative Cooling Tower or a Lime Spray Dryer downstream of the boiler to rapidly lower the exhaust gas temperature and reduce D/F formation, as well as remove any acid gases, as in the case of a spray dryer.

The installation of a properly functioning spray cooling tower will also improve the performance of an Activated Carbon Injection system (A/C) as well as a Hydrated Lime injection system, when installed upstream of a Fabric Filter in order to capture D/F, as well as any Heavy Metals (HM) present in the gases.

Other Applications

Other applications too numerous to mention profit from the installation of a properly functioning spray cooling system. Some of these include non-ferrous metals, power boiler ESPs and fabric filters, and any other process that produces hot exhaust gases upstream of a dust collector

CFD Calculations

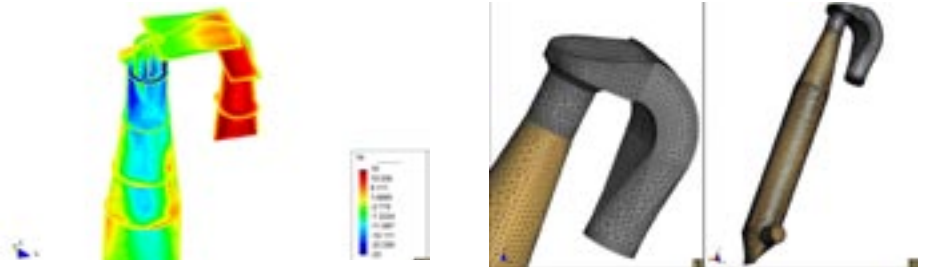
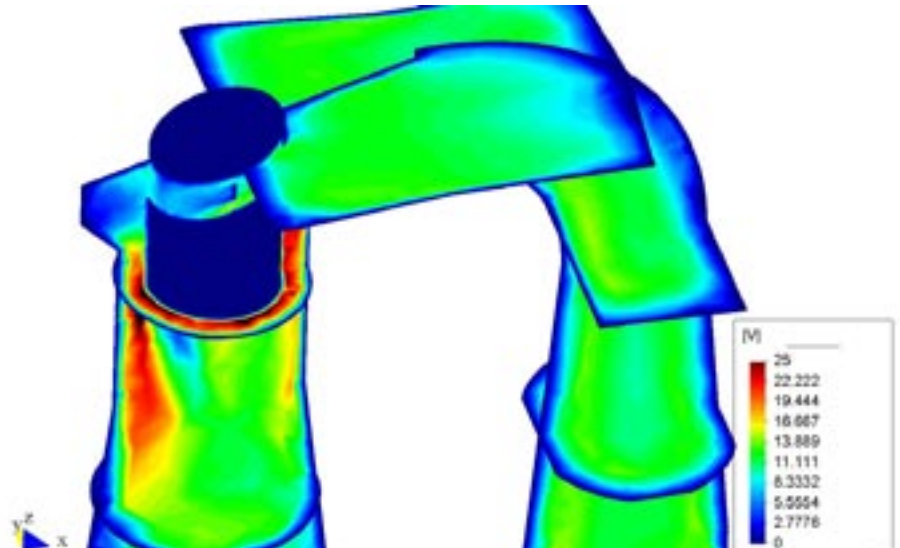
BoldEco Environment has for acquired Computational Fluid Dynamics (CFD) technology, allowing for the simulation and accurate study of fluid dynamics problems in various industrial applications

Typical cases requiring the implementation of CFD technology are the optimization of a poorly functioning GCT, a fabric filter exhibiting a high number of bag failures or in preparation of a system upgrade. The implementation of the results of this technology, if tempered by practical experience, can result in optimizing gas flow distribution, thus avoiding gas flow related problems like velocity differentials, recirculation, build-up and high wear.

In heavily custom-engineered applications with the presence of highly abrasive dusts, the verification of gas flow fields inside the dust collector itself allows the reduction or elimination of abrasion and wear on filter bags and other internal components.

The optimization of the flow distribution in ESPs is indispensable to achieve the design efficiencies of the dust collector.

By way of proper study of the fluid dynamics of an application, it is possible to obtain the information necessary to correctly engineer specific equipment.



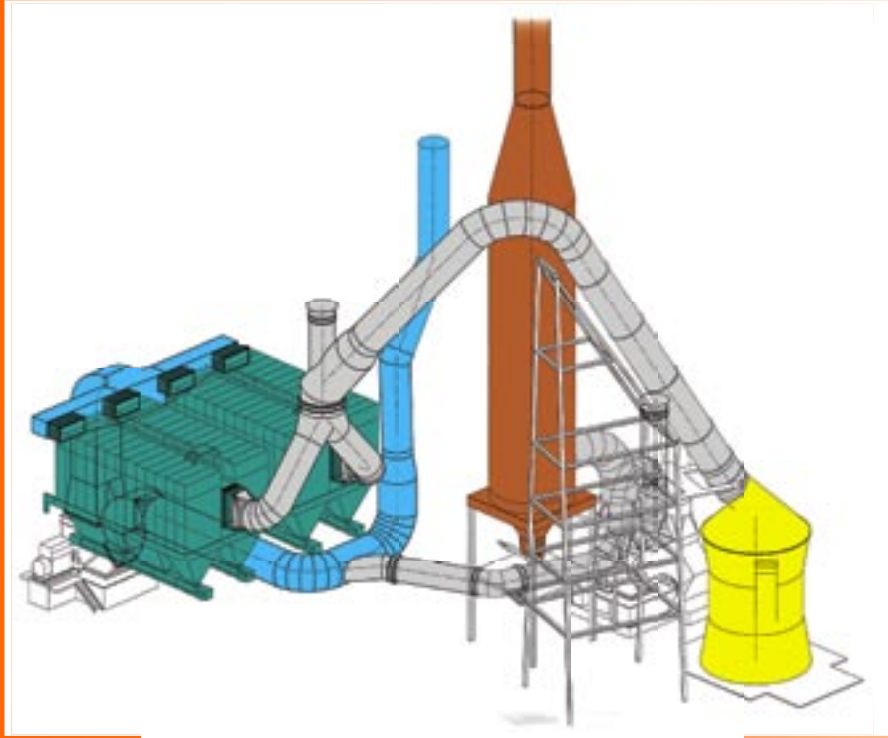
CFD MODEL OF A SPRAY TOWER

In-house capability

Typical CFD Applications

Typical applications include:

- Pressure drop calculations
- Gas mixing verification
- Build-up and erosion control
- Settling chamber and separator efficiency



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