



# Evaporative Gas Cooling and Conditioning Systems

*Dual Fluid Atomizing Technology*

## **HART ENVIRONMENTAL, INC.**



Spray Chamber and Baghouse System

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### **Products and Services**

- *SONIQUENCH® Gas Cooling Technology*
- *AIRSAVER™ Atomizing Nozzles*
- *ULTIMIX™ Atomizing Nozzles*
- *HEI Engineering Services*



Since 1973

## High Performance Atomization

### Areas of Experience

Hart Environmental, Inc. designs and manufactures SONIQUENCH evaporative gas cooling and conditioning systems prior to final treatment in air pollution control devices such as baghouses, electrostatic precipitators, scrubbers, or simply to protect downstream equipment. This technology introduces a pre-determined amount of liquid into the hot process gases in order to reduce and control outlet gas temperatures so that the equipment downstream will perform safely, effectively, and efficiently.

Hart Environmental, Inc. serves the ferrous and non-ferrous, glass, cement, incineration, and related industries where hot gases are produced in a production or combustion process.



SONIQUENCH System using Ultimix spray nozzle technology upstream of a baghouse at a metals plant.

SONIQUENCH systems technology provides precise temperature control and dry bottom operation. The company's application and operation know-how has received worldwide recognition on new and retrofit installations. In many cases the Hart Environmental expertise has corrected and/or replaced other types of systems with operational or performance deficiencies. Pre-requisites for a reliable gas cooling or conditioning system requires 1) A thorough understanding of liquid droplet sizing and evaporation rates, 2) An atomization system capable of producing a very fine range of droplet sizes over a wide flow modulation or turndown range, and 3) A process control system capable of

handling the atomization system's flow modulation characteristics so that the correct amount of liquid and air (or gas) accomplish precise cooling.

Precise temperature and flow control relies on an understanding of system requirements. Once the application is analyzed and the type and number of atomizers are selected, it is time to consider spray lance design, air and liquid valve rack assembly trains, control concepts, pumping stations, and compressed air supply station.



Ultimix and AirSaver Spray Nozzle Assemblies

Different Sizes and Configurations of Spray Lances



Hart Environmental, Inc. offers two types of atomizing nozzles depending on application, operation, and performance requirements. They are dual fluid designs.



## Atomizing Nozzles and System Components For Performance and Operation

One is an external mix nozzle, or Ultimix. The other nozzle is an internal mix nozzle, or AirSaver. The Ultimix nozzle has a turndown capability of 20 to 1, or more, providing decreasing droplet size on modulation turndown. And, the AirSaver nozzle can provide turndown capabilities of up to 10 to 1 operating at 50-60% less energy compared to other types of atomizers. The AirSaver nozzle can be operated at constant or decreasing droplet size on turndown.



HEI Air and Water Modulating Valve Rack Assembly Skid



HEI Dual Pump & Filter Station Assembly with back-up capabilities

Successful hot gas cooling or conditioning systems must begin with the selection of the best atomizing nozzles. This is usually the choice of a dual fluid nozzle technology, either the external or multi-chambered internal mix style nozzles. The nozzles must produce very fine to sub-micron liquid droplets at the higher liquid flow

rates required for hot gas cooling applications. The nozzles selected should also operate at reasonable pressure and energy levels, be self cleaning and essentially maintenance free, and continue to produce constant and finer droplets as the nozzle flow rate is turned down. These stringent specifications can be met by the Ultimix and AirSaver spray nozzle technologies.

Nozzle spray qualities and field data are constantly tested and analyzed.

Spray nozzle droplet measurements are based on the Fraunhofer Diffraction Theory, which is comparable to the Malvern Instrumentation. Sauter Mean Diameter (SMD) is often used to compare nozzles. But, for evaporative gas cooling, the effective, or D90, droplet sizes are most important and necessary for sizing.



Water Droplet Sizing Test



Ultimix Nozzles with Air-Cooled Spray Lance Assemblies in a non-ferrous—horizontal hot gas cooling chamber

## **HART ENVIRONMENTAL, INC.**

### **Evaporative Gas Cooling and Conditioning Systems**

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**Rapid cooling reduces the size and cost of evaporative gas cooling chambers and duct systems.**

**Self-cleaning, non-clogging atomizing nozzles reduce maintenance costs and downtime.**

**High liquid flow nozzles reduce the number of nozzles required.**

**Gas cooling and conditioning increases the performance and collection efficiency of electrostatic precipitators.**

**Wide range of turndown ratios permit best temperature control.**

**Total evaporation results in dry bottom, dry walls, no build-ups, and no free water carryover.**

**Pre-assembled components and modules cuts field installation, wiring, and piping costs.**

**No internal fixed headers which allows for individual spray assembly removal and accessibility.**

**System and component redundancy allows maintenance to be performed without shutting down production.**

**The combination of all of the above features allows the gas cooling and conditioning system to be used to treat the upstream gases entering baghouses, precipitators, scrubbers (dry and wet), ductwork, and stacks.**



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