Water and energy-efficient induction humidification system for textile, non-woven and hygienic applications (IHS®)

Aeris Group is a holding that employs specialised companies operating in the air treatment field, mainly air conditioning, heating, cooling, dust and fibre filtration, heat recovery systems and associated services. All companies within the group work to ISO 9001: 2015 quality certification.

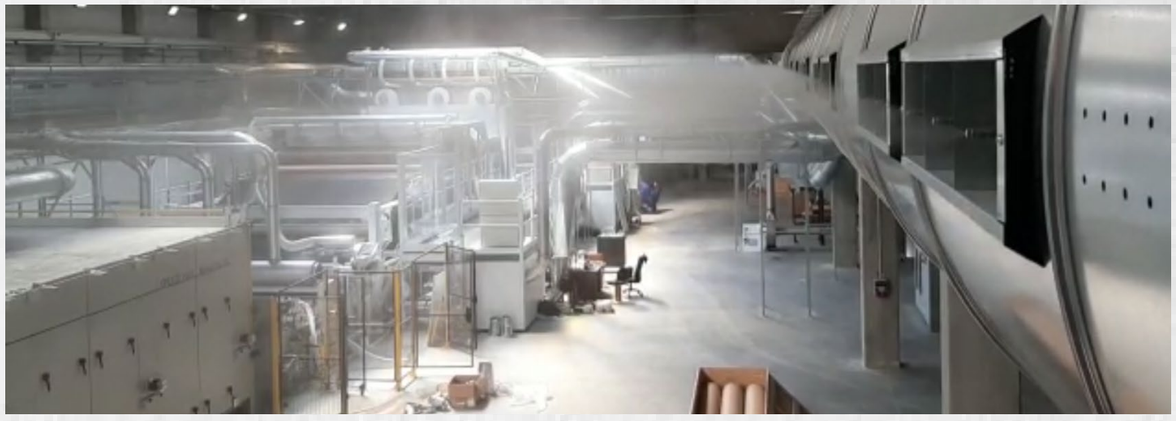
The group's shared purpose is to obtain the best efficiency for each solution, minimising investment and management costs as much as possible and minimising the payback of our customer's investment.

"It is the synergy of the group that makes the difference, a continuous sharing of experiences between the companies, unique in their specificity but all with the same background," explains Eros Nani, CEO of Aeris Group Holding.

"This benefits our growth. The different fields of application allow us to develop new systems and to approach solutions that can be proposed by our companies in different industrial applications."

The patented IHS is Aeris Group's response to the textile, non-woven and hygienic market's need for a solution that offers high reliability and safety while also addressing environmental and sustainability issues, particularly the reduction of energy and water consumption.

The IHS project proposal received recognition from the European Commission for being innovative and of high quality compared to the other technologies in the market; it subsequently received the Seal of Excellence quality label. The project went on to receive funding from the Horizon 2020 research and innovation programme of the European Union.



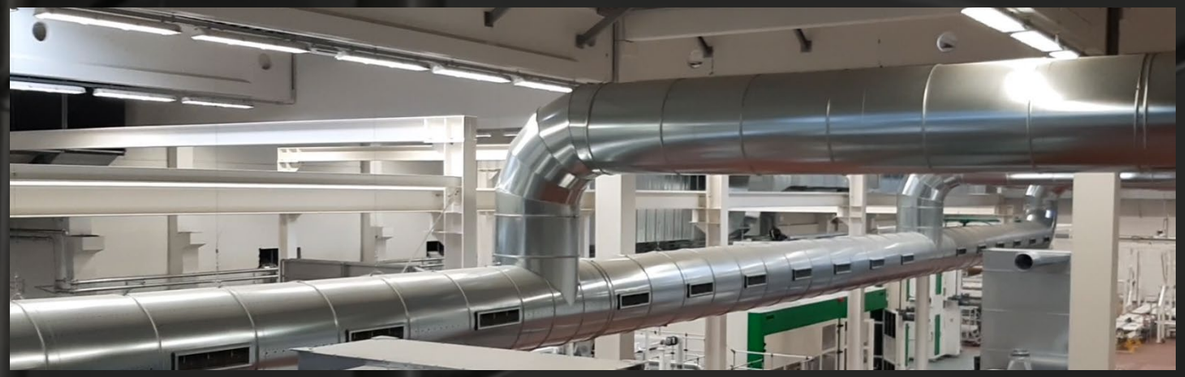


Image: Extract IHS

The common purpose of the Group is to obtain the best efficiency for each solution, minimising investment and management costs as much as possible and minimising the payback of our customer's investment.

Eros explains, "Like all systems designed by Aeris Group, IHS is unique in the aeraulic scenario of the industry, especially for textile and non-woven, and was developed in compliance with the guidelines of the European Directive ErP 2018.

Energetically speaking, this leads to an exceptional result: the reduction of up to 80 per cent of the energy impact for the adiabatic humidification plants and the reduction of 65 per cent of the water consumption necessary for the process.

The IHS technology is the heart of the system, with performances never obtained before: a COPH (performance coefficient) higher than 40 and an SEH (saturation efficiency rate) of 100 per cent.

Available systems on the market do not exceed COPH 10 and SEH 50 per cent, meaning that if IHS requires only 1kWh of energy consumption to humidify environments with 100 per cent of processed water, traditional systems require at least 4kWh, four times more, and the double of water consumption to achieve the same result.

IHS' humidification and cooling capacity has no equal, it is the result of five years of research and is designed to the highest hygiene standards. Furthermore, it is the only humidification system in textile and non-woven, in compliance with VDI 6022 standards, ensuring the absence of pathogenic spores while simultaneously creating a better internal climate and optimal well-being for the complete lifetime of the system.

Image: Mr Eros Nani

The IHS utilises special diffusers of laminar water flow that finely nebulise water and release it directly into the environment. Release air is subsequently captured and recalled by the inductive ducts with patented technology. Already a metre away from the pulsating diffusers, under normal conditions of departmental load, the water is completely evaporated and absorbed by the environment, with saturation levels that until today were unthinkable and obtained, for the first time, with an air distribution system with completely dry ducts.

This system's efficiency is 100 per cent compared to the water used; therefore, all the water sprayed by the nozzles is absorbed by the air: 0 per cent waste water. Thanks to the inductive diffusers, the air capacity moved is ten times more than the real capacity, enabling the conditions to be guaranteed not only close by the process but in the environment too. The main advantages of this system, compared to the competitors, are:

- elimination of possible proliferation of bacteria and mucilage
- elimination of possible corrosion risks of the components
- elimination of any risk of condensation
- temperature and humidity value homogeneity in the process and in the treated environment
- total de-stratification, especially for high buildings
- total recovery of all the endogenous heat produced in the room (motors, lighting, etc.)
- no obstacles in the room as there are no diffusers at floor level, close by the operators and process line
- the possibility of introducing air at low temperature directly into the department, without condensation problems and without the creation of fastidious airflow at low temperature
- complete absence of wasted water
- air diffusion system with completely dry ducts
- fewer pipes in the production department.

Besides the IHS, we also developed its evolution, creating the dual-stage Induction Humidification System **IHS®Ds**. IHS®Ds comes from a careful analysis of fluid dynamics and the physical principles that state the phenomenon of adiabatic evaporation and following cooling generated. By combining the micro-spray technology and the evaporative effect, IHS®Ds provides an accurate level of humidity control currently obtainable exclusively with steam injection but with lower energy consumption than any other adiabatic system.

The first step foresees the inductive saturation with turbulent motion, executed by a set of high-pressure nebulisation nozzles placed on horizontal collectors; the spray banks are connected to interception valves in order to carry out several humidification steps, each of them maintains a spray modularity between 40 and 140bar, depending on the system requirements. In this section, each Vortex nozzle, during the micronisation phase, creates a whirling motion of the air surrounding the diffusion area, with an inductive effect of recall to mix, in a small space, the atomised water with the process air. In less than one metre, the water content in the processed air is close to saturation.

The second humidification step foresees the evaporative humidification. The saturated air with microparticles of non-absorbed water still in suspension impacts the PAD post-humidification barrier, continuously spraying it with what has not yet evaporated. In this section, the air passing through the moistened cells accelerates the evaporative phenomenon by absorbing what is still present in the liquid phase and reaches a saturation level close to 100 per cent RH.

With cross-section alveolar air passages, the designed PAD has a construction project designed to increase the time and contact surface of the air-water mixture favouring natural evaporation. It is made with thermo-formation of flocked flat sheets with a dual purpose: remove the droplets from the air flow and allow evaporation from the porous surface, almost avoiding wasted water.

IHS®Ds has a proportional-modulating humidity production and, depending on the size, it reaches up to 15 humidification steps to which the modulation of the water spray pressure is added for each step.

IHS®Ds is always supplied in combination with an inlet air filtration coil with EN779 efficiency from F7 to F9 depending on the place of installation (UNI EN 16798-3: 2018 Directive), uses only water fed from RO systems with final sanitisation through UV lamps. It provides flushing and emptying cycles of the water supply collectors; it has no storage or stagnation points of water

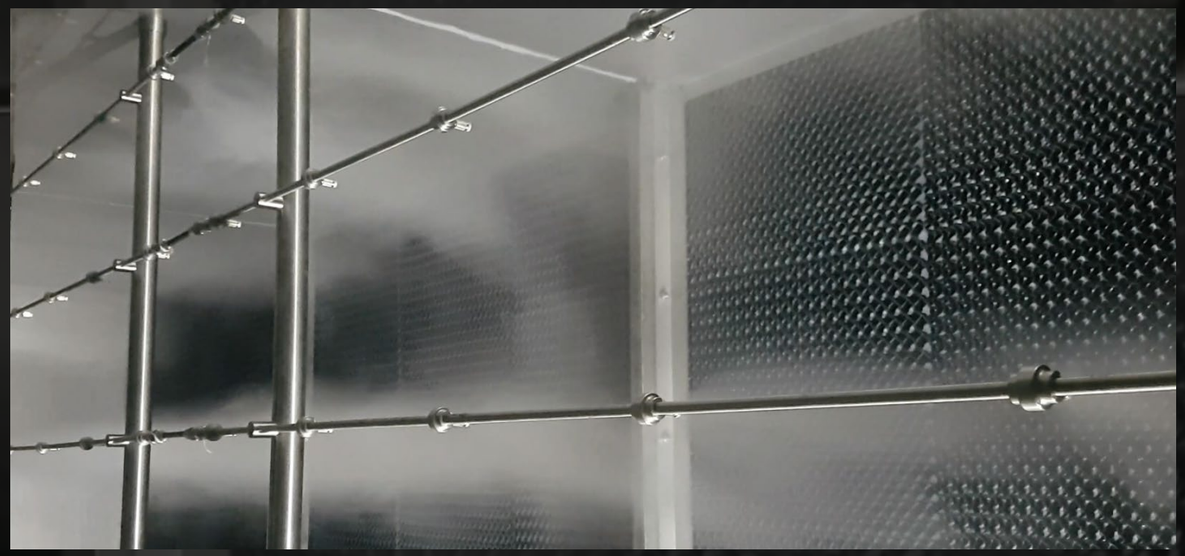


Image: IHS®Ds Saturation System

inside. In addition, the surface of the 2nd stage PADs, before turning on each system, is impregnated with AG + sanitiser, a permanent antibacterial treatment.
The brain of IHS is the DIGITRON 2.0 Vario software, an advanced user interface with an open platform that makes the complete system industry 4.0 ready. The platform provides the connection via modbus of all in-field sensors, damper actuators, valves and drivers of the motors.

Digitron 2.0 Vario is not limited to the thermo-hygrometric control of the production departments. It constantly checks the correct execution of all the inputs given to the different actuators connected to the system, receiving field feedback that allows the continuous supervision of position, anomalies and absorption and an immediate reply, correction or adaptation of the system to the real needs of the treated areas.

Motors, fans and humidification pumps work at different flow rates controlled continuously by specific algorithms that take into consideration the thermo-hygrometric conditions of the department, the outside conditions, the insolation or dispersions of the departments, the thermal load present in the same and, continuously, change the amount of air and water supplied to the correct value required at the specific moment. The result is a self-adjusting system that always guarantees the correct operation with minimum energy consumption.

Remote monitoring from any PC located in the company or outside it—tele-control, historical recording of conditions and anomalies, exact and real-time recording of energy consumption, thermal fluids and humidification water, all operations normally offered as optional—are always included in our Digitron 2.0 Vario, an open system ready for any extension or to be interfaced with other systems in the company.

“Today,” concludes Eros Nani, “adopting IHS as a plant solution in your company means greatly taking care of environmental sustainability, a unique plus that you can spend on the market, considering the growing attention to these issues in textiles and fashion.

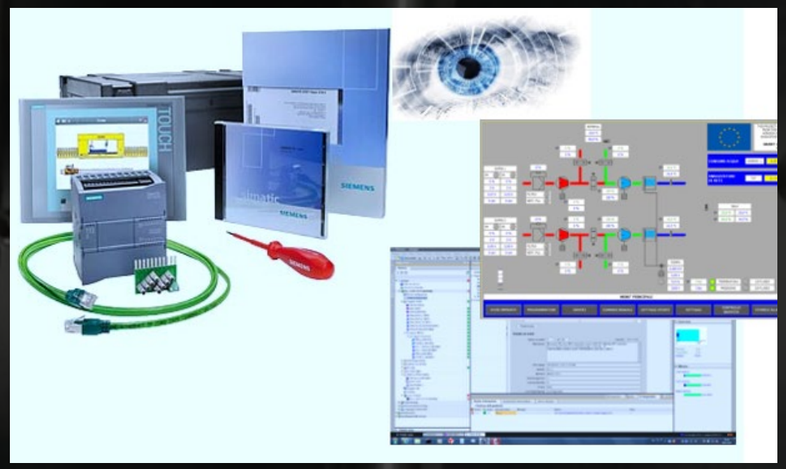


Image: Digitron 2.0 Vario Software

SUMMARY

IHS water and energy efficient induction humidification system for industrial application is the only system that conforms with the EU regulations for energy efficiency, environmental sustainability and hygiene requirements. Advantages for the end users, never obtained before: Coefficient of Performance (COPH) > 40, Supersaturation Efficiency (SEH) 100%., Water saving (H20) 65%, and Energy saving (ESH) 80%.

PROJECT PARTNERS

Politecnico di Milano are developing research activity aimed at the modelling and simulation by software of the behaviour of humid air in the environments to be air treated. Newton and P&M Impianti are supporting the final tuning of the components of IHS. ALKADIA will be providing marketing and carry out the industrial launch of the product in the market.

PROJECT LEAD PROFILE

Mr Nani has over 30 years research and development experience in air engineering, with a specific dedication to industrial applications.

Working on both engineering and prototypes, Mr Nani is today a leading technological expert in industrial air engineering.

CONTACT DETAILS

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