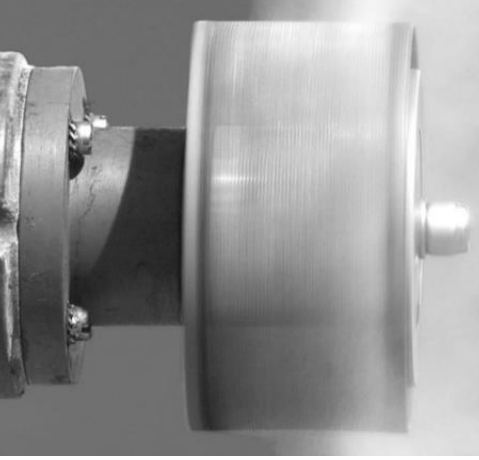

microniser

Presentation – Data Center

Humidification and adiabatic Cooling

Dear Sir or Madam,

With a view to rational use of energy in your data centers, Microniser® offers a solution combining humidification and adiabatic cooling.

Where the best refrigerating machines offer an EER[1] of 5, Microniser offers an EER greater than 60! In other words, the energy required for cooling is divided by 10 with Microniser. In addition, Microniser also regulates the relative humidity level in order to achieve optimal operating and safety conditions.

In this document, we briefly describe the Microniser® system to illustrate its economic and ecological value for cooling and humidifying Data Centers.

Microniser® equipment is offered for sale and long-term rental.

We invite you to contact us to discuss the integration of Microniser technology into your existing or planned Data Center / building.

Yours faithfully,

Renier de Caritat
Managing Director

Pascal Dierickx
Product Manager

[1] EER : Energy Efficiency Ratio

1. Technical description of the Microniser® rotating atomiser

A Microniser® atomiser is composed of a spray head, in the form of a cylindrical cage with a specific bore, mounted directly on the axis of the motor (Figure 1). The water is sent into the cage rotating at high speed and is fractionated into very thin droplets by passing through it thanks to the centrifugal force.

Atomisers are piloted with a set of control cabinets: Electrical & Hydraulic.

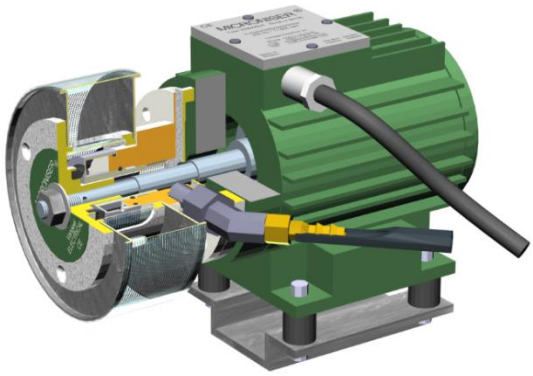

Figure 1: Exploded view of the Microniser® atomiser

2. How the Microniser® solution works

The Microniser® atomiser fractionates water and sprays it in droplets that are thin enough to be absorbed by the air. This process is adiabatic as water draws the energy necessary for its evaporation from the air, reducing its temperature.

Microniser® makes it possible to directly reach the humidity setpoint by spraying the precise quantity of water required without going through a saturation state.

With the Microniser® system, all injected water is absorbed by the airflow. Therefore there is no recycling of water or stagnant water which involves risks of algal or bacterial proliferation. The Microniser® solution is therefore particularly hygienic.

Without heating and without wasting water, the system meets a high humidification demand with minimal energy consumption. By its design and simplicity, Microniser is very economical and limits the impact of air treatment on the environment.

a. Advantages of the Microniser® solution

Economical - Ecological - Hygienic

- Very low electricity consumption: 280 W per atomiser
  - water at the pressure of the distribution network: neither pump nor compressor.
  - adiabatic evaporation
- Simplicity and speed of installation:
- Reliability: annual maintenance or every 3,000 hrs of use with a cost reduced to the minimum
- Optimisation:
  - regulation of the sprayed water flow adjustable from 0 to 150 L/h per atomiser.
  - Temperature and/or humidity measurements to reach the optimal conditions.
- No waste of water
- No water recycling:

  The system stays clean and without proliferation of bacteria. The system operates with municipal water or possibly treated with reverse osmosis or softener. The sprayed water remains pure and contributes to the conditioning of a quality air.
  - No stagnating water
  - No bacterial pollution of the air (Legionnaire's disease)
  - No need for algaecide treatment

The Microniser® system is also certified by the BREEAM®, recognition of a reduced environmental impact.

b. Humidification box

The Microniser® atomiser can be fitted in a horizontal or vertical humidification box, the spray head placed downstream of the airflow (Figure 2).

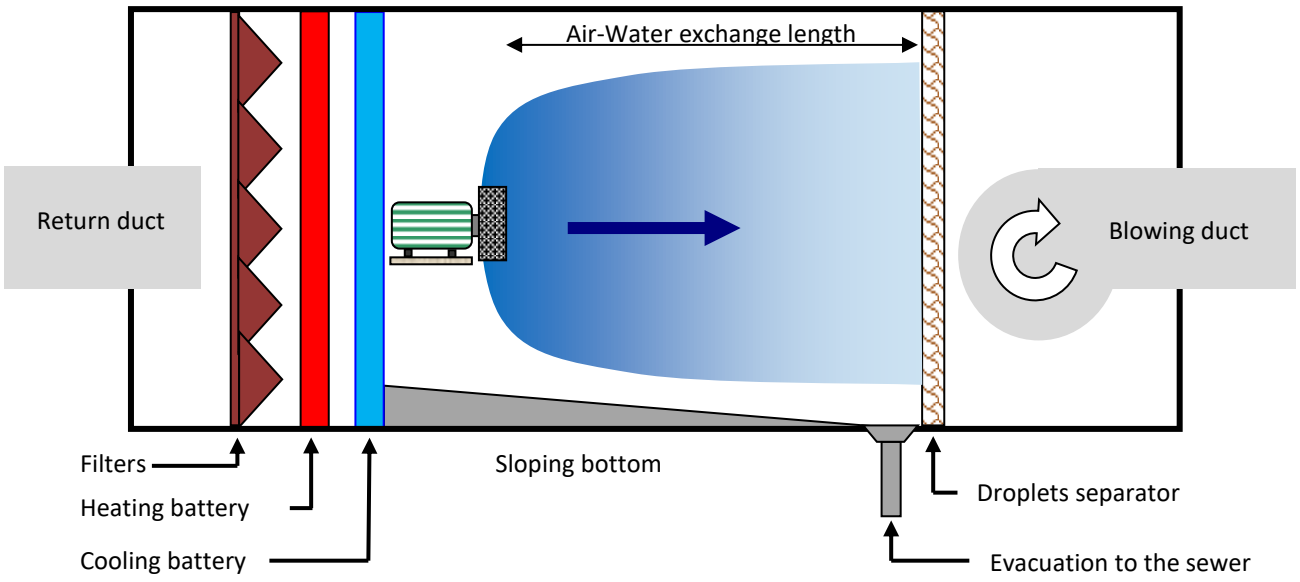

Figure 2 – Atomiser in an Air Treatment Unit

c. Humidification in a direct environment

With the Microniser® atomiser model fitted with a fan, it is also possible to spray a thin water mist directly in an industrial site without a ventilation system. This solution allows to humidify large volumes which do not have a network of ducts.

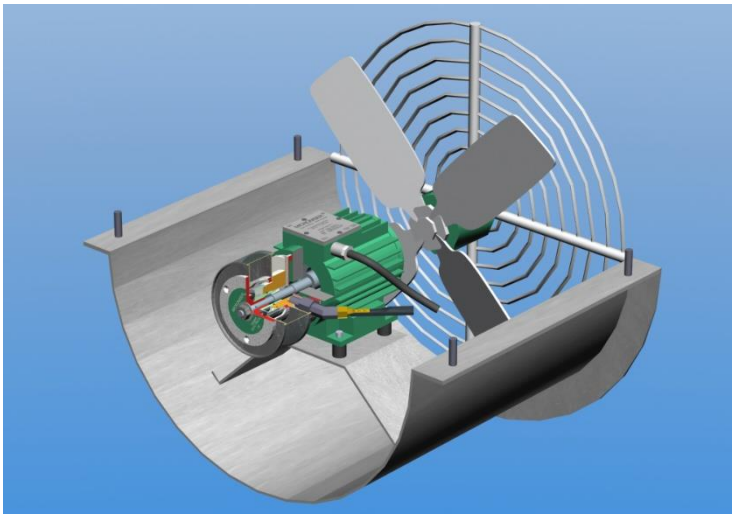

Figure 3: Microniser® atomiser with a fan for use in a direct environment

3. Financial comparison for a Data Center

The tables below present a comparison of the installation and operating costs for cooling and humidifying a Data Center. The Microniser® solution is compared to a refrigerating machine combined with a hot steam humidification system.

The situation[2] chosen is deliberately unfavourable for Microniser®: low flow, short usage time, low temperature decrease, low water supply, with osmosis, etc. This comparison shows the financial advantage of Microniser® even under these unfavourable conditions[3].

		refrigerating machine + hot steam	Microniser®	Microniser® renting
Equipment	€	16000	6740	0
Reverse osmosis (option)	€	0	4200	0
Droplets separator	€	0	540	0
Humidification box and ventilation	€	5000	5000	0
Assembly and start-up	€	2000	2000	0
Total investment cost	**€**	**23000**	**18480**	**0**

Table 1 Investment cost : No investment with the Microniser Renting: monthly rent.

[2] Assumptions : operation of 2450 h/year, air flow of 10.000 m³/h, group entry (27°C, 50% RH), group outlet (23°C, 70% RH), untreated water (3 €/m³), electricity (0.2 €/kWh), labour (40 €/h), inflation (2%), osmosis efficiency (80%), droplets separator efficiency (90%), performance of the refrigerating machine (90%). For more details, please contact us at info@microniser.com.

[3] The Microniser® team can perform a specific comparison for your installation.

		refrigerating machine + hot steam	Microniser®	Microniser® renting
Yearly volume of untreated water	m³	44	49	49
Yearly cost of untreated water	€	134	148	148
Yearly cost of reverse osmosis water treatment	€	0	205	205
Yearly electricity consumption	kWh	70364	686	686
Yearly cost of electricity consumption	€	14073	137,2	137,2
Yearly spare parts	€	2000	390	0
Yearly labour time	h	30	4	0
Yearly labour cost	€	1200	160	0
Total yearly operating cost	**€**	**17406**	**1041**	**491**

Table 2 Operating costs : With its very low water and energy consumption and its easy maintenance, **Microniser®** is significantly cheaper.

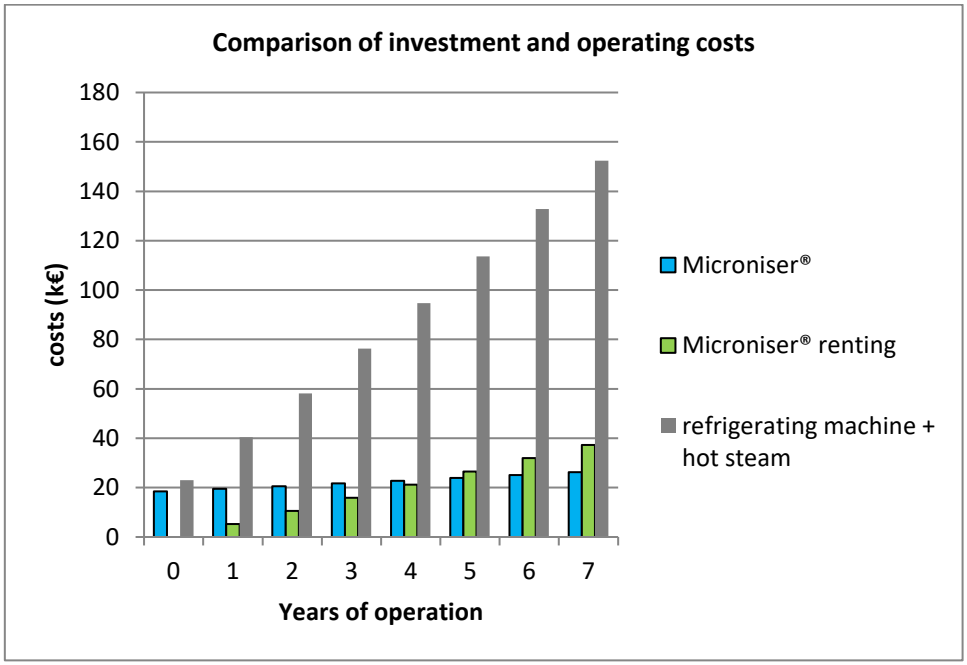

Figure 4: On sale or renting[4], Microniser® has a much lower cumulative total running cost thanks to its low operating costs.

Figure 4 shows the evolution of total costs over several years. Under these unfavourable conditions, the Microniser® system presents an investment cost equivalent to the refrigerating machine combined with a hot steam humidification system. During operation, the advantage of Microniser® increases very quickly with the saving of water, energy and maintenance.

Microniser® renting requires no investment but simply a monthly rent including maintenance. Microniser® renting is therefore unbeatable for investment. In addition, its operating and renting costs

[4] 400 €/month for 1 atomiser in this example

are lower than the simple cost of operating the other energy-consuming systems! And that without additional investment cost.

Higher air and/or water flow and longer usage time would further accentuate the lead of Microniser®[5]. In this unfavourable case, the operating cost of Microniser® is 16 times lower than that of the refrigerating machine with hot steam, the current market leader. The financial savings achieved thanks to Microniser® come mainly from the Rational Use of Energy and its low maintenance costs.

It is also worth noting that the Microniser installation can be added to your existing installation. As presented in the financial comparison, a Microniser installation will pay for itself in less than two years and your existing installation can remain in place as a simple inactive back-up.

4. References

The Microniser® Humidification Solution is operational in hundreds of large complexes for HVAC as well as for adiabatic cooling, anti-odour spraying, direct humidification or dust abatement.

Some examples for these different types of applications: the Courts of Justice in Mons, Arlon and Brussels, the IRE in Charleroi, STIB Metro Stations, the Brussels buildings of the INAMI, the FOREM in Charleroi, BNP Paribas Fortis, Bank Degroof, Antwerp Tower, the Auditorium (Philharmonie), the European Investment Bank, the Atrium Business Park in the Grand Duchy of Luxembourg, various tours in Paris, Airbus Industrie in Nantes, Alkor Draka, Demeuter, Durobor, Promet Russia, Rezinal.

[5] The Microniser® team can perform a specific comparison for your installation.