

# success story



Healthier hospital  
environments with  
the right humidification

## where

- Hôpital Universitaire Necker-Enfants Malades**
- healthcare sector;
  - Paris - France ([www.Necker.fr](http://www.Necker.fr)).

## what

- ultimate SAM (Short Absorption Manifold)**
- 25 ultimateSAM units in small ducts with 0.5 bar line pressure

## why

- optimum steam distribution;
- short absorption distance;
- maximum efficiency, thanks to heat insulation that reduces heat loss and formation of condensate.



## Hôpital Universitaire Necker-Enfants Malades France's foremost children's hospital

The hospital was established in 1926 through the merger of Hôpital Necker and Hôpital des Enfants Malades, the latter first opened in 1802 and the world's first hospital for children. Today, the hospital provides specialist medical and surgical care for children, plus a selection of specialist services for adults.

More than 4000 professionals look after the patients in the hospital's 400 beds for children and 200 for adults, providing high-level medical care resulting from the synergies between the hospital's infrastructure, research unit and clinical divisions.

A reference centre for several rare diseases, more than 20% of patients at the complex come from other regions of France and different countries.

The hospital's priorities are quality treatment and quality-of-life for patients and their families during their stay at the hospital. These same objectives inspired the construction of the new Necker hospital, a mothers and children's hospital covering 50000 m<sup>2</sup> on five floors.

Within this context of quality and excellence, the CAREL ultimateSAM steam distributor was chosen to manage air humidity control in the new building. This solution guarantees maximum hygiene and optimum steam diffusion, creating an healthy and welcoming environment that ensures the comfort and well-being of the young patients and their parents.

Made-to-measure based on requirements (multiples of 152 mm in both height and width), ultimateSAM can adapt to the different sizes of the air ducts in the building, guaranteeing the required steam flow-rate in every room, each with its own specific set point.

It also ensures precise and aseptic humidification, by using AISI 304 steel components and delivering only dry steam (from the centre of the steam distributors, thus preventing formation of condensate on the edges) in the air duct.

Insulation on the manifold and the nozzles maximises energy efficiency, reducing air heat gain and condensate formation.

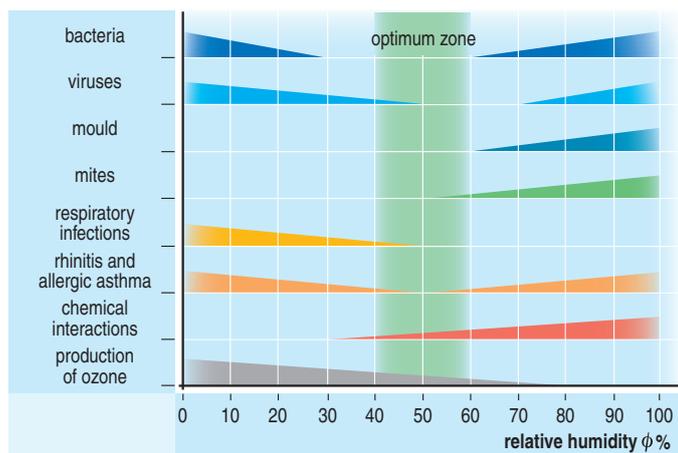
The arrangement of the nozzles along the distributors allows uniform delivery of steam into the duct, guaranteeing a very short non-wetting distance.

## The importance of humidification in hospitals

The right level of relative humidity (between 40% and 60%) is fundamental for health and personal comfort, and even more so in a healthcare context, where people are weaker and more vulnerable.

Excessively low humidity, as occurs during the winter as a result of indoor heating, causes an increase in problems with the respiratory system, eyes, skin, nose and mouth. It also assists the generation of electrostatic discharges, which are very harmful to patients and may damage electronic medical equipment.

Humidity that is too high, on the other hand, may lead to proliferation of bacteria, germs and viruses, in particular the Legionella bacterium.



In operating theatres, moreover, humidity control is required by several European and international directives, and is therefore an essential regulatory requirement.

CAREL ultimateSAM ensures the optimum humidity value is reached and maintained, guaranteeing delivery of dry, aseptic and hygienic steam into the air.

## Steam distributor with short absorption distance

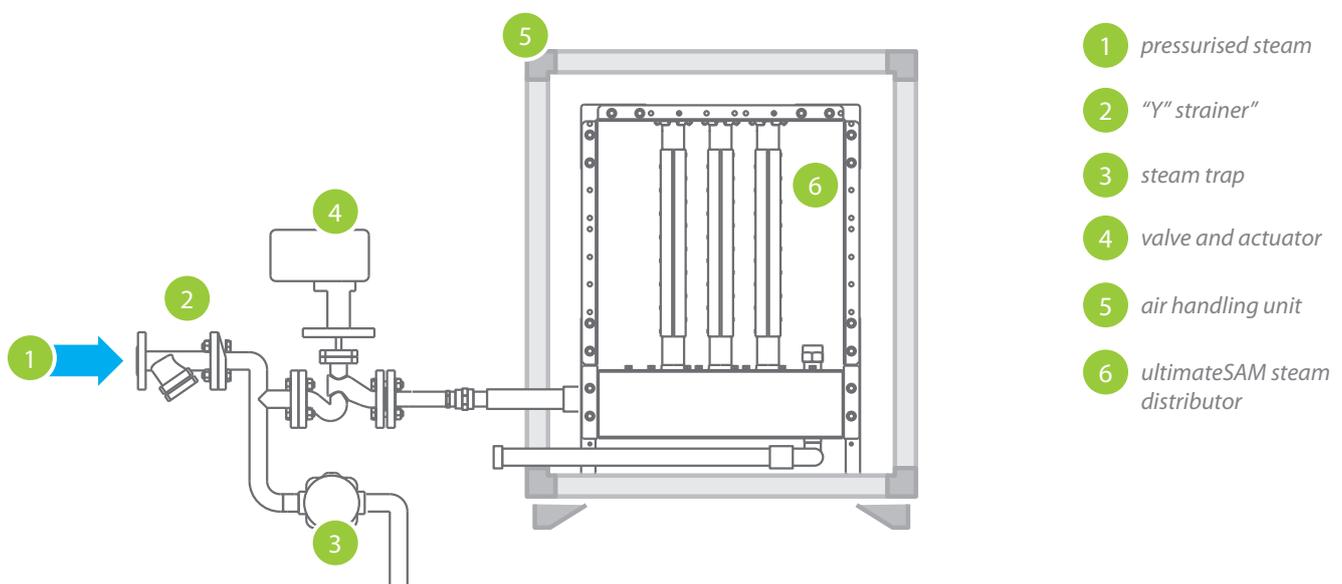
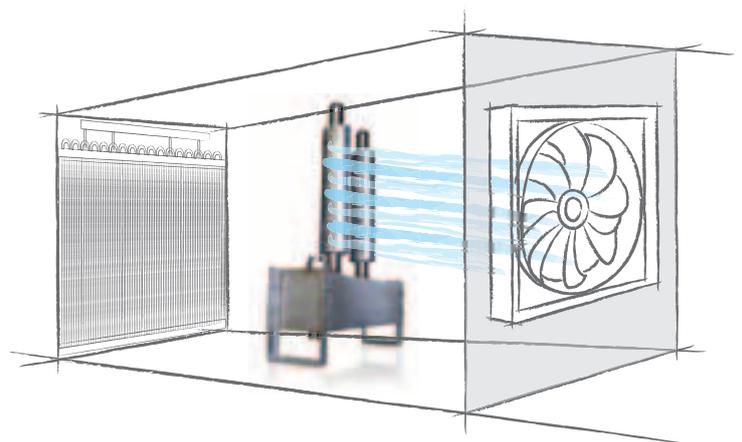
The ultimateSAM system distributes pressurised steam from the hospital's existing supply network into the air ducts, adapting delivery flow to the specific needs of the various rooms using a modulating valve.

Thanks to the numerous nozzles, steam is delivered uniformly, guaranteeing a very short non-wetting distance. The steam distributor can be ordered to measure (in sizes from 447x598 mm to 3000x3100 mm, with steps of 152 mm).

By exploiting these features, CAREL designed the most appropriate solution for each of the 25 ducts at the new Necker hospital.

The 25 ultimateSAM units installed perfectly suit the different dimensions of the ducting in the building and the compact dimensions of the absorption chambers.

Hygiene-grade humidified air - fundamental in hospital contexts - is ensured by using AISI304 steel and the condensate drain system. In addition, the nozzles that take in the steam from the centre of the distributor prevent entrainment of condensate, a potential means of bacteria proliferation.

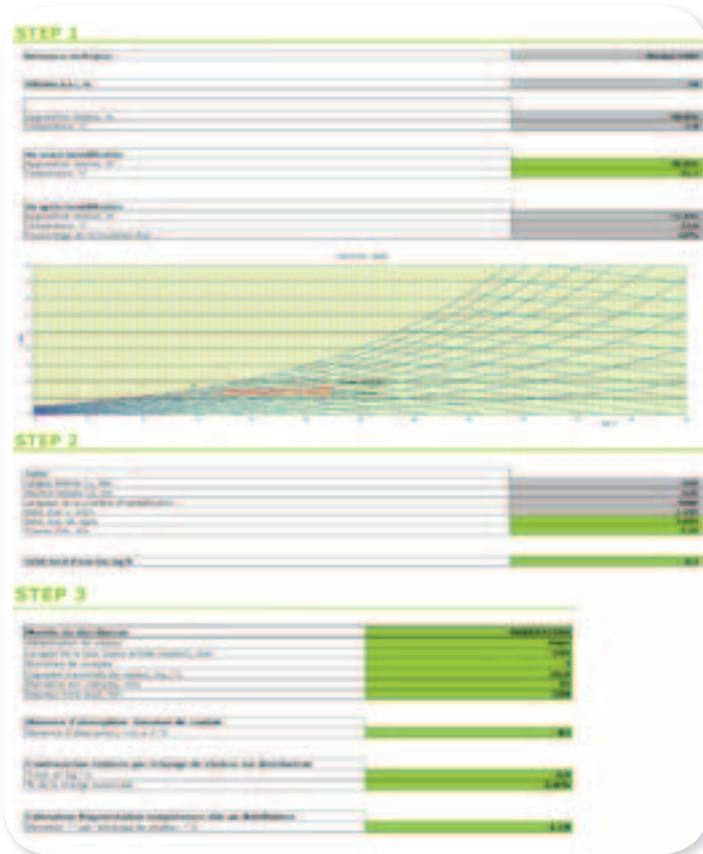


## Simple design tool

The ultimateSAM sizing tool is used to design ultimateSAM solutions based on required temperature and humidity, duct dimensions, air flow-rate and steam line pressure specifications.

Based on these inputs, the calculation sheet determines:

- The model of distributor, valves and accessories;
- Absorption distance;
- Estimate of condensate loss in the distributor;
- Estimate of heat gain in the duct due to the steam introduced.



ultimateSAM tool



"Y" strainers



steam trap



modulating valve



steam inlet connections

## A powerful and complete solution (effective and made-to-measure)

CAREL supplied a flexible solution that adapts to different steam demand within the building and to the size of the ducting, providing 25 ultimateSAM units with different flow-rates and dimensions.

This customised design was made possible exploiting the CAREL sizing tool and the constructional flexibility of ultimateSAM.

Considering the low steam flow-rates required alone, the single-pipe steam distributor option would seem sufficient. However, to maintain the compact dimensions of the absorption chambers, CAREL recommended multi-pipe distributors, as these ensure more uniform steam delivery and consequently a shorter absorption distance.

For smaller ducts with high humidification loads, a steam trap was installed in place of the drain trap, to reduce installation dimensions.

### ultimateSAM models installed

P/N	Steam flow-rate (kg/h)	Width (mm)	Height (mm)	Absorption distance (mm)	Number
SABAASI200	5.1 to 13.3	447	598	450, 500, 1000	13
SABBASI200	9.9 to 14.3	599	598	450	7
SABCASI200	7.7	751	598	450	1
SATAALI200	78.6	477	749	500	1
SATBASI200	53.5 & 81.5	599	749	550 & 650	2
SATCASI200	64.3	751	749	550	1

The two different versions of ultimateSAM used - SAT (top feed) and SAB (bottom feed) - differ in terms of steam inlet position and flow-rate requirements.

For the Necker hospital, CAREL recommended the SAT model where higher steam flow-rates were needed, and the SAB model for lower steam demand.

The following table shows an example of how the SAT model, despite its compact dimensions, can achieve considerable steam flow-rates.

### Models installati

P/N	Steam flow-rate (kg/h)	Width (mm)	Height (mm)	Absorption distance (mm)	Number
SATAALI200	78.6	447	749	500	1



## Conclusions

Ultimate SAM delivers steam from the hospital's existing pressurised steam line (0.5 bars) into the ducting. The installation, made-to-measure to adapt perfectly to the ducting, can modulate flow-rate based on humidity demand.

The product was chosen for its short non-wetting distance, a fundamental feature considering the compact dimensions of the hospital's absorption chambers.

The need for aseptic steam in a healthcare environment is further guaranteed by the quality of the AISI 304 steel used to make the components.

The Necker hospital design was implemented through the collaboration between CAREL, Bruno Verdeyen from CAREL France and EIFFAGE ENERGIES Ile de France, the company responsible for installation. This synergy meant that product quality is backed by reliable service throughout installation and the adoption of customised solutions to best respond to the specific application requirements, thus ensuring a high level of customer satisfaction.

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