High Efficiency Solutions.

CAREL


## where

**Precision Paper Converters**

- Kaukauna, WI - USA.

## what

**gaSteam installation**

- 1 UG090HD103 unit, supplied with reverse osmosis system;
- 1 additional UG unit for installation following planned site extension.

## why

- Lower running costs (operates on gas, savings in electricity consumption);
- high precision (± 2% RH) ensured by continuous modulation;
- minimum maintenance; the system uses demineralised feedwater.

# Precision Paper Converters

## Air humidity control in an industrial process using gas fuel

Established in 1991 and under current ownership since 2002, Precision Paper Converters is a manufacturer of high quality facial tissues. The company provides outstanding service to selected partners in this niche market. Experts in this specific field and in similar interfolded products, such as lens wipes and delicate task wipes, PPC is the only company in North America to focus exclusively on the production of facial tissues. PPC makes these products for other paper companies, which sell them under their own brands. These companies in fact choose not to make their own facial tissue, or do not make all the sizes/styles they want to offer the market. In addition, PPC has significant presence in healthcare, producing paper and tissue sizes specific to needs of healthcare industry.
Due to the low winter temperatures in Wisconsin (January average of 19 °F or 7 °C), relative humidity inside the production facilities rarely exceeded 15%, consequently meaning a series of problems due to excessively dry air: in particular, high levels of static electricity were a major headache at PPC, causing imperfect folding, stacking problems and difficulties in packaging and delivery of finished products.
This series of problems resulted in production delays and wasted material, as well as discomfort for personnel (dry skin, cracked lips, etc.). PPC therefore decided to solve this issue once and for all.

**Success Story**

# High-precision humidity control, for quality and comfort

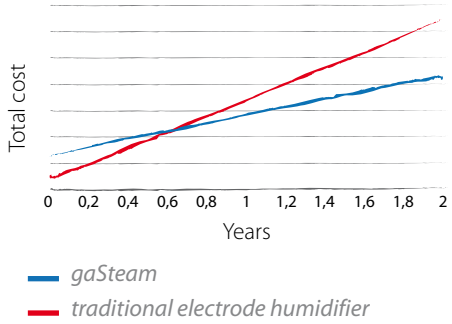
Production processes in the paper sector (and in other similar fields) are significantly affected by variations in material moisture content in relation to ambient humidity, as such changes in moisture content lead to variations in the dimensions of the materials being processed. In addition, control of ambient temperature and humidity conditions also prevents damage from the electrostatic charges that build up when the sheets of paper rub together, and that increase in intensity the lower the humidity of the air.
The problems encountered by Precision Paper Converters due to excessive electrostatic charges (folding, packaging, delivery of finished products), as well as discomfort for personnel, led the company to take action to resolve the situation.
PPC contacted a consultant, a local engineer, who analysed the situation and designed a humidification system sized to suit the needs of the facilities.
The analysis was focused on how to eliminate the negative impact of excessively dry air.

*A PPC interfolder*

# Gas-fired isothermal humidifiers

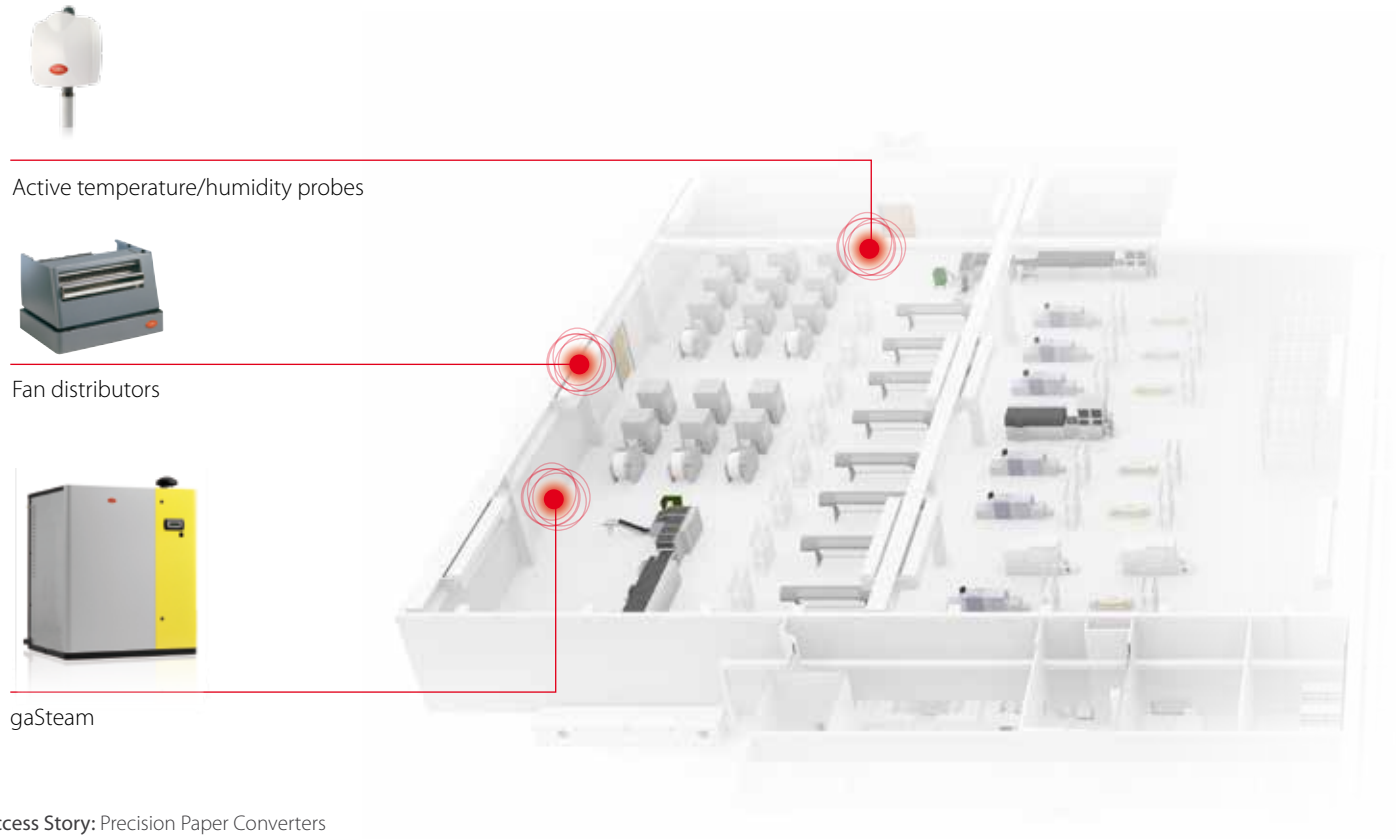
The isothermal humidification process involves production of steam by boiling water. This procedure requires energy input from an external source (in this case gas) for the water to change state. Steam humidifiers guarantee maximum hygiene, as boiling water produces aseptic steam (drinking water is always recommended to supply the humidifiers). Moreover, one of the main factors when choosing an isothermal humidifier is energy cost. To generate 2.2 lbs (1 kg) of steam at atmospheric pressure, keeping in consideration all the various factors, requires around 750 Wh of energy, either from electricity or other sources. The use of the gas as the energy source is thus an ideal solution in places where this costs less than electricity.

*Comparison between a traditional electrode humidifier and gaSteam*




Values used: electricity 0.18 $/kWh (0.15 €/kWh), gas net heat value 853 BTU/ft³ (31.75 MJ/m³), cost of gas 0.024 $/ft³ (0.7 €/m³)

*Typical layout of an application such as the one used by PPC*



# Unique features of gaSteam humidifiers

gaSteam humidifiers have very high overall thermal efficiency, meaning the units fully exploit the affordability of gas. The stainless steel heat exchanger guarantees an efficiency of around 94-96%. gaSteam can operate on mains or demineralised water (from RO), the latter being more costly but means less scale formation due to the softer feedwater, and less maintenance, one of the main objectives for PPC.
The main features of gaSteam are summarised in the following table:

| Features | UG045 | UG090 | UG180 |
|---|---|---|---|
| flow-rate | 99 to 397 lbs/h (45 to 180 kg/h) | | |
| continuous modulation | 25 to 100% | | 12.5 to 100% |
| low NOx emissions | yes | yes | yes |
| boiler and internal components in contact with water | AISI 304L stainless steel | | |
| preheating function | for a faster response | | |
| patented AFS antifoam system | yes | yes | yes |
| frost protection function | yes | yes | yes |
| precision | ± 2% RH | | |

The control system directly detects the flame, guaranteeing maximum reliability and safety. In addition, when required, the system automatically reignites the flame or closes the gas supply. Finally, the controller with intuitive graphic interface, settable in 5 languages, features a "quick set" screen to guide users through the initial configuration of the humidifier when commissioning the system.

# A powerful and complete solution

PPC has installed a 198 lb/hr (90 kg/h) gaSteam humidifier in its production facilities, so as to maintain a constant relative humidity of 50% at a temperature of 70 °F (21 °C), in a way that is energy efficient. In this 53,000 $ft^3$ (1,500 $m^3$) space, the estimated load of 150 lbs/h (68 kg/h) was calculated also keeping in consideration the extremely cold winter temperatures in Wisconsin (temperatures as low as -13 °F or -25 °C are not infrequent). Installation of a reverse osmosis water treatment system has drastically reduced humidifier maintenance requirements. The steam is distributed directly into the production facilities by four fan distributor units.

Material supplied:

| P/N | Description | Qty. |
|---|---|---|
| UG090HD103 | 150 lb/h (90 kg/h) gas-fired humidifier | 1 |
| VSDU0A0001 | Steam fan distributor | 4 |
| VSDBAS0001 | Steam fan distributor support | 4 |
| DPWC111000 | Wall temperature sensor | 1 |
| UGKINST090U00 | Installation kit | 1 |
| KITDTEXT06 | Drain tempering external kit | 1 |
| UEKY000000 | Y connector | 2 |

Also supplied were the steam distribution hoses, the condensate drain pipes and two Y connectors, required to deliver the steam to the four fan distributor units.


*gaSteam with distribution directly into the environment*

## Conclusions

By installing a high-precision gaSteam humidifier, PPC can now perfectly control the ambient conditions inside its production facilities, maintaining a constant temperature of 70°F (21°C) and a relative humidity of 50%.
Having therefore eliminated the problems of static electricity and improved comfort for personnel, the company has seen a boost in productivity and a reduction in production rejects, for a limited energy cost.
The owners of PPC are completely satisfied with the application, and intend to install another system as part of the planned site extension.

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