

# success story



More elastic fibres  
with proper  
humidification

## where

### Sapphire Textile Mills Ltd.

- process humidification;
  - Lahore - Pakistan.
- [www.sapphire.com.pk](http://www.sapphire.com.pk)

## what

### ChillBooster in condotta

- cooling and humidification with over 20 evaporative systems in the various departments

## why

- energy saving;
- water saving;
- low running and maintenance costs;
- high efficiency thanks to water atomisation;
- easy to install, including retrofits on existing systems.

## Sapphire Textile Mills Ltd: perfect yarn structure

Sapphire Textile Mills Limited is one of the biggest textile manufacturers in Pakistan. The machinery used in the various processes implement the most modern technology from Europe, Japan and the United States. The cotton is produced locally, while other types of fibres come from the best harvests from around the world. The company produces a complete offering including yarns, fabrics, home linen (tablecloths, curtains) and knitwear, which are then exported all over the world.

The range of products is made using a variety of yarns created by open end spinning, in various weights and colours, or decoloured. Special yarns are also available for niche products made using special machinery, such as MVS (Murata® Vortex Spinning system), and special fabrics including COOLMAX®, Fortrel®, Tencel®, Modal® and Lycra®.

As we know, raw fibres show different behaviour as regards their capacity to absorb moisture, and their ability to slide through the machinery is affected by humidity. The right level of humidity allows processing to continue without having to stop the machinery. While cotton and viscose react less problematically to variations in climate, such changes are immediately evident when working with synthetic fibres.

Managing Director, Nadeem Abdullah, and executive director of production unit number 5, Shaukat Iqbal, realised over time that the air washer humidification system integrated into the humidification chamber wasn't able to ensure design requirements in more extreme conditions, despite consuming large amounts of water and electricity.

New West Technologies, distributor of CAREL humidification products in Pakistan, specialises in innovative energy saving solutions tailor-made to suit customer requirements. It supplied a complete solution, including design, installation, commissioning and after-sales service. The system proposed by NWT and now operating features two 1000 l/h ChillBooster cabinets, operating in two stages and ensuring minimum power and water consumption, with considerable benefits in terms of running and maintenance costs and without wasting resources, meaning advantages for the environment too.



## The importance of humidity in the spinning process

Just like in other industries, in the textiles business significant benefits can be achieved by controlling ambient conditions. Correct humidification guarantees an increase in productivity and, in the case of adiabatic humidification, considerable cooling of the working environment. Humidity control within the range from 65 to 80% RH increases productivity as the fibres are stronger and more elastic. In addition, these conditions also reduce the amount of dust in the air. Both the yarns and the semi-finished products need to remain in equilibrium between their own moisture content and the humidity of the surrounding air until they're made into fabrics. Low humidity in the air is also very uncomfortable. In facilities where there is no system for controlling the environmental conditions, problems often occur during embroidery, weaving and spinning due to breakage of the yarns and formation of static electricity. The speed of modern looms and the use of very fine yarns, both natural and synthetic, means the relative humidity must be kept high. Percentages between 65 and 80% RH are suitable in both summer and winter. The compact and highly efficient CAREL adiabatic system operating on pressurised water can rapidly humidify industrial spaces where various types of processes are performed, such as spinning, winding and weaving.



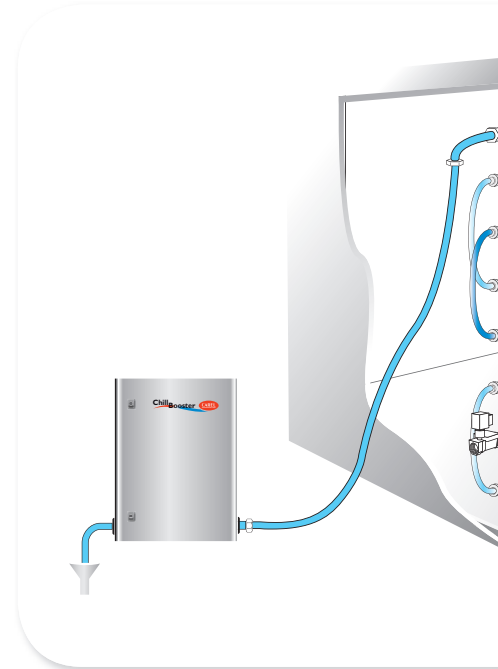
*Automatic winding*

*Ventilation openings fitted directly on the machinery*

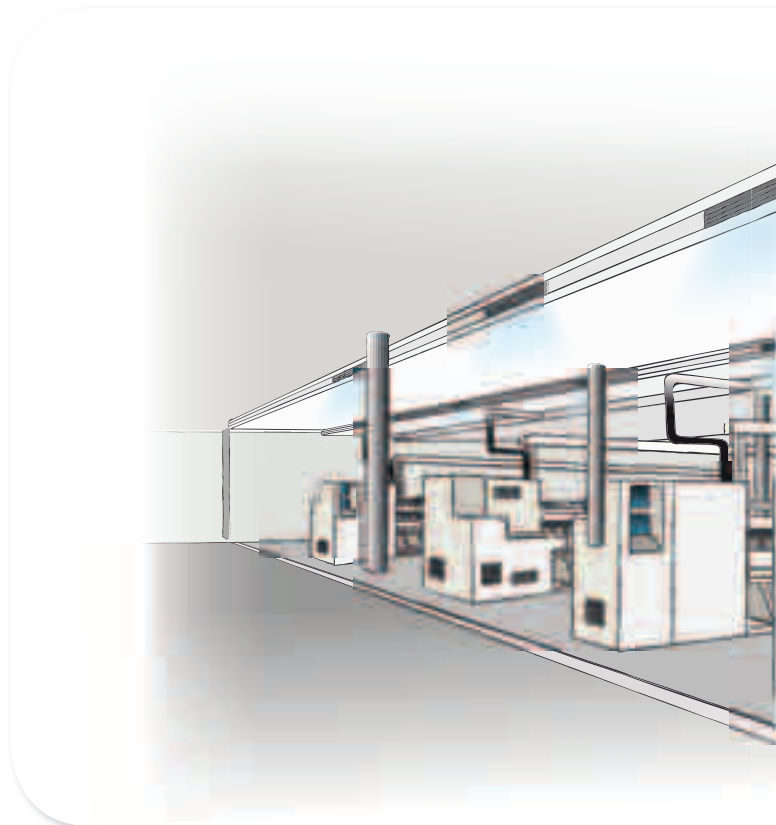
## Adiabatic humidification in the duct

The air-conditioning system in the Sapphire facilities production department is very complex and needs to guarantee the right temperature, humidity and ventilation conditions for the various production departments, each with different needs; for example, some departments only work with outside air, while others have partial recirculation.

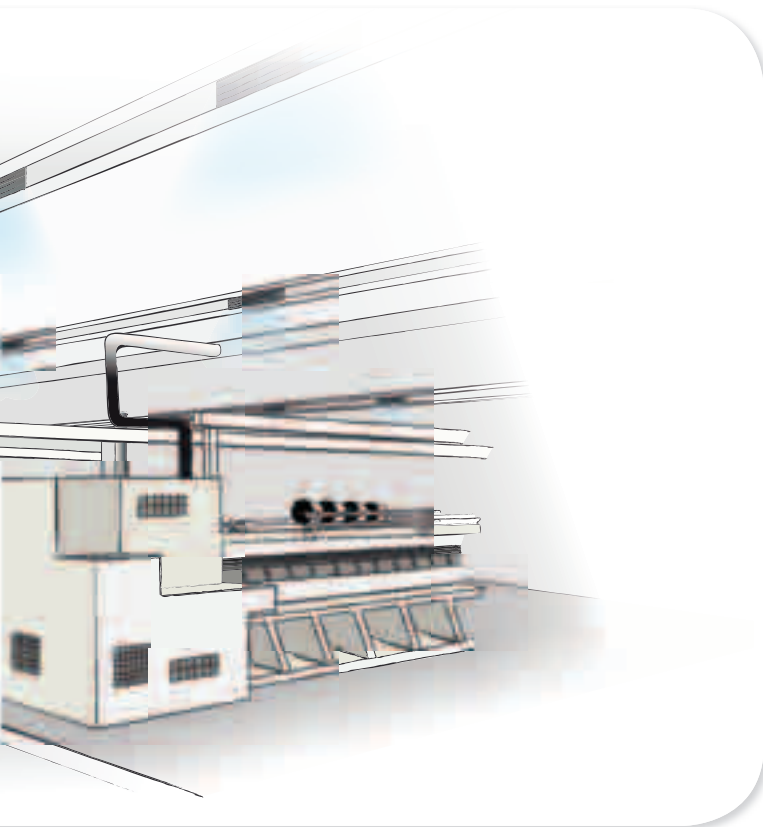
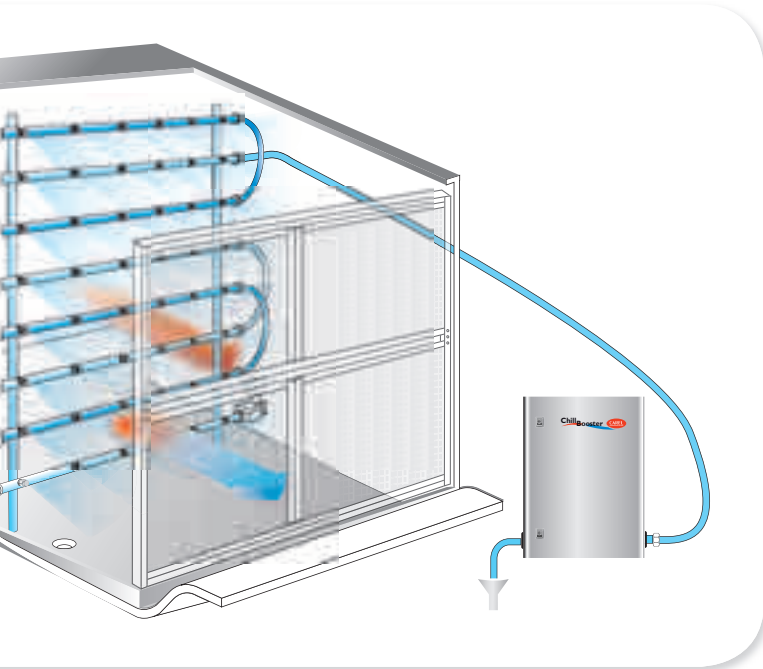
To satisfy the requirements of high capacity, reliability and minimum maintenance and ensure the continuous production, the solution



*Layout of the rack in the duct*



chosen uses two ChillBooster humidifiers, which consume just 0.6 W/l. Two-stage operation is guaranteed by a CAREL ir33 universal controller connected to a humidity probe on the wall. ChillBooster is suitable for all applications that require a high humidification capacity, up to 1000 l/h. The appliance uses a pump to pressurise water that's then atomised by nozzles, producing a fine and uniform mist. The droplets generated evaporate spontaneously, humidifying and cooling the air.



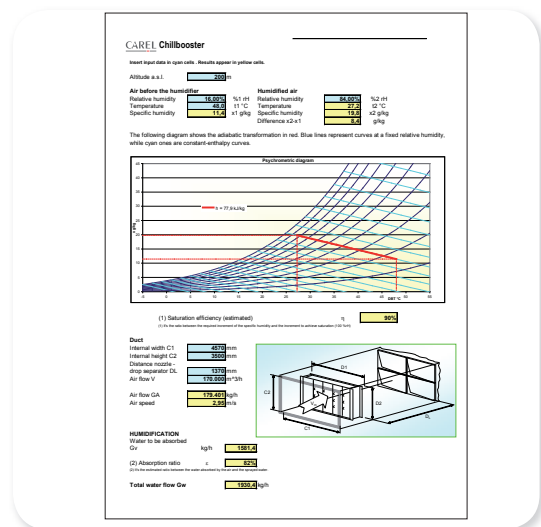
## Simple design tool

In this specific application, the humidification system must ensure a transformation from outside air conditions of 48°C and 16% RH to the ideal conditions for the process: relative humidity > 60%.

The ChillBooster supplied consists of:

- a pumping unit that delivers pressurised water at 10 bars to the distribution system, with ON/OFF control of flow-rate, high temperature protection valve and drain solenoid valve;
- modular stainless steel manifolds;
- atomising nozzles;
- drain solenoid valve on the distribution system;
- metal connection hoses and fittings;
- UV water disinfection system (optional).

The psychrometric chart below shows the transformation in question. The air in the room satisfies the design conditions of 32°C and 65 %RH.



transformation on the psychrometric chart



pumping unit



nozzles



nozzle manifold



hose



solenoid valve at end of line



ir33 universal



humidity probe



## A powerful and complete solution

CAREL provides all the components ready for assembly. The ChillBooster system is easy to install, thanks to the nozzle racks available in different lengths, connection hoses and quick couplings (no special tools or welding required). The rack can be assembled and adapted based on the required measurements. In addition, water does not stagnate in the system's lines as the drain solenoid valve in the pumping unit and the solenoid valve at end of the line drain the water whenever the unit stops.

### Example of material supplied for ducted humidification in the spinning process area

Code	Description	No.
AC100D0000	Pumping unit, 1000 l/h, 230 V 50 Hz, IP55	1
ACKRN01000	Brass nipple G 1/2"	4
ACKT1F2000	Corrugated AISI 304 steel hose, dia.= 1/2", L=2 m	4
ACKRDM0000	Brass compression fitting, straight, 1/2"M - dia.= 20 mm	14
ACKRDI0000	Brass compression fitting, straight, D20 - dia.= 20 mm	8
ACKT013000	Manifold dia.= 20 mm with 13 holes, NPT 1/8"F L= 1.96 m	12
ACKT1F0500	Corrugated AISI 304 steel hose, dia.= 1/2", L= 0.5 m	5
ACKV1D0010	N.O. drain valve, IP67	1
ACKG100000	Gaskets for 1/2" fittings	10
ACKNR00000	10 red nozzles, 5 kg/h	7
ACKNC00000	10 cream-coloured nozzles, 7.5 kg/h	10



rack with nozzles



humidity probe installed on the wall



ChillBooster operating

## Conclusions

ChillBooster uses a paddle pump to pressurise the water to 10 bars, which the special nozzles then atomise into millions of droplets with a diameter in the tens of  $\mu\text{m}$  that quickly and spontaneously evaporate, humidifying and cooling the air. The design requirements were achieved with low fixed running and maintenance costs, to the extent where the executive director, Shaukat Iqbal, decided to replace the existing air washers in all production departments.

The comparison between power consumption highlights **electricity savings of 93%!**

Department	Previous consumption * (kW)	Current consumption ** (kW)
Blow room new (1)	18.5	1.2
Blow room old (2)	11	0.6
Comber & Drawing	11	0.6
Carding & Simplex ap (1)	22	1.2
Carding & Blow (2)	18.5	1.8
Doubling	15	1.2
Ring 1 / A	15	1.2
Ring 1 / B	30	1.8
Ring 2	30	1.8
Simple	11	1.2
Ring 2 + 3	30	1.8
<b>Total</b>	<b>212</b>	<b>14.4</b>

\*= with air washer

\*\*= with ChillBooster



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Managing Director  
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Shaukat Iqbal  
Executive Director  
Sapphire Textile Unit - 5



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