Evaporative Cooling of Ramdev's Yoga Ashram

Baba Ramdev's Yog Bhavan in Hardwar

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Introduction

Lying at the feet of Shiva's hills, i.e., Shivaliks in Uttarakhand, is the ancient city of Hardwar. Legend has it that the Suryavanshi prince Bhagirath performed penance here to salvage the souls of his ancestors who had perished due to the curse of sage Kapila. The penance was answered and the river Ganga trickled forth from Lord Shiva's locks and its bountiful water revived the sixty thousand sons of king Sagara. In the tradition of Bhagirath, devout Hindus stand in the sacred waters here, praying for the salvation of their departed elders.

The Project

Baba Ramdev's ashram in Hardwar is the spiritual destination of large numbers of Indian and foreign devotees. The Yog Bhavan, where thousands of persons practice *yoga* in the presence of the celebrated *yoga guru*, is a mammoth hall with an area of 2,00,000 sq ft, large enough to accommodate 30,000 persons. It is 115m wide, 165m long and 13m high. While air conditioning the hall would perhaps give to the *yoga* practitioners physical comfort commensurate with the spiritual bliss they experience there, it would be a rather expensive proposition. But the salubrious climate of the holy city offered an affordable solution. Rather hot and dry in the summer, but moderate in the winter, the climate is ideally suited for evaporative cooling. Therefore, the Patanjali Yogpith Trust that runs the ashram, decided to install an evaporative cooling system in Yog Bhavan. We received the order to supply and installed equipments.

The 2 lakh sq.ft. hall

Design Conditions

Outdoor design conditions in Hardwar can be quite severe in the summer at 44°C with very low humidity. During the monsoon, RH goes up to 85% at 32°C. The

About the Author

Shyamsundar Rao has been with Symphony Limited since 2002. He is currently handling the large projects business of their Industrial Sales team. His area of experience has been selling industrial and consumer products and marketing. Though an engineer, he is keenly interested in sales and marketing. He has been instrumental in securing some prestigious orders for Symphony from customers like Patanjali Yogpith, Shivam Auto, Asahi Glass, Nestle India and Maruti.

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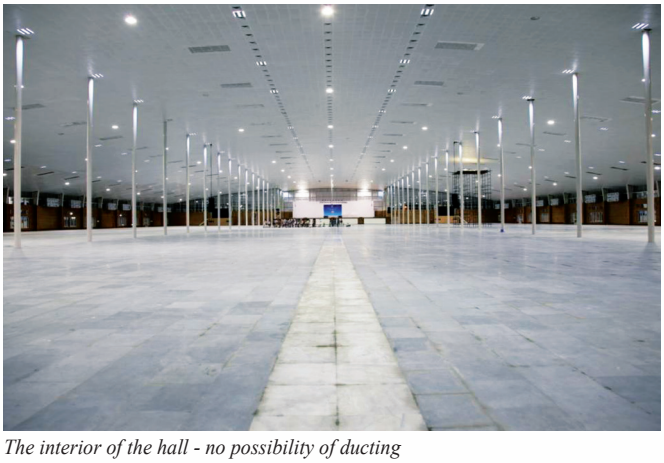
winter temperature is 12°C minimum, and one can do without heating. There is no feasibility of ducting in the space. Due to the large width, air throw of 55m would be required. Peak occupancy would be 25-30,000.

The indoor design temperature to be achieved was specified at 26 to 28°C during summers. We considered 30 air changes per hour.



The interior of the hall - no possibility of ducting

Equipment

We used 22 evaporative coolers, eleven on each side of the hall. Each cooler is ducted into a plenum in the hall. We achieved 85% efficiency of the coolers by using 20HP motors for each unit. We could have gone up to 95% using 25HP motors, but the performance was found satisfactory with 20HP motors, so we decided to save energy by leaving it at that.

Eleven evaporative coolers are installed on each side of the hall

21 diffusers at the end of each plenum

Each cooler has a 40" centrifugal blower, forward curved with 50 mm static, with powder coated automotive steel body and stainless steel water tank. The air filters for each unit comprised of 2 wet sections of 12" thick paper cellulose, Munters make.

We placed 21 diffusers in each plenum, out of which 15 are spot type diffuser of 2200 cfm for long throw and adjusted for even distribution of air in the hall. Six diffusers are jet type, to handle short throws and to balance the air.

Air travels 55m to reach the centre of the hall

The biggest challenge of the project was to ensure that air reached the centre of the hall without any ducting. The width of the hall is 110m and there was no space to run the duct inside the hall, so with our technical team based in the USA, we calculated all the parameters and designed the plenum to deliver air up to 55m. In fact, we reached beyond 60m. The plenum was not acoustically lined.

System

Since the building had a pre-fabricated structure with hot air trap in the middle, we created a positive pressure of cool air so that hot air rises and is naturally exhausted from louvers placed at the centre and sides of the hall. The structure, with hot air trap of 6' width at the centre, running 160m with false ceiling of gypsum board tile of 2x2 ft above the false ceiling, is insulated with 25mm thick fibre wool placed in polythene bags. The side walls are panelled with wooden board. Sixty percent of the wall has windows along the two sides for ventilation.

The total power consumption, with all the units running, would be 328 kW. The indoor noise level is 64 dB.

Standby Spares

The following spare parts have been provided to enable quick service in the event of a breakdown:

- Two motors of 20 HP each.
- Two pumps.
- One wet section complete set, comprising stainless steel water tank, two sets of 12" rigid media, water connections etc.

Conclusion

It was a learning experience for our team. Completion of the project to the satisfaction of Patanjali Yogpith helped us bag another two orders worth Rs.3 crores for their upcoming Gurukul, which has over 200 rooms to be centrally air cooled. ❖