Automobile factory shed cooling

Background

India is the one of the world's fastest moving economies. As a result, the purchasing power of Indians is growing rapidly — and so are their tastes. Today, brands that were once aspirational for Indians are no longer just dreams. Nowhere is this clearer than in the auto sector. There are many international automobile players setting up plants in India to benefit from India's development.

The potential of the Indian automobile industry can be best understood by the following statistics: India is the world's second largest two wheeler market, the fourth largest commercial vehicle market, and is ranked eleventh in the passenger-car bus and truck market.

The boom in the auto sector has unleashed cut-throat competition. This has made it inevitable for the industry to look for newer, innovative ways to control costs and boost productivity. This is, however, easier said than done, particularly with the shortage of skilled labour and the challenges faced by the industry in attracting and retaining talent.

It is a proven fact that a comfortable working environment in factories has a direct bearing on the productivity of workers and the quality of products. Today, automobile plants in India require various means for providing comfortable working conditions on the shop floor. This can reduce costs, and provide a much-needed competitive advantage.

Challenges

Installing air conditioning for large shop floors is not feasible from the point of view of either cost or air quality. Air conditioning is known to be energy intensive and in the case of large factory sheds, due to the sheer size of the building and the existing heat load of machines and people, the capacity of the air conditioning plant required and the associated energy use makes air conditioning prohibitively expensive. Further, with air conditioning installed, indoor air is repeatedly circulated inside the plant itself with very little or no fresh air added. This increases the levels of CO_2 within the factory shed which deteriorates the indoor air quality. Hence, automobile plants have traditionally used either air-washers (single-stage evaporative cooling) or forced air ventilation for their factory sheds. The disadvantages of using such systems are:

- Air-washers provide single-stage evaporative cooling or DEC (Direct Evaporative Cooling), which reduces the temperature to some extent, but adds significant humidity (moisture) in the process — the high level of moisture in the air can affect the quality of auto components.

- Forced ventilation gives only the required air changes, but cannot reduce the air temperature. Moreover, due to heat gain in the plant, the inside temperature will always be more than the outside temperature. This does not significantly enhance comfort.

Solution

HMX Systems has an innovative solution branded the 'HMX-IDEC' for automobile factory shed cooling that makes use of two-stage evaporative cooling. This uses Indirect Evaporative Cooling (IEC) or sensible cooling (no moisture addition), followed by direct evaporative cooling (DEC) or adiabatic cooling. Our unique patented sensible heat exchanger called DAMA (Dry Air Moist Air) gives better cooling without adding any moisture at the 19' stage. This ensures excellent overall efficiency of both stages i.e. about 120%. As the air is already cooled before the DEC stage, overall moisture pickup is low. The Ambiator thus provides lower temperatures without addition of excess moisture on the shop floor — making it a preferred choice for cooling large spaces for people and processes in the auto and auto ancillary sectors.

Result

Many automobile manufacturers and auto ancillaries installed the HMX-IDEC to provide comfortable working conditions for their people and processes. Compared to air washers, IDEC have the following advantages:

- For IDEC and air washer with the same CFM, the IDEC can achieve an additional temperature drop — or more cooling — of about 4 to 5°C and about 50% reduction in moisture addition in the same conditioned space.
- The same temperature conditions can be achieved with a lower machine capacity (CFM). This not only saves energy but also ensures that humidity addition is less (approximately 1/4th) that of an air washer.

By having 100% fresh, clean, and cool air, a stuffy and smelly work environment is avoided leading to better IAQ (Indoor Air Quality). Furthermore, evaporation losses of raw material such as solvents and paints are reduced in lower temperatures. All in all, the HMX-IDEC provides comfortable conditions which are conducive to work in and thereby increases the productivity and morale of employees.

Based on our field experience, we have prepared this table ready reckoner for a few cities:

Based on summer conditions of	Ambient temprature (°C)	HMX-IDEC outlet temprature (°C)	Our customer for this application
Pune	40.0	21.5	Victor Reinz
Jaipur	43.3	20.3	Bosch
Ahmedabad/Sanand	43.3	22.5	Tata Motors, Bosch
Bengaluru/Mysuru	35.6	24.1	SKF

Many of our clients have chosen HMX-IDEC over other products in the market such as coil-based two-stage evaporative cooling, air-washers, etc., after they experienced the difference in performance.

HMX-IDEC

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V3, Apr 2026