Air Flow and Ventilation in Warehouses
Richard Aynsley, Ph.D. Director Research and Development
Big Ass Fan Company, Lexington, KY
1. **What are some of the air quality issues that warehouse workers typically face?**

Air quality issues in warehouses are covered by ASHRAE Standard 62-2001 Ventilation for Acceptable Indoor Air Quality. The principal issues in warehouses are:

   a. Contaminant source control (indoors from people, materials and machinery and outdoors from industrial or vehicular sources)

   b. Appropriate level of fresh air ventilation (Liters per person per hour mandated by the Standard depending on the density of occupation and sources of pollution)

   c. Filtration of air to remove particulate and other contaminants.

   d. Humidity management (when warehouses are air conditioned to control humidity)

2. **How can warehouses achieve good ventilation?**

By providing fans to ensure the mandated volume of fresh outdoor air is brought into the warehouse and a similar volume is exhausted. This is normally achieved using wall mounted exhaust fans with air intake openings on the opposite side of the warehouse. Alternately, exhaust fans can be installed in the roof.

3. **How do Big Ass fans fit into the picture?**

It is extremely difficult to arrange exhaust fans to ensure that fresh air reaches all locations in the warehouse. Obstructions, such as storage racks, interfere with air flow, and stagnant regions tend to develop in corners of the space. BIG Ass fans are circulator fans. They are extremely effective and energy-efficient at circulating air within a warehouse, eliminating stagnant zones.
How do Big Ass fans also help with temperature control?

In summer, Big Ass circulator fans are run at top speed mixing all the air in the space to an even slightly raised temperature. It is the increased air flow over workers near floor level that provides a significant net cooling effect. A conservative indication of this cooling effect is provided below (http://navymedicine.med.navy.mil/Files/Media/directives/5010-3.pdf)

In winter the Big Ass fans are operated at about half speed this will keep air movement at head height to around 50 fpm. At this speed air movement is barely noticeable. Hotter air that accumulates near roof level, is mixed with other air in the space (destratified) to raise the air temperature for improved worker comfort near floor level.
What kinds of savings, both cost and productivity, can be achieved with Big Ass fans?

Typically, winter heating costs in warehouses can be reduced by 20% to 30% by destratification using Big Ass fans. In summer, air flow from Big Ass fans improves thermal comfort of workers in warehouses. Productivity increases due to air movement are difficult to measure, however one study under extremely hot and humid conditions in a South African gold mine (Wyndham and Strydom, 1965), clearly showed the benefits of air flow.

References


Dr. Richard Aynsley

Director of Research and Development

Dr. Richard Aynsley, B.Arch (Hons I) & Ph.D. in Aerodynamics, Uni. of NSW Australia and MS(ArchEng) Penn State, is Director of Research & Development at the Big Ass Fan Company. He has conducted wide-ranging research and consulting over the past 37 years in building science, energy-efficiency, and building aerodynamics for commercial and government clients in the USA, Australia and New Zealand.

He has published numerous articles in peer-review international journals and was principal author of Architectural Aerodynamics, Applied Science, London as well as chapters in a number of textbooks He serves on technical committees of the American Society of Civil Engineers’ Technical Council on Wind Engineering, the Air Movement & Control Association International’s Standard 230 Laboratory Methods of Testing Air Circulator Fans for Rating, and American Society of Heating, Refrigerating and Air-conditioning Engineers’ SSPC on Thermal Environmental Conditions for Human Occupancy.