

Sustainability and Net Zero Energy in Industrial Facilities

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In the modern era of global warming, fast depleting energy resources and environmental degradation, the world more than ever needs to conserve energy and preserve the environment. Buildings (industrial and commercial) are among the largest consumer of electricity and biggest producers of waste. Energy efficiency in industrial buildings is of prime importance as energy consumption in industrial facilities is far greater than commercial or residential facilities. Industrial buildings, particularly manufacturing plants, warehouses and factories for perishable goods, are heavy-duty users of energy as they often operate 365 days a year. Designing industrial or manufacturing facilities requires in-depth knowledge of the application and a custom energy efficient design which incorporates and fulfills all the pertaining requirements. To simulate industrial built environments, energy modeling was performed using software such as EQuest and Energypro for this research. Building models were generated to evaluate the application of energy usage reduction techniques in industrial buildings such as geothermal heat pumps, natural ventilation, thermal storage and living walls. Energy generation is also explored by simulating techniques such as bloom energy, wind turbines and solar powered photovoltaics to offset onsite energy usage and attain net zero energy. Results from this research show that in the new generation buildings, sustainable techniques if applied correctly can maximize energy performance of industrial built environments. Various permutation combinations of these sustainable techniques can be used based on facility application and weather conditions. Hybrid models tailored for specific application are very effective when integrated with sustainable energy reduction concepts and onsite energy generation techniques.

Key Words: Energy Efficiency, Sustainable Techniques, Net Zero Energy, Energy Modeling