Optimizing Energy Efficiency in Airport Terminals With Intelligent Building Management Systems

Airports are power guzzlers, where energy systems are functioning round the clock, on all days in a year. Terminals, in particular, account for over 50 percent of total energy consumption. To better control energy utilization, authorities are looking for innovative systems that can smartly and reliably manage all electrical and electronic activities inside airport buildings. With intelligent building energy management solutions (i-BEMS) making it possible to improve performance, they are increasingly gaining traction across industries.

Airport Building Energy Management: The Before and After

While the energy-saving potential with low-cost measures ranges between 5 and 30 percent, airports have not necessarily been able to achieve this. One of the reasons is that airports with legacy building management systems (BMS) have not been able to fully utilize sensor data as existing systems are disparate and not interconnected. This leads to a lack of systematic or optimized tenant user experience, due to which available data from building automation systems (BAS) is not fully utilized. A lack of accessibility of real-time data leads to inadequate focus on fault detection and a genuine inability to properly diagnose operational inefficiencies.

In most legacy airport buildings, interfaces between BAS/BMS, operations and maintenance (O&M), and energy management are lacking. Owing to the facilities’ poor design, operations, and management, these insufficiencies and unclear roles for managing heating, ventilation, and air conditioning (HVAC) systems can contribute to up to 80 percent (SEAI, 2008) of its energy bills. As HVAC consumes about 70 percent of the energy in airport terminal buildings, there is a strong need to install and connect BMS and BAS systems by leveraging i-BEMS. Its effective user profiles and artificial intelligence (AI)-based algorithms also helps automatically optimize BMS and BAS schedules.
Here are the most common hurdles facing airports today:

**Airports with BMS: A Thing of the Past**

- HVAC alone consumes 70% of energy expended in airport terminal buildings.
- Terminals account for 50% of total energy consumption.

**Roadblocks**
- Complex infrastructure
- Low budgets
- Limited human resources
- Unused sensor data
- Inefficient building management system
- Ineffective HVAC system

**Energy management issues with traditional BMS**

- Temperature fluctuations
- Unharmonized schedules of components
- Improper heating & cooling curves
- Simultaneous heating and cooling
- Over-dimensioned pumps
- Incorrect dimension of generators
- Clocking
- Inadequate temperature setback
- Closed mixing valves

By embracing the concept of i-BEMS, smart airports can focus on achieving energy efficiency without compromising on reliability and comfort. The key here is to adopt intelligent solutions that leverage sensors, connected devices, and data analytics. The generated real-time sensor data facilitates diagnosis of operational inefficiencies and execution of maintenance work on time, thereby considerably reducing energy wastage.

A major advantage of i-BEMS is that it serves as an interface between BAS or BMS, O&M, and energy management. This fully integrated system can save energy even with the increase in air travellers. For instance, Dublin Airport gained 33 percent from energy savings after revamping its BMS, despite 6 percent rise in passenger traffic. Other airports have also used i-BEMS to control HVAC in various ways. Read about this and more below.

**Smarter BMS Automates Energy Optimization**

i-BEMS’s integrated system enables operators to view all off-site operations on a cloud-based online platform, simplifying the inspection process. Using consumption analytics, this system can automatically detect many common faults. For instance, in the case of unharmonized schedules of different components like fans and pumps of heating coils, the dashboard shows temperature fluctuations that alert operators to check the HVAC system. i-BEMS leverages AI-based algorithms to automatically optimize this energy usage.

The HVAC management system architecture can analyse alarms and temperature changes, and allows scheduling timings and set points based on the actual state of the building. Installing i-BEMS also enables
access to detailed energy analytics, where actual data can be compared with the baseline, expected, and budgeted energy consumption data for each month. Consumption analytics additionally accounts for power density, control limits, time of use, and Pareto analysis to allow operators to make data-driven decisions for effective energy optimization.

A similar integrated control and management system is deployed for other energy-intensive functions, such as lighting, water harvesting, and waste management.

**Toward Holistic Efficiency Gains**

As the BMS market is poised to reach $19.25 billion by 2023, there is heightened focus on fully integrating new and existing airport building systems for complete life cycle support and control process automation. i-BEMS aims at boosting productivity, reducing errors and failures, improving response time to events, and maintaining airport infrastructure, while saving on installation and inspection costs, and enhancing building safety.

Several countries and regions have already begun investing in airport modernization and expansion projects. This is true of the Middle East where the Gulf Cooperation Council has put aside $100 billion to revamp airports in the region. Similarly, in the US, San Francisco is planning to unveil a “triple zero” plan, which aims at achieving zero waste-to-landfill, zero net energy, carbon neutrality by 2021.

As more airports deploy i-BEMS systems, they will witness significantly optimized energy usage in the terminal, reduced carbon footprint, lower OPEX, and better passenger experience.