AdCept Technologies Pvt. Ltd.

HVAC/R Systems Monitoring

Heating, ventilation, and air conditioning/refrigeration (HVAC/R) systems regulate thermal comfort inside of buildings and maintain adequate air quality by circulating and replenishing interior air with fresh outdoor air. Building operators and mechanical contractors who oversee these systems strive to ensure that HVAC/R equipment is running efficiently so that a proper interior environment is sustained and operating costs held at reasonable levels.

To achieve better performance from HVAC/R systems, interior monitoring can provide valuable feedback in terms of system operations, leading to insights for correcting inefficiencies and optimizing equipment. Monitoring can also identify opportunities for energy efficiency upgrades and provide validation for improvements that contribute towards LEED certification.

Our IoT solution, comprising of data loggers and sensors, enable accurate monitoring of interior conditions, helping building professionals diagnose mechanical issues, locate sources that compromise comfort, and better balance healthy and comfortable interior environments with energy costs.

Challenges in maintaining Indoor Air Quality in Centrally Air-conditioned Malls, Schools, Apartment Buildings and Offices

For facilities managers ensuring proper air circulation in buildings have always been a top priority. However, plagued by the Covid-19 pandemic, the facilities managers recognized that this year air quality would play an even more important role in maintaining a healthy environment. Due to health challenges posed by the pandemic, there's a need to be proactive in employing a solution that allowed them to repeatedly test and monitor all HVAC systems to ensure maximum performance required for optimal fresh air circulation. Monitoring carbon dioxide (CO_2) levels indoors would help ensure proper circulation of fresh air, while reducing stagnant air that might retain virus particles.

Additionally, every big facility typically generates Lakhs in utility bills each year. High per square foot utility bills are a high price to pay, even if the HVAC system is relatively new. In keeping with a national push to bring greater energy efficiency, it is essential to analyze motor utilization, a first step toward cutting energy costs. To accomplish the above, energy consumption data are required to be collected over a period of time, besides recording the temperature, relative humidity, CO_2 levels, motor run times, and electricity usage.

Advanced Technology Solution

We recommended IoT-enabled data loggers for convenient measuring and recording of CO_2, temperature, and relative humidity in buildings. . The data collected from the loggers enables performance optimization of the buildings' HVAC systems to ensure that indoor air quality is conducive

to health and safety standards. We employ a data-driven approach to achieve these goals, deploying variety of portable data loggers throughout the facility to collect energy consumption data in addition to recording temperature, relative humidity, CO2 levels, motor run times, and electricity usage.

Typical System Components

IoT Data Logger

The IoT gateway is a Microcontroller based product with GSM interface for connecting field instruments with cloud. It collects real time data from field instruments and pushes data to cloud server. Data stored at cloud server can be viewed from remote places. The gateway stores data in local non-volatile flash memory in case of network issue and sends data to the server when network connection is restored to avoid data loss. It supports MQTT Protocol.

The data logger supports the following measurements: 4-20mA, AC Current, AC Voltage, Air Velocity, Carbon Dioxide, Compressed Air Flow, DC Current, DC Voltage, Differential Pressure, Gauge Pressure, Kilowatts (kW) and Temperature.

Split-core AC current Sensor / Motor "ON / OFF" sensor

A split-core sensor is used to record AC amperage, for use with the data logger with an input of AC current, sine wave, single phase 50 Hz or 60 Hz, load power factor 0.5 to 1.0 lead or lag. Senses power induced from line voltage using self-gripping split-core design for faster installation. These are available in 5 ranges - 20, 50, 100, 200 & 600 Amps. This is used to estimate electrical draw on the motors. We use the runtime data to estimate actual kilowatt hour usage for each motor.

Differential Air Pressure Transducer Sensor

The transducer can measure either air pressure or velocity with the flip of a switch. It is available in three installation configurations: duct, panel, or universal. Duct and panel models have two pressure and velocity range options: 0-1" WC / 0-3,000 ft./min or 0-10" WC / 0-7,000 ft./min, with seven field-selectable sub-ranges for pressure and eight for velocity. All variants are available with and without display. It has an IP65/NEMA 4 environmental rating.

Indoor Carbon Dioxide - Temp - RH Data Logger

Indoor CO2, RH and Temperature logger makes it more convenient than ever to measure and record CO2 in buildings and other non-condensing environments. It measures CO2 from 0–5,000 parts per million (ppm).

Motor Temperature Sensor

The temperature probe works with data loggers. The digital temperature and humidity sensor is a temperature and humidity combined sensor that has been calibrated to provide digital signal output. The sensor includes a capacitive sensor wet component and a temperature measurement device and connected with a high-performance 8-bit microcontroller. The ultra-small size, low power consumption, signal transmission distance up to 20 meters or more, makes it the best choice of even the most demanding applications in a variety of applications.

System Architecture

IoT-enabled data logger measures and records levels of CO2, temperature, and relative humidity in buildings and it works with an app on either a mobile phone or tablet so users can access data and configure audible alarm notifications of the logger. With the built-in gateway functionality, data can be collected from the logger and automatically sent via Ethernet, WiFi, GPRS, 3G or 4G communications to a cloud-based platform. The cloud data can be viewed anywhere at any time, simply by logging into an online user account, which can also be set up to send alarm notifications via text or email should conditions exceed user-set thresholds.