Case Study & POC & Demos Information

Type: Case Study

Name: Smart Ehningen - IBM minimizes energy, operating and maintenance costs using its "Smart Buildings" concept

Description:

1. Overview:

"Smart building" means "*minimizing energy costs, operational costs and maintenance costs, providing an ideal work environment, increasing the life expectancy of equipment and facilities, and minimizing downtime by constantly analyzing data about the building and the environment*".

IBM wanted to reduce the operational costs of its new administrative headquarters in Ehningen, Stuttgart, Germany, without compromising on comfort. It wanted to protect the environment using state-of-the-art technology. IBM enhanced the use of floor space, installed sensors, implemented intelligent solutions for energy generation and optimization and infrastructure and technology services, and increased employees' environmental awareness, enabling it to cut the cost of operating the building by more than 35 percent.

2. Business benefits

The business benefits resulting from the implementation of IBM's "Smarter Buildings" concept:

- Optimizes the use of floor space and equipment, and reduces downtime by constantly analyzing data and taking proactive measures.
- Cuts the cost of operating and maintaining the building by more than 35 percent using optimizations.
- Meets the German federal government's goal of reducing CO2 emissions by 40 percent by 2020 – years before the deadline.

3. IBM demonstrates tremendous technological advancement in "Smart Ehningen"

IBM is working on creating a more intelligent urban living space for the future by developing intelligent concepts and solutions in the "Smarter Cities® Alliance". The "Smarter Buildings" initiative encompasses everything that affects the economic and environmental quality of buildings and how they are used. IBM wanted to showcase its major achievements at its new location in Ehningen, which is near the German city of Stuttgart.

IBM has equipped its administrative headquarters in Ehningen with almost everything required for exemplary building management. Two data centers, 3,000 jobs and a convention center are based in this building, which has a total floor area of approximately 61,500 m². IBM wanted to prove that the operational and maintenance costs of buildings can be reduced considerably – without compromising on comfort – using intelligent concepts and solutions based on technology available today. At the same time, it also wanted to protect the environment.

3.1. Step one: save twenty percent by reducing floor space

The building was first optimized during the design stages. Experience has shown that intelligently reducing floor space can provide savings of between 10 and 25 percent. In sales-oriented companies such as IBM, typically only 70 to 80 percent of employees require a fixed workstation in the building. The remaining employees are usually visiting customers, attending training sessions, on other business trips, working from home or on vacation.

Using innovative workplace management and assigning desks on a variable basis optimizes office capacity and can lead to lower costs. The lower demand for workstations also leaves more space for relaxation areas, canteens, bathroom facilities and parking spaces.

3.2. Step two: infrastructure and technology services lead to savings of five percent

If you want a building to "behave" intelligently, you must equip it with the necessary sensors. It's just like a living organism. If the building doesn't know what is hurting it, it can't do anything about it.

At the IBM Ehningen site, hundreds of sensors located throughout the building measure the current indoor and outdoor temperature, the status of various devices, energy and water consumption, humidity, the amount of sunlight penetrating the building, CO2 emissions, the strength of the wind, the building's heating and cooling efficiency, and much more.

Data is sent in real time via a digital control system to the central IBM® TRIRIGA® Energy Optimization System, which consolidates, processes and automatically evaluates the data. The IBM TRIRIGA Energy Optimization System has defined rules and limits, which help it recognize abnormalities. By analyzing trends and comparing current data to previous data, it notices when consumption is atypical and identifies problems early. The relevant employees receive a detailed list of required tasks, enabling them to come to the right place with the proper spare part very quickly.

In order to implement the "Smarter Building" concept, IBM used the 3I that define the "Smarter Planet" framework:

1. Instrumented: Hundreds of sensors and detectors constantly monitor energy consumption, the condition and performance of equipment and the environmental conditions on the IBM campus in Ehningen
2. Interconnected: The recorded data is transferred over the network to the building management solution, which automatically consolidates it and processes it for a variety of purposes.

3. Intelligent: Advanced analytics solutions detect and diagnose abnormalities and faults, automatically alert service personnel when necessary, identify and take advantage of the cheapest and most environmentally friendly energy mix, and identify potential savings.

Systematic analysis of consumption data and usage periods for heating and cooling systems, elevators, lighting systems and other technical equipment enables IBM to determine ideal replacement or maintenance intervals, thus optimizing maintenance management. This minimizes downtime and cuts costs.

3.3. Step three: cutting energy consumption by twenty percent and protecting the environment

According to a recent study, buildings account for approximately 45 percent of the world's energy demand. As fossil fuels become more and more expensive, companies can save money and cut CO2 emissions by optimizing energy consumption.

IBM therefore uses all the technology available at its site in Ehningen to optimize energy consumption. By centrally recording power usage and controlling all IT, air conditioning and lighting systems connected to the solution, IBM can quickly identify faults and repair defective equipment. By automatically monitoring room temperature, humidity and CO2 levels, the company can provide an optimal working environment. If employees act carelessly, for example, by turning up the heating in winter and leaving the windows open, keeping the blinds up in bright sunshine or leaving all the lights on after hours, these mistakes can be identified and remedied.

IBM also relies on a separate power supply from a thermal power station. Bilfinger Berger, an IBM partner, built the power station and is now responsible for its day-to-day operations. In the thermal power station, a gas engine with a capacity of 3.4 MW powers a generator to produce electricity. The waste heat from this unit is used to heat and cool the administrative complex, making the power station approximately 90 percent efficient. The thermal power station was designed to meet around one third of the building's total demand for electricity, and approximately three quarters of the demand for heat. Compared to conventional power plants, it is very environmentally friendly. Biogas is burned off, so the building is almost carbon neutral.

During the daily peak, the thermal power station mainly produces power to meet the demand for electricity in the buildings. The decentralized generators are connected to optimization software, which calculates and selects the cheapest and most environmentally efficient energy mix for the IBM campus. Bilfinger Berger transfers surplus energy directly into the electricity grid for public consumption and uses the profits to offset the initial investment in the power station, which was built as part of an agreed contract.
Thorsten Juergens, Business Development, Enterprise Asset Management for IBM Maximo & IBM TRIRIGA at IBM, says: "I am very confident about the expected savings; we only recently completed the entire system, and we can't say exactly how large the savings will be. From our previous experience in similar projects at our US locations in Armonk and Rochester, we hope to cut our energy costs by around 20 percent. The technology used provides us with a better balance of energy and protects the environment."

3.4. Step four: Increasing employee awareness and participation

Thorsten Juergens comments on another IBM initiative at the Ehningen site: "Often, even seemingly minor measures can reduce energy costs significantly. We developed a plug-in for IBM Sametime®, our company-wide communication solution. This plug-in shows each employee the building's current energy consumption onscreen. At peak times, when electricity is particularly expensive, we encourage employees to power their laptops using the batteries. The batteries can be recharged later, when electricity is not as expensive."

This program also determines whether Windows power management is enabled on the workstation, and the optimal power-saving settings can be selected with just a few mouse clicks. The plug-in can also send context-specific energy-saving tips to employees to alert them to certain situations and encourage them to save energy. Implementing this measure alone has cut electricity consumption by between one and two percent.

3.5. Step five: using electric vehicles to help protect the environment and balance out peaks in energy use

When a large proportion of electricity is produced using renewable resources, electric vehicles will become more viable, so we will see more and more electric cars on our roads in the future. In the medium term, IBM is preparing for the upcoming boom in electric vehicles with its Smarter Building concept.

When IBM employees require transfers to and from Stuttgart airport, they use rental cars, which they can reserve using the in-house electronic reservation system. These rental cars will be replaced with electric cars in the future, and IBM has already reached a contractual agreement with an onsite vehicle rental agency. IBM is planning to install two new electric vehicle charging stations, enabling employees to recharge the electric car batteries easily.

IBM employees increasingly use electric vehicles as their company or private cars, so more electric vehicle charging stations will be built on the site to enable employees to recharge their cars more easily in the future. The batteries in these vehicles can also be used to store energy for the building, because the batteries contain intelligent recharging technology. IBM is considering using the energy stored in the batteries to power the building during peak hours, when energy from the grid is particularly expensive. These batteries can then be recharged using either energy produced in-house or power from the grid when prices are lower. IBM is expecting this concept to cut energy costs by an additional three to five percent. The increased use of electric vehicles will also improve energy efficiency in general, and reduce CO2 emissions as part of a wider environmental protection initiative.

4. Results breathe hope into future customer projects

When contemplating the results of the activities in the Smart Building initiative at the Ehningen location, one can recognize that IBM's efforts have paid off well: by managing its building more efficiently, according to actual need and market prices, IBM will be able to save up to 45 percent of our total costs. And IBM is doing all this with technology that is readily available. The additional investments in sensors and information technology paid themselves off very quickly.

Electric vehicles will take us one step closer to reaching our goals. From this very positive experience with building management, IBM can see ways for its customers to manage their own buildings more efficiently.

IBM is therefore very confident that it will make the most of its knowledge and know-how in future customer projects.

5. Conclusion

IBM TRIRIGA energy optimization technology combines real-time monitoring with event management and analytics to help building owners and managers optimize energy, and enhance operations and reliability. This IBM technology improves facilities and real estate asset reliability and performance to reduce energy, lower maintenance and management costs and extend asset life to help create a smarter building.

IBM Intelligent Building Management integrates with building management systems and equipment to capture data which can be used for improved energy analytics and performance, facilities management and reduced operating costs:

- Collect energy and operational metrics into a central repository for enterprise-wide analytical and optimization capability
- Centralize real-time events for consolidation, correlation and to initiate actions (e.g., service requests)
- Initiate work orders for anomalies detected from application of analytical rules based on energy and operational data
- Get a single, role-based dashboard view of the building data to visualize energy, environmental and portfolio performance metrics
- View historical data to compare trends and identify corrective action
- Create future scenarios for better planning with predictive analyses
- Operating systems supported: Linux

Organization: IBM

Website:

ibm.com/software/products/gb/en/tririga-energy-optimization

Related products:

Software and Services:

IBM Maximo
IBM Lotus® Notes® and
IBM Sametime® plug-in

Vertical Industries:

- City infrastructure and civil engineering

- Information Services
- Energy distribution
- Enterprise Management

Technologies used:

- IBM Tririga Energy Optimization
- IBM Intelligent Building Management

Demos:

Related Patents: n/a

Related Standards: n/a