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Energy efficiency partnership between Lindner Hotels and Siemens

More than 10% savings thanks to energy management

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The efficiency of building systems depends not only on high-quality planning, execution and commissioning but also on professional building operation. Yet even highly automated, well managed heating, ventilation and air-conditioning systems have hidden efficiency potential, as demonstrated by Lindner Congress & Motorsport Hotel at the Nürburgring. With support from the Building Performance Optimization remote service from Siemens, the hotel plans to cut its energy consumption by at least 10% through zero-investment and investment measures with a payback period of less than one year.

Energy-efficient building operation and the collection of energy consumption data has always been part of the Lindner Hotel Group's strategy for operating its hotel properties. As early as 1990, the company began recording the energy data of Lindner hotels on a monthly basis and combining this information with its occupancy schedules and energy rates in a way that enabled the creation of key figures, known as "benchmarks." This relatively crude system for recording energy consumption was sufficient for assessing the hotels' energy use until around 2006. Motivated by a disproportionate rise in energy prices, Lindner Hotels AG launched its internal "Energy Save" offensive. The message at the time was this: Each of Lindner's 1,000 employees was to save one euro in energy costs each day. Time-limited power purchasing agreements, which expired in 2006 and would have subsequently led to approximately €350,000 in added costs per year, were the external impetus for this concerted appeal to the staff to save energy.

The project, which was initiated by Otto Lindner, CEO of Lindner Hotels AG, immediately produced the desired effect. Over the next few years, the company saved between €300,000 and €320,000 a year in power costs through organizational measures alone. The initiative was preceded by technician workshops, the enhancement of existing energy indicators for different hotel classes, an employee bonus system as well as a Best Maintenance Practice Award for the hotel with the highest savings quotas. Currently, the hotel group is seeking certification for all 34 Lindner hotels from the Deutsches Institut für Nachhaltigkeit und Ökonomie (German Institute for Sustainability and Economics – DINO). The focus is not only on energy and the environment but also on management aimed at sustainability.

Costly energy data recording

While going a long way towards harnessing the achievable savings potential, the largely manual recording of energy consumption, regular training for operations technicians and motivation campaigns for hotel personnel did not come close to exhausting it. The more operations technicians learned about energy efficiency in buildings, the more they realized that monthly readings would not be enough to identify deficiencies in the facilities and control strategies. In addition, it was not feasible simply for manpower reasons to adhere to a strict schedule for the readings, for example every 30th day of the month at 12:00 p.m. With the tools available at the time, additional energy saving measures came only at the expense of comfort, which, however, was undesirable in an industry focused on star ratings. Nevertheless, the Lindner Group's engineering department wanted to further improve the energy efficiency of their building systems in order to compensate for energy cost increases.

The fact that in recent years the Lindner Group had installed building automation systems in most new hotels financed by investors was very beneficial. While energy cost increases were one motivating factor, price reductions and additional features offered by building automation and control systems convinced Lindner's management that these systems had become more economical. In the case of Siemens' current Desigo PX system, for example, most of the existing meters used in the building for energy monitoring and control (EMC) can be integrated into the system.

Lindner's technicians were impressed by the functional and economic benefits of the Desigo system technology and gave preference to the Siemens building automation system for new buildings and retrofits. The result was a highly cooperative partnership between Lindner Hotels AG and the Siemens Building Technologies Division.

Asset analysis on site

To further improve the building efficiency of Lindner Hotel AG properties, Siemens' Building Performance Optimization (BPO) team analyzed a total of seven Lindner hotels in 2010 and 2011. Lindner Congress & Motorsport Hotel at the Nürburgring – the only new construction of the seven hotels investigated – posed particular challenges to the team. Although this new building already offered a high level of energy efficiency, the energy experts still managed to identify additional savings potentials. They then worked with the customer on the development of an improvement strategy that consisted of zero-investment, low-investment and investment measures. Examples:

- Up to that point, the recooling plant (air-conditioning) had been activated by the device-internal autonomous control system, as was the control of stepped operation. Proposal: Activate and control the recooler together with the chiller via the building automation system, based on actual demand.
- The chiller was turned on when the exterior temperature was as low as 8°C, even if the air conditioner did not signal a need for cooling. Proposal: First take full advantage of the potential offered by free ventilation and only then turn on the chiller with recooler. These two measures could be achieved simply by reprogramming the system.
- Adjust the pressure setpoint of the air distribution network by opening the air flow controllers all the way to make the fans run at full load. The pressure measured in the duct is then defined as the new pressure setpoint.
- Although air flow adjustments are part of the BPO program, the team did not reduce the air flows in the present installations due to an overly lean design of the ventilation systems. Alternatively, CO₂ sensors are to be installed in the exhaust air ducts of the HVAC systems for the restaurant and the lobby.
- Investigate the potential use of a weather forecast-based control function in the control strategy for the heating and air-conditioning systems.
- Add a free cooling function to the existing recooler. The chiller will then switch on at an exterior temperature of around 16°C instead of 8°C. This requires intervention into the hydraulics (installation of an additional plate heat exchanger), making it an investment measure to be carried out at a later point in time.

Taking into account the unique features of hotels

An important aspect of the BPO analysis was the assessment of the measures from the hotel operator's perspective as well as the effects they might have on comfort. Result: Many energy-saving processes that make logical sense have to be weighted differently in the hotel sector.

Energy-saving measures that are acceptable for an urban hotel – for example reducing the air volume between the hours of 10:00 a.m. and 4:00 p.m., may not necessarily be right for a convention or wellness hotel.

The ability to take automated meter readings of energy consumption, display this information within freely selectable time periods and automatically generate energy reports greatly reduces the workload of hotel technicians. In addition, freely configurable intervals open up entirely new opportunities for analyzing efficiency, for example by displaying electrical load curves for the different consumers, such as the air conditioning chiller during major events. Not only does this offer a basis for establishing additional efficiency measures but it also allows empirical values to be derived for new hotels to be built in the future.

Making efficiency visible: the Green Building Monitor

For most hotel guests, booking a room at a specified flat rate means getting unlimited amounts of energy in the form of hot water, power, heating and air-conditioning as well as free ventilation through the window. To prevent energy waste using functional means, key card switches, stored room temperature limits as well as window and door contacts for turning off heating and air-conditioning systems are now standard in many hotels.

Up-to-the-minute displays of energy consumption in the hotel lobby, on the other hand, are still new in the industry. Along with eco-certification and Building Performance Optimization, they are part of sustainability marketing in Lindner hotels. From the hotel staff's perspective, transparency of energy consumption through a Green Building Monitor attracts a certain amount of attention, approval and satisfaction among hotel guests. Hotel management feels that it is important to let guests see how all the right things are being done behind the scenes to improve energy efficiency and climate protection so that guests can enjoy the resulting comfort.

Energy engineers at Siemens Advantage Operation Centers (AOC), in this case the AOC in Frankfurt am Main, prepare the energy statistics and live data for the Green Building Monitor. Additional energy saving tips as well as optional weather information, weather forecasts, news tickers and other informational content are intended to increase awareness. Dynamic displays on the Green Building Monitor that enhance the attention-getting effect are also important.

For the hotel technicians of the Lindner Hotel Group, Siemens' BPO offering is a special opportunity to examine and optimize their own view of building systems through the eyes of a third party. Lindner Hotels AG benefits from the cross-sector and sector-specific, national and international experience of Siemens engineers.

The **Siemens Infrastructure & Cities Sector** (Munich, Germany), with approximately 87,000 employees, offers sustainable technologies for metropolitan areas and their infrastructures. Its offerings include integrated mobility solutions, building and security technology, power distribution, smart grid applications, and low- and medium-voltage products. The Sector comprises the Divisions Rail Systems, Mobility and Logistics, Low and Medium Voltage, Smart Grid, Building Technologies, and Osram AG.

For more information, visit <http://www.siemens.com/infrastructure-cities>

The **Siemens Building Technologies Division** (Zug, Switzerland) is the world leader in the market for safe and energy-efficient buildings (“green buildings”) and infrastructures. As a service provider, system integrator, and product vendor, Building Technologies has offerings for building automation, heating, ventilation and air conditioning (HVAC), fire protection and security. For more information, visit www.siemens.com/buildingtechnologies

Selection of photos



Image caption: Energy efficiency and sustainability are top priorities for the Lindner Hotel Group. This photo shows Lindner Congress & Motorsport Hotel at the Nürburgring.
Source: Lindner Hotels AG



Image caption: Green Building Monitor in the hotel lobby. Energy data and peripheral content is fed from the Siemens Advantage Operation Center in Frankfurt am Main.
Source: Siemens AG



Image caption: The heat for the Lindner hotels at the Nürburgring and the “Erlebniswelt” is provided by a woodchip heating plant operated by RWE.

Source: Siemens AG



Image caption: Air-conditioning chillers must fit a building’s use profile. Efficiency can be noticeably improved by optimizing the control processes and integrating autonomous control functions into the building automation system.

Source: Siemens AG



Image caption: Upgrades with cooling and electricity meters is required in order to continuously record a chiller’s energy efficiency.

Source: Siemens AG



Image caption: Installing a high-efficiency pump does not guarantee energy-efficient operation. Air-conditioning chillers, in particular, depend on defined control processes.

Source: Siemens AG



Image caption: In the past, HVAC installations used to be sized overly generously; today, their power output is on the lean side. However, on-demand control and free night cooling make it possible to save energy. Source: Siemens AG



Image caption: Sometimes nearly empty, sometimes full to bursting: In the future, CO₂ sensors in the exhaust air system will control air volumes in the restaurant. Source: Siemens AG



Image caption: The prerequisite for effective energy management is extremely detailed recording of power consumption in individual installations, facilities or large power consumers. Source: Siemens AG

Glossary

AOCs (Advantage Operation Centers) are globally networked service control centers operated by Siemens AG in order to continuously monitor the relevant building and installation data of customer systems. Building systems are logged, analyzed in detail and optimized by trained technicians and engineers. Documenting the latest consumption data and the effect of energy saving measures on a Green Building Monitor mounted in an area accessible to end users is an important tool to encourage users to behave in ways that save energy and protect the environment.

Benchmarking is the process of comparing the energy consumption of a property or a building with properties or buildings of similar size and use or with statistically determined reference and standard values. Since most buildings and their technical installations and use profile are unique, the significance of benchmarks for energy efficiency measures and installation modernization is very limited. The specific energy consumption of hospitals, hotels, industrial production buildings or museums cannot easily be compared. To determine a concrete optimization potential with the help of EMC, it is necessary to perform a detailed analysis of the installations' operation, taking into account individual comfort, process and usage requirements.

BPO (Building Performance Optimization) is an energy service developed by Siemens. Energy management and ongoing monitoring of operations make it possible to efficiently and continuously maintain the required building/room conditions. Siemens energy experts work with their customers to analyze the status of the installations in order to uncover hidden efficiency potentials. The transparency provided by energy monitoring and control (EMC) usually allows substantial energy savings potentials to be uncovered. From this potential, economically oriented (zero-investment, low-investment, life-cycle oriented) measures can be developed whose immediate effect on the consumption structure is continuously checked and thus secured by way of ongoing monitoring. At the same time, know-how is continuously transferred to the customer. The BPO energy service meets the requirements of the DIN EN 16001 energy management system standard, certified by TÜV Rheinland.

EMC (Energy Monitoring and Control) is a strategic measuring concept for recording the consumption of power, heat, cooling, water, air flows in heating, ventilation, air-conditioning and chiller systems as well as their control zones. EMC can transmit energy and power output data and provide detailed information on the development of media flows, temperatures or temperature differences as well as load and consumption peaks. Data that is automatically recorded on a

continuous basis is compressed and processed into meaningful reports on energy and media consumption, costs and emissions. The resulting transparency forms the basis for additional energy services such as BPO.

The **Green Building Monitor** from Siemens is a device mounted in prominent locations within a building. It presents building users and visitors with a visually attractive display of the latest and historical consumption values for power, heat, water and other media, the building's carbon footprint as well as internal and external temperatures and optional reference values and benchmarks. The data is fed to the monitor via the EMC application. To raise awareness, current weather forecasts, stock market prices as well as internal and external news can also be added.

Lindner Congress & Motorsport Hotel at the Nürburgring at a glance

Rooms

154 comfort class rooms, 29 m²

14 first class rooms (VIP level, 6th floor), 29 m²

8 junior suites, 41 m²

5 suites (VIP level, 6th floor), 61 m²

1 wellness suite, 70 m²

Restaurants

2 restaurants on the ground floor, each seating 100 guests, hotel bar, patio

Chill-Out Lounge

Smoking Lounge

VIP area on 6th floor with restaurant and lounge

Wellness and fitness

330 m² wellness area on 4th floor

Fitness room

Other facilities

Helipad on the roof of the hotel with direct access to the VIP area

Casino and bar

Optional for events/catering (max. 5,000 people)

- Ring Arena, 2,000 m²
- Ring Boulevard, approx. 750 m²
- Warsteiner Event Center, 1,800 + 200 m²

Heating

District heating drawn from a biomass heating plant¹ (woodchips) operated by RWE-Energiedienstleistungen GmbH. The plant supplies the new center's entire "Erlebniswelt," including Lindner hotels, and the Eifeldorf "Grüne Hölle" hotel complex.

Power output 5 MW (peak load: 2 MW via fuel oil boilers)

Heat consumption 7,500 MWh/a

Cooling

Compression chiller, nominal refrigeration capacity 250 kW

Conditioned room air

Room temperature control, hotel room

Under-floor heating

Fan coils (heating/cooling/ventilation)

Domestic hot water heating

Heat recovery from cooling cells for preheating, then via district heating

¹ The biomass heating plant is part of the EMAS certification (Eco Management and Audit Scheme), also known as the EU eco-audit. Under the EMAS certification, the direct and indirect environmental impact of the Nürburgring is recorded and offset by mandatory environmental protection measures. The environmental management system, which has existed since the early 1990s, continues to be a groundbreaking innovation for racetracks.