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Power of Smart Switchgear Coupled with Digitization for Safer, Reliable and Better Future

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Abstract

Our resources are limited, and we need to better make use of what's around us, giving clean sustainable energies, a solid chance in the future. The world is heading toward a digitized future. Already, an entire generation has grown up immersed in the digital world. This paper talks about recent developments where we can fully digitize the Electrical distribution which help in improving safety for people and assets, increase power reliability and business continuity, optimize operational and energy efficiency, achieve sustainability goals and meet regulatory compliance.

Keywords: Data Center, Digital Transformation, Eco Structure, Industrial Internet of Things (IIoT), Smart Switchgear

1. Introduction

Digitizing the energy sector is crucial since it enables energy consumers to be at the center and contributes to a new design for the energy markets. Digitalization provides new opportunities, which can be by optimizing valuable assets, integrating renewable energies from variable and distributed resources and reducing operational costs. At the same time, it favors consumers by reducing the energy bills, through energy efficiency and participation in mechanisms of flexible demand. For these reasons, it stands as a pivotal element in the further evolution of smart cities and communities.

By expanding digital transformation across buildings, data centers, industry and infrastructure, we can together create a more efficient, reliable, safe and sustainable world[1].

2. Major Segments and Need

2.1 Buildings

In buildings, the business value of digital transformation lies in lower energy use, greater occupant comfort and simplified operation. In terms of energy, buildings account for 36 percent of all global final energy use and 39 percent of carbon emissions[2]. And yet, the technology exists now for buildings to generate more energy than they use.

2.2 Data Centers

The power requirements of IT physical infrastructure, from cooling to back-up power systems are increasingly eating into budgets. Cooling alone can account for 40 percent of the data center's total costs[3]. At the same time, a widely cited forecast predicts that by 2025, the information and communications technology industry's electricity consumption will increase to 20.9 percent of the entire global total, and thus account for 5.5 percent of global greenhouse gas emissions[4].

2.3 Industry

The same promise of doing more with less applies to the industrial sector. The industrial internet of things (IIoT) connects inventory to smart sensors across the supply chain, making it easier than ever to bring goods to market faster, with lower production costs - the Holy Grail for industrial companies. On top of that, digitally

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driven plants, with their seamless record keeping and real time monitoring, ease regulatory compliance and better mitigate environmental impacts.

2.4 Infrastructure

Infrastructure, whether publicly or privately owned, will be put to the test in the coming decades. Expanding populations, especially in new economies, will continue to stress the systems that move people, products, and energy around the world. In addition, the urgency of global climate change will require infrastructure to meet this growing capacity while concurrently reducing emissions. This energy paradox must be resolved - and it will, through Digital Transformation.

Taken together, these four sectors of the economy buildings, data centers, industry, and infrastructure are all undergoing transformations that will fundamentally change the way people will live, work and play.

A Blueprint for Successful Digital Transformation

Surveys and reports indicate that many businesses and organizations need a trusted authority to manage this complexity to unlock the full potential of digital transformation.

3. Challenges/Opportunities

3.1 Risks to Safety

Electrical system issues are recognized as the cause of 22% of workplace fires[5], while an estimated 25% of electrical failures are attributed to loose or faulty connections, according to major insurance carriers[6]. These points to a need for more vigilance in finding sources of overheating.

3.2 Risks to Uptime

Studies have shown that 30 to 40% of business downtime is caused by power quality disturbances and that 70% of those disturbances originate within the premises[7]. Any amount of power interruption can be devastating to an organization's operations. Beyond lost productivity is the cost of replacing expensive equipment such as a failed transformer. Preventing downtime requires 'seeing into the future', or rather being able to identify when conditions on your power network are deviating outside of safe parameters, or when protection settings have deviated from their original design.

3.3 Risks to Energy Efficiency

Beyond the costs of power-related interruptions, there are also the economic costs of inefficiency. The US Department of Energy estimates that "with the application of new and existing technologies, buildings can be made up to 80 percent more efficient or even become 'net zero' energy buildings with the incorporation of on-site renewable generation"[8]. This need gaining visibility into every aspect of energy, from billing to consumption to onsite energy production.

3.4 Risks to Operational Efficiency

Another big part of operational costs is the time and money facility teams spend maintaining power and buildings systems, often with limited staff. Maintenance represents 35% of a building's lifetime costs (IFMA, 2009)[9], so any improvements to team efficiency and equipment lifespan can represent a significant bottom line savings. However, predictive maintenance requires a new level of analytic capabilities.

3.5 Risks to Compliance

Emissions regulations are becoming common in most countries, while many corporations are implementing their own sustainability goals. Meeting these objectives is challenging without the necessary energy consumption data.

These are a demanding set of challenges. What is even more concerning is that facility management teams in most large buildings and plants are still unaware of these risks and opportunities. The reason could be a lack of visibility to enterprise-wide power and equipment conditions. Though the consequences of a power outage are severe and the costs of energy and maintenance are high, most new and legacy facilities still use only a rudimentary level of technology to help prevent power system failures and minimize operational costs. When problems arise, the response is usually on a reactive rather than proactive basis.

Figure 1. Representing benefits of digitization.

4. Benefits

Early warning of risks, faster recovery from problems, Time and cost-saving opportunities revealed, streamlined maintenance and Enhanced equipment performance and lifespan.

4.1 Power of Digitization

Facility teams should be taking full advantage of the many applications and benefits that digitization now enables. Without a fully connected and intelligent power management system, facility teams are 'working blind', unaware of the many risks that may be threatening business continuity and efficiency. The steps to implementing such a solution can be extremely cost-effective considering all the dimensions of ROI that can be achieved in a very short payback period. Many of the pieces may already be in place in most facilities, such as smart meters and breakers. Once connected, facility teams will see the benefits immediately. After helping thousands of customers navigate successful digital transformation, companies are ready to present a comprehensive report on the state of digital transformation among a global sample of customers.

Figure 2. Smart, connected devices are the first step in a completely digitized power distribution system.

The Global Digital Transformation Benefits Report 2019 puts forth concrete evidence of the power of digitization across the spectrum of global commerce.

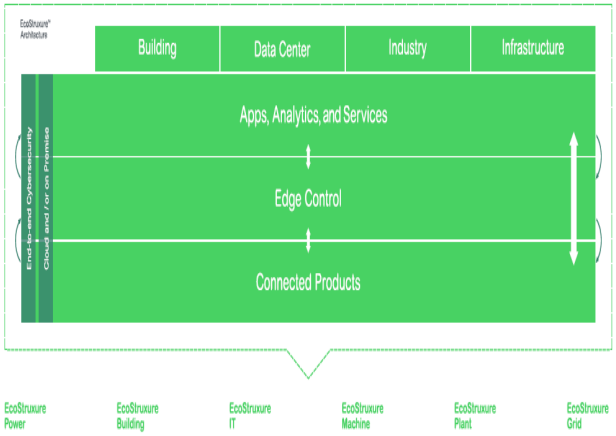

Figure 3 EcoStruxure™ the engine for digital transformation.

The first layer is connected products with embedded intelligence, such as sensors, medium and low voltage breakers, drives and actuators.

Figure 4. EcoStruxure™ overview.

Connected Products > Energy monitoring
Edge Control > Control functions
Apps,Analytics& Services > Insights / Analytics

Figure 5. Communication of breaker to concentrator.

The figure 5 shows a PowerTag® which is a compact and easy-to-install Class 1 wireless communication energy sensor that monitors and measures energy and power in real time.

The Edge Control layer gives organizations the critical capability to manage their operations on-premise as well as from the cloud depending on their needs. This includes connected control platforms with remote access, advanced automation and operator override capabilities. Local control and firewall protection is included to maximize the benefits especially for mission-critical applications.

The Figure 6 is an example of Auxiliaries applications for breakers where devices are capable of digitally communicating to the user on the status of the breakers which could be ON /OFF/TRIP indication, tripping the breakers when needed with a forcible inhibit function or in case of Under voltage/Overvoltage and the control function where the breakers can be remotely turned ON/OFF. These auxiliaries provide convenience as it can be remotely monitored and controlled. These kinds of functions provide peace of mind and information in the digitally at fingertips. These devices can be remotely operated and are very reliable.

Figure 6. Auxiliaries for digitization.

These are used today in extreme climatic conditions and have shown excellent capabilities by performing well in industries like Oil & Gas, Mining, Railways among others.

Figure 7. Apps, Analytics and Services.

The third layer is apps, analytics and services. EcoStruxure™ enables the most extensive breadth of vendor-agnostic apps, analytics and services on open IP protocols in order to work with any hardware, system, or control.

The products are compliant to the standards (IEC & ISO). The interface is complainant to cybersecurity standards[10].

The overall benefits of going digital is indicated as a measurable value.

Table 1. Measuring the power of Digital Transformation .12 Benefits at a glance[11].

BENEFIT	UP TO	AVERAGE
CapEx		
Engineering costs and time optimization	80%	35%
Commissioning costs and time optimization	60%	29%
Investment costs optimization	50%	23%
OpEx		
Energy consumption savings	85%	24%
Energy costs savings	80%	28%
Productivity	50%	24%
Equipment availability and uptime	50%	22%
Maintenance costs optimization	75%	28%
Sustainability, Speed, and Performance	**UP TO**	**AVERAGE**
CO2 footprint optimization	50%	20%
Time to market optimization	20%	11%
Decrease in occupant comfort-related incidents	33%	24%
Return on investment	0.75 year	5.3 years

Example: IoT- Enabled Hotel Efficiency

Building a new, five-star luxury hotel with stringent energy efficiency goals is a bold ambition. Le Meridien Goa, Calangute, a unit of Models Leisure Ventures, reduces energy consumption while delivering an exceptional guest experience with IoT hotel solution: EcoStruxure™ for Hotels.

4.2 Driving Efficiency while Reducing Complexity

As a single source provider of hotel infrastructure technology, EcoStruxure™ helped Le Meridien Goa, Calangute, a unit of Models Leisure Ventures, to reduce complexity and improve efficiency with a fully integrated, IoT-enabled hotel solution.

4.3 Challenge

Reduce complexity, the typical development process involves multiple technology vendors and points of contact, reduce annual maintenance contract fees and Save energy and optimize costs.

4.4 Solution: Sustainability and Efficiency with EcoStruxure for Hotels

4.4.1 Connected Products

Automation servers, energy meters, Medium Voltage (MV), Low Voltage (LV), final distribution, passive network infrastructure, switches and thermostats, and common area lighting control solutions.

4.4.2 Edge Control

EcoStruxure Building Operation, EcoStruxure Power Monitoring Expert, RLG Guest Room Management.

4.5 Advantages with Hotel Solution Example

- Single-source provider of hotel infrastructure technology solutions.
- Management of green power procurement and implementation of Distributed Energy Resources (DER) at the site level.
- Single point of contact for project execution.
- Complete visibility and control of systems.
- Reduced energy use.
- Integration with 3rd party fire alarm and public address systems.

4.6 Results for the Hotel solution

- Data from the integrated building management system indicates a 10-12% reduction in energy consumption with an anticipated minimum 15% in the next 12 months
- As the single-source provider and single point of contact for execution it was easy to have complete control over a diverse set of implementations
- The hotel opened ON TIME

5. Conclusion

Digitalizing the energy sector is crucial since it enables energy consumers to be at the center and contributes to a new design for the energy markets. The benefits of digitization of the electrical distribution infrastructure in critical buildings and facilities are almost limitless. This brings in improved safety, reliability and efficiency along with simplification in areas such as regulatory compliance.

Most facility teams are still working 'in the dark' by not leveraging available and proven IoT-enabled power management technology to its fullest to achieve optimal performance. Digitization brings insight to costs and risks that are otherwise unmanageable or unforeseen.

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