

Rittal – The System.

Faster – better – everywhere.

WHITE PAPER

# GREENING UP THE FACTORY



ENCLOSURES

POWER DISTRIBUTION

CLIMATE CONTROL

IT INFRASTRUCTURE

SOFTWARE & SERVICES



FRIEDHELM LOH GROUP

## EXECUTIVE SUMMARY

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For the last 50 years, the concept of lean manufacturing has helped drive industrial innovation. Everything from alternative power sources to recycling programs to eco-friendly packaging has been achieved thanks to lean manufacturing principles. However, today's focus on sustainable manufacturing and 'greening up the factory' has the potential to dwarf the accomplishments of the last half-century, and manufacturers regardless of industry are quickly embracing large-scale sustainability initiatives.

Sustainable manufacturing is of prime importance to North American manufacturers. In fact, approximately 71% of North American manufacturers have a corporate responsibility or sustainability policy in place, according to a recent sustainability survey by the National Association of Manufacturing (NAM).<sup>[1]</sup> In the food and beverage industry, major producers like Nestlé, Mondelez, and PEPSICO have set the

ambitious goal of using 100% sustainable packaging by 2025. The common denominator for each of these examples? Industry 4.0 and its continued evolution toward helping manufacturers use detailed, real-time data and analytics about systems and processes to optimize the use of resources, reduce inefficiencies in production cycles, and better understand how each step of the production cycle impacts the next.

In this white paper, we'll examine the trends toward increased sustainability, possible strategies for global manufacturers to reduce carbon emissions, and important factors for companies to consider when devising a sustainability program to help create a smooth transition and long-term success.

[1] MANUFACTURING'S COMMITMENT TO SUSTAINABILITY:  
<https://www.nam.org/wp-content/uploads/2019/07/NAM-Sustainability-Survey-Report-2019.pdf>





## RITTAL SOLUTION

Rittal's modular design, forward-thinking engineering, and seamless integration make it easier than ever before for manufacturers to unify each step of the industrial automation process, from planning to production. Rittal's sister company EPLAN provides powerful CAE design software complete with digital twin capabilities, procurement tools, cloud-based collaboration, and more to optimize each step of

panel design and controls engineering. With Rittal and EPLAN, manufacturers can achieve an automated enclosure production and modification process that removes inefficiencies and redundancies and promotes increased productivity across the entire value chain. In short, **Rittal** has **simplified** the complexity of today's manufacturing landscape to help you get the job **done**.





# TRENDS DRIVING SUSTAINABILITY INITIATIVES

## Mission, Vision, and Values

An emerging trend in global commerce is the impact of a company's values on both their customer base and employees. Customers want to purchase goods and services from companies with strong ESG (environmental, social, and governance) beliefs, and this trend has only increased in the wake of the COVID-19 pandemic, particularly around the notions

of environmental preservation and sustainability.<sup>[2]</sup> To put it simply, today's customer wants to feel the manufacturers that supply their products are acting in good faith to reduce their net impact on the environment and support local, regional, or national efforts to maintain our natural world.

[2] Sustainability and Values For A Competitive Advantage:  
<https://www.forbes.com/sites/stuartrivine/2021/10/01/sustainability-and-values-for-a-competitive-advantage/?sh=223aa9a34935>





## RITTAL SOLUTION

Rittal's commitment to sustainability initiatives comes from an innovative, state-of-the-art approach to industrial automation frameworks designed to increase efficiency at each touchpoint of the value chain. Manufacturers can discover end-to-end production efficiency through our:

- Climate Control Analysis to identify gaps in climate control efficacy and eliminate inefficiencies
- Blue e+ and TopTherm cooling units that reduce energy consumption and provide optimized, targeted cooling outputs
- U.S. network of production and modification centers that provide a more stable, localized supply chain to reduce the carbon footprint associated with shipping products
- Digitalized design, engineering, and assembly of key components to conserve the energy and resources necessary for enclosure production







## RITTAL SOLUTION

Seizing opportunities for increased market share is really dependent on speed to market and how quickly manufacturers can scale based on projected demand and capacity to meet that demand. Rittal's U.S. network of production and modification centers helps manufacturers rapidly deploy custom and precisely-assembled panels, enclosures, climate control systems, and accessories to meet the ever-evolving demands of their industry.

With modification centers in **Sparks, Nevada**; **Houston, Texas**; and **Urbana, Ohio** and a growing network of regional distribution facilities, Rittal provides coast-to-coast inventory and delivery to help you increase your speed to market and scale your manufacturing footprint.

With the ability to increase the efficiency of your industrial panel and enclosure assembly by up to 85%, Rittal Automation Systems (RAS) is a suite of solutions from fully automated machines to tools that eliminate the manual interventions of enclosure modification and control panel production.

RAS machines are engineered for precise cutting, tapping, milling, and wire processing that manufacturers in any industry encounter as today's enclosure applications become more varied and unique. The variety and flexibility of cuts or wire processing these machines provide allows for repeatability and scalability based on customer demands or market forces.

The workhorses of the RAS suite of solutions include our Perforex MT milling terminal, Perforex LC laser center, Wire Terminal WT, and smaller worktop machines such as time-saving wire processing machines to virtually eliminate the manual processes of wire stripping, crimping, and other time-consuming tasks.

In conjunction with EPLAN's solutions, 3D visualization, digital twins, rapid schematic creation, real-time alterations, and reduced design transfer time, RAS completely reimagines the machining process to save you time and money.

## Safety Concerns

Safety concerns in any manufacturing facility are always a top priority and can come from a variety of angles, be it safety to workers from exposure to potentially harmful chemicals as byproducts of production sequences, or the safety of nearby residents and micro-ecosystems in the event of a production accident or fault. Industrial automation

frameworks powered by Industry 4.0 not only help reduce the potential for workplace accidents by removing what were once hazardous, complex tasks on production floors, but also network alerts and real-monitoring capabilities help facility managers avoid the potential for hazardous leaks or spills by stopping them before they happen.

## Regulatory and Industry Standards

With sustainability firmly in place in the larger social consciousness, governmental regulations and industry standards are likely to become more aligned in the coming years. In fact, this integration is already in place in the automotive industry where suppliers must adhere to the ISO 14001 standard to sell to major automotive global players. The ISO 14001 provides the regulatory prescriptive framework for manufacturers the necessary requirements for environmental operations and reporting.<sup>[3]</sup>

In addition, the new UL/CSA 60335-2-40 <sup>[4]</sup>, which will go into effect in 2024, is set to drastically change climate control in the automotive production space. This new set of regulatory guidelines is aimed at reducing the emission of greenhouse gasses from refrigerants used in cooling units and curbing the use of flammable liquids in cooling systems. As such, the new industry standard is already prompting automotive manufacturers to prepare for what the next generation of climate control solutions will look like, compatibility with existing automation frameworks, and how the integration of these new systems could impact production sequences in the short and mid-term.

## Potential for Cost Savings

Last on this list though it may be, reducing operational costs and increasing revenues are very much key motivating factors for manufacturers in adopting a sustainable production architecture. Whether its cutting energy costs associated with operating machines and equipment, repurposing wastewater or other spent materials for use in other contexts, or adopting lean manufacturing methods with

tasks like packaging, the potential for cost savings is too realized to ignore. Sustainable initiatives in global manufacturing are not a flash in the pan or a passing fad. It's not simply a movement or a push toward an unattainable ideal. Instead, sustainability is a normalized, accepted state of play global manufacturers should embrace with open arms.

[3] Environmental management systems — Requirements with guidance for use:  
<https://www.iso.org/obp/ui/#iso:std:iso:14001:en>

[4] Understanding UL 60335-2-40 Refrigerant Detector Requirements:  
<https://www.ul.com/news/understanding-ul-60335-2-40-refrigerant-detector-requirements>





## AUTOMOTIVE INDUSTRY

The best defense is a good offense, and for automotive manufacturers this means integrating climate control solutions that today adhere to the new emissions standards that are part and parcel of upcoming UL/CSA 60335-2-40. Rittal's innovative line of cooling units have long avoided the use of flammable coolants, and our Blue e+ line of cooling units is already UL Certified to UL/CSA 60335-2-40. Plus, the Blue e+ provides energy-efficient cooling through:

- Optimized, targeted outputs with cooling capacities up to 6,000 watts for use in environments ranging from -4°F to 140°F.
- IoT interface for remote monitoring and network alerts to optimize cooling strategies and early detection of coolant leaks or system maintenance issues to prevent exposure of harmful materials or wasted resources.
- Up to 75% energy savings due to patented heat pipe technology, an innovative hybrid process that relies upon two parallel cooling circuits to dissipate heat from the enclosure as soon as the ambient temperature falls below the setpoint, providing passive climatization. This method of cooling is more efficient than conventional cooling as it directs cooling where it's needed when it's needed.

# POSSIBLE STRATEGIES TO REDUCE CARBON FOOTPRINTS

It's one thing to understand a set of motivations or identify a spark that lights a metaphorical fire, but it's another thing entirely to create a set of strategic actions that provide a measurable impact. And this can be more daunting when it comes to sustainability in global manufacturing because of the legacy nature of production processes and sheer number of considerations manufacturers must address. However, here are a handful of common elements managers should look at as they take the initial steps toward creating a sustainable production framework.

## Process Improvements via Lean Manufacturing

Originally pioneered by companies like Toyota, John Deere, and Nike, lean manufacturing (also known as lean production) is a methodology that reduces waste or redundancies while simultaneously maximizing productivity.<sup>[5]</sup> Waste is identified as anything that does not bring value to the customer or is outside the realm of what the customer is willing to pay.

A lean manufacturing framework increases efficiency and promotes process improvement by:

- Conceiving of value from the customer's perspective in the sense of products and services for which the customer is willing to pay at a price point that drives sales.
- Creating flow in the value chain from when an order is received until delivery to prevent breakdowns in the production process and enable an integrated set of processes in which activities move in a constant stream.
- Mapping the value stream, which analyzes flow of raw materials and component parts to identify waste at each point in the production lifecycle.
- Establishing a pull system where production is based solely on demand. Whereas a push system requires a buildup of inventory and production is based on forecasts, a pull system allows for greater flexibility as new jobs do not commence until actual orders are received.<sup>[6]</sup>

With Industry 4.0, IIoT, and end-to-end automation as the bedrock of lean manufacturing, companies across all industries have significantly reduced waste and eliminated costly redundancies in their production programs.

[5+6] 5 Lean Principles Every Engineer Should Know:  
<https://www.asme.org/topics-resources/content/5-lean-principles-every-should-know>





## RITTAL SOLUTION

In a partnership that reimagines the industrial automation process from design to deployment and all points in between, Rittal and EPLAN bring together a modular engineering philosophy, precise and automated Rittal Automation Systems machines, and powerful, database-driven electrical engineering to provide maximum efficiency and visibility to mission-critical manufacturing and automation control processes.

EPLAN's comprehensive software suite includes:

- **EPLAN Electric P8:** Database-driven platform for electrical controls design — digitalized control data forms the foundation for the automated creation of machine and plant documentation
- **EPLAN Engineering Configuration (EEC):** Tool for designing and applying configuration interfaces and for automatically generating documentation
- **EPLAN Data Portal:** Integrated, web-based data portal with up-to-date device data from leading component manufacturers
- **EPLAN ePULSE:** Secure cloud solution connects data, projects, disciplines and engineers worldwide in a collaborative environment
- **EPLAN Pro Panel:** Design and build of control cabinets, manufacturing and automation solutions, and power distribution systems for energy supply, all in 3D
- **EPLAN Preplanning:** CAE software that enables you to capture engineering data from the start of the engineering phase, for example, the actuators and sensors for a plant, machine, or building
- **EPLAN Fluid:** Engineering tool for designing and automatically documenting the schematics for fluid-power systems with pneumatics, hydraulics, cooling, and lubrication requirements

With EPLAN and Rittal, manufacturers have unparalleled design power and superior engineering at their fingertips to create a game-changing industrial automation framework.



# PRIME WSI DISCOVERS ENHANCED EFFICIENCY WITH RITTAL ENCLOSURES

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In this video case study, Prime WSI President Blair Thornhill discusses how partnering with Rittal for their industrial enclosure needs has helped his company become more flexible, agile, and competitive.

**Watch the video to learn how** <https://youtu.be/oeTWpNS94zY>





## RITTAL AT WORK

Prime Well Service Instrumentation (WSI), a Texas-based manufacturer of controls and data acquisition products for frac, coil, and well service equipment for customers across the globe, have experienced the design power and superior engineering they have at their fingertips with Rittal and EPLAN.

To meet its business goals, Prime WSI utilizes a variety of industrial enclosures, boxes, and accessories with high degrees of precision and customization to protect its best-in-class software and hardware for deployment in harsh environments. Given the high degree of customization associated with the enclosures used for Prime's popular pump control boxes, they were constantly battling long modification times, imprecise and inaccurate cutouts and holes, and a lack of visibility and insight into each stage of the panel production process.

Rittal's Houston Rapid Design and Modification Center offered the modular thinking, industrial automation principles, and emphasis on rapid turnaround time Prime needed to truly optimize the assembly of its pump control box line.

The use of cutting-edge 3D panel design software from EPLAN, Rittal's sister company and a global leader in software for electrical engineering and industrial automation, also put power in the hands of Prime's technicians to make design alterations in real time and communicate those alterations in a way that enhanced communication and collaboration across the value chain.

EPLAN's software allows Prime to leverage database-driven engineering, and the reliability of Rittal's enclosures has helped Prime provide a better quality product for their customers.



## Smart Heating and Cooling Technologies

Lean manufacturing principles, when paired with today's smart manufacturing solutions, are a powerful tool in the toolbelt of plant managers to eliminate redundancies and gaps in efficiency, but it's important to identify and understand when lean methodology conflicts with a sustainable approach to manufacturing. Creating the best bottom-line for the customer, on which lean philosophy is based, can be at odds with a long-term sustainability strategy that calls for increased overhead costs, at least at the outset.

However, the core of lean manufacturing resides in eliminating the potential for any wasted resources, which is at the heart of sustainable manufacturing, too. This is where a Rittal Climate Control Analysis can connect the divide between lean and sustainable manufacturing principles. Through a comprehensive

audit of your climate control system, Rittal's climate experts will identify redundancies and inefficiencies in your existing infrastructure and demonstrate how solutions like Rittal's Blue e+ cooling units, TopTherm air conditioners, chillers, and IoT accessories optimize cooling strategies for reduced energy consumption and costs, along with prolonged service life of equipment.

The amount of energy required to provide adequate heating and cooling in an industrial space is perhaps one of the biggest challenges plant managers must overcome in creating a sustainable production program. Even with the push toward completely automated, smart factories, plenty of legacy outfits still exist in both North America and overseas, many of which still employ aging or outdated climate systems riddled with gaps in efficiency.





## RITTAL AT WORK

A Rittal Climate Control Analysis helped Ford's Cologne production facility discover massive inefficiencies in their climate systems and chart a course for integrating an optimized cooling solution. Rittal climate technicians conducted a comprehensive evaluation of the facility's 220 cooling units only to discover 25 units were operating beneath optimal thresholds, many of which required serious repair or replacement.

In addition, Rittal technicians completed a holistic efficiency calculation of the entire plant to determine any additional steps to enhance cooling capacity and outputs. Rittal's climate experts also provided a detailed, strategic plan designed to level-up the plant's climate infrastructure and transform the Cologne plant into a model of peak climate efficiency.

This plan resulted in:

- Replacing 150 cooling units with Blue e and Blue e+ units for an estimated reduction of CO2 emissions by 276.3 tons and a total cost savings of \$650,000 throughout a 10-year period
- More than 75% increase in energy efficiency compared to the plant's previous climate system]





## **Proactive *AND* Predictive Maintenance**

Too often in today's manufacturing landscape the ideas of proactive and predictive maintenance are in process silos. However, when it comes to establishing a sustainable manufacturing environment, these two methods of troubleshooting and upkeep must be joined via an automation network designed to cut material or resource waste off at the pass while simultaneously identifying potential complications before they arise.





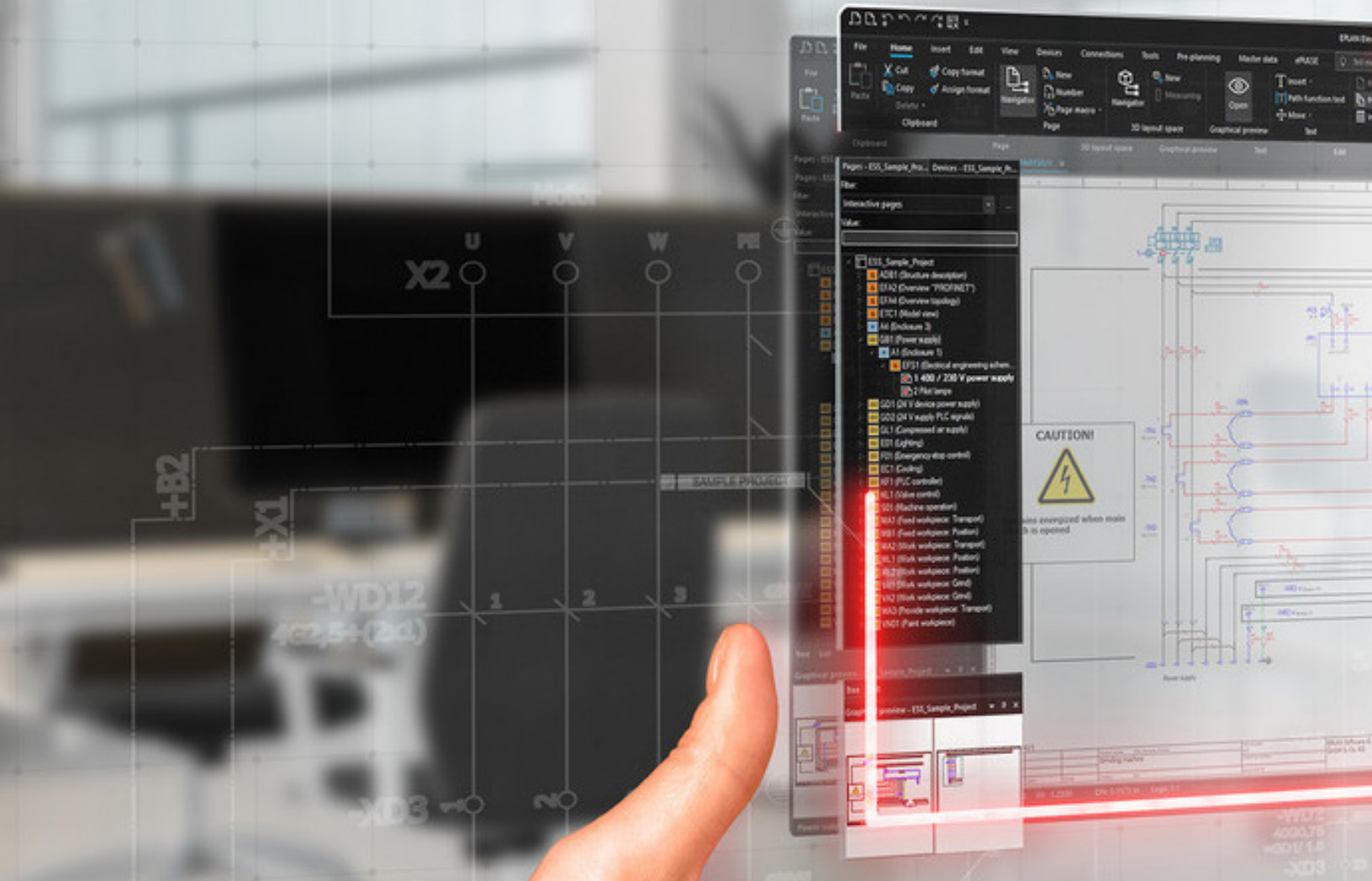
## RITTAL SOLUTION

What makes Rittal's Blue e+ line of cooling units a must for energy and operational efficiency? The ability to modernize and enhance your cooling system via superior energy efficiency, cost reduction, and elimination of manual intervention from plant engineers or managers. With Blue e+, gone are the days of monitoring climate conditions on-site, and the day has arrived when the integration of IoT, mobile-enabled capability, and real-time insights and analytics are the driving forces behind an effective climate solution.

Blue e+ also integrates several innovative features:

- Hybrid cooling that relies on two parallel cooling circuits working to circulate air throughout the enclosure. The integral heat pipe dissipates heat from the enclosure as soon as the ambient temperature falls below a specified setpoint, providing passive climatization. This inverter technology provides optimal and adequate cooling output at any time with increased energy efficiency compared with more conventional cooling methods.
- Global applications via multi-voltage capability to connect to all standard power grids worldwide. Possible input voltages range from 110 V (single phase) to 480 V (three-phase) at grid frequencies of 50 or 60 Hz, which means a considerable reduction in the number of device variants, but also to a greater simplification of spare parts procurement resulting in enhanced supply chain logistics.
- Technological integrations that put more power than ever before in the hands of those on the production room floor such as a touch-screen display, multi-lingual system messages, and standardized communication interfaces to ensure easy integration in a production plant's control systems.

# POSSIBLE STRATEGIES TO REDUCE CARBON FOOTPRINTS



## Waste Reduction and Prevention

Waste reduction and prevention is one of the core principles behind lean manufacturing, and integrated, intelligent automation systems are at the core of identifying procurement and production redundancies and inefficiencies. As we saw earlier, EPLAN's integrated design platform gives manufacturers the ability to see into the proverbial future in terms of procurement and the sourcing of component parts to help create an efficient, stable supply chain. The EPLAN Data Portal provides direct updates from

component part manufacturers and the EPLAN Cloud creates a collaborative digital workspace where designers, engineers, plant managers, and other players across the value chain can interact and share data in real-time to eliminate workflow redundancies.

This not only reduces waste but encourages further synchronization of tasks and jobs to help ensure the left hand is working in conjunction with the right at each touchpoint of the manufacturing process.





## Innovative Packaging

Putting products into packaging is often the last step in the manufacturing cycle, though it can be one of the more resource-intensive and thus one of the most apt for a sustainability initiative. Automated packaging lines with greater efficiency and precision are just the beginning for how the manufacturing space can green up its packaging processes.

More eco-friendly packaging materials, new packaging products engineered to reduce the square-footage in distribution centers or delivery vehicles, and enhanced logistics software to combine the number of products in one parcel or package are just a handful of the advancements that are helping manufacturers package and distribute smarter.



# FACTORS TO CONSIDER WHEN IMPLEMENTING A SUSTAINABLE MANUFACTURING STRATEGY

You have the motivation and drive to create a sustainable manufacturing system, and you have identified a handful of potential avenues to pursue to create a manufacturing production environment that uses Industry 4.0 and IIoT to reduce waste, conserve, or reuse resources, and be a better steward of the natural world around you.

What's next? That's a good question, and there are a couple of quick factors to keep in mind as you move toward implementing a sustainable manufacturing strategy.



## Investment and Payoff

Each of the possible strategies and initiatives we've discussed thus far require initial investment up front. This could be in the form of a sustainability audit, a ramp-up of the necessary capital and resources, and the time necessary to build the right foundation on which a sustainable manufacturing framework can thrive. The most common question from plant managers is: When will I see a return on these investments? Or: When will I begin to see the true, real-world benefits of a sustainable manufacturing cycle?

The answer, of course, depends on the size, scope, and scale of your company and your carbon footprint.

## Establish the Right Benchmarks

With any new method or process, you want to create the benchmarks and key performance indicators (KPIs) you'll use to judge success, evaluate areas for improvement, and prove return on investment. What's important to understand is that the right KPIs for your transition to sustainable manufacturing will be just as individualized as the action you put together. In other words, if your sustainability blueprint is focused

Remember how a Rittal Climate Efficiency Analysis of Ford's Cologne production facility uncovered more than 10% of the facility's cooling units were operating at suboptimal levels? And remember how our climate experts put in place a robust plan to overhaul the aging climate system that resulted in a more than 75% increase in energy efficiency?

Let's translate that into dollars and cents. The Cologne plant projected a ROI period on the climate upgrade of about three and a half years; however, the introduction of Rittal Blue e+ cooling units paved the way for a total cost savings of more than \$650,000 over a 10-year span and reduced the ROI estimate to just two and a half years, a full 12 months ahead of schedule.

on reducing energy consumption for your heating and cooling units, then it makes sense to review your monthly energy usage, costs, and the overall efficiency of your climate units and the equipment they are helping to keep at optimal temperature.

## CONCLUSION

The move toward a sustainable manufacturing atmosphere is multifaceted, complex, and contains a variety of challenges that are unique to the various sectors in the manufacturing space. Rittal's emphasis on efficient industrial automation processes not only simplifies the transition toward a green production environment but also unlocks new and innovative opportunities for manufacturers to further modernize and optimize their industrial automation infrastructure.

Whether it's a holistic climate control analysis, a proactive approach in providing solutions that adhere

to the regulations of tomorrow, or an energy-conscious mindset to the design and engineering of industrial enclosures and climate systems, Rittal's dedication to helping manufacturers green up their factories extends beyond the bottom line of today. Our Industry 4.0 and IIoT mindset helps manufacturers future-proof the transition to sustainable production processes to help ensure long-term productivity and profitability no matter the industry or application.

Explore our entire line of industrial automation products and solutions at [rittal.com](https://www.rittal.com)

# Rittal – The System.

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- Enclosures
- Power Distribution
- Climate Control
- IT Infrastructure
- Software & Services

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