

POWERING UP CAPACITY IN THE DATA CENTER MARKET

**How flexible manufacturing
can ease global generator
supply constraints**

KOHLER®
IN POWER. SINCE 1920.



INTRODUCTION: BUILDING DATA CENTERS ON TIME AND TO BUDGET

THE RESURGENCE OF THE GLOBAL DATA CENTER MARKET

These are busy times in the global data center market, with infrastructure spending rising sharply across the globe. Colocation and hyperscale developments put on hold last year are now coming back onstream, as data center operators invest heavily to meet rapidly expanding demand.

End-user spending on global data infrastructure is expected to reach \$200 billion in 2021, an increase of 6% from 2020, according to the [latest research by Gartner](#).¹ This rebound will continue over the following years, it adds, as megatrends like public cloud and 5G adoption drive uptake of data services.

SUPPLY CHAIN PROBLEMS LOOMING ON THE HORIZON

But this market buoyancy has the potential to cause significant supply chain problems. The lead time on some critical data center equipment such as generators is already running out to 6-9 months – or longer when customised enclosures and other work packages need to be completed by third-party fabricators. The lack of capacity can have an adverse effect on multi-million-dollar projects that rely on suppliers delivering in strict sequential order. Time, quite literally, is money – with severe delays putting entire projects at risk.

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FLEXIBLE MANUFACTURING CAPACITY PROVIDES THE ANSWERS

So how can the problem of capacity constraints in the data center sector be overcome? The answer comes with sustained investment in production facilities and process improvements by core supply partners, meaning that all services can be carried out in-house. This e-Book shows how a one-stop-shop approach to generator supply – from design and manufacture to testing and inspection, all under one roof - delivers a more flexible response to market demand. It also highlights how a relentless focus on safety, quality and testing inside the modern smart factory can boost the reliability of power generation systems.



KOHLER DATA CENTER PRODUCTION CAPABILITY AT-A-GLANCE

GLOBAL CUSTOMERS DEMAND THE HIGHEST STANDARDS

For hyperscale and colocation newbuilds, the project is everything. Multi-million-dollar infrastructure investments operate on carefully orchestrated schedules to produce state-of-the-art data centers - on time and to budget.

Suppliers play a critical role in delivering that ambition. Systems and components must be 'right first time', helping engineering companies and M&E contractors to avoid the risk of any costly delay. For largescale, cutting-edge technologies such as generators at up to 4,500kVA, meeting customer expectations - day in, day out - relies on having the right people, production, and processes in place to deliver the highest-quality turnkey solutions.

SUSTAINED INVESTMENT IN GENERATOR PRODUCTION

At Kohler, this full-service capability occurs at the state-of-the-art plant in Brest, northwest France. Here, 17,000 generator sets are designed, manufactured, tested, and inspected each year - many to individual customers' specification. From Brest, gensets are then transported by road, rail, air, and sea to data center projects worldwide. The plant has undergone sustained investment recently, with an additional several million dollars to be spent on manufacturing, logistics and dock capacity later this year.

WORKING WITH THE CUSTOMER TO DELIVER ON TIME

Critically, for the data center sector, Kohler's streamlined approach to the production of gensets - built using a proprietary range of our own Kohler KD range of engines - results in consistent delivery to the tightest of deadlines. Working in collaboration with procurement teams at some of the world's leading engineering companies, the latest scheduling software, parts planning and stockholding analysis are deployed to ensure that data center programs are de-risked and delivered on time. The aim, ultimately, is to ensure that all requirements of data center customers are met, without fail, no matter the size of the project.

BREST PLANT AT-A-GLANCE

SIZE: 42,800m² including manufacturing, warehouses, and head office.

EMPLOYEES: 742

PRODUCTS: Generators from 7.5 to 4500kVA

OUTPUT: 17,000 gensets per year

FACILITIES: In-line and cell-based manufacture, supported by FAT test cells, laboratories, and training area.



MEETING CUSTOMER EXPECTATIONS ACROSS POWER NODES

CONSISTENT WORKFLOWS DELIVER REPEATABLE STANDARDS

Data centers demand the highest levels of performance for backup power generation. When called upon, systems need to respond reliably, consistently, and sustainably, sometimes in the harshest operational environments.

To meet these criteria, Kohler is committed to the highest production standards at its facility in Brest, instilling a culture of repetitive process more commonly found in the automotive sector. A set of deliverables guide every step of process, ensuring repeatable build standards across all power nodes.

OUR OWN EXCLUSIVE ENGINES PROVIDE CONTINUITY OF SUPPLY

For applications such as large data centers, gensets are built in dedicated cells, using our own KOHLER® engines providing a crucial building block for the production process. These compact and powerful engines incorporate a modular design with a high degree of common components, allowing for efficient servicing, reduced spare parts inventory, and more streamlined technician training. Having our own exclusive engines means Kohler always has the supply it needs to meet rising data center demand.

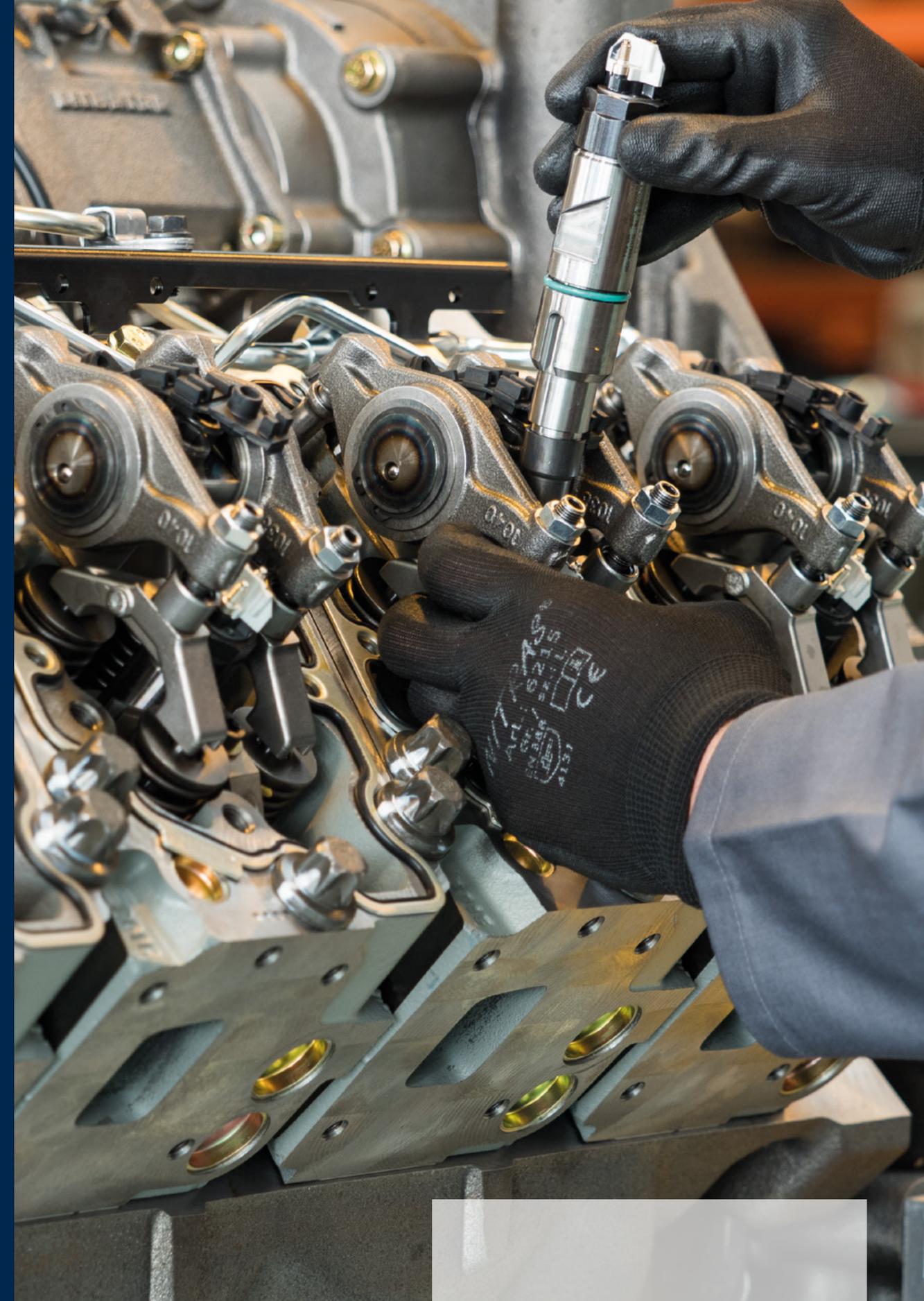
Kohler's global procurement policy ensures that all component and system suppliers undergo strict performance measurement – with GAP analysis and dedicated follow-up taskforces deployed to ensure that consistent standards are met. Regular score-card assessment covering factors such as delivery and quality are used, along with a yearly business continuity plan which ensures that suppliers are in good shape for the future. The aim is to protect supply-chain reliability and, therefore, to minimize the risk of delays to global data center customers.

DIGITALIZATION PROVIDES REAL- TIME PERFORMANCE VISIBILITY.

Once parts and materials arrive at the Brest plant, they are logged with serial/batch numbers to ensure full traceability. A five-stage process comprising mechanical coupling, mechanical assembly, electrical assembly, testing, finishing, and final inspection occurs before multi-modal shipment to the customer.

“Brest instils a culture of repetitive process more commonly found in the automotive sector, where key deliverables guide repeatable build standards across all power nodes.”

For hyperscale and co-location projects, meticulous planning and quality control-plan assessment ensure that the build process progresses efficiently. Warehouse management systems are used to ensure that the correct components are delivered from the warehouse to the cells at precisely the right moment. Program leaders monitor key performance metrics across each day to ensure that quality and safety standards are consistent and that the project schedule does not slip.



CONTINUOUS IMPROVEMENT

Reputation is everything for data center operators. Top-tier organisations often view new infrastructure as highly visible extensions of the brand. These data center operators are therefore very selective when it comes to the supply-base, looking to work with organizations that can prove their own commitment to excellence.

For Kohler, this expectation is met through sustained investment in continuous improvement – identifying opportunities to streamline work and reduce waste. At every step of the generator-build process, incremental advances are sought to improve performance and deliver results.

Continuous improvement (CI) comes in many guises, including:

Huddle meetings and CI cards: A culture of openness is fostered across the Brest plant. Team leaders and associates have stand-up meetings at the start of each shift, providing an opportunity for any challenges or concerns to be discussed. A card system is operated to encourage associates to propose any continuous improvement suggestions. This initiative recently identified some difficulties that shopfloor operatives of varying heights were encountering when performing certain tasks. An ergonomic working group was created, resulting in the installation of fully adjustable workstations.

Implementation of 5S: The Japanese 5S quality tool – translated to sort; set in order; shine; standardize; and sustain – is deployed throughout the plant to improve the overall function of operations. This creates an orderly and well-maintained facility, where everything has its place. Smart toolboxes and cabinets are arranged to enable associates to work in the most efficient way. The shopfloor has demarcated zones throughout, optimizing the movement of people and products. Glass walls and screens are arranged so that visual management systems can be seen by all. 5S encourages a culture of accountability, where associates are genuinely empowered to make a difference.



“Simulation-based process software has been used, where required, to improve operational efficiency by reducing takt times and it acts as a means of continually enhancing safety standards.”

Simulation-based process improvement:

The latest process flow software is used to visualize and optimize the movement of forklifts around the plant. This cutting-edge technique is deployed to analyse traffic congestion and eliminate any potential bottlenecks on the factory floor. Simulation-based process software has been used on specific projects, where required, to improve operational efficiency by reducing takt times and it has been deployed to enhance safety standards.

Training for the future: The commitment to continuous improvement can only be delivered with the full buy-in of all staff. At Kohler, professional development is underpinned by regular training sessions handling various topics such as lifting, handling, and tool usage. This investment in people aims to give associates as many transferable skills as possible, providing a motivated workforce that can work in the most flexible ways.



SAFETY AND ENVIRONMENT

THE PURSUIT OF A 'ZERO-IS-POSSIBLE' APPROACH TO WORKPLACE SAFETY

The health and safety of employees remain the single most important factor at any manufacturing plant. Data center customers expect strict adherence to safety policies as part of supply-chain excellence.

At Brest, a risk-based, data-driven injury prevention programme has been implemented as part of a sustained effort to reach zero on-site accidents. This ambition aligns with a culture of repetitive process and the drive for continuous improvement.

Potential accident hotspots are identified and analysed using flow simulations to enable plant managers to predict where issues might occur. A zero-is-possible (ZIP) card process is used to encourage associates to flag any potential issues. Workshop managers and operations leaders regularly review these ZIP cards as part of 'scrum' meetings. As a result, new processes/safety measures such as safety tours, education on best practice and even equipment upgrades are implemented to drive improvements.

SAFETY AT THE CORE OF ALL ACTIONS

At Brest, the recordable incident rate is on a long-term downward trajectory – but Kohler recognizes that safety is a never-ending journey, and there is no room for complacency. The injury prevention programme is a live and constantly evolving initiative that adapts as production processes change.

Allied to health and safety is a broader commitment to the environment, with the Brest facility achieving ISO 14001 and ISO 9001 certification. Environmental initiatives such as wastewater-reduction programs have been implemented across the plant. Ultimately Kohler as a group is working toward net-zero environmental impact by 2035 – reducing or offsetting greenhouse gas emissions, sending zero solid waste to landfill, developing innovative energy- and water-saving products; and encouraging associates to take action.



“A risk-based, data-driven injury prevention programme has been implemented as part of a sustained effort to reach zero on-site accidents.”



TESTING PROCEDURES

HIGHLY CUSTOMIZED TESTING PROVIDES PEACE OF MIND

In pre-COVID times, data centre operators were regular visitors to the Brest site, with more than 170 witness tests carried out in a typical year. More recently, those tests have been performed remotely – with engineering companies and end-users plugged into a range of digital tools that allow them to monitor various tests in real-time.

All large generators undergo final testing and inspection. Tests are often defined upstream by the customer and are highly bespoke. They might cover a broad range of parameters, including power outputs, durability, vibration, emissions, and more. Durability tests can run for 200 hours or longer.

Test results for first-of-type data center generators can result in modification of the design. Recent cooling and load bank tests of a first of type generator for a new project resulted in modification of the exhaust and water outlet manifolds. Kohler specialists always work swiftly and adaptably with engineering companies or end-users to perform refinements to systems and components, as required.

The test cells also allow Kohler to perform in-house research and development, looking at important areas such as emissions reduction technologies for Stage V compliance and the suitability of cleaner and more sustainable fuel types.

INSPECTION AND SHIPMENT TO TIGHT SCHEDULES

Final inspection is performed with a checking app, which covers documentation, parts traceability, torque control and other factors. Data center customers have strict requirements for standards and specifications, and Kohler recognizes the need to get it ‘right first time’.

Shipment is also a critical consideration. The Brest site is well-linked by road, rail and sea – with a proposed investment in dock facilities enabling a future expansion of operations. Gensets have also been transported to remote regions by air, using Antonov heavy transporters to ensure equipment gets to customers’ hard-to-reach facilities in the very best condition.

Ultimately, the Brest facility stands ready to meet the global data center market’s needs – no matter the size of the project or its geographic location.





CASE STUDY

SUPPLYING 36 DATA CENTER GENERATORS ON TIME AND TO BUDGET

Kohler recently completed a significant data center contract comprising 36 generators designed and built for a facility in the Netherlands. The project consisted of fully fitted-out turnkey packages, with Kohler working in close collaboration with the lead engineering contractor to deliver gensets featuring air conditioning, switchgear, and other customizations.

At the start of the project, Kohler worked with the customer to produce several iterations of engineering drawings, ensuring that every technical detail had been considered and signed off. With the specification fully agreed upon, manufacturing process studies were then performed to ensure that production efficiencies could be maximised across the contract's duration. Planning and scheduling were implemented to suit the requirements of the customer's broader programme, with genset production soon hitting a regular drumbeat across a period of around 13 weeks. Concurrently, custom-designed containers were also being built at the Brest facility to accompany some of the gensets.

CLOSE CO-OPERATION WITH THE CUSTOMER DELIVERS RESULTS

The project required high levels of organisation and close communication with the customer. Bi-weekly meetings were used to review the snags list and action list, while monthly meetings were held with the project team and directors to review progress and overcome any technical challenges.

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At the height of the work, one data center generator set was being built and tested every two days across 13 weeks.
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The result was a highly successful project, delivered on time and to budget. Kohler recognized the importance of adhering to the end user's schedule, and has established a long-term relationship with the engineering contractor and is currently working on other global data center projects.



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CONCLUSION: FLEXIBLE MANUFACTURING CAN EASE SUPPLY CONSTRAINTS

The global data center sector has proved to be extremely resilient during what have been unprecedented times. That strength in performance reflects the critical role that such advanced infrastructure plays in our always-on digital lives.

With end-user spending on global data infrastructure increasing rapidly in 2020 compared with the previous year, the industry will have to work hard to ensure that supply constraints do not hinder the positive momentum. Hyperscale and colocation companies want to do business with trusted global partners, with a local capability, who have the in-house design and build capabilities that enable them to deliver on their promises. Engineering companies look to work with innovative suppliers who can help them evaluate a broad range of customizable generators to find the optimal solution. Procurement teams, meanwhile, will only consider suppliers who are reliable, dependable, and technically qualified.

ALL THE ANSWERS – UNDER ONE ROOF

Kohler’s investment in its advanced manufacturing facilities in Brest brings additional supply capacity to the market – providing end users with greater levels of responsiveness and much-needed lead time flexibility.

A full range of integrated services covering design, engineering, manufacturing, installation, and maintenance can be provided from under one roof, de-risking projects and shortening supply-chains. This is supported by a direct-to-market sales strategy that gives the customer a fully accountable single point-of-contact – one contact, in one company, for all data center generator needs.

FOR MORE INFORMATION ABOUT HOW KOHLER CAN DELIVER THE DATA CENTER POWER YOU NEED, [CLICK HERE.](#)

References

- 1. Gartner - General Manager Insight: Data Center Infrastructure Spending Downturn and 3 Actions for Recovery <https://www.gartner.com/en/newsroom/press-releases/2020-10-07-gartner-says-worldwide-data-center-infrastructure-spending-to-grow-6-6-percent-in-2021>



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