HOW COLLABORATION AND CUSTOMIZATION ARE DELIVERING MORE EFFICIENT DATA CENTER PERFORMANCE

KOHLER®

INTRODUCTION - THE GLOBAL GROWTH OF THE DATA CENTER SECTOR

The expansion of the global data center market shows no sign of abating.

According to Gartner, end-user spending on global data center infrastructure was expected to reach $200 billion in 2021, representing an increase of 6 per cent from the previous year.

Notably, as mega-trends such as increased internet traffic from homeworking and the adoption of cloud services underpin market expansion, so the types and sizes of data center investments continue to proliferate, too.

At the edge, smaller data centers up to 5MW are increasingly being constructed in metropolitan areas close to where data is consumed. These facilities are often constrained by space and noise restrictions and face the strictest controls for environmental emissions.

Meanwhile, mid-scale colocation facilities up to 25MW represent options for third-party organizations, with the scalability of servers, cooling, power, and security providing flexibility in rapidly expanding markets.

And finally, there are largescale business-critical hyperscale new-builds, up to 500 MW, owned and operated by global companies such as Google, Apple, Facebook, Amazon and Microsoft. These highly resilient facilities are becoming ever-more automated, with an unrelenting drive towards optimizing energy usage.

In short, these are exciting times in the data center sector, characterized by investment, growth and innovation.

HOW CUSTOMIZATION AND COLLABORATION ARE DRIVING THE MARKET FORWARD

The buoyant nature of the global data center market brings heightened pressure to execute new build projects on time and to budget. To achieve this, data center designers and operators demand a more collaborative relationship with the suppliers that serve them.

Suppliers are expected to be agile, adaptive and responsive to customer demands. Moreover, a one-size-fits-all approach to system design and integration is no longer deemed acceptable. Data center designers and operators expect collaboration, innovation and customization to help them achieve their goals.

This whitepaper analyzes Kohler's response to these market demands, explaining how collaboration and customization can deliver better outcomes across the value chain, from design and production to maintenance and support. It will also highlight how the benefit of such an approach can be applied in practice, delivering real-world advantages on global data center projects.

> " A one-size-fits-all approach to generator design and integration in the data center sector is no longer deemed acceptable"

EVALUATING EARLY-STAGE DATA CENTER DESIGN CONSIDERATIONS

Data center designers will be guided by several critical considerations when specifying key systems such as generators for data center new-builds or extensions. Typically, mission-critical backup power systems include a stored energy source – usually a battery UPS and diesel generating sets, control interface and electrical switchgear. Whichever specific configuration is chosen, the generator must be compatible with the uninterruptible power supply and all other associated power equipment.

When sizing and specifying the generator, the critical load is perhaps the single most important consideration. However, many other factors come into play. These include cooling, noise, emissions, air conditioning, fuel storage and overall dimensions. Ultimately, the aim is to provide a mission-critical solution that is suitably sized and that works reliably and cost-effectively whenever required.

Getting to that endgame can be a complex challenge. Does the generator supplier offer the required range of power options to meet the task at hand? Additionally, is an exhaust after-treatment system needed to meet local emissions regulations?

Then there are considerations around generator enclosures. Can these be designed to fit on-site space constraints, while providing technical teams with the maintenance access they require? How do the noise and environmental site conditions impact the enclosure design? These are all factors that must be assessed at an early stage to ensure the right choice is made.

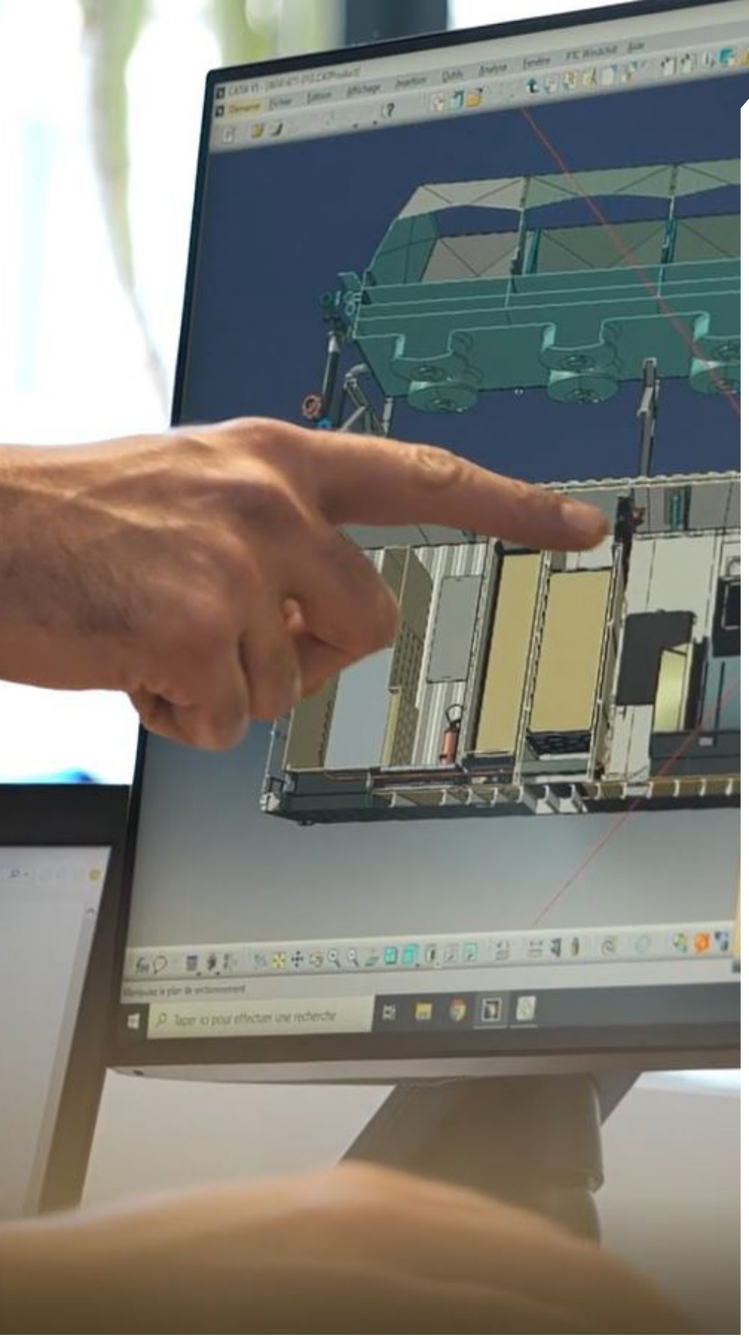
THE POWER OF PARTNERSHIP IN THE SUPPLY CHAIN

This is where collaboration and customization come into their own. Increasingly, engineering consultants charged with overseeing generator selection want to work with suppliers who can help smooth the design and engineering process from start to finish. That includes establishing a relationship with a project manager or principal engineer who can act as a single point of contact. It requires dealing with a supplier who can offer access to a multi-disciplinary team – including engineering, tendering and sales – to help progress through to detailed designs.

> “ Suppliers are expected to have invested in an in-house team of mechanical and electrical engineers that can be called upon to support requests for proposals.”

Increasingly, suppliers are expected to have invested in an in-house team of mechanical and electrical engineers that can be called upon to support requests for proposals – often providing bespoke solutions that ensure the very best performance. In such circumstances, CAD drawings and 3D models can be quickly provided for integration into client tender documents. And suppliers must be able to embrace the power of digitalization to improve process efficiency.

In short, generator suppliers must be prepared to work entirely in partnership with engineering consultants and end-users on data center projects, providing new levels of customization and collaboration to meet their requirements.



HOW SOFTWARE TOOLS INCREASE COLLABORATION IN THE SUPPLY CHAIN

So, what does increased collaboration in the supply chain look like in practice? One tangible, real-world example is the increasing adoption of Building Information Modelling (BIM) – a 3D model-based process that gives architects and engineers the tools to coordinate complex construction projects in a more efficient manner. By offering a ‘single point of digital truth’, BIM can improve design quality, reduce project times and deliver cost savings.

For data center designers, BIM might be used to optimise on-site power rooms, confirming layouts and enabling clash detection. Or it might be deployed to ensure sufficient ventilation and verify access clearances for maintenance operations. Whatever the application, BIM is about embracing digitalization to improve design quality and drive improved efficiencies. No wonder it is increasingly seen as ‘must have’ on many major projects.

KOHLER PARTICIPATION ON BIM OBJECT PLATFORM

Consequently, Kohler supports data center designers and operators through participation in BIM OBJECT – one of the leading global web platforms used to store BIM models of key components and systems in the data center industry. This participation extends to more than 100 EMEA products, including the most powerful generators from the KD Series. The platform provides technical data, photographs, 2D/3D drawings, and links to supporting videos and datasheets.

Participation in BIM OBJECT is ongoing, and more products will be added soon. The platform is an excellent example of digital collaboration, helping designers visualize projects more easily from conception and shortening deadlines.

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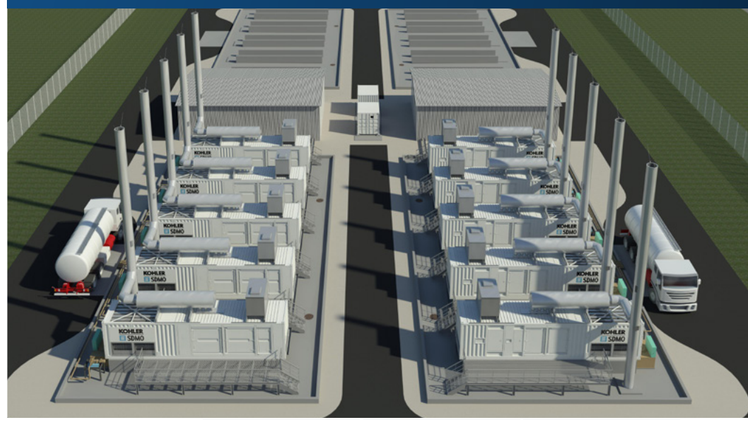

HOW CUSTOMIZATION DELIVERS BETTER POWER SOLUTIONS

When it comes to a detailed specification of generators, standard elements such as engines provide the building blocks, acting as a foundation for any new design. Suppliers then offer a bespoke service, resulting in customization for specific requirements. This might, for example, include the addition of an oversized alternator for large start-up currents.

Generator footprint is becoming increasingly important, especially in edge data centers with strong industry demand for compact designs to fit the tightest of spaces. In terms of both surface area and volume, the footprint of a generator is key to ensuring its integration into an environment, making it crucial that generators pack big performance into a compact frame, in both soundproofed and open versions.

Similarly, noise reduction is critical in data centers, with suppliers deploying the latest acoustic techniques to ensure that the end products meet all local noise regulations. Engineers focus on customized genset design and installation to consider the local impact in populated areas, ensuring compliance with sound levels regulations all over EMEA and the rest of the world. Suppliers can measure the sound emitted by all generator systems, whether open or fully sound attenuated, to ensure the generator selected is within specific site location noise regulations.

Emissions represent another area where bespoke solutions are required. Exhaust after-treatment systems, such as selective catalytic reduction, are used to meet standards such as those set by the European Union's Medium Combustion Plant Directive, which has been introduced to improve air quality by reducing harmful emissions of sulphur dioxide and nitrogen oxides. In all cases, advanced engine design and exhaust equipment can be applied to generators to allow the lowest exhaust emissions possible.

Finally, flexible canopies and containers provide bespoke solutions for generators. Edge data centers might typically be housed within 20-foot, skin-tight canopies, custom-modified to suit site conditions. Mid-range generators more suited to colocation data centers come in 40-foot containers rather than canopies, which means they can be stacked alongside standard-sized shipping containers for ease of transportation. Hyperscale new-builds up to 500 MW typically feature generators housed in walk-in containers, with thicker walls for sound attenuation.

All containers provide customizable options for positioning associated equipment, including the fuel tank, transformer, and switchgear. These modules also offer a broader range of options for cable entries, air inlets and exhaust outlets, matching the bespoke requirements.

“ Generator footprint is becoming increasingly important, especially in edge data centers where there is strong industry demand for compact designs to fit the tightest of spaces with maximum achievable power density.”

SYSTEMS INTEGRATION MUST NEVER BE OVERLOOKED

But data center generators are only as good as the parts that define them – and that requires a laser-like focus on total systems integration. Generator suppliers are expected to work with clients to engineer every detail, down to the last bolt, preferably with most of the components manufactured in-house. This in practice means:

- Paralleling switchgear that can be designed for emergency, prime power
- Automatic transfer switches that ensure the smooth transfer of power from the utility to the generator and back
- Accessories such as enclosures, fuel storage and management systems through to electrical connection boxes and alarm modules that can be configured to meet specific application needs and integrated with site-wide power management systems
- Controls designed with advanced network communications for remote monitoring – an important factor in today’s increasingly digitized world

The aim is to design and build generators that meet the highest level of uptime – providing reliable mission-critical power on demand. And increasingly, that means taking a customizable approach to design.

FROM DESIGN TO PRODUCTION, AND COMMISSIONING

Collaboration doesn't stop when the design phase ends. Dedicated project management teams stay aligned to data center projects throughout production, testing, delivery, project execution and commissioning, with efficient documentation control processes used throughout. Generator suppliers liaise with all sub-system providers in advance of the manufacturing process to ensure that projects remain on schedule.

Factory acceptance testing is also a highly collaborative process, with on-site witness tests to ensure that all specifications have been met. Alternatively, clients can observe factory testing remotely through specially designed digital portals, where results can be instantly displayed in real time.

Delivery to site, meanwhile, is arranged to agreed timeslots in coordination with project programmes for efficient project execution. Increasingly, the data center industry is embracing a trend towards modularization, whereby purpose-engineered systems and components built at supplier factories are delivered to the site for 'plug and play' installation. This modular approach can act as a powerful means of streamlining new build processes, helping the end-user to reduce carbon footprints, and lowering overall project costs.

> "At a top-line level, data center customers increasingly look to work in partnership with global suppliers who can execute locally."

Once installation and commissioning have been completed, suppliers such as Kohler use internal reviews to learn from every data center project. With any required lessons learnt and implemented, a process of continuous improvement can be adopted, with relevant outcomes helping to ensure the formation of long-term successful business relationships.

At a top-line level, data center customers increasingly look to work with global suppliers who can execute locally. This one-stop-shop approach eliminates the need for duplication of design activities and helps ensure consistency of production standards, particularly when activities like fabrication of enclosures can be managed at the same place where generators have been built.

This is the blueprint for collaboration and customisation in action. And it is the only way that the data center sector can continue to expand at the pace required, while ensuring that all project requirements are met.

CASE STUDY: KOHLER PARTNERS ON GLOBAL DATA CENTER PROJECT

A recent project saw a requirement for 18 data center generators for a project in the Netherlands.

At the outset, design specification requested very low noise performance – at 65dB from a positioning of one metre. This technical requirement reflected stringent local noise regulations put in place to protect people living nearby.

Kohler designers and engineers worked closely in partnership with the client to produce a bespoke design based upon a novel enclosure solution.

The contract featured compressed timelines, with all 18 units needing to be delivered to the site within five months of the initial order. In this case, time was money – with other equipment following in strict sequential order and the genset delivery, therefore, forming an essential part of the project's critical path.

The project was managed smoothly, with no delays. On-time and to budget delivery of the generators has resulted in repeat business, with the client ordering a further 25 units for data center applications.

CONCLUSION - COLLABORATION AND CUSTOMIZATION ARE CRITICAL COMPONENTS OF THE DATA CENTER SUPPLY CHAINS

In conclusion, the global data center market is undergoing a period of rapid expansion in all key regions worldwide. This growth is likely to continue for the medium-term, as data-hungry technologies such as 5G and artificial intelligence continue to come to the fore.

Demand for data results in the need for new infrastructure, with a diverse range of edge, colocation and hyperscale-sized facilities in the pipeline. These projects put pressure on the supply chain, with any delay to critical systems and components having a knock-on effect in other areas.

More than ever, data centre designers and end-users want to partner with suppliers who can operate collaboratively, offering customized solutions that meet the customers' specific needs.

Kohler is fully resourced to support customers requiring bespoke designs. We have invested in a talented team of in-house designers and engineers, whose experience supports innovation and a proactive attitude to every data center project. This skill set is combined with a single point of contact, ensuring speed and agility of service as projects progress.

This level of customer service is supported by a one-stop-shop approach to generator design, manufacture, delivery and installation, thus improving quality, consistency, and performance reliability.

In short, Kohler can provide generators for all data center requirements – offering customized and optimized solutions that you can rely on.

CLICK HERE to contact us, or visit **KOHLER-SDMO.COM**.