

Power Your Data Center Generator Application with Kennametal

With decades of experience, Kennametal is a full-spectrum, end-to-end partner for manufacturers tackling power generation applications.



The HARVI Ultra 8X is a large shoulder-milling tool with the tool stiffness to achieve high metal removal rates even in abrasive materials like cast iron.



Data centers are power-hungry facilities at any scale, and the boom in data center construction to meet the computing requirements of AI expansion requires a parallel boom in parts for power generation. According to estimates from the International Energy Agency, electricity consumption for new data centers is projected to more than double by 2030 to a level comparable with the annual electricity use of a major industrialized nation, with both primary and backup generators providing uninterrupted power supplies to these facilities.

This expansion is set to rely on diesel- and natural gas-powered internal combustion engines, says Travis Morrison, Kennametal's Manager for Key Accounts in the North and South American Power Generation markets, due to the accessibility of these power sources. The trouble is that parts for these types of engines are often made from steel or cast iron. Cast iron breaks up like powder when machined and proves highly abrasive, wearing tools quickly and threatening job profitability for unprepared shops. While many tooling providers can provide a well-engineered tool for a small handful of applications in power generation, sourcing tools across the full spectrum of applications — to say nothing of sourcing support for these applications — requires a partner company with experience in power generation, data centers and engines. In short, it requires Kennametal.

Expertise, Every Step of the Way

For new manufacturing projects involving power generation parts for data centers, Morrison recommends partnering with Kennametal as early in the process as possible. For many new applications, he says this should be as early as the purchasing process for capital equipment like machine tools. His reasoning

◀ The KCFM 45 is an indexable face mill meant for fine finishing in cast iron. Its carbide grade is a good fit for machines with less-powerful spindles, while ceramic and PcBN grades can run at higher speeds and demonstrate lower costs per part.

comes back to the cast iron and compacted graphite iron material for many parts that go into diesel and natural gas generators. Cost-effectively manufacturing this material requires not only the proper tooling, but a machine tool capable of running it. He points to Kennametal's KSEM PLUS™ modular drills, which can extend up to 4 inches in diameter at lengths of up to 10 × diameter, and which can also now use stepped self-piloting geometry to eliminate separate pilot drilling operations. These are powerful tools, but “50% of the time when I try to apply these in an application with a dated piece of equipment, they don't have the thrust capability to push the tool because it runs at such incredible metal removal rates,” he says.

To ensure customers can run their most advanced tools to their full capability (and profitability), Morrison recommends that shops make compatibility with Kennametal's tooling a requirement during the development of turnkey projects, whereupon the machine tool OEM and Kennametal can collaborate. These turnkey builds should involve tooling, fixturing, automation and any other peripherals the shop wishes to incorporate into the process. Doing so not only simplifies the quote, but it provides Kennametal an accurate picture of the process before the company's engineering team creates a corresponding project in its system and sets to work on assemblies.

These assemblies use both custom and standard tooling, sometimes combining the two in the same assembly with a stock tool and custom toolholder or vice versa. Morrison says the final collection of tool assemblies typically shows a nearly even split between custom and stock tooling used. The custom tools may be more expensive, but can combine features into a single tool, cutting tool change time and reducing the number of tools that need to be loaded into the tool crib to produce a part.

Once Kennametal has constructed all the necessary assemblies, the company produces a handover document depicting the full assortment of toolholders, tools and inserts. It also provides a data chip loaded with all the information toolroom employees will need to set the tool and construct the assemblies, enabling users to start cutting parts as soon as they install the machine tool and obtain the Kennametal tooling.



▲ Kennametal's KenDrill HPR solid carbide drills use a patented corner radius to extend tool life while achieving high hole quality. The corner radius also helps avoid chipping the workpiece during part exits.

Even after this stage, Kennametal works with shops to provide support. For new projects and manufacturers' existing jobs, Kennametal offers programming optimization support, making use of the company's extensive experience manufacturing power generation parts. Morrison says it is possible for Kennametal to assist shops by conducting optimization tests in its own lab, but the company's specialty is more hands-on: Kennametal specialists can travel to customer shops to conduct tests on the customer's own machine, minimizing variables that can lead to unexpected performance issues.

Kennametal also provides regrinding services for its tools, refreshing them at a significant cost savings to buying new tooling. These refreshes involve reconditioning tools and performing retips and regrinds as needed and come with a performance guarantee from Kennametal. While 80% tool life for regrinds is the industry-norm, Kennametal aims to turn around reconditioned tooling that performs like new for extended value.

Providing service from the start of the capital equipment buying process through to the end of life for tooling is emblematic of Kennametal's mission to become, as Morrison puts it, an "end to end" partner for shops in the power generation market. What's more, he says both OEMs and suppliers in the market have expressed appreciation for Kennametal's consistent partnership, support and expertise across every aspect of the process development lifecycle. This feedback becomes even more impressive when considering the company's ability to provide tooling for applications across any of the market's common parts.

Tooling For Any Challenge

Throughput is the largest concern for manufacturers currently working in the data center power generation market, Morrison says. The massive influx of work in the sector has pushed some manufacturers' lead times out to 24 months, so even shaving off a few seconds of cycle time for one operation can turn into massive savings. While custom tooling plays a key role in this improvement, so do standard combination tools (Morrison cites tools that combine porting and valve seating) and hardy tools that can withstand more aggressive speeds and feeds.

These tools are similar to those Kennametal recommends for manufacturers working in adjacent industries. Fluid pumps for cooling liquids and fracking blocks and fluid ends in natural gas fracking hold many parallels to parts in the data center segment of the power generation market and thus Kennametal's proven tooling platforms and machining strategies are largely transferrable. The difference comes from the material, which for data center primary and backup power generation are cast iron, composite graphite iron or steel. These materials require specific geometries and grade technologies for good performance.

Thankfully, Kennametal has experience solving this challenge, and has paired many of its tooling platforms with grades and geometries designed for data center power generation. The Kennametal team points to four of its platforms as exemplary of its all-around expertise: its HARVI™ Ultra 8X and KCFM™ 45 indexable milling platforms, its KenDrill™ HPR solid carbide drills and its KSEM™/KSEM PLUS modular drills.

The HARVI Ultra 8X is a tool Kennametal designed primarily for shoulder milling. It is a high-productivity tool with multiple rows of inserts across its face, and each insert showing eight cutting edges. Taper flange adapters improve the tool's stiffness



▲ KSEM modular drills feature material-specific point geometries for compatibility across many materials. They also sport an internal coolant supply, which directly hits the cutting zone to improve chip evacuation and tool life.

and tool life, ideal for a solution Kennametal recommends for extreme roughing and high material removal rates. For a clearance wall machining application, switching to the HARVI Ultra 8X was able to increase one customer's metal removal rate from about 88 to about 140 cm³/min while decreasing pre-setting needs by nearly 60% and tool changes by around 80%. This freed up more than 900 machine hours annually and reduced the customer's costs for the operation by 43%.

Kennametal's KCFM45 lies at the other end of the machining spectrum. These indexable mills are face milling tools designed

for flat surfaces. Their high-precision pocket seats only show 2 microns of runout, which helps them to meet high surface finish requirements. Kennametal also designed them with adjustable cartridges and pockets, which further improve performance in finishing and semi-finishing operations with wiper-style inserts. The performance boost is crucial when face milling a cylinder block, says Kennametal Regional Product Manager for Milling Clay Platt, as these require extremely smooth surface finishes.

Turning to holemaking tools, Kennametal's KenDrill HPR solid carbide drill line is the largest and most comprehensive geometry and grade combination across Kennametal's portfolio, according to Keith Hoover, Regional Product Manager for Holemaking and Holefinishing at Kennametal. The regular line of HPR drills comes in lengths of 3, 5 and 8 × diameter, with extra-long drills of 12 × diameter and deep hole versions up to 50 × diameter.

The tool line's success comes down to a few key features of its design. High-polished flutes minimize friction while improving chip evacuation, and Kennametal's patented HPR point thinning geometry helps users self-center tools to improve hole straightness even with low thrust. Kennametal also crafts these tools with a large corner radius blending the cutting lip to the drill's outer diameter. Hoover calls it an "exceptionally capable drill point that can penetrate with really aggressive feed rates," even as the corner radius has undergone enough edge preparation to "allow us to withstand some really abrasive use cases." The tool's corner radius and four margin lands also improve stability for inclined exits and mitigates shock from interrupted cuts in features like cross holes.

Kennametal's KenDrill HPR drills also bear the company's KCK10A coating, a newer coating with heat-resistant and wear-resistant properties which Hoover says enable shops to increase spindle speeds by around 20% faster than on the company's previous best coatings, with feeds about 30% faster. These parameter increases promote improved metal removal rates and help with the overall productivity of the tools.

Kennametal is adapting its KenDrill HPR line to other platforms in its portfolio, such as the KSEM and KSEM PLUS modular drilling platforms. As mentioned earlier, the KSEM PLUS platform extends to 4 inches in diameter with lengths of 10 × diameter as standard, and Kennametal's HPP point technology means to eliminate pilot drilling in about half of drilling applications involving the KSEM PLUS. A central locking screw

mechanism provides secure clamping for inserts, improving process safety and extending tool life for both drill body and insert. Kennametal also recently expanded the outboard inserts on the KSEM PLUS and developed the KCMS 40 grade to work on stainless steels, high-temperature superalloys and long-chipping alloy steel parts in power generation alongside established grades for ductile and cast irons.

For a customer drilling a blind hole and counterboring on a head stud threaded hole for an engine block, moving to a KSEM PLUS modular drill over doubled the metal removal rate in the application from 148 to 316 cm³/min while decreasing pre-setting needs by over 35% and tool change needs by over 40%. The benefits from these changes saved the customer almost 51% of costs for the operation annually. Another customer with a similar application was able to improve its metal removal rate from around 102 to around 274 cm³/min, with over a 55% decrease in pre-setting needs and a 60% decrease in tool change needs. These benefits brought annual savings of about 37% on this application.

Your Partner in Power Generation

Kennametal is a partner for power generation applications with robust experience, proven services from the start of a project to its completion and an ecosystem of durable stock and custom tooling able to handle challenging parts across a wide spectrum of applications. Wherever you are in the development or implementation of a manufacturing process for power generation parts — especially in the data center segment — Kennametal is well positioned to help you succeed.

Want to learn more? Follow the link to discover more about Kennametal's offerings in the power generation market:
kennametal.com/us/en/industries/power-generation.html

Interested in speaking with a Kennametal expert?
Contact Kennametal's Global Customer Support Team:
kennametal.com/us/en/support.html



▲ Kennametal's KSEM PLUS modular drills feature interchangeable head styles with two fully effective cutting edges. Users can switch between a head style meant for low costs per hole and a head style meant to tackle cross holes, inclined exits and other difficult features.

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