KOHLER'S ROADMAP TO MORE SUSTAINABLE DATA CENTERS

We are living in a **climate crisis**, and we all need to respond.

For **genset** manufacturers such as **Kohler**, that means reducing **greenhouse gas (GHG) emissions**: both by improving existing **diesel** technology, and by developing new solutions to bridge the gap to fully **renewable power**.

One of the biggest markets to be addressed is **data centers**. Despite increases in efficiency, their power consumption continues to grow – to around 1% of worldwide electricity demand. In particular, the surge in demand for **cloud services** is driving the growth of large, **'hyperscale' data centers**.

Regardless of their size, all **data centers** need to ensure a continuous electrical supply, to avoid data losses and outages in service. The **diesel generator**, or **genset**, has been the primary equipment used to fill any short-term emergency gaps in **grid power**, due to its proven long-term reliability, high energy density, and low operating costs. Even though they are intended as short-term, back-up use, **diesel gensets** objectively have the potential for high **emissions**, and there is increasing pressure to reduce their **carbon footprint** or switch to alternative technologies.

Legislation to tackle **climate change** is impacting **data centers**, and the industry is responding with self-regulation initiatives to reduce **emissions**. In particular, the big five IT companies (Amazon, Google, Microsoft, Facebook and Apple, known as **GAFAM**), have made strong public commitments on being greener.

These trends mean that more action on sustainability is needed from **genset** manufacturers. **Kohler** has substantially reduced **emissions** for its **diesel gensets**, with improvements in in-cylinder technologies, such as electronic **fuel injection** and **exhaust gas recirculation**. Computer-aided engineering tools and computational fluid dynamics have also enabled the modelling of **engine** behaviour to become more sophisticated.

Another big improvement has been the reduction in **'wet stacking'** – when unburned fuel builds up in the engine's exhaust system, leading to excessive wear and damage. This is usually addressed by burning off unused **fuel**, by running generators at 30% of their rated capacity for at least 30 minutes monthly – but this is costly and wasteful.

Kohler has addressed **wet stacking** with highly optimized **engine design**, such as in the **KD series**. This enables operators to run monthly **generator** tests with no load, only running a load test annually – which can reduce overall **generator emissions** by up to 85%.

As well as the **engine** itself, after-treatment systems can capture the different gases and particulates present in the **engine's** output. These systems include **diesel oxidation catalysts**, **diesel particle filters** and selective **catalytic reduction**.

Beyond **diesel**, **biofuels** such as **Hydrotreated Vegetable Oil (HVO)** can provide another way to reduce GHG emissions. **HVO** can reduce genset carbon emissions by up to 90%, and is produced from waste and residual fat from the food industry as well as from non-food grade vegetable oils. **Kohler's KD engines** have been proven to operate with **HVO100 biofuel**, and we are continuing to work on solutions with other new clean fuels.

Further ahead, **Kohler** is directly involved in developing and trialling **lithium-ion batteries** and **fuel cells** for **data center emergency power**. While they produce no **emissions** in use, **batteries** and **fuel cells** are expensive and can have a significant environmental impact in their production and disposal, including building new infrastructure.

With a long-term commitment to reach **net-zero** GHG across its operations by 2035, **Kohler** is investing massively in **sustainability**: both by minimizing **diesel emissions**, and adopting new technology. Together, these two priorities will enable us to hit our environmental targets, and help our customers meet their green goals.

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