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PowerHour FAQs

Diesel Generators in the Data Center — When to Go Big

Today the most popular data center generator system design employs multiple single generators, each paired with a utility transformer. But it's time to revisit the advantages of paralleling multiple generators into a central plant. There are several paralleling architectures that eliminate the single point of failure of a paralleling bus. Also, using larger generators in the data center design provides advantages in many applications.

To learn more about diesel generators when designing a data center please join the Cummins PowerHour webinar:

Following this PowerHour participants should be able to:

- The advantages of using big generators (3MW and above)
- The advantages of a design using paralleling architecture
- Variations on data center power system architectures to achieve concurrent maintainability and fault tolerance

One of our clients is considering using parallel generator sets for his application. What's the best controller to recommend for paralleled generator sets, or is it specific to the application?

Cummins has a different perspective than some other manufacturers because we design and manufacture the controls and switchgear as well as the generators. For a paralleling application, or any application for that matter, we recommend our PowerCommand control (PCC) which is mounted right on the generator set. I'm familiar with the other controllers that are available — Woodward and Basler for example — but for a Cummins generator set, you definitely should use our PCC controller.

What are the benefits of running a generator at full load versus lightly loading the generator?

There are multiple advantages. As we discussed earlier, you get better fuel efficiency with full loads. In other words, you're going to get more kilowatts per gallon, similar to miles per

gallon, when running with larger loads. Another advantage is reduced emissions. A generator set produces less NOx and other pollutants when the generator is running at peak efficiency with a higher load. Another concern is wet stacking. With fuel injection and modern controls, that's become less of a concern, but we still recommend that the generators be run a 30% load or above.

How do you use load demand to increase fuel efficiency for a paralleling generator set application without sacrificing the redundancy levels that the facility is rated for?

Load demand is an excellent way to improve fuel efficiency. Generator sets have a load "sweet spot" for fuel efficiency. For the highest fuel efficiency the generator set should be running at 70%, 80% or 90% load, versus running it at 20% or 30% of capacity. When you use the load demand function, the system will automatically shut down generators when you have excess capacity. And a good load demand system, using Cummins master controls or masterless load demand, allows you to adjust set points so that you only shut down those generators that are not needed to achieve N, N+1 or N+2, depending on the application. So you need to determine the set points that will minimize fuel usage while still maintaining that N+1 configuration.

What is the industry's recommended best practice standard for maximum voltage and frequency dip?

The answer to that question really depends on the client. In the example I presented, the data center management wanted to run with the UPS's in bypass mode, meaning they would not be using UPS; they elected to be connected directly to the generators. They knew that when they were on the generators their worst case load swing would be 20%. So for this client, the acceptable voltage dip was no more than 20%.

I don't know that there is an industry standard. The maximum acceptable voltage dip is specific to the client and the application. In most data centers, when you're first dropping the load on, you are using a UPS. So the UPS is going to gradually ramp the load onto the generator rather than dumping the load directly on the generator.

What is the low load application factor for the QSK 95? Is there concern if running a low load for extended periods?

You shouldn't have any problems running at 30%. I do believe the QSK 95 can run lower than that, but I don't know the facts off the top of my head. You should consult with a Cummins application engineer if you're dealing with a low-load situation.

What is meant by "The Power of One"? What are the benefits of choosing a complete Cummins system?

First of all, Cummins manufactures not only the generator set, but also the controller that comes installed on the generator. The Power Command control has the paralleling control built in, along with the governor and the voltage regulator. So everything is built into a single control. There's a lot less wiring and installation is simpler. In addition, Cummins supplies the switchgear and the digital master controls for the paralleling system, so the PowerCommand generator control and the DMC paralleling control are programmed to work together seamlessly.

So, there's a single point of contact for the entire backup system. Installation and commissioning are faster and easier because you're dealing with a single source. We take responsibility for every component of the system, and we know how to make repairs when necessary.

In short, Cummins supplies the generator sets, the switchgear and all of the controls. Cummins-trained technicians do all of the installation and commissioning, and Cummins provides application and service support for the entire system. That's what we mean when we say "The Power of One."

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