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PowerHour FAQs

Introduction to Combined Heat and Power

Stricter emissions regulations, fiercer competition and the need for greater efficiency are driving power users to rethink their energy strategies. In their quest for more sustainable, productive energy solutions, operators are turning to cogeneration, or combined heat and power (CHP) systems.

To learn more about combined heat and power please join the Cummins PowerHour webinar:

Following this PowerHour participants should be able to:

- Define CHP project concepts and terminology to discuss customer CHP opportunities
- Identify economic, design, and operational criteria for various CHP configurations and equipment
- Identify the key tools and data required to create informed CHP feasibility studies

What's the average ROI? Is there an average?

No, there is no average ROI because the answer depends on your application. It will vary depending on the location and the specific application as well as the operating time for the generator set. The cost of fuel is a major factor when evaluating the advantages of CHP. I'd recommend contacting your local Cummins distributor to obtain that information.

How is more electricity produced with combined power and heat than just using the electricity alone?

With CHP, you are producing electricity onsite without relying on a utility. And you're taking advantage of the heat produced by the engine. You're able to absorb that heat and then transform it into usable heat for a secondary system — heating up water, oil or maybe steam. The biggest driver is the overall efficiency of the system and the ability to lower the cost of production.

What is the reason for such a low exhaust temperature?

The reason for the low exhaust temperature is to avoid any condensation, either in the system or going back into your engine. Obviously, engines don't operate with water! So the

primary driver for the low exhaust temperature is to avoid any condensation. We recommend working with your local Cummins distributor for assistance when designing the system for your specific application.

What about alternative fuel sources and typical methods of cleaning or scrubbing?

This isn't directly applicable to today's topic, but I'll give you some background. When you have an alternative fuel source available, such as bio-gas or landfill gas, it's worth considering using it as the energy source for your generator set. For example, one of the projects I showed today was a chemical plant that uses landfill gas to produce electricity. They use the electricity to heat water and produce steam for chemical production.

Can you produce super-heated steam with this type of application?

No, not in this case. And I should also point out that a CHP system is supplementing the steam produced by the existing boilers; it's not a substitute for the boilers that are already in use onsite. CHP is used for additional capacity.

What is the price differential between using a standby generator and a CHP unit with the same rating for an application?

The answer is application-specific and you would have to work with your Cummins distributor to determine the difference in price.

What about using natural gas instead of diesel?

Diesel generator sets can be used but the primary driver for using CHP is fuel cost. For most locations, natural gas is less expensive than diesel fuel, and if an alternative source is available onsite, such as bio-gas, that's another factor to consider when calculating the relative fuel costs.

Is there a minimum generator capacity for CHP?

Not necessarily. That would be determined by the requirements, such as heat load, for your site. As I mentioned in my presentation, generally you should be looking at an operating time of 6,000 hours per year or more. Anything less than 6,000 hours won't be feasible for energy cost savings, because your payback period would be a lot longer.

In a hospital setting, where the generators are being used for standby power, could the combined heat and power concept work? Or is the 6,000 hours the determining factor for this system?

As you know, for standby applications, use is limited to about 250 hours per year. And for cost-effective CHP, you need at least 6,000 hours. For hospital CHP, you would use the generator set in continuous operation, to supplement the electricity needs of the hospital while simultaneously providing heat to produce hot water or steam. Steam is useful because you can transport steam a longer distance without losing much of that heat energy — steam can hold more heat than hot water can hold.

Is a CHP system reliable enough to provide electricity without the availability of the utility? Can CHP serve as the prime power source?

CHP can be a reliable power source, but that's somewhat dependent on how many generator sets you have running in parallel, so they can piggy-back on each other. But it's always beneficial to have CHP systems connected to the utility so you have a stable base load. Otherwise, if your electrical load fluctuates, that affects the heat output from the generator, which will then impact the overall efficiency of the CHP system.

What is the availability percentage of a typical CHP in a year?

That answer is application-specific. It depends on what you're using the heat for — what are you heating? Steam? Oil? Water? And the availability is affected by how often your CHP equipment could end up getting fouled. If it gets fouled more quickly, that will affect the availability of the system as a whole.

Can available gas emitted from oil production wells be used to fuel and run a CHP system?

It depends on the quality of the fuel. And of course there needs to be a use for thermal heat at the production site, to heat water or for some other purpose that justifies the use of a CHP system.

When it's time for an engine rebuild, at the 6,000 hour point, does the customer have to rely 100% on the utility?

Typically the generator sets are going to be paralleled with the utility. So they may end up relying on the utility a lot. You still have the 6,000 hours, so we recommend a continuous application. Typically, if you're running continuous for a year, it will be 8,000 hours.

Are diesels out of the question because of the emissions and the exhaust heat exchangers sitting up?

No, using diesel or gas generators is not ruled out. In some CHP applications where we're using a natural gas generator set, we have to install additional aftertreatment equipment like STR. And then you need to understand how much additional back pressure you have available for the other equipment you're adding to your exhaust system. That is going to be determined based on what engine you've selected.

Does Cummins have any plans for a micro-CHP?

Not at the moment. Low run time hours makes a CHP system very costly, so we don't have a micro-CHP system in development. Micro-CHP could potentially be studied sometime in the future.

What is Cummins' recommendation for designing a heat exchanger, in terms of pressure? Can we design a generator set circuit with lower pressure so that in case of a leak, the customer fluid in the generator set cooler isn't contaminated?

This is highly dependent on the manufacturer of your heat exchanging equipment. And, based on our generator set data sheet, the engine cooling circuits have some pressure that's being produced by the engine. That will have an effect, as well as how much restriction you can have on your external circuit. So, the answer is also based on what the heat exchanging equipment is able to handle and how it aligns with what the generator set is able to produce.

In fact, the separation of the circuits ends up protecting the engine. You need to keep that in mind — how do you protect the engine, and how do meet the engine's requirements? As mentioned before, CHP can also be thought of as just another way of cooling down the engine.

What is the lowest kilowatt base load required to make a CHP system feasible?

That would vary based on what generator set is selected. The question is, is the electricity produced by the generator set going to provide any energy savings? Are the financial savings enough to make CHP feasible? The site energy requirements are what will determine which generator set you choose.

Do power generation companies use this technology?

Yes. CHP is not really a new technology. It was used over 100 years ago in the first centralized power plant. In that case, they were using the excess heat from the turbines used to produce the electricity, to supply steam for local manufacturers and to heat water for neighboring buildings. CHP is being used today in district heating systems.

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