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PowerHour FAQs

NFPA 110 Time to Readiness

The 10-second start is a point of pride for industry-leading generator set manufacturers. The ability of an emergency power system to deliver acceptable power within 10 seconds of an outage has made engine-based generator sets the standby power system of choice for healthcare and other critical power facilities. However, there's been some confusion in the industry regarding those critical 10 seconds and methods of demonstrating compliance. This course dives into NFPA 110's Type 10 requirement, how a power system can meet the intent of the code, and the impact this requirement has on the way generator set and power systems is specified and designed.

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Following this PowerHour participants should be able to:

- Recognize NFPA 110 classifications of emergency and standby power systems
- Identify key aspects and intent of NFPA 110 that impact equipment selection and design of generator set emergency power systems
- Describe various strategies for ensuring generator set and system performance as they relate to NFPA 110 Type 10 guidelines.

What are the pros and cons of specifying NiCad (nickel cadmium) batteries?

Although NFPA 110 requirements specifically call for lead-acid batteries, NiCad may be an appropriate substitute and we do see NiCads specified on some projects. NiCad batteries have been used for a number of years and are generally offered in cell configurations equivalent to their lead-acid counterparts. NiCad batteries are more tolerant of temperature changes and generally have a longer lifespan than lead-acid batteries. However, it is important to note that NiCad batteries are more expensive than their lead-acid counterparts. So you need to be aware of the price premium when specifying NiCad.

Also, the appropriate battery charger is crucial for maximum battery survivability. Not all battery chargers are created equal. If you initially start with a lead-acid system and then decide to swap for a NiCad system, you may find you also need to install

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a different battery charger. Not all chargers are compatible with both types of batteries.

Some AHJ's (authority have jurisdiction) interpret NFPA 110 6.2.5 to be a requirement rather than a consideration – can you clarify?

6.2.5 has to do with a built-in delay to prevent nuisance starts in response to momentary power dips or interruptions. But the code actually says “For most applications, a nominal delay of 1 second is adequate.” It goes on to say the time delay should be short enough to allow the generator to be online within the time specified for classification type. In other words, it depends on the application. We understand that in many cases this section of the code is being interpreted in different ways — this is an opportunity for a manufacturer such as Cummins to help you engage with your local AHJ for clarification.

The only absolute requirement in NFPA 110 is the start timing — the generator must deliver power to the load within 10 seconds. So, for a 10-second start, if the built-in delay is 1 second, then the actual time allowed for the ATS to connect to the generator is 9 seconds.

What is the best way to dispose of “old” fuel, i.e. oil that is contaminated or dirty?

The best answer is not allowing your fuel to get to that point, by regular testing and remediating. “Polishing” is a common term to describe the process of remediating fuel. This involves pumping all of the oil out of the fuel tank, cleaning it, and transferring it back into the tank. However, “polishing” is an ambiguous term; polishing may include many different processes. Typically, a polishing system will pump the fuel out of the tank, run it through a water separator, and then filter it through one or more filters. In some cases, the polishing system may also inject an additive like a biocide or a lubricant.

We’ll see specifications requirements that say, “Engine generator shall be equipped with a polishing system” but not spell out what the polishing system is supposed to do. Also, polishing systems are available in two versions: a permanently-installed system for a large site with big fuel tanks, or a mobile system that the service provider can bring in to polish the fuel as one of the normal service procedures.

Will using biodiesel fuel affect the generator’s performance in terms of meeting Type Ten requirements, 10-second start and transient performance?

Any significant deviation in fuel quality may impact generator set performance. Generally, for a biodiesel blend of up to 20%, we see minimal impact on the start time performance.

For biodiesel blends above 20%, we do see issues related to power as well as transient performance. Biodiesel may have a lower energy density than its unblended diesel counterpart; therefore, the engine may have to increase fuel consumption to achieve similar power levels. But this varies depending on the manufacturer.

The other concern raised by the use of biodiesel blends is compatibility with fuel system components. Biodiesel fuels are not compatible with some metals, and components made of those metals may be degraded by contact with biodiesel. For example, in Minnesota the state mandates that all diesel fuel contain a minimum of 10% biodiesel, and there’s no labeling requirement. So you may not know what you’re getting onsite.

So I would recommend working with the generator set manufacturer to ensure they are providing a generator that is compatible with the biodiesel blend you are using onsite. For example, all Cummins diesel products are compatible with up to 20% biodiesel.

How do Cummins diesel-fueled and gas-fueled generator sets compare for applications where a 10-second startup is required?

NFPA does not call out different performance requirements for emergency power systems with compression ignition versus spark-ignited (gaseous) engines. There are different testing requirements. Most manufacturers, including Cummins, offer a range of both diesel and natural gas-powered generator sets. Cummins has two subsets of natural gas products, separated by their relative size. Most of our natural gas (or propane) generators can be used for Type 10 applications, so you don't need to automatically rule out natural gas or propane as the fuel source. However, it is important to clarify the specific model's performance capability with the manufacturer to ensure you've made the right selection.

What are the advantages and disadvantages of using natural gas-fueled generator sets for a Level One application, instead of using diesel?

First, you need to consult with the manufacturer to verify that the specific gas-powered generator set you are considering is able to meet the Type 10 requirements.

Obviously, fuel storage is different for natural gas-fueled systems. Most owners would prefer not to store compressed natural gas onsite. But there is an advantage to using utility natural gas; in some areas of the United States the natural gas supply is considered an infinite source, so you do not need to store fuel onsite. But in other areas, particularly in seismic zones, the local AHJs require stored fuel because they don't view the utility natural gas supply as reliable. So you need to check with the local AHJ to understand their storage expectations.

What does NFPA 110 say about engine jacket water heaters?

When NFPA 110 calls for an engine jacket heater, what they are talking about is a coolant heater. A coolant heater is an option installed by the generator set manufacturer to heat the engine coolant when the engine is not running. The engine jacket heater warms the coolant, and the coolant circulates within the engine to maintain an elevated temperature, typically between 100-130°F. Uniform heat distribution reduces engine wear and improves startability.

If you have a water jacket heater to maintain the coolant temperature (see the previous question), do you need an oil heater as well?

There are a number of heater options offered by manufacturers. In addition to a water jacket heater/coolant heater (see the previous question), options may include a lubricating oil heater, fuel heater, intake air heater, battery heater, control heater and so forth. There are many different options.

Per NFPA, the requirement is that the engine jacket water heater be sized as recommended by the generator set manufacturer. Some manufacturers may choose to include other options, such as a lubricating oil heater. These options may help the generator reach the required starting time, but they are not mandated by NFPA 110. The other heaters I mentioned — control heater, alternator heater and so on — are anti-condensation heaters. They aren't intended to help with starting time performance; they are anti-condensation heaters to prevent condensation from building up on the equipment.

Does NFPA 110 specify a limit or maximum percentage for emergency generator set load? For example, 90%?

NFPA 110 requires that the generator set be sized appropriately for the load it is intended to serve. ISO 8528 is the standard for generator set ratings and load factors, maximum load and so forth. For a standby generator sets, most manufacturers refer to ISO's ESP (Emergency Standby Power) ratings, which allows the generator set to operate up to 100% of its rating. However, the rule assumes that the maximum average load over a 24-hour period is approximately 70%.

Does NFPA 110 require remote annunciators?

Remote alarm annunciators are a fairly common requirement, and most generator set manufacturers are able to offer annunciators for remote display of system status and alarms to meet the applicable NFPA 110 requirements.

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