

7 FACTORS TO CONSIDER WHEN INSTALLING A INVERTER

Inverters can help provide an extra measure of creature comfort for truck drivers. But, there are concerns about potential damage to a truck's electrical system. Here are seven points to keep in mind. **BY THE XANTREX INDUSTRY EDUCATION TEAM**

Power inverters — the devices that convert standard battery power (DC) to household power (AC) — are becoming more commonplace in the trucking industry. Depending on who you ask, it's to the delight or chagrin of fleet and maintenance managers who often have a love-hate relationship with inverters.

"Inverters have always been a magnet of controversy," said Steve Carlson, OEM sales manager for Xantrex, a supplier of inverters. "Fleets know that drivers love them, as they provide an extra measure of creature comfort that helps with driver retention. But, they can be nervous about inverters and their potential to damage the truck's electrical system."

According to Carlson, inverter shipments have risen sharply since early 2012. The company expects this trend to continue over the next few years. "The distrust of inverters is really a thing of the past if, and I stress *if*, the right inverter and installation practices are followed. The key is for fleets to do



CARLSON

their homework and know what's best for their operation prior to making a purchase. One size does not fit all, and inverter quality varies greatly."

Carlson shared a few questions that typically rise above all others when fleets try to determine which inverters to purchase:

1 Determine Inverter Size

Far and away, "what size inverter do I need" is the number one and most important question Carlson hears from fleets.

"Inverter sizes range from 300W cigarette lighter plug-in inverters to 5,000W units. Each fleet should do a survey on truck size and power usage and understand how their drivers will use an inverter — what items they want powered and what items will be used at the same time. That will help right-size the inverter for your operation," he recommended.

For example, Carlson explained that truck drivers often run numerous electronics, including a laptop, all at the same time.

"On each device you'll see a wattage number," he said. "A microwave might be rated at 1,000W, a TV at 250W, and a laptop at 95W. Add them up to see how much continuous power you'll need, and then add 20 percent. In this case, you'll need just more than 1,600W. Next, round up to find an inverter that meets your power needs."

While determining continuous power is an

important consideration, so is "surge power."

"Whenever you power up any device, the initial load is more — and sometimes double — what the continuous power requirement is," Carlson explained. "The surge rating on quality inverters should be about double. For example, an 1,800W inverter can handle a short 3,600W power surge requirement."

Next, Carlson said to research how long the inverter can handle the surge.

2 What Power Type — Sine or Modified Sine Wave?

There are two types of inverters on the market, a sine wave and modified sine wave models.

"Both work well in a truck environment, but for those running sensitive electronics (such as continuous positive airway pressure machines) or products that are plugged into their own chargers — a drill or a toothbrush — sine wave is the preferred choice," Carlson said. "Since sine wave is the same power as what you get at home, the voltage is consistent without spikes or drops. So, the device you're powering reacts just as it would if you were plugged in at home."

However, in most cases, modified sine wave power is just fine in operating most electronics and appliances with the exception of few sensitive applications, according to Carlson.

Regarding cost, the price gap has narrowed, and today most higher-wattage sine

At a Glance

When installing a power inverter in a truck, factors to consider include:

- The size of inverter needed.
- How the inverter will be powered.
- Unit reliability.
- Whether or not to opt for a built-in battery charger.

POWER PORTER

wave inverters cost about 15 to 20 percent more than a modified inverter. "With a sine wave unit, you'll notice a slight decrease in the efficiency rating, since electronics within the inverter use power to keep electrical levels consistent," Carlson said.

3 Can Fleets Install an Inverter?

Generally speaking, fleets can install inverters, according to Carlson. "Most technicians will have no problem handling installation and we offer fleet training programs to our customers," he said. "Just remember, you're working with electricity, and electricity can bite if you're not careful. It's our recommendation that inverters over 300W feature hard-wiring and fusing."

Carlson said there is a bevy of considerations to make when installing an inverter, starting with where it should go and making sure there is adequate ventilation to allow heat to dissipate.

"And, you have to be cognizant of wire-sizing and the distance between the inverter and plug-ins that can be put in the sleeper, plus the distance between the battery and inverter. There's a lot to consider," he said.

According to Carlson, most fleets want the convenience of a factory-installed and warranted inverter. "We really recommend either an OEM install when you purchase a new truck, or have the installation done by an authorized dealer," Carlson said. "The OEMs have installation down to a science and it's done on the line to rigid specs. Truck and

aftermarket dealers also have the experience, so it's worth spending a few extra bucks to have the installation done right, the first time, should your own staff not have the time or expertise."

4 Confirm Reliability

"When it comes to reliability, the old adage, 'you get what you pay for,' comes into play," Carlson said. "You will pay more for an inverter that has a 'Regulatory Listed' approval, such as Underwriters Laboratories (UL) or Electrical Testing Labs (ETL) with a UL458 rating. This means the inverter was inspected and approved by an independent agency which safeguards against issues with

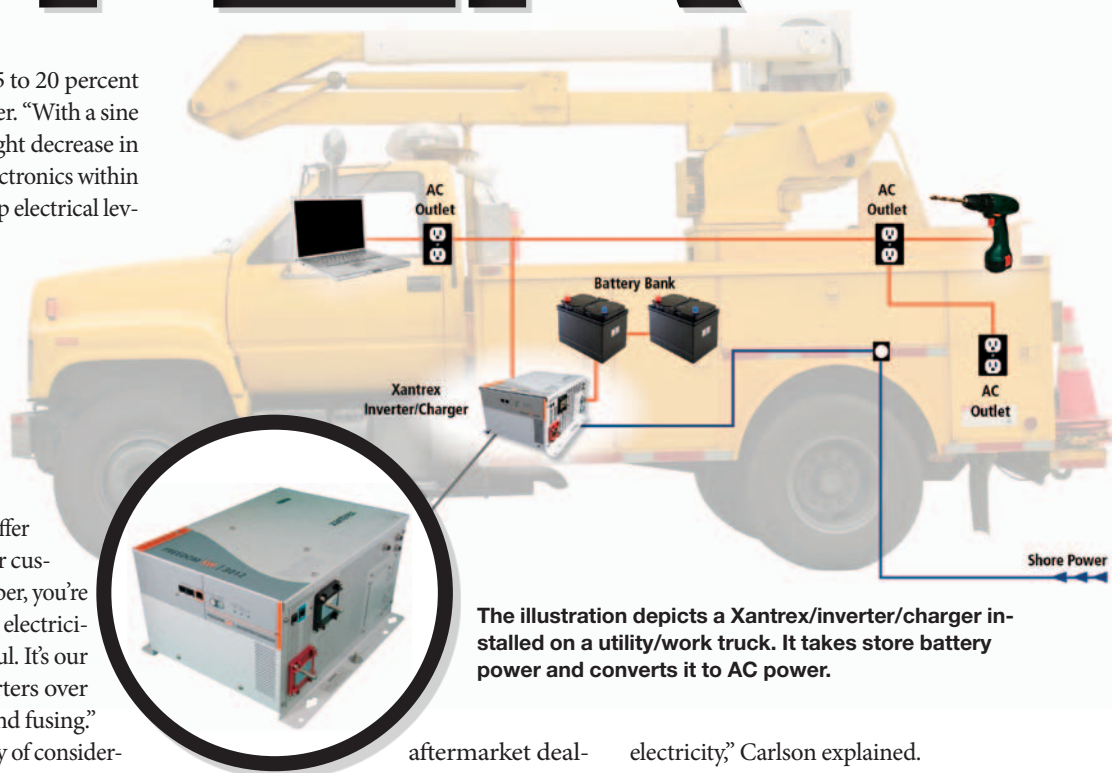
electricity," Carlson explained.

[Editor's Note: ETL is originally a mark of ETL Testing Laboratories, not a mark of Intertek Testing Services. The ETL Listed Mark is proof of product compliance (electrical, gas, and other safety standards) to North American safety standards]

UL458 is the listing for inverters and chargers in mobile applications. They must meet strict vibration, environment, and thermal requirements that non-UL458 units do not.

"This is the most important safety point I can make, and in fact, the Technology & Maintenance Council (TMC) RP163 calls out this UL listing for all inverters and chargers installed in a truck," Carlson said.

[Editor's Note: RP stands for recommended practice.]



The illustration depicts a Xantrex/inverter/charger installed on a utility/work truck. It takes store battery power and converts it to AC power.

Also, RP160 (which discusses DC and AC wiring in a truck) has requirements that are automatically met by UL458-listed inverters. The main point being that the neutral and ground wires are bonded together within the inverter. All inverters that are not UL458 listed do not do this as it allows the inverter to be made at a much lower cost.

"Buying an inverter that is not regulatory listed tells you 'buyer beware.' We've seen these types of products actually shock users, plus, internally, they often can't protect themselves against power surges," he said, explaining that inverters installed by truck manufacturers are all UL approved, but inverters sold at truck stops are not.

Carlson also suggested looking at how inverters are internally tested for quality control.

Carlson noted that inverters will occasionally shut down, but quality inverters do so without damaging themselves. If dust or cat hair, for instance, gets inside the inverter, it can cause the inverter to overheat. Some higher watt inverters have an error code that shows what the problem is

"And, if you overload the inverter, placing more wattage demands than it can handle, the inverter will shut down. The difference between a quality inverter and a low-end inverter is how they deal with a shut down," Carlson noted. "A quality inverter is designed to shut down with no ill effects. A low-end inverter can 'wear out' after multiple overloads."

5 Should Fleets Opt for an Inverter with a Built-In Battery Charger?

"The simple answer is yes, if you can use 'shore power' (electrical outlets at home or on the road at terminals, loading docks, or



The PROwatt SW is a sinewave power inverter that can be used in commercial trucking applications.

POWER (WATTS) REQUIRED FOR:

- Microwave: 1,000 to 1,500
- TV: 250
- Hot Plate: 1,300
- DVD Player: 40
- Laptop: 95
- Hair Dryer: 1,500
- Electric Blanket: 200
- Portable Heater: 1,000 to 1,500
- Electric Toothbrush: 2

There are two types of inverters on the market, a sine wave and modified sine wave. Both work well in a truck environment, but for those running sensitive electronics (such as continuous positive airway pressure machines) or products that are plugged into their own chargers — a drill or a toothbrush — sine wave is the preferred choice.

truck stops)," Carlson said. "When plugged in, you can run everything you're running with your inverter for as long as you want, plus you can recharge and top off your batteries. The more you can use shore power, the better, as it prolongs the life of your batteries."

In fact, Carlson said having the shore-power option and a charger in the system will add 20 to 30 percent to the life of the batteries if plugged into grid power whenever possible.

"It also has the potential to eliminate one battery swap out over the five- to six-years [life] of the truck. This happens by keeping batteries fully charged, offsetting parasitic loads, and reducing the number of cycles."

According to Carlson, most installations use the inverter off the truck's starting batteries, and quality inverters will have a low voltage disconnect (LVD) to shut down when voltage drops to 11.7 volts. This ensures the truck will have enough juice to start.

"Check on the LVD feature before you buy an inverter," Carlson cautioned. "Many inverters on the market will run the batteries down to 10.5v, which will let drivers run electrical devices longer in the cab and sleeper. However, they won't be able to start the truck unless the truck comes equipped with an LVD."

"Another option is to run two dedicated deep-cycle batteries and connect them to the inverter. They do add weight and cost

to the vehicle. But, deep-cycle batteries were designed to be drawn down to a 50-percent state of charge, or 10.5 volts. This gives you double to triple the amount of continuous power to run hotel loads. Something your drivers will appreciate," he said.

6 Determine a Company Driver Policy

According to Carlson, not knowing what kind of inverter your driver is bringing in is why fleets often have a policy of not allowing drivers to outfit company trucks with their own inverters.

"But, if you do allow drivers to bring in their own inverters, then we recommend you give them a list of approved devices, with the most important common denominator being UL458 listed. And, we suggest you make it mandatory that your shop or outside dealer perform the installation."

7 Reduced Use of a Truck's APU

The addition of an inverter to a truck's electrical system will reduce hours of use on a diesel-fired auxiliary power unit (APU), assuming that the APU does not already have shore-power compatibility.

"And, it will reduce maintenance costs and increase APU life," Carlson said. "An inverter can be used for hotel loads in the cab as long as environmental conditions do not require air conditioning. When those conditions happen, just power up the APU for air conditioning."

With this set-up, the only time the APU would need to come on is if the batteries drop to a low level. Once the batteries are charged, the APU can shut off again. "This significant reduction in APU run time means a quick payback on the cost of the inverter," Carlson said. **WT**

About the Author

The Xantrex Industry Education team contributes educational articles for industry education and media reproduction. The objective is to conceive and create content that focuses on important aspects related to onboard AC power in mobile applications. Contact Mitul.Chandrani@schneider-electric.com for more information.