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Critical Information for Improved Bird Performance Through Better House and Ventilation System Design, Operation and Management

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Will Your Standby Generator Stand Up?

*By Jess Campbell, Dennis Brothers, Gene Simpson, and Jim Donald
National Poultry Technology Center, Auburn University*

Most growers are confident in their generator's ability to run for 30 minutes to an hour without problems because they are typically cycled once a week. But what if they needed to run for a week or more? The tornado devastation that occurred in April of this year in Alabama caused power outages for a large number of poultry farms lasting from 2 to 10 days or more. For growers who had chickens, this meant running on generator power until utility power was restored. Many growers were able to keep their generators working flawlessly to maintain power throughout the outage; but others were not so fortunate.

Our investigation of the standby power failures that occurred in Alabama last April has shown that most of the failures were caused by fuel shortages, inadequate maintenance, inadequate equipment, or improper installation of the equipment. Since most of these failures occurred on farms where growers were dutifully test-running their generators once a week, the major lesson learned here is that maintenance and preparations required to make sure generators will run a weekly half-hour WILL NOT ensure that they will do what they are intended to do and what the grower paid for, which is to supply power throughout an extended utility outage. The weekly test run is important and must be maintained, but growers must be aware of and take the additional steps needed to make sure their generators will stand up to the challenge of a prolonged utility outage.

The devastation experienced in Alabama was certainly out of the ordinary; but severe weather and power outages can occur anywhere. For growers everywhere, now is the time to learn from the Alabama experience and get ready to survive the challenge when it comes your way. This newsletter explains the steps we recommend, based on the standby power failures we have seen in Alabama.



These photos show large rat nests inside generators that were not discovered until the metal covers were removed.

Standby generators and equipment must be kept free from rodents, birds and insects. The pests and their homes can cause serious damage to generator control systems, wires, and belts resulting in generator failure.

This is one of the kinds of problems not likely to show up in weekly test-runs.

Follow the handy checklist included in this issue to make sure your generator will stand up to the real test when it comes.



Keep adequate diesel fuel on hand

The typical 100 kw generator can burn 3-5 gallons of diesel fuel per hour, depending on the load. It's a good idea to have at least enough fuel to run your generator through the first 24 hours of an outage. That would typically require having 72-120 gallons on hand. It's probably an even better idea to be able to run the generator through the first 48 hours, which would require 144-240 gallons on hand. You should of course consult your generator manual or the manufacturer to get a closer idea of how much fuel your particular model burns per hour.

The reason for having a fairly large fuel cushion is that during a utility outage the local fueling stations are also likely to be without power and unable to pump fuel, which means you may have to drive some distance to find available fuel. Planning for an extended outage should include mapping the known fueling stations at different distances from your farm, say at 5 miles, 10 miles, 20 miles or more. Keep in mind also that even if fairly nearby stations get power back before it is restored at your farm, long lines are likely to be forming, so actually getting the fuel may take hours instead of minutes. Having a 100 gallon tank on a trailer is handy when you need to transport fuel on short notice. Don't forget that you will want to keep an adequate supply of fuel for your truck as well.

Keep extra fuel filters and other replacement parts on hand

In the Alabama experience, fuel filters especially were found to clog up and need to be replaced. Many growers found that their generators worked flawlessly until about an hour after refueling the storage tank. Refilling a near empty or empty tank stirs any sediment in the bottom of the tank into the new fuel. This can eventually clog the fuel filter and starve the engine of fuel. It is not possible to adequately clean and clear a clogged fuel filter. Those growers who had extra fuel filters on hand could simply replace the fuel filter and restart the generator. The lesson here is to keep extra fuel filters in stock in the generator shed. When a major catastrophe hits and local automotive stores and poultry equipment shops might not be open for business, you don't want to be caught without spare fuel filters on hand.

Note: Some growers found even their second and third replacement fuel filters quickly becoming clogged. This problem typically occurred on farms with older fuel storage tanks, and is the subject of our next recommendation.

Maintain quality of stored fuel and tanks

When diesel fuel is allowed to stand in a tank for years without any conditioning or little mixing, sediment forms in the fuel and settles to the bottom of the tank. This layer of sediment continues to build over the years and goes undisturbed because the tanks are kept full (or close to full) throughout the year. As explained above, when during a utility outage a tanks is almost completely drained and the owner refills the tank, the addition of fuel to the near empty tank disturbs this sediment layer at the bottom of the tank and puts it in into suspension in the rest of the tank. When this occurs, the sediment is sucked into the fuel filter and stops the filter up. This typically happens to fuel tanks around 8 years and older. Tanks 8 years or older must be checked for sediment deposits in the bottom of the tank. If significant sediment deposits are found, the tank either needs to be cleaned or replaced.

Another precaution is to install fuel pick-up tubes so they are at least 4-6 inches from the bottom of the tank so as not to pull sediment in the fuel pickup-tube from the bottom of the tank. A practice that can help minimize fuel filter clogging is to whenever possible refill the tank before it has reached the half-full level.

Another fuel storage issue is water contamination, usually caused by condensation. Bacteria, particulate matter, and a variety of other fuel problems are caused by the presence of water in diesel fuel. It is recommend that fuel be checked twice a year for water using a water-finding paste called Kolor Kut (or equivalent). Storage tanks must be protected from the weather and especially the rain. The lesson here is to make sure diesel storage tanks are kept clean by checking for water and sediment in fuel. Fuel conditioners may work on clean fuel but cannot be used to dissolve the sediment in a fouled tank. Consult your generator service technician for help.



Kolor Kut (or equivalent) paste can be added to the end of a rod or wooden dowel and submerged into the bottom of the fuel tank to test for water contaminated diesel fuel. If it changes color then your fuel is contaminated with water, the culprit behind many fuel problems.

Protect Generator and Transfer Switch Electronics

Modern standby power systems use electronic controls to sense power or the loss of power, tell the generator to start, and also to keep it running. To ensure smooth operation of the system, the circuit boards and control wires in the generator junction box and the power transfer switch must be kept clean and free from damage. It is common for wasps, yellow jackets, mud (dirt) daubers and even rats to get into this equipment and build their homes on major electronic circuit boards and controls, causing major problems when wires are chewed or circuit boards are damaged. CAUTION: While regular inspection of this equipment is a good practice, a service technician should be called in if any problems are found. Generator electronic controls are fairly expensive and most growers don't have the training to service the electronic controls themselves. Especially, if you do find a wasp nest please don't spray wasp killer on any electronic controls or circuit boards. This can do serious damage to the electronic circuits. The lesson here is to have a trained professional inspect and test the transfer switch and electronic controls on the generator every year. As always, make sure all power is locked in the off position during work.



If your generator is 5 or more years old and the junction box has never been cleaned or inspected for loose wire connections, insect or rodent damage, then now is the time to do so. A simple mud dauber nest on a circuit board could prevent your generator from running. We recommend inspecting and cleaning junction boxes once each year.

Install a manual by-pass key switch

A manual bypass key switch allows you to manually start the generator if the electronic controls malfunction. If your generator does not have a manual bypass key switch then getting one installed by a licensed electrician or trained generator service professional should be at the top of your list. These switches can be installed and used with almost any standby generator. The cost to do this is well under \$1,000, depending on the generator make and model. Most of these switches also come with water temperature and oil pressure gauges that can be wired into the existing equipment. Many growers have told us these switches saved their farm from catastrophe after the storm and other random power failure events. The lesson here is if you don't know what a bypass key switch does, you need to get one and learn how to use it.



An emergency manual override bypass switch can be added to most generators for under \$1,000. This switch allows the generator to be manually started in case the electronic controls malfunction and cause the generator to shut down. Many come with oil pressure and temperature gauges to monitor generator conditions.

Provide adequate ventilation for your generator

Generators must be cooled during extended periods of running. If they are not, they will overheat and be shut down by the control system. A totally enclosed generator shed should be ventilated similar to tunnel ventilation. The exhaust air from the radiator of the generator must exit the building through an opening 1.5 to 2 times the size of the radiator of the generator and installed directly in front of the radiator. The air inlet for the generator should be twice the size of the exhaust outlet and in-line with the generator. It is also important to make sure the generator exhaust is not directed toward or close to the generator air intake. If this is observed, ducting should be provided to direct hot exhaust away from the air intake and out of the building.

Exhaust louvers on generators are subject to failure to operate by being damaged or held shut by high winds. It is recommended that these louvers be removed and replaced with 1-inch PVC coated bird wire or equivalent to ensure that when the generator runs for an extended period it will be sufficiently ventilated. (See the back side of the generator service checklist for more information on problems caused by poor ventilation.)

Provide proper and regular generator service

Automatic transfer switches and generators are not intended to be installed and forgotten. This equipment must be serviced, tested and inspected on a yearly basis by a technician trained in both mechanics and electronics. A standby generator service is much more than an oil change and fluid check. It requires much more attention to detail, for example, than a routine automobile service. The checklist included in this issue gives the minimum list of things that should be checked by a qualified service technician during the annual service. Growers should also check their service manuals and warranties for additional information on things that need to be done to keep the equipment in top shape. Generators should also be serviced immediately after any extended runtime period of 48 hours or longer. The lesson here is to make sure that your generator is getting fully serviced by a trained professional who knows what to check for and fully inspects the system.

The Bottom Line

The bottom line is that we need to have a thorough annual generator service program in place. Failure to plan is planning to fail. Get to know your generator service person. We often talk to growers who don't even know their generator service person's name. Have your generator service person's name and number written down in the generator shed, as well as the number for a backup generator service person. When storms hit, your generator technicians may be experiencing more calls than they can handle and might not be able to help you immediately. The cost of an annual generator service is money well spent on what is hard to see as the most important piece of equipment on the farm – until the real test comes.



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Jess Campbell, Program Manager,
National Poultry Technology Center


Dennis Brothers, Poultry Housing Special-
ist, National Poultry Technology Center


Jim Donald, Professor and
Extension Engineer


Gene Simpson, Professor and
Extension Economist

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Standby Generator Service Checklist

Generators must be fully serviced once per year. This generator service list is a minimum recommended list of items to check. For a complete list contact your local generator manufacturer's recommended service requirements and any warranty requirements.

Date: _____ Serviced By: _____

Location: _____ Owner: _____

Make: _____ Model: _____

KW: _____ Phase: _____ Volts: _____ Run Hours: _____

1. _____ Inspected junction box wiring, connections, and circuit boards
2. _____ Check, changed oil, filters and refilled
3. _____ Coolant checked, no contamination found, temperature range ok
4. _____ Inspected all belts and hoses and none are damaged or cracked
5. _____ Radiator inspected for leaks and dust buildup on inside (fan side)
6. _____ Fans and fan shrouds or guards are in good shape
7. _____ Block heater is operational and heating
8. _____ Battery tested, terminals cleaned, charged and less than 2 years old
9. _____ Battery charger is operating properly and connected properly
10. _____ All generator and engine controls are operating properly
11. _____ Inspect remote start wires
12. _____ Transfer switch controls and failsafe are operating properly
13. _____ Air filter changed
14. _____ Oil filter changed
15. _____ Fuel filter changed
16. _____ Engine running temperature _____ F
17. _____ Engine oil pressure reading _____ PSI
18. _____ Generator voltage _____ ac
19. _____ Generator frequency _____ hz
20. _____ Diesel fuel level good, checked for water, fuel lines inspected
21. _____ Generator shed airflow is adequate, louvers not blocked, exhaust is ok

#1 Generator Service Contact: Name _____ Phone _____

#2 Generator Service Contact: Name _____ Phone _____



Picture on the left shows a brand new filter (white filter on left) compared to one just one year old that was taken from a generator like the one at right, where exhaust air was allowed to recirculate through the generator air intake. Note how the generator exhaust is aimed directly at the generator instead of being aimed away from the generator air intake. In this installation, an extension ducting kit is needed on the muffler to direct the exhaust out of the shed. If the exhaust is allowed to be sucked into the generator air intake it will eventually clog the air filter, starving the generator of combustion air. It is very important to provide proper ventilation so that fresh outside air flows into the generator intake, while the hot exhaust is directed out of the shed.

Note also in the enlarged inset photo at right, a bird nest allowed to be built in the generator exhaust pipe. We recommend installing flaps on the generator exhaust to prevent bird, rat or insect entry.



Exhaust recirculating through a generator can also cause problems with the radiator. The radiator must be kept free of debris and exhaust fumes. The two pictures on the left are of radiators that have become stopped up with dust, debris and exhaust fumes. These generators were running hot for an obvious reason. Notice these pictures are taken from the inside of the radiator. This problem will go unnoticed unless you look at the radiator on the inside. The picture to the right shows how dirty the fan blades are on the generator with a clogged radiator.