Honeywell
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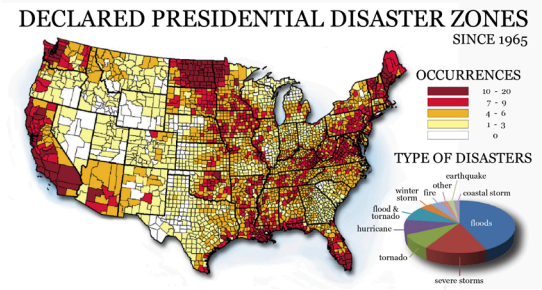
10 Tips to Save Your Combustion Equipment During Electrical Outages

Safety Note

From earthquakes in California, to tornadoes in Kansas to hurricanes in Florida, natural disasters are everywhere [Figure 1]. They can damage power plants, destroy gas lines, disrupt power grids and create blackouts, causing combustion equipment to go off-line. Understanding how to prepare for electrical issues is imperative to minimize loss for any combustion-related catastrophes. Electrical power issues come in many forms but can have the same combustion system impact.

Below are 10 combustion equipment tips related to electrical power issues, which must be taken into consideration when it comes to maintaining the integrity and safety of equipment. Whether or not you have been impacted by a natural disaster, pay attention and reevaluate your electrical systems to make sure they are not taken off-line in an unsafe manner and/or damaged if a loss of power happens in your area.



Preparing for natural disasters and their repercussions is at the back of our minds, especially if our plant is outside a traditional "natural disaster" hazard zone. It is critical to be aware and get familiar with the best tactics to prevent or minimize damage to your equipment, facility and people.

1. **BMS Failure Issues**

   A Burner Management System (BMS) can be destroyed by power outages from catastrophic events. Destroying a BMS will put you out of service for a few hours if you have a spare that is still supported by the manufacturer, or a few days if you don't.

   If your system is an older electro-mechanical style, you are vulnerable to being out of service for many days. Obsolete BMS systems must be upgraded when changed out. This often requires a complete re-wire of your control panel or finding and ordering a new BMS in a crisis mode. The best practice is to make sure that you have a spare BMS system at your facility, or that you have ready access to one. When you consider the potential for loss, a few thousand dollars for an additional BMS is a worthy investment.

2. **Loss of Cooling for Fans, Doors and Bearings**

Cooling water is sometimes designed into oven doors and cooling bearings on fans. In some cases, forced draft and induced draft fans on boilers have water-cooled bearings; but at times this water flow is not alarmed, or the loss of this water flow is not alarmed. If the water were to be interrupted due to a city, municipal, or booster pump problem, it may cause problems. In certain cases, plants recirculate water and rely on city water as a backup. In some disaster situations, though, even the city's backup water is not available. To avoid this obstacle, backup generators should have re-circulated water pumps; and cooling water must have a backup system and/or some type of flow or temperature alarm. In addition, these alarms and backups should be tested regularly for proper operation.

3. **System Failure Modes can Mean Trouble**

It's important to know at what position each part of your combustion system is configured to fail in the case of a power interruption. For example, in what position will damper linkages or boiler feed water valves end up (fully open, at their last position, or fully closed)? The wrong position can be catastrophic. Control systems must also be configured to make for a safe start-up after an unexpected equipment shut down.

If the BMS does not provide a lockout circuit, some equipment may restart automatically when the power is restored. Key interlocks require manual reset. Manual reset requires a person to physically press the reset button to restore operation. With no manual reset feature, equipment can instantly restart without warning, which can be dangerous and damage critical equipment components even after momentary outages.

4. **Start-ups can be Challenging**

Starting up is always a cause for concern. If you shut down instantaneously at high fire with no planning, you could have a firebox with enough fuel in it to be flammable. It would only take a hot ignition source for an explosion to occur. Remember that in some cases, adding purge air to a firebox that already contains fuel and a hot ignition source can also create the right conditions for an explosion. Recall your combustion basics: it's all about fuel, air and heat as an ignition source. You should consider trying to restart only after the firebox has had a chance to cool off.

5. **Improper Shutdowns can Cause Trouble**

In some cases, shutting down in a hurry means large diameter oven fans won't get a chance to cool down as the manufacturer intended. Many oven shutdown procedures call for ventilation and recirculation fans to continue to operate after flame failures and/or during orderly shutdowns to protect them from overheating and warping. If forced to shut down with no time for cooling, be careful to listen for noises and vibrations during start-up. These indicators could mean that you have damaged fans, bearings or shafts. It could also mean that the equipment is no longer safe to operate in that condition.

ABOUT US

Honeywell Combustion Safety is a part of Honeywell Thermal Solutions, an industry leader in commercial and industrial combustion solutions. Honeywell Combustion Safety, formerly known as CEC Combustion Safety, has been in business since 1984. With engineers and staff members that sit on Code committees such as NFPA 56, NFPA 85, NFPA 86, and NFPA 87, our inside expertise is integrated within all of our practices, and our global reach ensures that customers around the world are kept safe. Honeywell offers testing and inspections, engineering & upgrades/retrofits, gas hazards management, training, and field services for all industrial facilities and different types of fuel fired equipment. By assisting organizations and their personnel with the safe maintenance and operation of their combustion equipment, Honeywell aims to save lives and prevent explosions while increasing efficiency and reliability of combustion equipment.

6. **Do Safety Switches and Interlocks Work Correctly?**

When things do not operate correctly, we rely on safety controls such as high-gas pressure switches, low-gas pressure switches, airflow switches, and flame detectors to keep us safe. When we experience power outages, systems are definitely not operating correctly, yet we rely on this equipment to work.

Consider the case of airflow not being correct due to a loss of fan power or voltage during a brownout or a full blackout. In these cases, we must have properly functioning airflow switches to ensure that fuel valves do not remain open during these conditions. In addition, all other safety interlocks need to be tested annually by qualified personnel, and they have to work at the right set points. If you do not have a regular program for testing these devices, you are opening the door to potential problems.

7. **Refractory Damage Vulnerability**

When you do bring systems back up, make sure you check for signs of failed refractory. Some equipment could be prone to refractory failures after an outage because the refractory brick is thermally cycled. This is something you should be aware of during any start-up. Refractory failures usually are indicated by glowing hot spots on equipment, and/or burned paint or changed surface colors on the outside of equipment walls.

8. **PLC Controller Issues**

If you have programmable logic controllers (PLCs), you may be surprised by how things are configured during a post power loss start-up. Your system will most likely recover to whatever was recently stored in the EEPROM, or non-volatile memory. Volatile memory relies on power to the equipment and would be lost during a shutdown. You must be aware of this and make sure the post start-up configuration of your system is safe.

If you have PLC controls, now might be a good time to ensure that your backup memory storage batteries are in good working order. Functioning backup memory could mean the difference between safety and a disaster.

9. **Special Atmospheres can be Trouble for Heat Treat Ovens**

Remember that heat treat operations utilizing special combustible atmospheres are extremely vulnerable to power loss issues. In these cases, you must get the atmosphere out and safely burned off or a catastrophe can result. This means having inert gases like nitrogen available to push the atmosphere out in an orderly manner or having a manual burnout procedure in place. Make sure all control systems are built and configured to get purging materials to the appropriate area, even under power outage conditions.

10. **Pressure Surges and Steam Safety Relief Valves.**

The sudden loss of power in a manufacturing facility could mean that control valves for processes suddenly slam shut. This means that a great deal of steam is already in the system flowing towards the valve, but there's no place for it to go. Steam is also something that does not instantaneously stop being generated. When this happens, safety relief valves should pop open. If they don't, mechanicals could fly apart, potentially causing injury. Now more than ever, you must embark on a safety relief valve testing program. Safety relief valves need to be lift tested or verified to operate at least once a year. Seek guidance if you've never had them tested. You can damage valves or get hurt if the testing is conducted incorrectly.

So What's the Answer?

There is not one simple answer, as disaster response situations depend on your specific circumstances and needs. You can consider backup power generation for critical processes. Backup power is a wonderful thing and can never hurt. Be certain to remember, though, that even emergency generators require routine maintenance and exercise so they can be relied upon when called into duty.

Be aware that there are many decisions to be made when you consider the back-up power generation and the form it takes. These decisions include which loads, what kind of fuel, what size engine, and even whether this should be continuous duty or stand-by rated. NFPA 110 (Life Safety Code) identifies two different classifications of generator systems--Level I and Level II. Each calls for significantly different design and maintenance criteria. Level I generators are considered life safety generators. They require items like fuel availability, even if the facilities' main fuel is shut off during an emergency.

Another option for emergency power protection is to have an uninterrupted power supply, or UPS, for critical control systems. UPSs are commonly used for computer systems. It works the same way for boiler or combustion equipment controls. Critical controls can usually be run through the system at all times, so in the event of a power outage, there is no interruption of control system power.

Usually, preparing for natural disasters and their repercussions is at the back of our minds, especially if our plant is outside a traditional "natural disaster" hazard zone. It is critical to be aware and get familiar with the best tactics to prevent or minimize damage to your equipment, facility and people. It is your responsibility to understand the impact that any natural disaster can have on your facility, and pre-empt any strike.

For more information

Learn more about Honeywell Combustion Safety, contact info@combustionsafety.com, visit www.combustionsafety.com or contact your Honeywell Sales Engineer.

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