

Spark Detection

Maintain Spark Detection/Extinguishment System To Ensure Effectiveness

By Bob Barnum, GreCon

In any type of production facility, fire control encompasses a wide range of equipment or systems from building sprinklers to plant site fire departments. A spark detection/extinguishing system must be thought of as part of a plant's overall security and safety network. Just as a residential alarm system provides protection to a homeowner, a spark detection system provides preventative protection against potential loss of human life, production facilities, equipment and costly downtime.

Maintaining a safety system that could save a life cannot be overemphasized. Just pushing test buttons from the control console is not adequate. The sensors and the extinguishers, as well as the control console itself, all have individual components that must be regularly inspected and tested.

The Detection

Excessive vibration and moisture are the two most common causes of sensor failure or false alarming. Failure due to vibration is normally caused by transmitted vibration from nearby or connected operating machinery such as a fan that is out of balance. The most obvious and best solution is to eliminate or reduce the vibration. If the problem persists, isolation of the sensor area from the vibrating source may be required using a flexible duct connector.

Moisture inside the sensor, due to precipitation or condensation, also can cause either failure or false alarming. To protect against precipitation, ensure that any sensor covers are tightly fastened and that their sealing gaskets are not damaged. Additionally, make certain that wire entries into the sensor are not oriented "skyward" to allow the intrusion of moisture. At certain

times of the year, temperature and humidity conditions may cause internal condensation. A desiccant tablet or pad placed inside the sensor normally will solve this problem. Remember, desiccants only last so long, so maintenance per-

sonnel will need to replace them as required.

Light leaks can be another cause of false alarming. These leaks can come from missing pipe rivets, pin holes in the pipe from wear or incomplete welds, nearby access doors, failure of a sensor mount or a number of other causes. Often times, this type of false alarming will occur only at specific times of the day according to the position of the sun. The sometimes not-so-simple solution is to find it and fix it.

Lastly, if a sensor's lens is obscured by material or from abrasion, it may not be able to see the spark, depending on the severity of blinding. A broken or cracked lens also can cause false alarming or internal damage from material intrusion. Periodic inspection of the lens and manufacturer's maintenance procedures should be performed. Sensor testing should be performed on a daily basis (at the minimum). Some spark systems can be programmed to automatically test each sensor every few hours, but periodic manual testing also is recommended to confirm the self diagnostics. Some systems require their sensors to be calibrated to bring them back into proper operation. This procedure is best accomplished by the manufacturer's trained technician. It is up to the user of the equipment, however, to ensure that the required calibration is routinely scheduled.

For high-temperature or high-pressure applications using fiber optic cables in conjunction with a sensor, the cable is another element that must be checked for integrity. Failure of the fiber optic's ability to conduct the infrared energy to the sensor will require replacement of the cable. The "viewing" end of the cable should be maintained against blinding in the same manner as a normal sensor lens.

One special problem quite often seen is on dryer systems. Condensation within the dryer duct can cause material build-up on the inside of the duct. This build-up can

Of the three major components of the spark detection/extinguishment system, it is the extinguishing equipment whose maintenance seems to be neglected the most.



This photograph of spark detection extinguishment nozzles shows the excessive wear that comes from abrasion.

Regularly inspecting the sensors and the extinguishers, as well as the control console itself, can help prevent a baghouse fire.



Here, one can see the effects of corrosion on extinguishment piping.

vary in thickness but will cause partial or total blinding of the fiber optic cable. If your plant has this problem, close attention and maintenance must be given to correct the situation.

Normal routine testing and cleaning of a daylight sensor is the same as for other types. One additional test, however, can also be performed—testing the sensor's responsiveness under different light conditions.

Should a fire actually take place within the pneumatic duct, it is mandatory that each sensor or fiber optic cable be given a complete inspection for cleanliness and proper operation before resuming production.

The Extinguishment

Of the three major elements of a spark detection/extinguishment system, it is the extinguishing equipment whose maintenance seems to be neglected the most. Excessive wear on the tip of the nozzle will cause material build-up in the orifice. This partially or totally plugged condition severely affects the nozzle's extinguishing ability. Nozzles must be mechani-

cally operative. Mineral deposits from the extinguishing water can restrict or inhibit normal function. For proper nozzle maintenance, the nozzle should be removed, inspected and replaced if necessary.

Valve problems are basically either mechanical or electrical. Mechanical problems include failure to open or close properly due to contamination or wear of the internal parts. These problems will best be discovered from daily testing of the extinguishment system. Damaged or worn valves should be replaced (but only with that spark system's approved valve.) Electrical problems will normally be a short or open circuit and will give a trouble alarm at the console. The trouble must be diagnosed and appropriate corrective measures taken.

The Y-strainer, preceding the valve, protects the valve from most types of harmful contamination. The strainer screen should be flushed clean on a regular basis. The frequency will depend mainly on the cleanliness of the original water supply. At least once a year the strainer screen should be removed, inspected and replaced if needed.

And lastly, freeze protection maintenance normally is minimal, yet cannot be ignored.

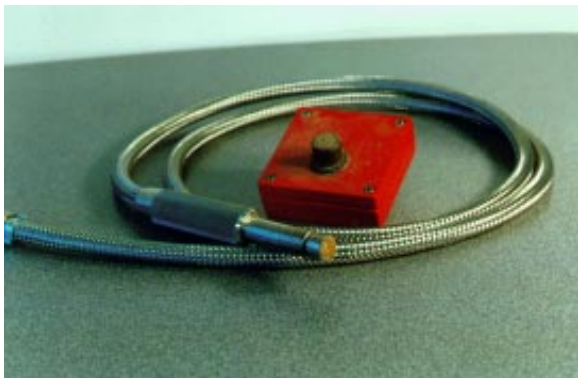
The most common type of protection used is a combination of heat tape, insulation and protective metal cladding. The freeze protection system should be completely checked and inspected each year in the fall and routinely monitored throughout the winter. When valve, nozzle or Y-strainer maintenance is performed during the winter, ensure that the heat tape is re-connected and the insulation and cladding properly replaced.

The Control Console

Control consoles comprise various electronic components and are, therefore,

subject to the problems that dirt, moisture and power fluctuations can cause. Dirt and dust are ever present in nearly all types of factories. Console enclosures normally are built to a NEMA rating, thereby protecting the electronic components as long as the door is kept closed and the conduit properly installed. Realistically however, doors are periodically opened and closed or even left open for extended periods of time. This natural accumulation of dust and dirt should be blown out carefully with dry low pressure air every six months or more often as the situation warrants. Operators should be instructed to keep any door closed and latched as much as possible.

Naturally, moisture in or around a control console must be avoided. Should excessive moisture accidentally get into the console, removal of power and standard drying procedures for electrical/electronic equipment should be used.



This spark detection FM 1/8 sensor and spark detection fiber optic cable are obscured by material build-up. (Blinded.)

Problems also can occur with the electrical power of a control console. Almost all systems operate on normal 120 VAC

input power supply. The console incorporates a transformer to make a conversion to DC voltage for the console's internal logic, sensors and extinguishment. If power fluctuations are a problem at the equipment's location, a voltage regulator should be used. Every six months, the batteries of the back-up power supply and their re-charging circuit should be tested.

Regular console maintenance also includes semi-annual checking of connectors and wire terminals for tightness and the absence of corrosion.



Here is an example of a spark detection FM 1/6 sensor obscured from abrasion. (Blinded.)



This is a GreCon BS-704 Control Console for spark detection/extinguishment system.

A visual inspection for damage of line cards, motherboards, ribbon cables and wiring integrity should also be made at the same time.

Because a spark detection system is a type of security or protection system, any kind of trouble-shooting by plant personnel should be limited to only what is outlined in the manufacturer's manual. Most spark detection equipment has been approved as a system by Factory Mutual. To avoid compromising or voiding this approval, it is important to always use only original, authorized replacement parts. Corrective work or diagnosis beyond what is described in the manual should be

performed by or with the help of the manufacturer's trained technician. If you do not have the manpower within your own resources to adequately inspect and maintain your spark system, establish a service agreement to have the manufacturer's technician do a complete job of equipment inspection and testing.

By following manufacturer's recommended maintenance and conducting daily tests of the spark detection/extinguishment system, you can ensure the security and safety of your plant and protect against costly and life-threatening fires and explosions.

