TRANSIENT SURGE PROTECTION FOR AGRICULTURAL FACILITIES

By
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With the widespread adoption of electronic devices in agricultural facilities ranging from personal computers, to electronic environmental control systems and computerized feed mills, protection from electrical surges is receiving more attention. As the cost of surge protection equipment drops, and the potential cost due to a single failure of electronic equipment increases, incorporation of surge protection has become very feasible.

Transient surges arise from many sources. The most common sources include lightning and load switching that induce transients which enter through the electrical or telephone utility service. Load switching from other users on the electrical power grid, and from other facilities on a user's premises, are also sources of surges. While the massive energy of a direct lightning strike can clearly cause extensive damage, smaller transients from remote strikes and from other sources can also create severe upsets in digital electronics without any

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outward sign of damage other than perhaps failure of the equipment. In fact, the majority of transient surges has been measured to have voltage magnitudes under 6000 volts (6 kV) at many locations in this country. Consequently, protection against these surges is very important.

A properly installed transient surge suppression system consists of several levels of protection. Each level is intended to remove a portion of the surge's energy. The system starts at the utility service, and progresses to each building's service panels, sub-panels and to particular circuits with sensitive electronic equipment. Each protective level is intended to remove a portion of the surge that may have survived a preceding level. These levels of protection are classified by Standards Organizations (ANSI, IEEE, NEC) by their location within the site as Category C (service entrance panel), Category B (panel boards and large sub-panels) and Category A (branch panels). In addition, protection for individual circuits, and for the utility service are advised.

A schematic of this "cascaded" approach is presented in Figure 1. This idealized representation illustrates all five of the levels of protection described above, and are numbered in ascending order for reference. In practice, many agricultural installations may not need all five of these levels. However, it is important to note that providing surge suppression only at the circuit to which sensitive electronic equipment is connected, is generally insufficient for high-energy transients. These surges can destroy this "low level" surge suppressor and still have sufficient energy remaining to damage the electronic equipment.

A good grounding system for the building is essential for correct operation of surge arrestors. This is due to how surge arrestors work: once a transient is detected, the arrester short-circuits, or "shunts", the transient to ground. If the ground is poorly established, the effectiveness of the surge arrestors can be greatly diminished. The electrical utility can make a simple measurement to test the adequacy of your grounding.

Most surge suppressors are made of either gas discharge tubes, or solid state components called metal oxide varistors (MOV's). While both functionally provide similar capabilities, MOV's are becoming increasingly more prevalent.

When selecting surge suppression devices, beware of imitations, such as "silicon oxide varistors". To be sure that the equipment is appropriate, look for ratings from an independent laboratory (such as U.L.) that certify the equipment to meet or exceed the ANSI/IEEE C62.41 transient over voltage test
waveforms.

Lightning protection of buildings is very important if sensitive electronic equipment, or life-supporting equipment such as ventilation systems, are housed in the building. An excellent source of information on lightning protection is the National Fire Protection Agency, Batterymarck Park, Quincy, MA.

For agricultural facilities such as livestock buildings containing electronic controls, the following minimum surge suppression equipment is advised.

1. Lightning arrester on main service pole.
2. Adequate ground.
3. Category A or B arrester for the building service panel.
4. Secondary arrester (or Category A) for the individual circuit to which the electronic controls are attached.

Certainly more surge protection would be helpful, but this minimum level should help protect your equipment against the majority of surges.

MANUFACTURERS OF SURGE SUPPRESSORS

This is a partial list of some manufacturers of transient surge suppression devices. The University of Kentucky does not in any way endorse a manufacturer or product at the exclusion of other manufacturers or products; the intent is only to provide a reference for interested parties.

General Electric Capacitor
Customer Service
Ft. Edward, NY
(518) 746-5750
Lexington, KY distributor (606) 278-8402
Secondary Arrester: Model 9L15EC - C001

Joslyn Electronic Systems Corporation
Santa Barbara Research Park
P. O. Box 817
Goleta, CA 93116
(805) 968-3551
Wide range of primary and secondary arrestors.

Joslyn Manufacturing Co.
9200 W. Fullerton Avenue
Franklin Park, IL 60131
(312) 625-1500
Surge/Tec Model 22-175 secondary arrester
Lexington, KY Distributor: Westinghouse (606) 293-2647

MCG Electronics, Inc.
12 Burt Drive
Deer Park, NY 11729
(516) 586-5125
Wide range of arrestors, including telephone and data systems.
Schematic illustrating a "completely protected" building electrical service utilizing the recommended cascaded system. Although not shown, telephone service is protected in a similar fashion. Electrical utility service arrester and ground are intended to absorb large transients originating from other sources on the power grid. Category C and B protection levels are designed to further dissipate outside transients, and any generated from within the facility (motor switching, for example). For very sensitive electronic equipment, surge suppressor strips are recommended as a sixth level of protection.