

Electronic noise in the animal environment

Agrivolt

Agrivolt is well-known for its expertise and its specialized products for electrical network management and equipment monitoring in livestock farms.

Over the last few months, requests for information and technical interventions on problems related to the presence of electronic noise have greatly increased to the point where it must now be considered a serious problem for livestock farms. What makes the situation alarming is the detrimental impact on the performance of the livestock in dairy, pork and poultry farms.

Identifying electrical noise in a livestock facilities and understanding methods of neutralization can be a difficult and confusing task. In addition, there can be problems related to electromagnetic incompatibility between equipment which also has a direct impact on the operation costs. Furthermore, consequences on livestock, while usually obvious, nevertheless may require a lot of time on herd analysis.

Electronic Noise

Electronic noise refers to electromagnetic disruptions generated by equipment found on the electrical network, as exists in livestock farms, which result in signals, generally at frequencies higher than 60 Hz. The term also describes an electromagnetic phenomenon likely to affect the operation of a device, an apparatus or a system. There is undergoing research to show the impact of electronic noise on human beings. As for livestock, its impact has already been evidenced over the last few years, from numerous livestock producer's reports.

Electronic noise comes from multiple sources, making them extremely complex to identify. The best known sources are, among others, electronic ballast lighting devices, variable speed drives, electronic ventilation and electric fences, but there are also some equipment which can generate electric arcs such as starters, circuit breakers and conductors when faulty.

Over the last few years, several factors have contributed to increase the presence of noise in a livestock farm. First, is the



increase in nonlinear loads i.e. the number of noise generating equipment: variable speed drives, electronic ventilation, electronic lighting, etc.

Then there is the sensitivity of the electronic circuits themselves; the distance between the sensitive circuits and the noise generating equipment being frequently reduced, compounds the fact that the power of these noise generators increases constantly and generates more and more current in the animal environment. To complicate the situation even more, it should be noted that the quality of primary networks, the size of the transformer and wiring, as well as the distances they cover, also have an influence on the amplitude of the noise we measure.

Electronic noise:

conducted or radiated

Conducted electronic noise: Propagation of the disruptions by conduction inside the cables or the equipment.

Radiated electronic noise: Propagation by radiation along the cables or equipment in the form of electromagnetic waves.

Misconceptions

The popular belief is that if the ID system (electronic system of animal identification) works well, electronic noise is under control. This comprehension of the phenomenon is false. **In a livestock farm, you cannot redirect the electronic noise to the grounding and bonding (equipment ground) networks, to solve a problem with the ID system. Doing so redirects the**

current generated by the electronic noise towards the livestock, thus affecting their performance.

In the majority of variable drives available on the market, there are some integrated filters (EMI) to ensure the protection of the equipment. This protective function is important; however in a livestock farm, their presence is often disastrous since they redirect the leakage current generated by the electronic noise to the grounding and bonding networks, which allows the current to come in contact with the livestock. The argumentation of equipment manufacturers is that these filters have been in use in the industry for many years, without any known negative consequences to humans. This assertion is gratuitous, at least until scientific research provides us, one day, with a more definitive answer. Yet, in a livestock farm, where animals are integrated in the grounding and bonding network, the electrical resistance of their body is known to be much weaker than that of humans.

The solution to electronic noise problems

Several serious research projects have been trying to effect and control the electronic noise generators. After many years of work, these projects remain without concrete results. Our own research has taught us that one must deal with the problem at the source and this approach has proven very effective. This opinion is shared by several experts in electricity.

Nuvolt Corporation has designed for its subsidiary Agrivolt a complete range of Filters for livestock farms in order to control all the noise generating sources. These Filters are designated as: AGRIVOLT NOISE FILTERS. The Agrivolt Filters, like EMI Filters, protect the equipment and eliminate the problems of electromagnetic incompatibility between components. **Moreover, they prevent an excessive quantity of current from circulating on the grounding and bonding networks, thus protecting the livestock on the facility.**

Electronic Filters for the protection of the herd in livestock farm facilities

Variable Speed Drives (1Ø & 3Ø)

F11B3Q-AM
600V Max 3 Phases 11Amps

F22B3Q-AM
600V Max 3 Phases 22 Amps

F32B3Q-AM
600V Max 3 Phases 32 Amps

F52B3Q-AM
600V Max 3 Phases 52 Amps

F68B3Q-AM
600V Max 3 Phases 68 Amps

F80B3Q-AM
600V Max 3 Phases 80 Amps

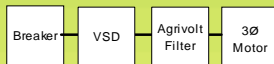
F110B3Q-AM
600V Max 3 Phases 110 Amps

F136B3Q-AM
600V Max 3 Phases 136 Amps

Applications:

Well Pumps
Vacuum Pumps
Milk Pumps
etc.

Installation - Single and Three Phase



Installation recommendations:

- Distinct Circuit per VSD
- PVC Conduit and THHN Wire (or equivalent)
- Do not use any shielded, teck or extension cord type wiring
- Remove any EMI type Filters (Internal or External)
- Reduce the Carrier Frequency
- Install the Agrivolt Filter between the VSD and the Motor
- Locate the VSD as close to the motor as possible
- See full specification sheet for more details

Heating and Ventilation

F11B1Q-AM
600V Max 1 Phase 11Amps

F22B1Q-AM
600V Max 1 Phase 22Amps

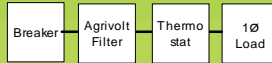
F11B3Q-AM
600V Max 3 Phases 11Amps

F22B3Q-AM
600V Max 3 Phases 22Amps

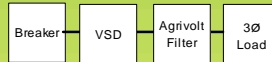
Applications:

Large Electronic Fans
Tunnel Fans
Variable Speed Thermostats
Heat Mats
etc.

Installation (Thermostat) - Single Phase



Installation (VSD) - Single and Three Phase



Installation recommendations (Thermostat):

- Install the Agrivolt Filter between the Breaker and the Thermostat
- Multiple Thermostats may be controlled with one Agrivolt Filter as long as it is not overloaded
- See full specification sheet for more details

Installation recommendations (VSD):

- Distinct Circuit per VSD
- PVC Conduit and THHN Wire (or equivalent)
- Do not use any shielded, teck or extension cord type wiring
- Remove any EMI type Filters (Internal or External)
- Reduce the Carrier Frequency
- Install the Agrivolt Filter between the VSD and the Motor
- Locate the VSD as close to the motor as possible
- See full specification sheet for more details

Lights

F22B1Q-AM
600V Max 2 wires 22Amps

F22B3Q-AM
600V Max 3 wires 22Amps

F22B4Q-AM
600V Max 4 wires 22Amps

Applications:

Compact Lighting
Electronic Ballasts
Dimmers
etc.

Installation (Electronic Lighting)



Installation recommendations:

- Install the Agrivolt Filter between the Breaker and the light fixtures
- Multiple light fixtures may be controlled with one Agrivolt Filter as long as it is not overloaded
- Remove any EMI type Filters
- Keep wiring of the lighting away from RF ID antennas and data cables.
- Keep 6-8 inches between the ballasts and metallic structures of the building
- See full specification sheet for more details

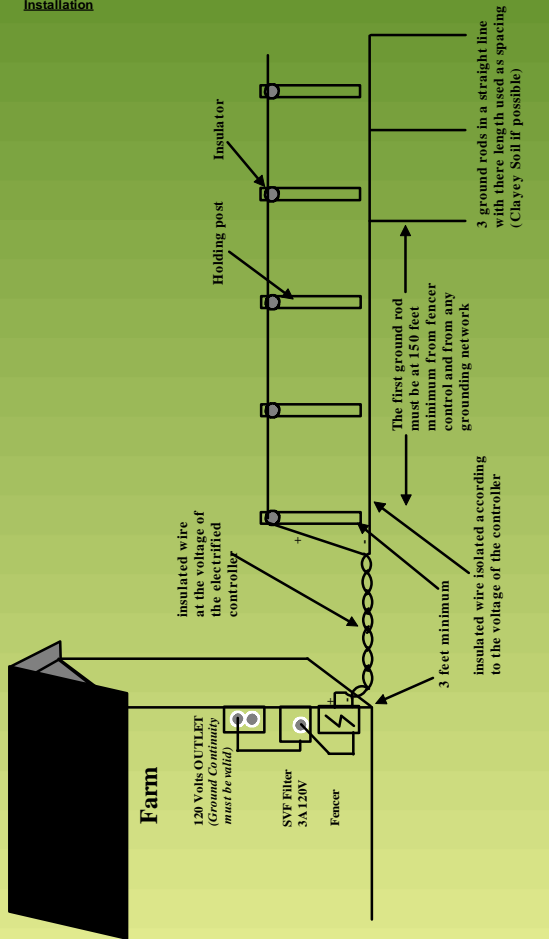
www.agrivolt.com

Electronic Filters for the protection of the herd in livestock farm facilities

Electric Fence

FF3A00
120V Max 3Amps

Installation



Installation recommendations:

- Insulators must be in good shape
- The fence must always be 3 feet away from any building
- The fence should not be touching the earth
- Do not use trees or anything else than the posts to hold the fence wire

Shocker

10-600
5000V Max

Installation

The Shocker Neutralizer is developed to minimize the leakage current generated by a fence controller used with a cow trainer, an electrified gate or from a shocker on a feeder. It reduces the detrimental impact on the herd's performance.

1. Operation Method

The primary function of the Shocker Neutralizer is to remove the electrified controller from the circuit to which it is connected. When a cow comes in contact with the trainer, the gate or the feeder cart the Shocker Neutralizer put back the controller in the circuit.

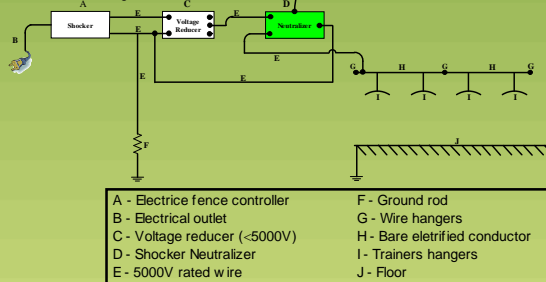
The electric impulse of the controller is then applied for 10 seconds each time a cow complete the circuit. By limiting the impulse for 10 seconds we minimise the stress impact to the animal.

2. Operation Compliance

We have integrated LED indicators to the Shocker Neutralizer to check the operation compliance.

- Green LED: (flash) Unit is ON.
- Yellow LED: - An electrical pulse has been generated;
- A cow is actually touching the electrified circuit.
- Red LED: There is a fault in the electrified circuit.

3. Connection Diagram



- | | |
|-------------------------------|--------------------------------|
| A - Electric fence controller | F - Ground rod |
| B - Electrical outlet | G - Wire hangers |
| C - Voltage reducer (-5000V) | H - Bare electrified conductor |
| D - Shocker Neutralizer | I - Trainers hangers |
| E - 5000V rated wire | J - Floor |

4. Installation Instructions

When installing the Shocker Neutralizer a few basic check-ups are required:

- The electrified wire (H) should be mounted on an isolator (G);
- Recommended voltage is 2 500V;
- Maximum voltage is 5 000V;
- The installation procedure of the fence controller, the cow trainer and the shocker on a feeder should be in compliance with the manufacturer's installation specifications.

5 000V Maximum

Make sure that there is a voltage reducer in place. A Shocker Neutralizer Filter cannot be used when the voltage is over 5 000V.

Installation Check-up

To get the maximum from a Shocker Neutralizer Filter, check the following:

- The insulation rating of the electrical wires (E) should be over 5 000V.
- The lowest possible impedance of the grounding electrodes is required, ± 10 ohms.
- Comply with the connection polarity.

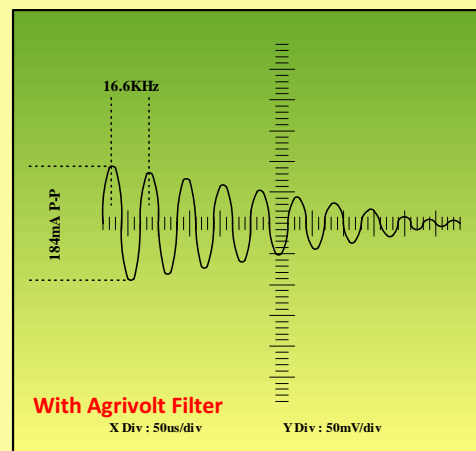
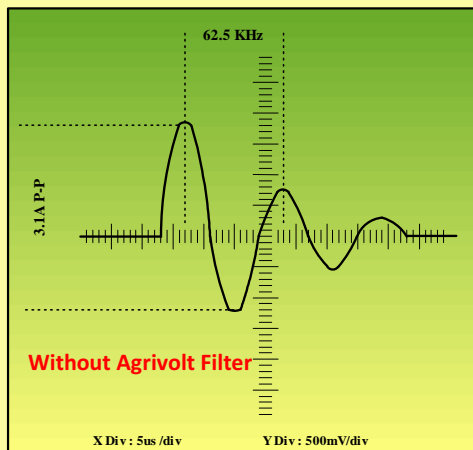
Principles of operation of the Agrivolt Filters

Agrivolt Filter, by design, modifies the characteristics of the impulse produced by noise generating equipment by having high impedance at medium frequency in differential-mode and common-mode while avoiding any bond with the grounding network. By avoiding redirecting this capacitive leak to the grounding and bonding networks, contrary to an EMI Filter, the Agrivolt Filter protects the animal and the equipment in livestock facilities. Moreover, it prevents the problems of electromagnetic incompatibility between various equipment components. Finally, in the case of the Agrivolt Filters for variable speed drives, they also protect the equipment

Residual Values

One cannot take voltage measurements in the environment of a noise generator and more particularly with a variable speed drive. The output of a variable speed drive is “floating” in relation to the earth. This situation explains why we can sometimes measure peaks up to 2000V notwithstanding the voltage at the input of the variable speed drive. Moreover, the measuring equipment used has high impedance and is easily influenced by radiated noise. It is thus necessary to take a measure in current for better accuracy.

It is completely impossible to reduce the amount of electronic noise to zero in the animal environment. Agrivolt Filters will allow to reach a safe threshold at 200 mA beyond 1 KHz, measured at the noise generating equipment. This threshold is based on IEC standard 1479-2.



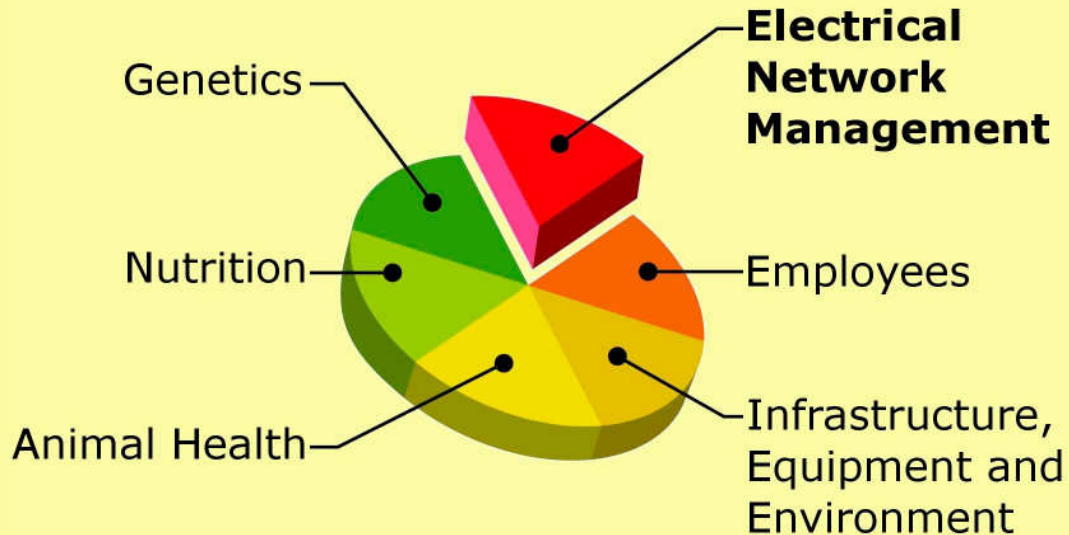
The installation of the Agrivolt Filters

To obtain maximum effectiveness with Agrivolt Filters, one must make sure to scrupulously respect any Agrivolt specification. Our recommendations about types of wiring, distances, or localization of the Agrivolt Filter in relation to the equipment are all essential. **It is absolutely imperative that existing EMI Filters be removed, because they prevent a good performance of Agrivolt Filters.** If EMI Filters cannot be removed or disconnected the VSD should be replaced. **All shielded or rubber type cord is to be banned.**

Agrivolt technical department



Electrical Network as a Livestock Facility Management Parameter



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8