

Understanding Stray Voltage

From the *Rural Electricity Resource Council*, www.nerc.org

One often misunderstood aspect of electricity use on farms is the concept of “stray voltage”. This term is used to describe a very low level electrical voltage between two objects that an animal (or human) can touch simultaneously. It is not what we normally think of as an electrical shock; the voltage levels and current flow are much lower. Humans rarely experience stray voltage. But for animals, much lower levels can be sensed due to the better electrical contact between their four feet and the wet concrete floor, or their wet nose and a waterer, metal feed bunk, or stanchion.

If farmers notice a change in production that seems to be associated with electrical equipment operation, or if animals exhibit extreme nervousness or a reluctance to eat or drink, stray voltage is one possible cause.

Normal Voltage Gone Astray

Voltage is the electrical pressure or force necessary to cause the flow of current. Just as a pressure is needed to make water flow through a pipe, voltage must be present to cause electric current to flow through a wire. It is a normal and necessary part of any electrical system. A problem may occur when there is a voltage *difference* between two animal contact points that is great enough to cause a flow of current. When this voltage difference becomes large enough, and the animal can *simultaneously* touch these two points, stray voltage may adversely affect the animal. Symptoms include a reluctance to drink from a livestock fountain, or touch metal objects. Dairy cows may exhibit slow milk “let down” or be excessively nervous when being milked.



Causes of Stray Voltage

Because the neutral wire of the electrical system carries current, stray voltage is also called “neutral-to-earth voltage”. A number of factors can create stray voltage situations, including:

1. **Deteriorated wiring, particularly if a circuit is overloaded;**
2. **Inadequate or improper grounding of electrical equipment;**
3. **Electrical shorts in equipment, or heating elements in livestock waterers;**
4. **Unbalanced 120-volt loads on single-phase services;**
5. **Undersized neutral wires or high resistance connections;**
6. **Unbalanced three-phase loads on multiphase electric services;**
7. **Improperly grounded equipment or electrical faults on a neighboring farm.**

Next Steps for Farmers

Anyone who may suspect a stray voltage problem is affecting their animals should take the following steps:

1st - Contact your electric power supplier and ask for the staff person who handles stray voltage questions. An on-site meeting at the farm may be needed.

2nd - Employ a qualified and experienced electrician to check your wiring, grounding connections and major electrical equipment. Measuring for stray voltage is not a do-it-yourself project; you will need an experienced team.

3rd - Follow the recommendations of these experts; it may be necessary to monitor and record animal behavior and the time of day it occurred as different corrections are made.

Your state agricultural college may have publications that further explain stray voltage causes and solutions. Information is also available on stray voltage and proper electrical wiring at this Web site. One booklet we offer, ***Understanding Neutral to Earth and Stray Voltage*** explains all aspects in easy-to-understand terms with illustrations. Click [here](#) to read a full description including prices in our shopping cart. The explanations, tips and useful images in this 21-page guide will help you understand the key concepts and solutions if you have stray voltage concerns.

