Agricultural Engineering
Agricultural Engineering Department Michigan State University Newsletter

By: Truman Surbrook **July/August, 2001**

Stray Voltage

Dairy farmers in particular need to be reminded that low level voltages can affect livestock behavioral patterns and sometimes affect production. Nervousness in some areas or around certain equipment and avoidance of those areas are an indication that something is wrong. Livestock farmers should have access to an inexpensive digital voltmeter. All that needs to be done is to measure between the suspected equipment and the adjacent floor or earth. Just hold one lead against the wet concrete floor adjacent to the equipment. Then touch the metal of the equipment with the other lead. If the measurement is 2 volts or more, the situation should be checked out. All electric power suppliers in Michigan offer a free service to check for stray voltage. If a producer does not know who to call, check the Michigan Agricultural Electric Council web site http://www.egr.msu.edu/age/MAEC/ for a list of telephone numbers. A low level voltage on equipment or at a livestock location can be an indicator of serious problems starting to develop. Here are some tips to help prevent on-farm wiring from becoming a problem.

Proper equipment grounding is essential for safety and to help prevent stray voltage. On farms, a copper equipment grounding wire is required to be run from the frame of equipment all the way back to the grounding terminal of the electrical panel. Sometimes this wire comes loose or is corroded. It needs to be fixed immediately. If anything goes wrong in the equipment, this wire is the safety line that prevents a dangerous voltage from developing. It also provides a path for current to flow in the case of a ground fault to prevent current from flowing in the earth. Current flowing in the earth from a ground fault can cause stray voltage problems all over a farm.

Make sure overhead and underground conductors are of adequate size to supply the buildings they serve. Also make sure the neutral conductor is well maintained. A corroded connection entering a building, or a corroded neutral terminal in the panel can make neutral current flow difficult, and stray voltage will develop. All overhead wires should be sized to keep voltage drop to a minimum. The National Food and Energy Council publishes an Agricultural Wiring Handbook that has tables to size overhead wires. If you need a copy, let me know, and I will see what I can do to get one for you.

We all know we can quickly touch something that is hot without getting burned. The higher the temperature the quicker we must be to avoid being burned. If the time of contact is short, the temperature must be high to cause a burn. If the time is long, we can be burned at a lower temperature. The same is true with electricity. Research back in the early part of the last century proved this fact and it still holds true today. There are concerns about high frequency voltages affecting livestock. If this is true, then the levels of voltage must be quite high. An electric fence that is not properly grounded to its own ground and separated by about 50 feet from livestock equipment or electrical system grounds is an example of a short duration voltage that can be felt by livestock and humans. We have a leaflet describing the details. Pulses through the earth from a fencer last from about 20 to 100 microseconds. Some humans and livestock can begin to feel these pulses when the peak level exceeds 20 volts. Measuring these short duration voltages requires specialized equipment and operator training. Unshielded and improperly connected leads can act as an antenna that picks up voltage out of the air such as a nearby radio station.

If you have questions about stray voltage, or other electrical issues, please call or send me an e-mail message.