SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

Types of Grounding

What is Electrical Grounding?

“grounding” refers to a low-resistance path that’s been constructed to carry an electrical flow into the ground, and a “grounded” connection refers to a connection between electrical equipment and the ground through a wire.

There are three types of grounding systems that are important for people to understand, along with their various advantages and disadvantages. These three systems include:

1. Ungrounded Systems
2. Resistance Grounded Systems
3. Solidly Grounded Systems

Ungrounded Systems

ungrounded systems are inherently riskier, they do exist and do serve specific purposes, though they were much more common back in the ’40s and ’50s. As such, we need to take the time to explain how they operate and the various advantages and disadvantages they provide.

The first thing to understand about ungrounded systems is that they’re not *actually* ungrounded. **Electrically speaking, your system is connected to the ground through the capacitance between the lines and the earth. Meaning it’s more correct to call it a capacitance-grounded system.** It’s simply referred to as an ungrounded system because of convention and because there isn’t an intended physical connection between the involved powerlines and the ground.

Put simply**, in an ungrounded system, the ground-fault current is negligible and can be utilized to reduce the risk of shock to people.** When a fault occurs, two wires are needed to carry some of the currents to avoid excess voltage that will cause excessive heat and damage the equipment involved. Because ground fault is negligible, finding faults can be very difficult and time-consuming, making the cost of ungrounded systems extremely high.

Advantage and Disadvantage

Advantages of Ungrounded Systems

There are a few **specific advantages that come with utilizing an ungrounded system.** Some of the most critical benefits of ungrounded systems are that;

- You have a negligible ground-fault current.
- They offer a relatively low value of current flow for lint-to-line ground faults.
- There is a low probability of line-to-ground acting faults escalating to a phase-to-phase or 3-phase fault.
- They assure a continuous operation of processes on the first occurrence of a lint-to-ground fault.
- They present no flash hazards to personnel in the event of an accidental line-to-ground fault.
- They minimize shock risks to people.

Disadvantages of Ungrounded Systems

Some of the **inherent disadvantages of ungrounded systems** are;

- They use two wires to carry an amount of current intended for three wires in the case of a fault, increasing heat and the potential for damaging equipment and insolation.
- They make it relatively difficult and time-consuming to locate any faults.
- All lines need to be individually tested.
- They carry very high operational and maintenance costs.
- They don’t control for transient overvoltages.

Resistance Grounded Systems

Resistance grounding, in short, is when electrical power systems have connections between a neutral line and the ground through a resistor. Said resistor is used to limit the fault current through the natural line. If your voltage doesn't change, your electrical current will depend on the size of the resistor involved, according to Ohm's law (V=IR).

There are **two distinct types of resistance grounding systems; high resistance grounding and low resistance grounding.**

High Resistance Grounding

High resistance grounding (HRG) systems **actively limit ground fault currents to <10 amps** and are commonly used in mills and plants wherever an ongoing operation of processes is intervening with the event of a particular fault.

Low Resistance Grounding

Low resistance grounding (LRG) systems **actively limit ground-fault current to between 100-1000 amps.** These systems are typically utilized in medium voltage systems of 15kV or less and are designed to trip protective devices once a fault occurs.

Advantages and Disadvantages

- **Advantage**
- Reduced currents also reduce the risk of shock and blast/arc flash.
- The systems limit the ground-fault current to a low level.
- They control transient overvoltages.
- They reduce electrical shock hazards.
- They maintain continuity of service.
- They reduce mechanical stresses in equipment and their circuits.
- They reduce the line voltage drops caused by the cleaning and occurrence of a ground fault.

Disadvantages of Resistance Grounding

Some of the **primary disadvantages of resistance grounding systems** are;

- High frequencies can appear as a type of nuisance alarm.
- A ground fault may be left on the system for an extended period.

Solidly Grounded Systems

Solid grounding refers to a grounding system in which an electrical power system is directly connected to the ground, and there is no intentional independence included in the circuit. Solidly grounded systems can utilize large amounts of ground-fault current and thus make faults much easier to locate compared to ungrounded systems. These systems are most commonly used in industrial or commercial power systems, and backup generators are typically kept on standby if a fault shuts down particular production methods.

Much like resistance grounding, **solid grounding can significantly reduce the potential for overvoltages within an electrical system.** However, these systems can have massive amounts of ground-fault current. Because of this, solidly grounded systems cannot operate with a ground fault- since all of the currents in the system run from fault to ground.

Advantages and Disadvantages

Advantages of Solidly Grounded Systems

Some of the **primary advantages of solidly grounded systems** include;

- They provide reasonable control over transient overvoltage from neutral to ground.
- They allow users to locate faults quickly and easily.
- They can supply line-neutral loads.

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Disadvantages of Solidly Grounded Systems

Solidly grounded systems feature several distinct disadvantages that vastly outnumber the advantages they bring to the table. For example;

- Solidly grounded systems possess a severe arc flash hazard.
- They can create problems in the primary system.
- They require the purchase, installation, and maintenance of an expensive and complex main breaker.
- They provide high values of fault current.
- They have the potential to cause unplanned interruptions in production processes.
- They can potentially cause severe equipment damage in the event of a fault.

THANK YOU