ArresterWorks

Arrester Disconnector

ArresterFacts 005

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The Arrester Disconnector

The Disconnector

An arrester disconnector as seen in Figure 1 is a device connected in series with an arrester that separates the ground lead from the bottom of the arrester if the arrester has overloaded and failed. It is also known as a ground lead disconnector (GLD) or isolator.

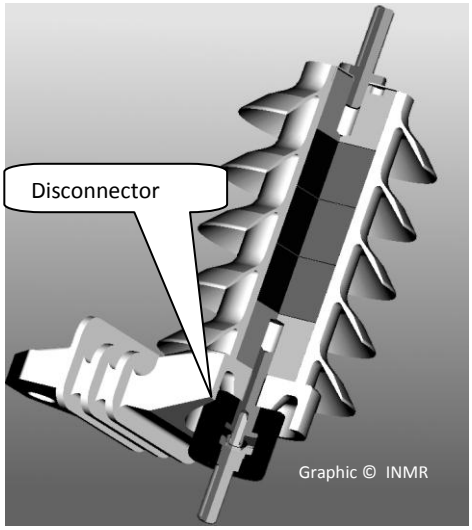

Figure1 Typical Disconnector

The GLD only operates if power frequency fault current flows through the device during a failure. It will not operate from surge current.

Basis of Operation

Commonly used designs available today include a heating element, steady state bypass element and a separation element. Electrically it is represented by Figure 2. There are several variations of this design, but all fundamentally operate the same way. During steady state operation the arrester leakage current is conducted around the heating element and separation element. The separation element is generally a small explosive device that is heat activated. During lightning surges, the heat generated in the disconnector is not adequate to ignite the separation element. The separation element is designed such that it only operates when fault current flows through the device.

Note: The standard arrester disconnector is not an interrupting device. It may break the fault current upon operation, but only under ideal conditions such as low fault currents. Since the disconnector does not interrupt fault current, an over-current device will be

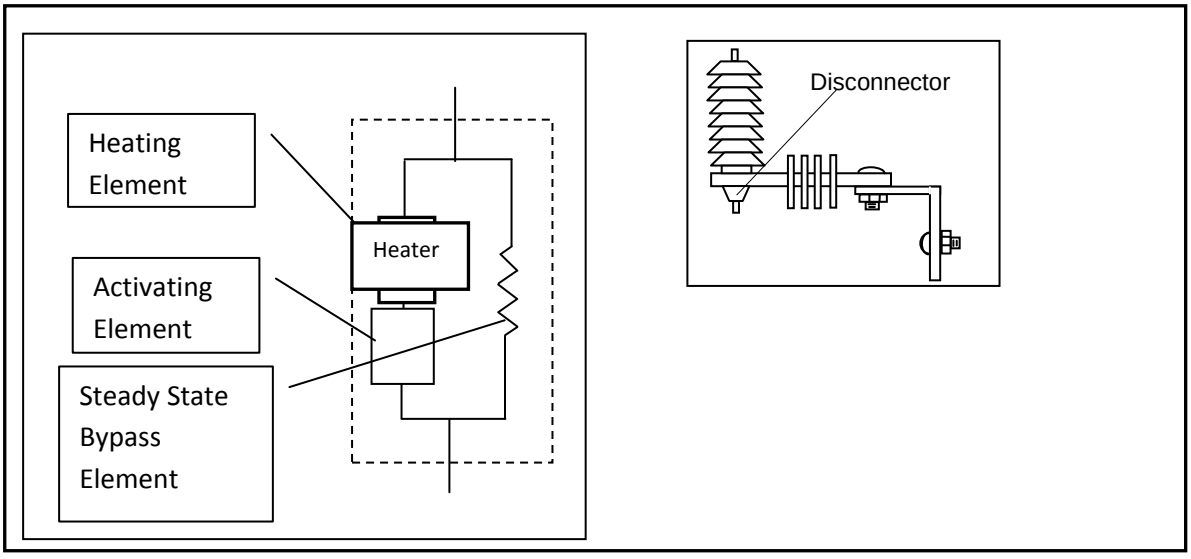

Figure 2 Typical Disconnector schematic

required to operate when an arrester is overloaded and fails.

System Conditions relevant to proper use of a disconnector

As stated in the last section, the GLD is only activated from power frequency fault current. Because of this operation requirement ungrounded systems and impedance grounded systems may not operate a GLD if the arrester fails. Some disconnector designs do have sensitivity in the 1 amp fault current range but most do not.

Time Current Curve

Each disconnector has a time current characteristic curve represented either graphically or tabular as shown in Figure 3. As stated earlier, since the disconnector is not a fault breaking or clearing device, the only curve that can be properly displayed is a disconnection initiation curve. Disconnection initiation is defined as the first sign of external arc voltage across the device during its disconnection operation.

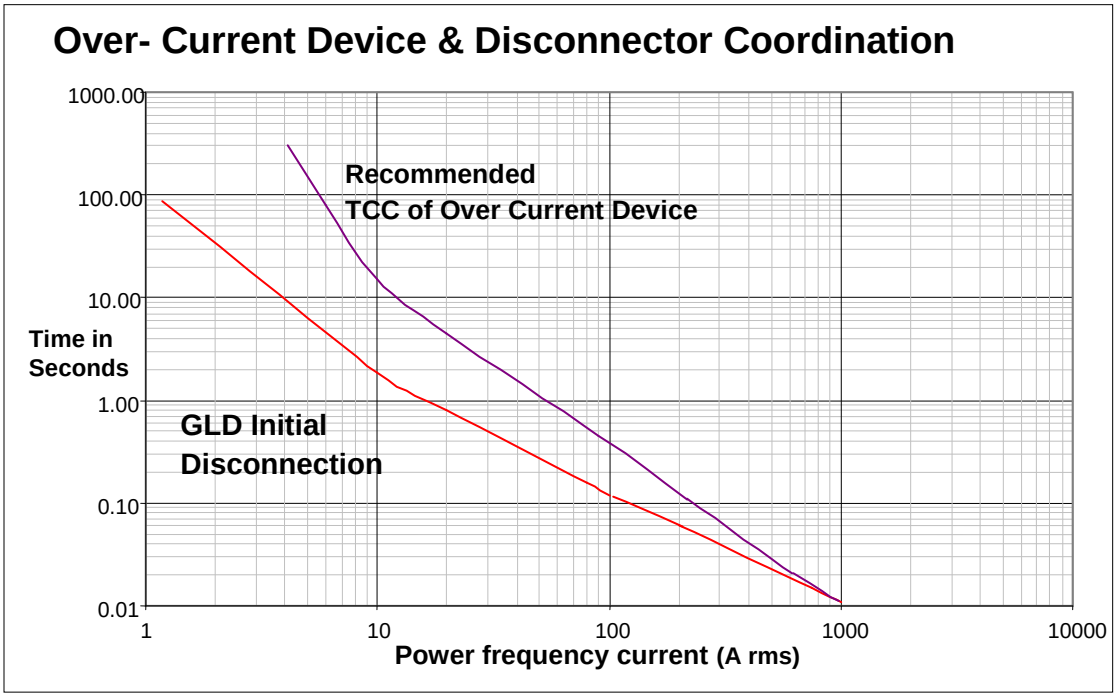

Figure 3 Over-current Device vs. Disconnector Initiation

Coordination with Over-current devices

If an over-current device is upstream of an arrester with a disconnector, it is possible for the over-current to be faster than disconnector ignition capability. It is therefore prudent for the user of an arrester with a disconnector to coordinate the disconnector initial disconnection curve with the minimum melt curve of the over-current device. It can be generally assumed that if the over-current device is slower than a typical 20K fuse link curve, then

coordination with the disconnector is attained.

Safety Aspects of Disconnector

Disconnectors are generally installed at the earth end of the arrester as shown in Figure 4. In this configuration the bottom of the arrester becomes energized at line potential after the disconnector separates and the arrester fails short. This voltage distribution is quite different from its more common voltage distribution at steady state. It is important that arrester users of this type arrester be aware that full line potential can exist at the bottom of the arrester where it is normally at or near earth potential. For this reason, the bottom of the arrester should always be treated as if it can be at line potential.

Another safety aspect of disconnectors to consider is that when the activating powder will separate the disconnector with considerable force and speed. This may cause the expulsion of small fragments and sparks. As stated above, since the GLD is not a breaking device, a resulting power frequency arc may be sustained for several cycles. This arc is also capable of melting metal and plastic parts which may drop to the ground.

The third safety issue to consider with disconnectors is that the device is heat activated and should not be heated in an oven above 150C because it could activate the device.

It should be noted that imparting an impact on as disconnector does not activate the powder since it is heat activated only. However care should be taken if the black power is impacted directly and heat is generated, it could ignite.

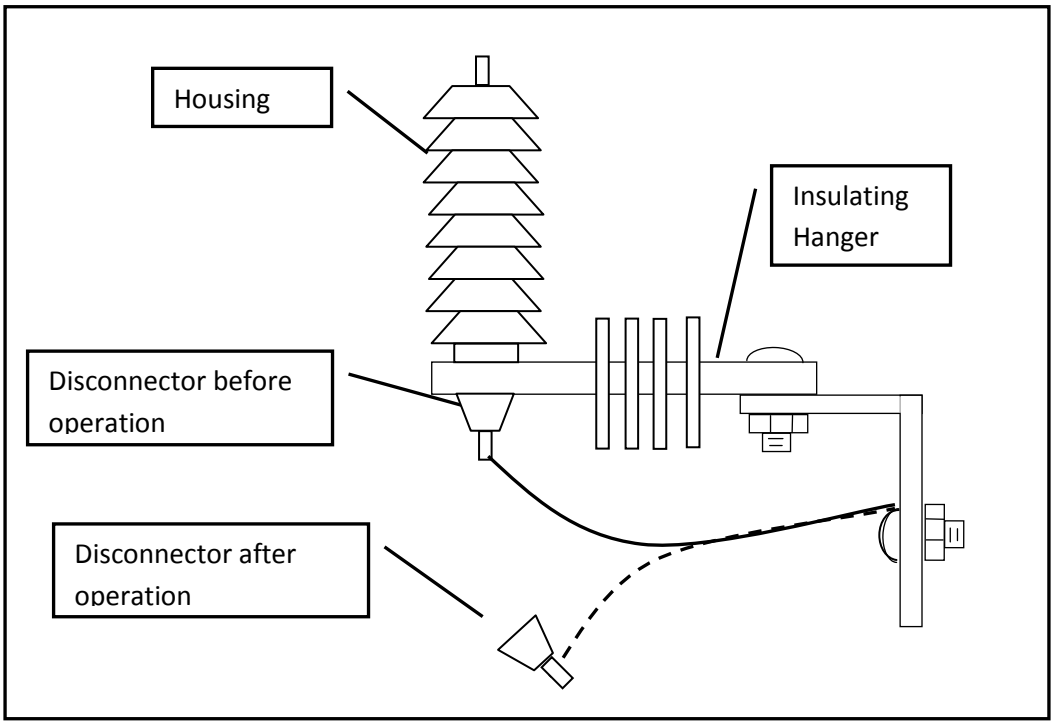

Figure 4 Typical Disconnector Configurations

is heated to its activation temperature, it

Insulating Bracket Considerations

From Figure 4, it can be surmised that once the disconnector has disconnected, the line to earth potential is then stressed across the insulating hanger. This stress may lead to tracking over the insulating hanger to earth if the disconnected unit is allowed to stay energized for long periods of time. The long term electrical and environmental withstand characteristics of the insulating hanger will need to be increased if the arrester is allowed to remain energized for more than a year.

Installation Considerations and Lead Management

It is important to note that when the disconnector operates and does disconnect the earth end of the arrester, the attached lead must have adequate length to allow it to create a gap between the bottom of the arrester and the disconnected half of the device. The flexibility of the lead also needs to be considered to insure that the device can create the aforementioned gap. Typically bus bar will cause a disconnecting problem, and ordinary flexible lead is adequate. Solid or stranded conductors with diameters up to 1 cm are generally easily disconnected from the arrester on typical devices. When arresters are mounted on a cross arm in parallel to each other, it is important that the arrester in the middle not have its earth lead bound in place by the two outside units. This can lead to a sustained outage even though the disconnector did activate and attempt to isolate the arrester.

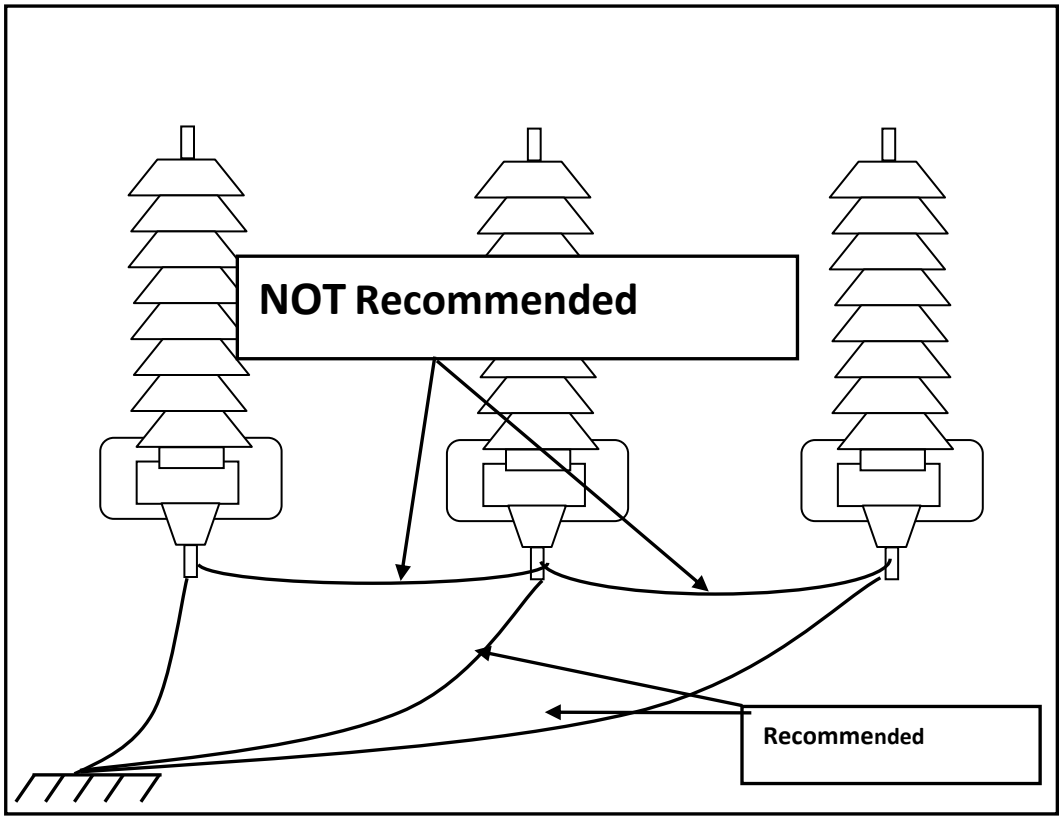

Figure 5 Recommended Lead Management for 3 phase parallel connection

Transportation and Disposal

Due to the fact that arrester disconnectors contain an activation element that is capable of exploding and separating the ground lead when exposed to the heat of ground fault current, it is also capable of operating the same way put in a fire. Therefore disposal should not include incineration.

According to Model UN regulations of dangerous materials, the GLD should fall into a Class 1 Explosive material. However with appropriate testing or modification to the GLD it can be re-classified to a different classification. If the GLD is manufactured in such a way that it will not create a projectile if caught in a fire during transportation, it can be classified as a non-dangerous goods and transportation is not an issue. See a paper presented at the 2007 INMR World Conference titled Emerging Transportation Issue with Distribution Arresters for more information about the transportation issue.

This does raise the question of how to safely transport all arresters on trucks. It is suggested that the end arrester be carried in a metal enclosed chamber routinely found on utility trucks. If that is not possible, wire the GLD end of the arrester to something substantial or to its own high voltage end.

Disconnectors use on Transmission Line Arresters

This disconnector has the same function as a distribution disconnector but does have to withstand different stresses without operation. It is important to note that any disconnector used in this application should have had higher current TLD tests as part of their certification process.

The Future Disconnector

Future Possibilities for Disconnectors

1. Interrupting Disconnector: This device does not exist at the moment, but is one that should be seriously considered by arrester manufacturers. It could eliminate a blink on the power system in the event of an overloaded and failed arrester.

2. Substation Disconnector: This is a device that could be mounted on higher voltage devices that could be used to disconnect this type of arrester as it does for distribution arresters.

3. Very Visible Disconnectors: Often times line personnel over look a failed arrester because the arrester disconnector in the disconnected mode is not obvious. Some sort of waving flag should be added to the designs of disconnectors.

ArresterFacts Usage

Thank you for using www.ArresterWorks.com as your source of information on high voltage surge arresters.

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