

Surge arrestors ensure operation of overhead lines

Information from Live Line Technology

Many parts of Africa experience some of the most intense lightning activity in the world, resulting in damage and disconnection of overhead lines. Effective surge protection is required to ensure minimum damage and maximum uptime of distribution plant. This article describes solutions to the problem.

Live Line Technology provides lightning protection products manufactured for distribution networks in South Africa with voltages ranging from 3 – 132 kV. This product range is the most comprehensive solution to overhead equipment losses caused by lightning. The technology is easy to install, maintain and operate. All these products can all be operated with a link stick, from ground and without the need of an outage.

Maintenance enforced and improved

Electrical utilities face the challenge of re-installing healthy surge arrestor units between maintenance schedules. Unfortunately, maintenance in Southern Africa is given very low priority, creating the occasion for high losses. This scenario is not only prevalent in South African utilities but occurs in other SADC countries as well. The products are designed to overcome poor maintenance schedules of spent surge arrestors on South African networks, by providing features that combine unique surge arrestor technology with preventative maintenance capabilities. The technology is the solution for overvoltage protection of overhead lines.

Firewall surge protection (overhead lines from 3,3 – 33 kV)

These surge arrestor products have live-line capabilities and protect overhead equipment against lightning and can be replaced by means of link stick. No outages needed for maintenance. Many parts of Africa have high rain densities and lightning activity, and warrant high quality protection equipment.

Features include :

- The arrestor is easily identified when blown and may be changed under live line conditions from the ground (easy drop out function).
- The arrestor provides for easy, effective and safer replacement.
- A cost effective method of protecting an area, leading to reductions of outage times.
- The arrestor can effectively be opened when there are problematic arrestors or GLDs, giving easy isolation during fault finding.

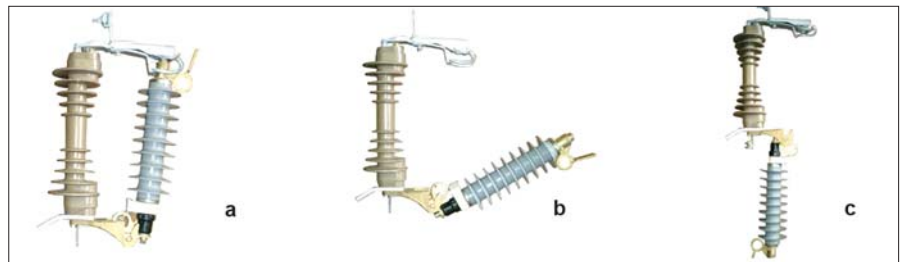


Fig. 1: (a,b,c) : All these products can all be operated with a link stick, from ground and without the need of an outage.

Transformer combi unit (rural transformer protection from (3,3 kV – 22 kV)

The combi unit, which improves the insulation co-ordination of pole mounted transformers, is built to Eskom's specification D-DT-1877. It houses both a live line surge arrestor and fuse link in a parallel connection, allowing the surge or lightning to travel through the surge arrestor and not the fuse. (indicated in blue in Fig. 3).

The lightning energy (indicated in red) will flow through the surge arrestor to earth. The rise in voltage is directly connected to earth. The fuse is not connected in the lightning path. (indicated in blue). The voltage potential between the phase and the earth is held to a safe differential and the transformer is saved. The overvoltage on the three-phase system is evenly balanced and discharged.

Transformers are saved because the voltage potential between phase and earth remains at the same differential during a lightning transient. The surge arrestor is positioned to provide the protection to the transformer and equipment it has been designed to protect. A secondary benefit is that the fuse at the transformer is not subject to nuisance blowing, improving SAIDI and SAIFI's

The surge arrestor protects both the fuse and transformer, reducing transformer failure rates. The surge arrestor is replaceable from ground via a telescopic link stick, reducing the time of surge arrestor replacement from 30 min to a 3 min operation. Linesman can carry out their replacement of the surge arrestor more effectively because they are electrically alerted once the unit expires. No exposure to high voltage power especially in rainy or wet conditions when most of the faults



Fig. 2: Surge arrestors provide high reliability protection for overhead lines.

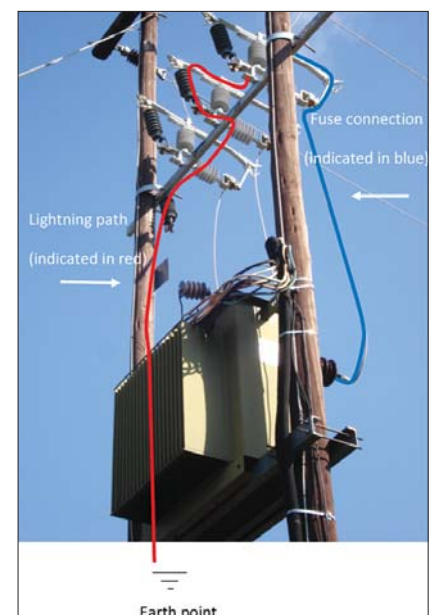


Fig. 3: The combi unit for pole mounted transformers.

Transformer Combi Unit

The solution to (PMT) transformer protection.



People and bird friendly too.



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occur. Benefits of live line surge arrestors include:

- A healthy surge arrester is present at all times. It provides an electrical and visual indication once it is spent. Blown equipment is no longer the indication that the surge arrester is previously spent. Both fuse and arrester can be changed under live line conditions from the ground with a telescopic hot stick.
- The surge arrester protects the transformer more effectively than conventional surge arrester units, and protects the MV fuse at the pole-mounted transformer. Other configurations create a scenario of multiple transformer failures and fuse blows.
- The system ensures a balance of phases during a lightning storm, and a safe voltage differential between earth and phase.
- Unplanned outages are eliminated. There are no more nuisance fuse blows, as the fuse is outside the lightning path.
- Planned outages are enforced. The surge arrester is prioritized. The technology drives the linesman and needs to be in position for the unit to operate.

The transformer combi unit, protects rural overhead pole-mounted transformers (most popular in are 11 kV/415 V and 22 kV/415 V) which feed industries and mines with electricity. These are the best type of MV surge protection in the market, as these surge arrestors have features that no other arrester in the market have, by the following unique characteristics:

The unit provides 100% safety – older technology in the existing systems are subject to fatalities, due to leakage current in spent surge arrestors, and staff can be exposed to danger. This can cause much risk to the electrical utility and management. The surge arrester alerts the electrical utility when spent. This means no more damaged surge arrestors will be in service, without immediate replacement. This is achieved by a mechanical interlocking system between fuse and arrester.

The combi unit allows lightning through the surge arrester. The fuse and transformer are taken out of the lightning path and this extends the lifespan of the transformer. In the old situation the fuse was in series (in front) of the surge arrester and all the energy was driven through the fuse. This created nuisance fuse blows and damaged the windings of the transformer, due to the fact that the potential difference (or voltage) across the transformer windings was very high and the earth point, or tank was non-existent or low.

The unit enforces the replacement of healthy surge arrestors via an mechanical



Fig. 4: The live line surge arrester in the Combi unit is positioned not further than 1 m from the transformer, as per Eskom specification, D-DT-1877 & D-DT-1876.



Fig. 5: Surge arrester being replaced live line via a conventional telescopic link stick.

interlocking system, which means that the transformer cannot be energised before installing healthy surge arrestors, which ensures correct configuration of arrester and fuse. (parallel). The arrester lead length is limited when installing the unit, which improves the protection of the transformer. More importantly the surge arrester is placed in the lightning path and in parallel to the fuse. The parallel connection allows the best electrical connection to a transformer due to the fact that the lightning will always choose the easiest path to earth which is through the surge arrester.

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