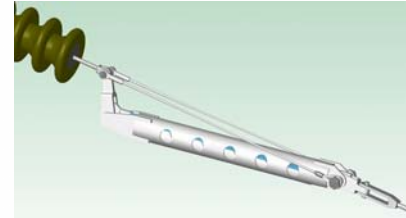


THE SAGGING LINE MITIGATOR (SLiM)

OVERVIEW

Line-to-ground clearance dictates line loading levels in many key situations. Excessive sag from high conductor temperature operations, caused by ambient conditions and line loading, is often the limiting condition. Previously, expensive line reconstruction or reconductoring could only truly solve this problem. Line monitoring systems do not fix the problem, they merely observe the problem and require operator intervention in the form of load curtailment decisions.



SLiM Pre-Production Design

SLiM CHANGES ALL THAT!!

The Sagging Line Mitigator (SLiM), a new class of transmission line hardware, fixes the problem by reducing excessive line sag at just the right time.

Using state-of-the-art materials and a tested and proven concept, SLiM reacts to increasing conductor temperature by decreasing the effective length of conductor in the span. This mitigates the natural thermal expansion experienced by the conductor during high temperature operations. The impact is to decrease line sag during such operations which, depending on construction specifics, can cascade through several adjacent spans. Moreover, SLiM solves the problem of excess sag at a considerable cost saving over conventional techniques including raising towers and reconductoring.

OPERATION

SLiM is activated by the same temperature changes that cause a conductor to sag excessively. The device is completely passive and requires practically no maintenance. As temperature rises, conductor lengthens and sags. Under same circumstances, SLiM changes its geometry to decrease line length. As conductor temperature returns to normal and sag is no longer an issue, SLiM returns to its original shape and stands ready to respond to the next conductor temperature excursion. During all these temperature excursions, the conductor remains within acceptable sag and tension limits.



SLiM Sag Reduction

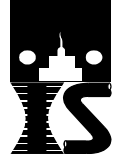
SLiM is rugged, strong, low to no maintenance, and designed to have a very long life. It is composed primarily of metals and can be readily installed by linemen while line is in operation (live-line) using industry standard connectors. Its operation is adjustable to match specific line and configuration requirements. SLiM has no negative effects on line electrical performance.

FULL SCALE TEST RESULTS

Full scale tests performed at Pacific Gas & Electric facilities in July of 2002 demonstrated the functionality of the device. These tests were conducted on two 500' tower spans (control-span and test-span with one SLiM device) of 795kcmil 54/7 ACSR (condor) conductor operating at ~5000lbs/90°F with an ambient temperature of about 90°F. Conductors were heated by a current of ~1200A. The sag differential between the two spans at a maximum conductor temperature of 210°F was over 4'. Results from these tests clearly show that SLiM is capable of reducing the conductor sag by a significant amount thus eliminating excess sag problems.



SLiM During Testing



POSSIBLE APPLICATIONS

A system contingency situation (one or more line out) increases line loading on nearby lines causing some of them to exceed their thermal limits – usually established to maintain conductor-to-ground clearances. The action of SLiM, which mitigates the excess sag caused by high temperature operation, can allow for safe line and system operation during the contingency situation since line capacity is increased by allowing operation beyond conventional thermal limits. This eliminates the need for costly line modification projects.

Many older lines were constructed to 120°F maximum conductor temperature operation. Studies have shown that SLiM enables operation of such lines at a conductor temperature exceeding 200°F without compromise of line clearances or tensions. This can represent a multi-fold increase of rated line capacity.

System planning projects that certain lines will become overloaded as a result of local load growth. In this instance SLiM can delay the need for either a new line or considerable line modifications while the anticipated load materializes.

Line routing or line modifications near airports quite often require structures to be as low-profile as possible. SLiM can be employed in a cost effective fashion to minimize line height for such installations while maintaining required ground clearances.

SLiM advances the state-of-practice in transmission line hardware by using a smart material and proven technology to solve high conductor temperature operation problems.

TAILORED COLLABORATION WITH EPRI

In cooperation with Electric Power Research Institute (EPRI) and a number of utilities, a demonstration project has started where pre-production versions of the device will be installed at key locations within selected utility sites. This project will demonstrate the usefulness and ruggedness of the SLiM device in actual applications as well as compile practical engineering information to aid utilities in designing, specifying, installing, inspecting, and maintaining these devices.

ACKNOWLEDGEMENT

The development and proof-testing of the Sagging Line Mitigator (SLiM) was funded by the California Energy Commission. Contributions of the Project Managers and utility advisors are gratefully acknowledged.

COMMERCIALIZATION STATUS

Commercialization of the SLiM device consists of setting up a manufacturing/testing facility to “assemble” the devices and a joint collaborative agreement with a line hardware supplier for distribution and sale of the device. A prospectus for the device has been developed and partners are being sought to continue with the introduction of this revolutionary product to the utility industry.

INFORMATION

For more information about the device or participating in the product commercialization, please contact Manuchehr Shirmohamadi at 510-594-0300 x202 or M.Shir@MISolution.com.