ENGINEERING

Air Moisture Is Cause of Lower Insulator Efficiency

LOSSES in high-tension power transmission are expected to be considerably reduced through the discovery at the Harvard Graduate School of Engineering that moisture in the air is the hitherto unsuspected cause of the costly inefficiency of the porcelain and glass insulators used on the lines.

The discovery, made by Prof. Chester L. Dawes and Dr. Reuben Reiter, was made possible by their perfection of a high-voltage bridge with which to detect the tiniest flaws in high-voltage insulation, a problem that has troubled electrical engineers for some time.

With the instrument, scientists can now enter an entirely new field of research in insulation and thus possibly bring man closer to his dreams of managing tremendous amounts of power safely and efficiently by revealing the causes of insulator "flashovers" that so frequently paralyze power lines.

Tentative findings also indicate that one of the causes of radio interference is due to high-voltage "static" discharges over the surface of these insulators.

That moisture in the air could cause such flashovers and shortcircuits was unknown during the 30 years that insulators of this type have been in use until the two Harvard scientists began a series of delicate measurements with the Dawes bridge. These showed that atmospheric humidity, or moisture in the air, produces not only a pronounced power loss over the insulator but that the loss is greater over a period of time than if the scientists began with a clean insulator. The greater the moisture in the air, it was found, the greater is the loss. Cleaning the insulator by vigorous rubbing with a chamois cloth, however, was found to return the power to its initial value.

This led to the assumption that a permanent deposit forms on the surface of the insulator and decreases its efficiency, an assumption later confirmed by observations through a special dark-field microscope which readily reveals minute surface irregularities. The deposit, it was found, takes the form of millions of tiny islands which, because of difficulties of observation, are not visible with an ordinary microscope.

The islands are formed, the two scientists believe, by the activating effect of high-voltage corona, or electrical discharge, on the air and the moisture contained in it. This action causes the nitrogen in the air and the moisture to form nitrous and nitric acid, which, acting with the metal of the insulator cap and tin, form the deposit. The exact composition of the islands is being further investigated, however, by chemical, X-ray and microscopic means.

Under normal conditions of the corona and atmospheric humidity, the resulting power leakage probably amounts to only a watt or so per hour for each insulator. With the accumulation of deposit, however, this loss increases with time, and for some systems may amount to a tremendous number of kilowatt-hours per year.

More important, however, according to Prof. Dawes, is the fact that the deposit is semi-conductive, and reduces the length of the insulating path over the insulator surface. Thus the insulator flashes over more readily and at a lower voltage, which may account for some of the inexplicable flashovers and shutdowns. The action of the electricity in jumping from island to island over the insulator surface is believed to be a probable cause of radio interference.

While electrical bridges somewhat similar to the one which made possible this research have been in use for many years, none of them has operated satisfactorily in measuring very small power losses at high voltages. The stray currents of previous bridges induced by the high-voltage wires have been eliminated by shielding the different parts of the bridge with sheet metal. Under some circumstances these currents have produced errors which might have magnitudes equal to several times that of the actual power being measured. High frequencies introduced by high voltage discharge, another source of large errors in previous instruments, have been eliminated by electric filters which permit only the power-frequency currents to pass.

The high sensitivity required for measuring minute amounts of power is obtained with vacuum-tube amplifiers, based on the same principle as those used in radio receiving sets and public address systems. These too, however, must be carefully shielded by metal screens from the induction effects of the surrounding high-voltage wires.

Thus far the bridge is functioning satisfactorily for voltage as high as 200,000 volts.

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ETHNOLOGY

Oak Leaves Find Use As Cigarette Papers

THE BEST cigarette wrappers are colored green and are at least as thick as medium weight Manila paper. Such, at least, is the opinion of epicures among the Shawnee Indians. The wrappers are from the leaves of the blackjack oak of Oklahoma and Texas.

The technique of making and using these wrappers was demonstrated recently to guests from the nearby University of Oklahoma by Billy Williams, genial member of the Shawnee tribe. In July or August, the leaves are cut into oblong pieces. The midrib and more prominent veins are flattened by gentle pounding on a flat stone, after which the oblongs are dried under a heavy weight. Beautifully flattened, the dried wrappers keep indefinitely.

When needed, several at a time are "relaxed" by steam or boiling water and placed in the user's pouch or pocket. The cigarettes are rolled in the usual way, even to a rather futile moistening of the edge. In smoking, it is necessary to keep rather tight hold upon the elastic green cylinder which results, lest it uncoil.

The flavor, instead of suggesting scorched leather as one might expect, is rich and excellent, by white standards as well as red. The burning oak leaf adds a slightly heavier, more pungent aroma which blends perfectly with that of the tobacco.

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