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**PROTECTION OF
GEOPHYSICAL, COMMUNICATION AND POWER
TRANSMISSION CABLE
AGAINST RODENT SPECIES ATTACK
BY
R-55 RODENT REPELLENT TREATMENT**

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We are informed that pocket gophers inhabit most areas west of the Appalachian mountain system of the eastern United States. These creatures have long presented problems in agricultural areas, dating back to the "Old West" when many a rider was unhorsed by unwary contact with the "push-ups" made by these small animals. Although motorized steeds have largely replaced the four-footed variety of the "Old West", pocket gophers still remain. These rodents present even greater economic problems as more and more communication cable, power transmission cable, plastic conduit and plastic pipe are installed within the earth.

We have been aware of the rodent problems connected with underground installations of cable, conduit and pipe since Phillips Petroleum Company is substantially engaged in plastics and rubber production. However, due to an immediate and pressing need in seismic operations, our attention was first directed to the problem of protecting land and portable geophysical cables from animal attack. In earlier seismic operations, animal damage to cables did not present a great problem because seismic cable strings covered relatively small areas and generally were taken up each evening and reset by day. As geophysical exploration covered greater areas and the strings were left in place during the night hours, depredations by various animal species substantially increased.

In our arsenal we had a chemical, tert butylsulfenyl dimethyl-dithiocarbamate (now designated R-55 Rodent Repellent), which has a high degree of repellency to a number of animal and insect species.

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As a result of research and developmental work, this chemical has been approved for the protective treatment of geophysical cables against specific rodent species attack. Rubber and polyurethane jacketed seismic cables treated with R-55 according to the established solvent technique have been in field use for several years. Treatments with R-55 Rodent Repellent have resulted in longer cable life, reduced cost of repairs, more effective use of field crew time and improved data.

The problem of pocket gopher damage to buried cable was again brought to our attention by an official of the U.S. D. A. Rural Electrical Administration, who had learned of R-55 treatment of seismic cables and expressed the hope that a chemical protectant for buried telephone cables could be developed.

It was our opinion that the treatment for buried cables would differ from the technique used in impregnating seismic cable jackets. In the case of seismic cable, some damage to cables can be tolerated and generally is expected because of the numbers of animal species which potentially may cause damage to surface-installed cable, and because the cable is accessible for necessary repairs. The R-55 treatment of seismic cables usually provides protection expressed as a percentage of about ninety-five percent, depending upon the animal species and the density of the animal population.

Damage to buried cable is generally caused by a lesser number of animal species and in certain regions the principal damage to such cable is by pocket gophers. Also, damage to buried cables cannot be tolerated to the extent that is acceptable for cables in surface use.

The developed solvent technique for the application of R-55 is not always adaptable to polyolefin materials. Also, it was our idea that it would be necessary to have a chemically treated barrier about the cable in order to prevent any damage to the cable jackets which

might impair the efficiency of the conductors. Field tests were initiated to determine additional R-55 treatment methods for cables buried in areas infested with pocket gophers. In a series of field tests, R-55, in measured quantity, was applied to the soil immediately surrounding buried cables. It was intended that a two-inch area of R-55-treated soil would surround the cable, forming a protective barrier.

The cables used in these field tests were twenty-six conductor, rubber jacketed, portable seismograph cables. These cables were selected because they are not armored and would indicate the slightest damage caused by gophers. The conductors at one end of the test cable were soldered and the end made waterproof. Initially, fifty-foot lengths of cable were used. In later field tests the test cable was reduced to five-foot lengths. The short cable length resulted in improved data for comparative evaluation as well as less labor and time in the placement and recovery of the cables.

In the initial field tests the fifty-foot cable lengths were buried in trenches which transected active pocket gopher runs. The number of burrows crossed by a 50-foot cable length ranged from one to as many as seven burrows. Direct comparison of various treatments with untreated cable under these conditions was complicated. In later field tests the five-foot cable lengths were positioned in active pocket gopher burrows. Only one treatment was installed in the active burrow and the treatments were spaced at least fifty-feet apart.

R-55 was applied at the rate of two pounds of technical material per mile of trench. Kerosene was used as diluent-carrier. The amount of diluent required depended upon the moisture content of the soil as well as the soil type. The quantity of oil used was three quarts to four quarts per fifty-foot trench. R-55 emulsifiable concentrate formulations were included in some tests, water being the diluent in such applications. Treatments were applied with compression sprayers.

The conductors of each test cable were examined with a Simpson volt-ohm meter at monthly intervals. The tests were continued for periods of six months. The cables were then removed and carefully inspected for damage. Those cables which showed complete failure prior to the termination of the test were removed and the cable damage recorded.

Results of all field tests to date have shown that cables buried in soil treated with R-55 Rodent Repellent were not damaged by pocket gophers. Fifty to eighty percent of the control cables buried in untreated soil, including armored cable, were damaged. This damage ranged from slight to very severe damage. Some cables, including armored cable, were completely severed.

In one field trial, R-55 treatment was applied to the soil about one-half mile of buried telephone service cable of the Pioneer Telephone Cooperative, Kingfisher, Oklahoma. This installation, including two pedestals, was in an area of heavy pocket gopher infestation. No pocket gopher damage has occurred during the eighteen months of this installation.

Following these field tests, a large scale trial was established in the Bixby, Oklahoma area. A project of the Bixby Telephone Company, Incorporated, it included about sixty-miles of buried telephone service line. Approximately one-half of this cable installation was treated at the rate of two pounds of technical R-55 in thirty-nine gallons of kerosene per mile of trench. R-55 application was made to the soil as the cable was placed by means of an apparatus designed especially for this installation. R-55 application and untreated control areas were carefully placed according to an exact count of gopher activity in each area by a wildlife specialist. Construction at this date is incomplete and results of the R-55 treatments on this installation are not available.

Based on R-55 performance to date, indications are that R-55 treatment of the soil about susceptible conduit and pipe would provide protection against pocket gopher and other rodent species attack.

Plastic extrusion techniques which are available indicate that it is possible to incorporate R-55 Rodent Repellent in polyolefin sheet and fabricated items. Laboratory test results have shown that polyolefin containing R-55 Rodent Repellent is highly repellent to attack by specific rodent species.

Our field experience, however, indicates that a barrier is necessary for the protection of buried cables from damage caused by rodents, such as pocket gophers. This barrier can be formed by the treatment of earth with a chemical, such as R-55 Rodent Repellent, or by incorporating this chemical in sacrificial coatings applied to the cables. ()

We wish to acknowledge the cooperation, technical assistance and advice received during the course of the R-55 Rodent Repellent field tests and field trials and express our grateful appreciation to personnel of Oklahoma District, Wildlife Services Division, United States Fish and Wildlife Services, including: Messrs. Monte Dodson, Director; John Meyers, Assistant Director; Robert McVickers, Wesley Webb, Don Hawthorne, James J. Pitts; and to Mr. J. R. Tigner, Research Biologist, Denver Wildlife Research Center; Dr. Donald A. Spencer, Chief Staff Officer, Animal Biology, Pesticide Regulation Division, U.S. D.A.; Mr. Monte R. Lee, Field Engineer, Rural Electrical Administration, U.S. D.A.; Mr. J. O. Conners, Division Engineer, Southwestern Bell Telephone Company.