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Direct Hooking Electric Theft: Silicone Rubber Piping over Bear Overhead Electric Conductors Technical Enforcement Mechanisms

Surekha S. Bhalshankar[1], Dr C. S. Thorat[2]

[1]National Institute of Electronics and Information Technology (BAMU) Aurangabad, Aurangabad, Maharashtra, India

[2]Government Polytechnic, Nagpur, Nagpur, Maharashtra, India

Abstract: ***In Maharashtra state industrialization is on the raising slope, hence demand of electricity continuously blooming. But to meet ever-growing energy demand for industrialization as well for house-hold work brings rise in tariff rates. Raising rates of tariff boost the increasing immoral activities in electrical power sector. With a technical point of view, Power Theft adversely affects the power quality, tariff rates and non-reliability of power supply. So power theft is a non-ignorable crime that is highly prevented, as it directly affected the power quality and economy of the state. Electricity theft is a social evil, so it has to be completely eliminated. Power consumption and losses have to be closely monitored so that the generated power is utilized in a most efficient manner. Now Utility companies have prime responsibilities to prevent the illegal usage of electricity. At these stage traditional methods to stop power theft is totally out dated. New technological development highly needed to solve the problem of illegal usage of electricity without any human control. The implementation of such technology will save large amount of electricity, and there by electricity will be available for more number of consumer then earlier with affordable tariff. This paper introduces the electrical power theft controlling mechanism.***

Keywords: Electricity Theft; Direct Hooking; Silicon Rubber Pipes

1. Introduction

Maharashtra State Electricity Board is bifurcated into three companies MAHAGENCO, MAHATRANSCO and MAHADISCOM. But power sector in Maharashtra is holding back. And short answer is power theft. According to State Economic survey an electrical distribution loss reaches up to 15.77% and aggregate technical and commercial losses (AT&C) to 21.83% in the year 2015-16. However, forcing consumers to pay Rs.6,600 crores every year. Fig.1 the AT&C losses have also gone up for MAHADISCOM from 18.71% in 2014-15 to 21.83% in 2015-16 [1,7].

With a technical point of view, Power Theft adversely affects the power quality, tariff rates and non-reliability of power supply. So power theft is a non-ignorable crime that is highly prevented, as it directly affected the power quality and economy of the state. Electricity theft is a social evil, so it has to be completely eliminated.

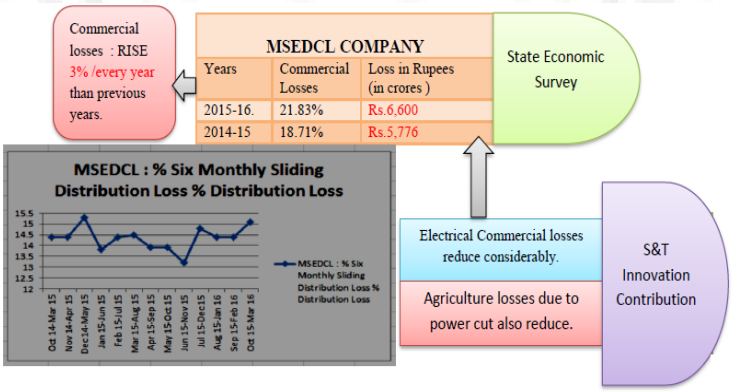

Figure 1: AT&C Losses Analysis of MSEDCL Company

As per experts, Fig. 1 just 1% reduction in loss can bring additional revenue of Rs225 crores to the utility.Indian Power sector (Distibution Utilies of India) bears Rs.70K crores/Year lose due to Electricity Theft.Again Every year 3% Increase in Electricity Theft.Power consumption and losses have to be closely monitored so that the generated power is utilized in a most efficient manner [2,3]. Now Utility companies have prime responsibilities to prevent the illegal usage of electricity. At these stage traditional methods to stop power theft is totally out dated. New technological development highly needed to solve the problem of illegal usage of electricity without any human control. The implementation of such technology will save large amount of electricity, and there by electricity will be available for more number of consumer then earlier with affordable tariff [3,4,5].

The most well-known and least difficult method for stealing power is tapping energy, specifically from overhead conductors. In Maharashtra 80% power theft is done by

direct hooking method. Now days it's very difficult to control this type of theft as there is no any technical solution to get rid from direct hooking rather than man power. Main objective of this paper is to build up Man-Power less Automatic system to control electric theft. In this paper, we introduce very simple and affordable Direct Hooking power theft controlling mechanism by using Silicone Rubber piping around bear overhead conductors [6].

2. Silicone Rubber Properties

Silicone rubber is a polymer containing silicon together with carbon, hydrogen, and oxygen. Silicone rubber is generally non-reactive, stable, and resistant to extreme environments and temperatures from -55 °C to +300 °C while still maintaining its useful properties. Due to these properties and its ease of manufacturing and shaping, silicone rubber can be found in a wide variety of products, including: voltage line insulators, automotive applications; cooking, baking, and food storage products; apparel such as undergarments, sportswear, and footwear; electronics; medical devices and implants; and in home repair and hardware with products such as silicone sealants.

Silicone rubber offers good resistance to extreme temperatures, being able to operate normally from −100 to 300 °C. Some properties such as elongation, creep, cyclic flexing, tear strength, compression set, dielectric strength (at high voltage), thermal conductivity, fire resistance and in some cases tensile strength can be at extreme temperatures. Silicone rubber is highly inert and does not react with most chemicals. The siloxane bonds (-Si-O-Si-) that form the backbone of silicone (dimethyl polysiloxane) are highly stable. Silicone rubbers have higher heat resistance and chemical stability, and provide better electrical insulation[4,6].

Fig.2 Silicone rubber has high insulation resistance of 1T.Ω.m-100 T.Ω.m, and its insulating properties are stable over a wide range of temperature and across wide frequency spectrum. There is almost no decline in performance even when immersed in water, making silicone rubber an ideal insulating material. It has particularly good resistance to corona discharge and arching at high voltages. Fig.3 Silicone rubber is thus used extensively as an insulator in high voltage applications.

Silicone rubber withstands high and low temperatures. In Silicone rubber withstands high and low temperatures. Silicone rubber can be used indefinitely at 150 ^{0}C with almost no change in its properties. It withstands use even 200 ^{0}C for 10000 hours or more, and some products can withstands heat of 350 ^{0}C for short periods. Silicone rubber can be used indefinitely at 150°C with almost no change in its properties. It withstands use even at 200°C for 10,000 hours or more, and some products can withstand heat of 350°C for short periods. Silicone rubbers are thus suitable as a material for rubber components used in high temperature environments.

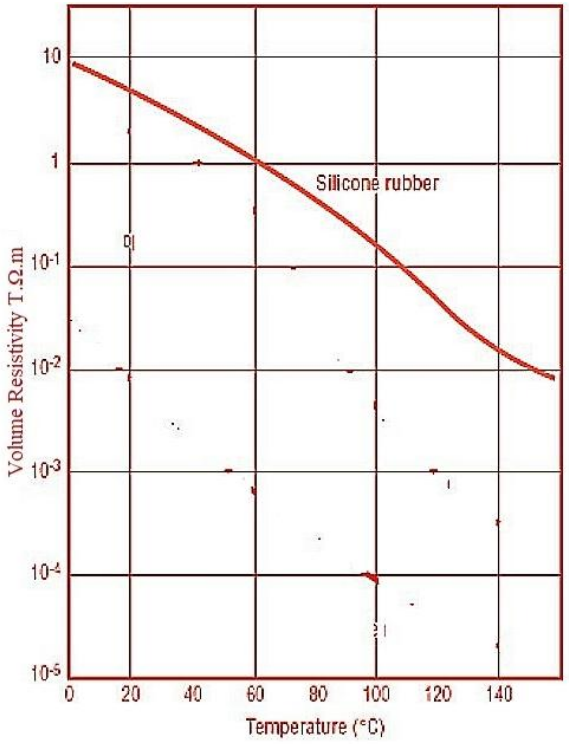

Figure 2: Graph of Volume Resistivity Vs Temp for Silicone Rubber

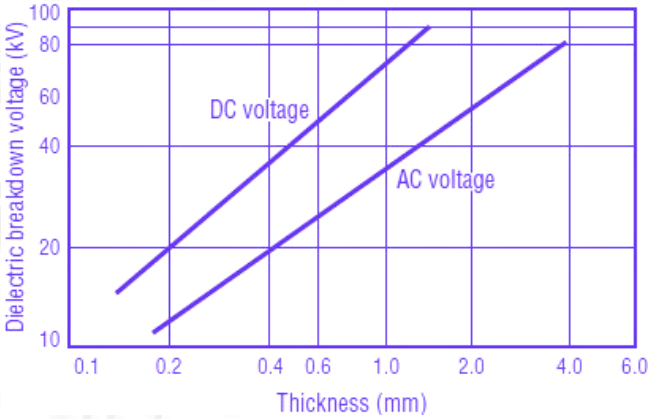

Figure 3: Graph of Dielectric Properties of Silicone Rubber

Silicone rubber also has excellent resistance to cold temperatures. Silicone rubbers can be exposed to wind,rain and UV rays for long periods with no change in its physical properties. Silicone rubber is chemically inert with good release properties, so it does not corrode other materials [1,4,5].

3. Silicone Rubber Piping for direct hooking

In this paper, we introduce very simple and affordable Direct Hooking power theft controlling mechanism by using Silicone Rubber piping around bear overhead conductors [6]. Fig.2 Silicone rubber has high insulation resistance of 1T.Ω.m-100 T.Ω.m, and its insulating properties are stable over a wide range of temperature and across wide frequency spectrum. There is almost no decline in performance even when immersed in water, making silicone rubber an ideal insulating material. It has particularly good resistance to corona discharge and arching at high voltages. Fig.3 Silicone

rubber is thus used extensively as an insulator in high voltage applications.

High temperature silicone cable ideally suited to high or low temperature applications, these cables works between -50°C and +180°C. Silicone is one of the important inventions of our era which can be used in a wide spectrum of areas from health to industry. ***Silicone*** is a synthetic rubber provided by serial complex reactions from Silicone elements. Silicone isolation, due to its high heat endurance and flame retardent qualities, is used reliably where fire control and firefighting is necessary. In high temperatures, as well as in low temperatures, High temperature silicone cable maintains its flexibility. Special formulations can ensure its flexibility even in -95 °C.

- Physical specifications do not change in high and low temperatures.
- Unaffected by climate conditions.
- High resistance to humidity, radiation, ultraviolet rays, ozone, oxygen, corrosion and pressure.
- Extremely high electrical isolation.
- Carrying capacity of additional currents higher than 50% in PVC and other rubber isolated cables.
- Resistance to chemical solvents.
- Feature of biological inertness.
- It does not stick to other materials. Silicone, as defined by standards, normally has a wide working temperature range (Between -60°C and 180°C).

4. Comparison between Aerial Bunched Cable Vs Silicone Rubber Piping

Sr. No.	Particulars	Aerial Bunched Cable 	Silicone Rubber Piping 
1.	Cost effectiveness	Cable itself came in high price. Shorter Spans and number of poles due to increase in weight of cable.	Low Price Silicone Rubber Pipes and less weight hence no of poles remains same.
2.	Life	The insulation degrades due to presence of sun, though inner insulation between wires somehow shielded from the sun.	Silicone rubbers can be exposed to wind, rain and UV rays for long periods with no change in its physical properties. Silicone rubber is chemically inert with good release properties, so it does not corrode other materials
3.	Reliable	Because of its weight the maintenance is not easy, especially in hill areas.	Easy for maintenance and reliable.

5. Conclusion

The research of this paper gives innovative method of power theft detection for direct hooking of overhead conductors. The developed system is Man-Power less, simple, easy to operate and cost effective. It saves time as well as revenue losses for the utility company. Finally, we discuss the challenging issues in energy theft detection and provide some research directions. In the future, power utilities requires more accurate and efficient energy theft detection designed.

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Author Profile

Surekha S. Bhalshankar received B.E and M.E. degrees from Govt. College of Engineering Aurangabad, India, in 2010 and 2012 respectively. Currently she is Part Time PhD student in National Institute of Electronics and Information Technology (NIELIT) Aurangabd as well she is working in MAHADISCOM as Asst. Engg. She is interested in the Smart Grid Technology and Renewable Energy.

Dr. C. S. Thorat is a Professor and Principal of Govt. Polytechnic College, Nagpur. He received B.E., MTech and PhD degrees from reputed colleges. He is innovative research oriented professor. His research interests includes power system and quality, Smart Grid