

REAL TIME MONITORING OF EHV CABLE SYSTEM

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ABSTRACT

The paper covers the revolutions in maintenance practices of underground EHV cable system which Adani Electricity Mumbai Limited-Transmission Business has adopted during maintenance of EHV cable network.

Some of the best maintenance practices implemented are listed below.

- Use of DTS (Distributed Temperature Sensing)
- Ground patrolling
- Real time monitoring of patrolling person
- Web Monitoring of excavation photos over cable route.
- Use of Augmented reality to replace as built drawings.
- Protection to 220kV Cables during Infringements.
- Real time Intrusions detection over cable route.
- Sheath testing of 220kV cables & way forward for online sheath monitoring.
- Monitoring of sheath current during normal and fault conditions.

Our experience in this area can be used effectively by other utilities in establishing high standard practices of underground EHV cable maintenance in achieving zero cable faults & maximizing ampacity.

This paper will act as a guide for helping power engineers to maintain underground Transmission network in crammed cities of developing countries and overcoming issues in maintaining underground EHV cable network successfully.

KEYWORDS

EHV Cable, sheath, Intrusion, augmented reality, virtual reality, monitoring

INTRODUCTION

To meet rapid load growth, AEML-TB has been augmenting the EHV network to bring bulk power to load centers within Mumbai city, the biggest Metropolis in India. Due to non-availability of adequate ROW (Right of Way) in congested urban areas, bulk power transmission through EHV overhead lines is not possible. The only other practical alternative is to lay EHV cables in underground trenches. Till date AEML-TB has installed 56 ckt-km of 220 kV underground cables and has proposed to install additional 50 ckt-km by 2020.

Due to increased penetration of buried EHV cable network in urban environment, it is necessary to safeguard & maintain the cable network.

No. of threats reported over 56 ckt-km of 220 kV underground cables

Period considered	Threats reported	Incidence of fault or damage to 220kV Cable
April 2015 to March 2016	103	0
April 2016 to March 2017	187	0
April 2017 to March 2018	233	0
April 2018 to March 2019	235	0

Number of threats reported over cable route is having rising trend considering continues urban development activities in metropolitan city of Mumbai & suburban area.

1. DTS SYSTEM

Distributed Temperature Sensing (DTS) system is commissioned on each scheme of 220kV cable since inception to avail all the possible benefits.

DISTRIBUTED TEMPERATURE MONITORING

DTS systems monitors continuous profiles of actual temperature along cable routes and Dynamic cable rating (DCR) systems provides continuous calculations of current carrying capabilities and prospective conductor temperatures.

With DTS system we have been able to optimally load the cable systems without violating the physical limits i.e. the maximum admissible conductor and insulation temperatures, respectively with following advantages:

Optimizing Cable Capacity: DTS A Tool at AEMT -TB

DTS system is integrated with SCADA to determine cable safety margin & optimizing cable capacity. Real time load data with Maximum surface temperature & Conductor temperature are displayed.

STPL (Short term permissible load) i.e. Maximum current (load) conductor can carry for next 48 hrs is forecasted based on measured conductor temperature.

Total Load Management indicates live load, average cable surface temperature, Conductor temperature & STPL loading for next 48 hrs which helps in optimizing cable capacity.

Safety - critical load situations

It is observed that max. temperature is higher by 10 °C than average conductor temperature. The safety margin of cable conductor temperature is determined up to max.80 °C. We have considered this temperature in view of life cycle performance of cable asset