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DEVELOPMENT IN EHV TRANSMISSION LINE FOR BETTER FUTURE

Ashwini M. Pudke[1], Shraddha J. Patil[2], Achal A. Palange[3], Sachin G. Phiske[4]

[1]Student(IIIrd Yr.), Department of Electrical Engineering, J.D.I.E.T. yavatmal, Maharashtra, India,
ashwini70386@email.com
[2]Student(IIIrd Yr.), Department of Electrical Engineering, J.D.I.E.T. yavatmal, Maharashtra, India,
shraddhapatil081098@email.com
[3]Student(IIIrd Yr.), Department of Electrical Engineering, J.D.I.E.T. yavatmal, Maharashtra, India,
achalpalange@gmail.com
[4]Asst. Professor, Department of Electrical Engineering, J.D.I.E.T. yavatmal, Maharashtra, India,
sachin.phiske@gmail.com

Abstract

Power is the basic key for growth of any country's economy and development. The increased demand of electricity, need to optimizing the utilization of power generation capacity and have to increase in the interconnections are the major issues with which power sectors are dealing. Energy consumption per person is also increasing tremendously in developing countries. However, the installing of a new power plant cannot be a solution every time. The Dense population, availability of land, initial and installation cost can be the major issues in this case of power transmission. The large amount of transfer of power from generating plants to load centre at long distance with bulky transmission lines is effecting to upgrade voltage class from High Voltage (HV) to Extra High Voltage (EHV). There are indications that EHV network will grow or it may say develop at a very fast rate worldwide as compared to previous some decades. Increase in transmission distance with maximum possible reduction in the power loss with saving in the economic costs of transmission lines is the higher boost worldwide for moving from HV to EHV. Efforts regarding for this already initiated worldwide.

Index Terms: *EHV transmission line, Insulator, Engineering Development.*

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1. INTRODUCTION

The transmission system is very important for the development for any country. Now a day, we are using the high voltage or extra high voltage transmission system. Due to this, there are some issues pertaining to the development. So, the main aim or motive of the country is to develop a strong transmission system between generation complex or generating station and in bulky consumption centres. So, the bulky consumption centres may be the industries or the domestic or agricultural requirement.

Now the important components of the transmission line are

- Insulators
- Conductors
- Tower and foundations
- Earth wire
- Hardware fittings
- Accessories

Insulators are the important component of a transmission system. It performs duel function, first one is it supports the tower mechanically and second one is it electrically isolates the conductor from the tower. Insulators are of mainly 3 types. Initially for last 100 years we all have been using the ceramic or porcelain insulators, Europeans use glass insulators, then of recent origin polymer composite or silicon rubber insulators are being employed for the transmission network. The conductor is again a much more important component it transmits is the voltage from long distances hundreds of kilometers from generating to the transmission system. The various type of conductor is in existence. The third being the much more important component that is the towers, so without towers the conductor's insulators cannot be used. So, the tower is one of the important components of a UHV or EHV transmission systems. The foundation also is a very important aspect which has to be taken care for the natural calamities.

So, towers and foundations are also the important components of a transmission system. The earth wire which is connected to the top most portion of the tower in a EHV or UHV transmission tower. In case of lightning this has to protect the equipments like the insulators strings and further the substation components. So, the earth wire or ground wires place an important role particularly during the lightning striking to the long high voltage transmission systems. Hardware fittings are used for insulators to connect to the tower. The hardware fittings are being changed when it comes to the 765 KV, 800 KV voltage levels that is the UHV voltage levels.

2. INSULATOR

2.1 CERAMIC INSULATOR

For a ceramic insulator to completely come out from the raw material to the final stage it take around 21 to 24 days, whereas the polymer insulator is so quick it can be done in a matter of 5 to 6 hours. So, initially the raw materials which consist of the clay feldspar alumina etcetera are got, and they are grinded using the ball millings. And further this grinded material or the ball milling material is passed on for the sieving, where further of the sieving the material is kept in a suspension, where the water which is comprising of 1 part and 3 parts of the clay material which was used has to be removed. So, this further after the multi stock sieving is sent after the water removal is sent for the shaping of the insulator. Here the shaping of insulator takes place depending upon the die sets which are being used either for transmission or for hollow post insulator or for a long rod insulator. This shaping of the material is being done, dewatering is being done again finally, the material which is kept in suspension mode is send it for this is again demagnetization of sieving. Then it is in suspension dewatering then it goes to the shaping. So, after the shaping it comes back to the shaping machines where the insulators are with the help of a die set are manufactured either for disc or for the hollow type of insulator. Then further the insulators which have been made or dried, they are glazed depending upon the pigmentation on the colour requirement. These either hollow insulators or transmission insulators are glazed and further after the glazing this insulators are send for firing again the firing depends more than a 24 hours with the certain temperature. So, after the firing the sorting or a weeding out of the defectives are done. Finally, after the testing, the inspection physically inspection of the insulators is being done.

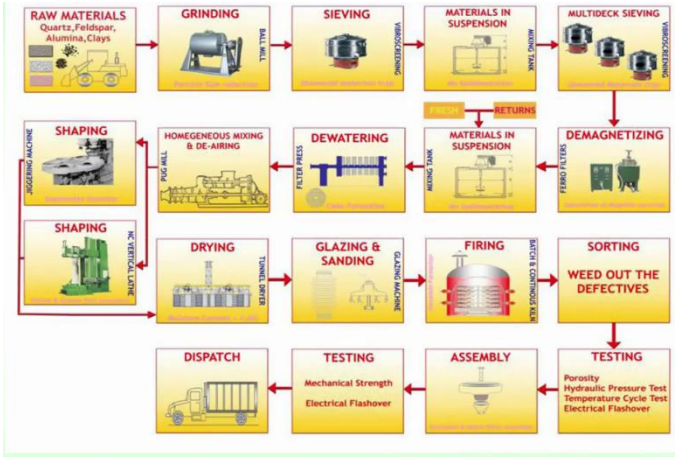

Fig.1 manufacturing process of ceramic insulator

2.2 POLYMER INSULATOR

The manufacturing process of a polymer is the recent advanced material polymer material, which is being used for the high voltage transmission system. Raw materials may be of silicon rubber basically silicon rubber is added with filler. Then you have raw materials the fibber glass rods which are used what the core of the material then you have metal and fittings on both side of the insulator these are the basically raw materials. Then the metal fitting is done at the end of both the fibber glass rod. So, proper crimping has to be carried out after the crimping to the metal and fittings on the fibber glass rod a primer is coated on the fibber glass rod. Further with the help of injection moulding machine suitably under compression and curing this polymer material with the proper die set is being manufactured. It is later cured, after the curing de flashing of the insulator is done.

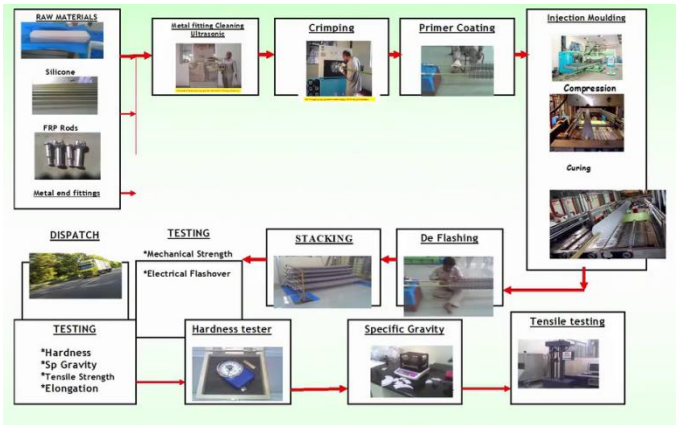

Fig.2 manufacturing process of polymer insulator

So, this is how the technology has improved and these are the recent insulators or of recent origin or organic in nature and are being used for the EHV and UHV transmission systems.

3 Challenges

Transmission lines travels hundreds of kilometers in difficult terrain, under varying and extreme environmental conditions – using variety of constructional equipment. The engineering challenges become much more difficult with higher voltages or extra high voltages as structures become very tall and heavy and complex also.

3.1 Generalized Issues

There are some issues while constructing transmission line occurred in the transmission system that is as follows –

- Minimization of right way
- Protection flora and fauna, wild life
- Creation of long distance high capacity transmission corridor to enable minimum cost per MW transfer as well as Optimal transmission losses
- Minimal impact on environment
- Strengthening of national grid

The right way is the minimum clearance t be maintained from the mid of the tower to either side. When the transmission System is being constructed and long distance transmission, we known that the transmission lines run over a long distance hundred of kilometers . So, it is likely to cross the forest were the flora and fauna are likely to be affected including the wild life. Protection of Flora and fauna and also because of transmission system, high voltage transmission system the impact to the environment should be minimal. This are requirements where utility or the government when they are going in for a long distance transmission have to be there in mind. Further strengthening of the national grid, this will be very helpful to control the entire grid through a single point system.

4 Efforts to mitigate the problems

The basic proof justifying the Corona Problems, Audible Noise, Radio Interference, Corona Energy Loss, Carrier Interference, and TV Interference in power transmission is explained in "Corona Effects on EHV AC Transmission lines". When corona is present on the conductors, EHV lines generate audible noise, which is especially high during foul weather.

5 World scenarios

American Electric Power started its transmitting power at a nominal voltage of 765kV and the maximum voltage of 800kV in 1969. Since then, 765kV transmission lines of nominal voltage have been introduced in other areas such as New York (by NYPA), Brazil, Venezuela, and South Africa. In Eastern Europe, Poland and Hungary started to operate of 750kV transmission lines of nominal voltage in the 1970s in order to receive power from the former Union. Recently, China and India also developed 765 kV and 1,000 kV transmission lines.

Country	Enhance voltage(kV)	Year	Transmission Distance (km)
USA	345-765	1969	300
Russia	750-1150	1985	2000
Japan	500-1000	2000	250
Canada	315-735	1965	900
India	400-765	2000	440
South Africa	400-765	1988	440
Poland	400-765	1986	114
China	500-750-1000	2009	640

6. Indian scenario

India is presently placed at a junction of the globalised and liberalized economy, which provides a great opportunity to exploit its potential, and lead to sustained economy growth and welfare of its populace. Present transmission network in India is 765kV lines existing 8,056 Km, 400kV lines existing 1,25,039 Km and 220kV lines existing 144,966 Km. The major goal for India towards self reliance is UHV AC transmission systems. It having introduced 765kV as the higher one transmission voltage as compaired to other, the country is aspiring and try to shift to 1200 kV (voltage) transmission networks during the XIIth plan period. A large network comprising 1200 kV transmission superhighways line is being planned as part of the National Transmission Network.

7. General safety precautions

- **Don't light fires**
  Do not light fires under or near lines without first discussing it with transpower or our network company.

- **Don’t attach something to a transmission structure**

  Do not connect metallic objects like fence wires or clothes lines to tower or poles.
- **Don’t plan earthworks, landscaping, or planting close to lines**

Do not build, excavate, dump or stockpile fill or plant trees close to a transmission line.

8. CONCLUSION

This is to review the efforts going on worldwide to meet the heavy electric power demands with minimum losses. Need, advantages and technical problems in implementing EHV technology, efforts to overcome that problem are mentioned and studied. Comparative considered the EHV transmission lines used in different countries and a comparison between them and with the low voltage levels have been performed. According to this, the advantages of EHV transmission lines are summarized. Finally, different research areas are identified.

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REFERENCES

[1]. Snigdha Sharma ,“CORONA EFFECTS ON EHV AC TRANSMISSION LINES” , IJSRET, volume 1 , PP 160-164, August 2012.

[2]. C.L. Wadhwa: Electrical power system, fifth edition. PP 632-644.

[3]. F.W. Peek(1929).Dielectrcal phenomena in high voltage engineering, McGraw-Hill. Pp 213-215.