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COUNTRY : JAPAN PREF. SUBJECT :PS2
REGISTRATION NUMBER : 7302 QUESTION N° : 2.3

B2_PS2_Q2.3_Y.Okawa

Question 2.3: Introduce briefly the under-coating location, reason, advantage. Based on the field experience. Which type of insulators are the future based on cost-benefit analysation in different environment?

Contribution for Q2.3 :

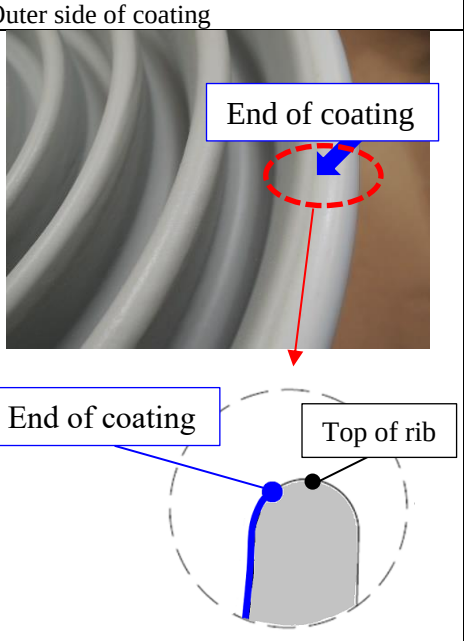
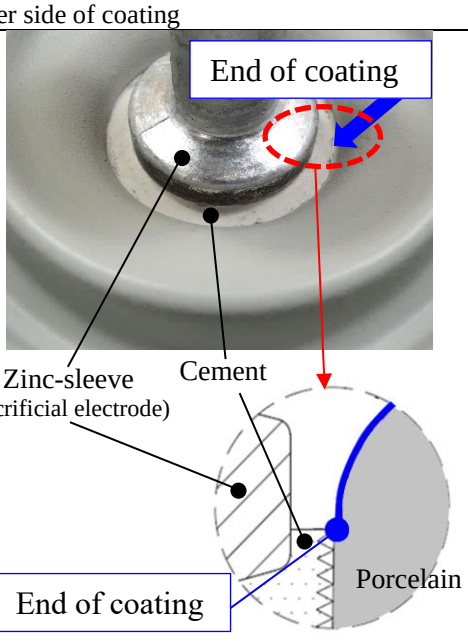
Advantage and performance of RTV silicone rubber under-coating ceramic insulator

In Japan, Installation of room temperature vulcanizing (RTV) silicone rubber coating ceramic insulators has been increasing for the purpose of preventing from flashover or corona discharge under polluted and wetted condition. Pre-coating at the factory is much more common than on-site coating due to customer preference for high quality. Recently, under-coating are mainly used for easy packing and handling.

In this time, typical specification of RTV under-coating insulators in Japan, and coating location, reason, and advantage of under coating will be described. And also withstand voltage performance and corona prevention performance of under-coating will be described.

Typical specification of RTV under-coating insulators in Japan, reason why determining ends of coating and these advantages are shown in Table 1. In over 20 years of field experience with these coating specifications, no major problem due to packaging or shipping have been reported and they still have been used without any problem. Pre-coating would be the best solution for under-coating application to achieve high quality coating because it is easy to control the coating process (e.g. keeping clean surface, masking for uncoated area, automatic coating, drying).

Table 1 Typical specification RTV under-coating insulators in Japan

	Outer side of coating	Inner side of coating
Coating location	 Slightly inside the top of the outermost rib	 Boundary between cement and porcelain
Reason	To avoid contact with packing material	There are concerns about effect to the performance and functions of disc insulators due to coating on cement and/or zinc-sleeve pin.
Advantage	- Prevent from coating damage during packaging and transportation. - Easy packing (cost)	No concern about negative effect to the performance and functions of disc insulators because of no coating on cement and/or zinc-sleeve pin.

Next, performance evaluation results of RTV under-coating insulators based on these coating specifications will be described.

Figure 1 shows the result of artificial pollution test with sample of U160BS in IEC 60305 :2021 having different coating area with non-coating, under-coating and whole-coating. Two patterns of pollution conditions were applied: No.1, simulating a coastal area, and No.2, simulating the inside of a tunnel. Pollution withstand voltages were obtained by repeated flashover method[1]. Tests were conducted after approximate 7 days from contamination considering hydrophobicity recovery. As a result, withstand voltage of under-coating is improved by approx. 75% compared to non-coating. It was confirmed that the improvement of withstand voltage is almost proportional to the leakage distance of the RTV coating area under both pollution conditions. Under-coating was found to be effective in improving pollution withstand voltage due to the long leakage distance ratio in the total.

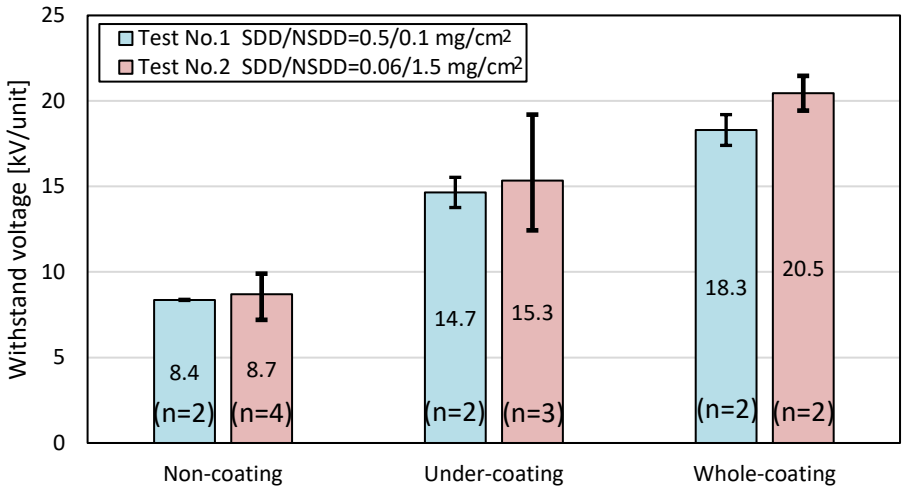
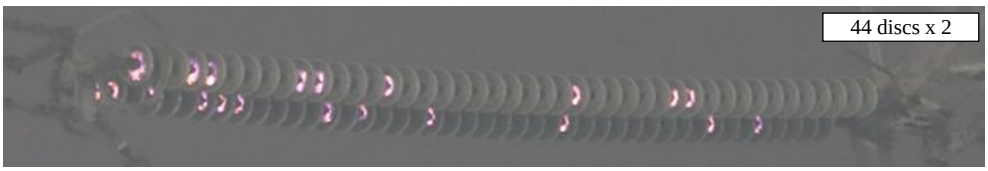


Fig.1 Test results of artificial pollution test of RTV coating insulators

RTV coating insulator have been applied for countermeasure for corona discharge under contaminated and wetted conditions in Japan. Corona prevention performance of RTV under-coating insulators have been evaluated with a full-scale 500kV tension equipment for the laboratory test, as a results effective performance have been confirmed. In addition, RTV under-coating insulator were installed on actual 500kV transmission line located about 480m from the sea coast and showed good corona prevention performance that no corona was observed by visually inspection. Figure 2 shows the example of corona discharge with and without RTV coating insulator strings in actual line when the discharge without RTV coating one was relatively active[2].



(a) String of non-coating insulators

(b) String of RTV under-coating insulators

Fig.2 Visual inspection results of discharge activity on 500kV transmission line
(Average temperature; 28.3℃, Average humidity; 88%)

[1] K. Naito, S. Kunieda, Y. Hasegawa and S. Ito “DC Pollution Performance of Station Insulators”, IEEE Transactions on Electrical Insulation Vo.23 No.6, December 1988.
[2] M.Takagi, H.Sakai, M.Maeda, K.Kondo “ The suppressing effect of corona discharge with RTV silicone rubber coated insulators under polluted conditions” CIGRE AORC Technical meeting 2020 No.C000064, 2020.