NAME: Teruhisa TATSUOKA
COUNTRY: JAPAN
REGISTRATION NUMBER: 07743

Q2.12 comes from the Paper B2-10633 which present the necessary re-painting of steel towers requires understanding of where to focus efforts for corrosion mitigation. An extensive corrosion rate monitoring program was developed at TEPCO to identify focus areas, corrosion rates and to allocate resources as needed for life extension of towers as shown in Fig. 1.

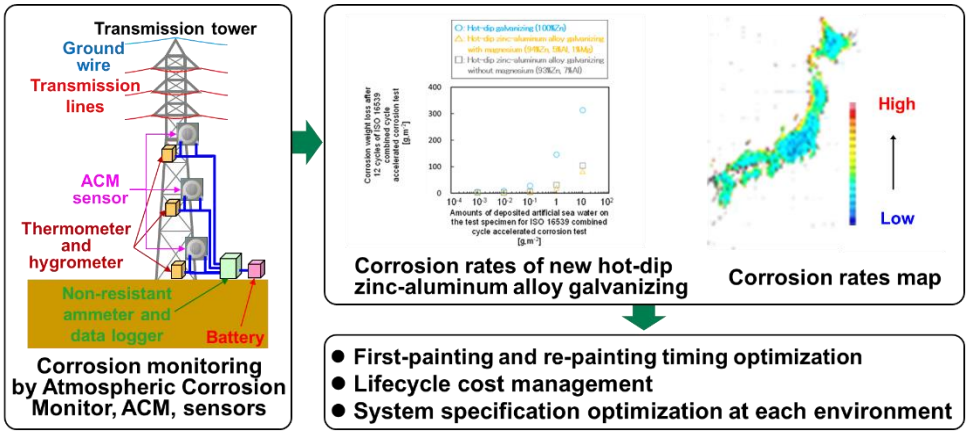

Fig. 1 Corrosion control and cost management.

Question 2.12 (1): What is the cost savings using such as decision support system?

Answer 2.12 (1): Cost saving by environmental risk maps

Environmental risk maps make us decide the postponement of the first painting for galvanized steel towers in milder corrosive environments and delivers around 8 million euros maintenance cost reduction.

Corrosion rate map and paint life expectation deliver the life-cycle cost comparison with different surface treatment type of transmission towers and specification design at each environment.

Zinc-aluminum alloy galvanizing can reduce cost in severe corrosion environments as shown in Fig. 2.

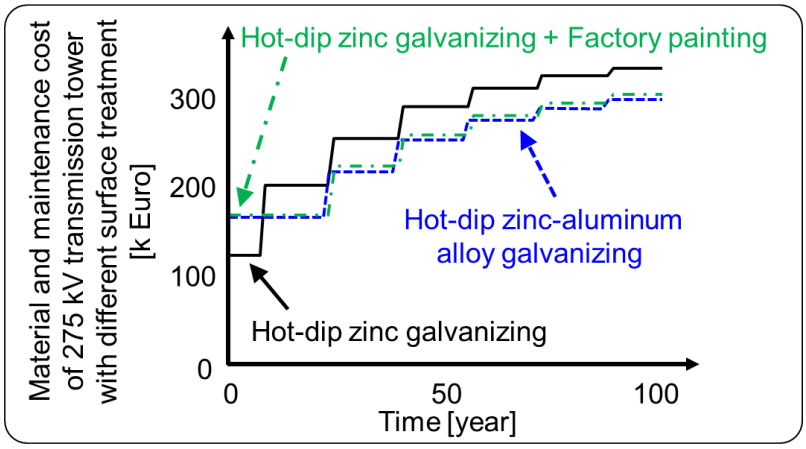

Fig. 2 Lifecycle cost comparison at severe and mild environment.

Question 2.12 (2): Has TEPCO or other utility considered cathodic protection of towers instead of coatings?

Answer 2.12 (2): Application of cathodic protection technology

a) No. TEPCO doesn't use cathodic protection system for transmission towers.
b) Because the cathodic current flows through thin water film layer on the coated steel in atmosphere is quite lower than that through in water, wet concrete and wet soil, cathodic current cannot reach to the wide area as shown in Fig. 3.
c) Cathodic protection systems have been applied to coated steel of bridge and reinforced concrete and are quite costly. Moreover, their lives are around 15 years because of conductive paint degradation and power supply unit failure.
d)

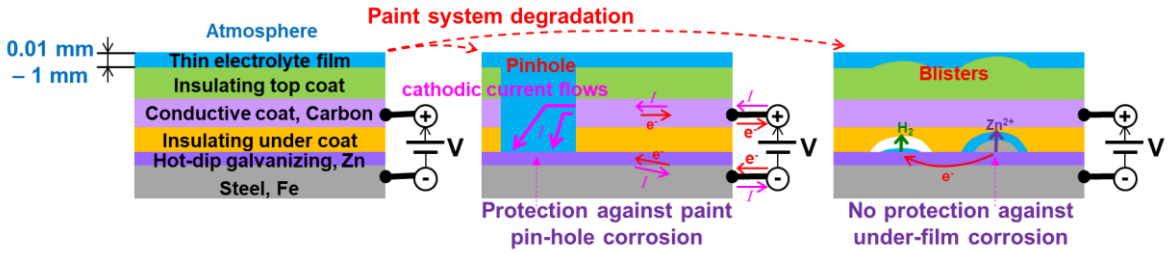

Fig. 3 Cathodic protection for paint system.

Q 2.12 (3): What is the expected life of the towers after the corrosion mitigation system is implemented?

Answer 2.12 (3): Maintenance interval optimization by precise life expectation

Tower inspection had been conducted constantly before. After the development of corrosion rate map, only one time precise inspection was conducted just before hot-dip galvanizing life which depends on the environment to decide first painting timing. Appropriate timing of inspection and first painting timing can reduce cost, labor and time as shown in Fig. 4.

The paint system life had been around 20 years according to the top coat thinning. However, the paint degradation mitigation revealed that the paint system life caused by under-film corrosion was over 40 years. Re-painting timing postponement could reduce maintenance cost.

When the corrosion environment is mild, zinc corrosion rate and under-film corrosion rate are very low and maintenance and inspection timing can be postponed.,

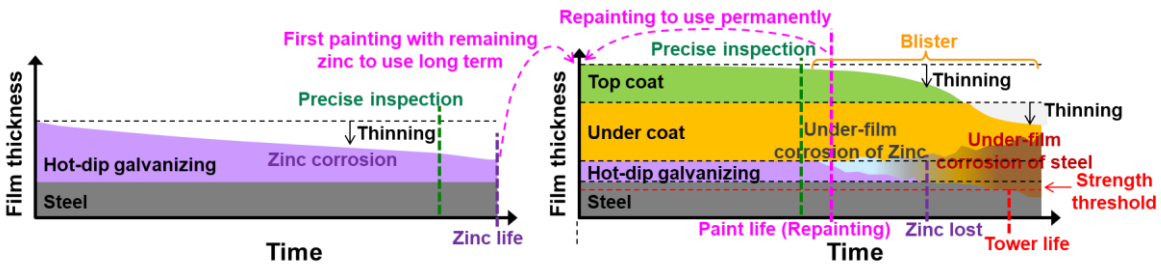

Fig. 4 Tower life and appropriate maintenance.

Conclusion

a) Environment risk maps such as corrosion rate map, deposition map and time of wetness map, paint degradation rate map, etc. delivered the improvement of maintenance method and the optimization maintenance interval.
b) Inspection timing, first-painting and re-painting timings could be optimized by precise life expectation.
c) Precise life-cycle cost comparison for each hot-dip galvanizing type installed in each environment could be done by corrosion rate map and paint degradation rate map.
d) It is tough work to apply the cathodic protection technology for transmission tower because of unreached cathodic current to wide area, conductive paint degradation, and power supply unit failure.