SoongSil Univ. Power System Lab.

Study Committee SC B3

Substations and Electrical Installations

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Economic Maintenance Planning of Power Transformer for Expected Cost

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Motivation

- For power transformers, maintenance decisions are made through diagnosis.
- A power transformer is composed of various sub-system and some of which do not apply diagnostics.
- A maintenance decision-making method of sub-systems to which diagnosis are not applied is required.

Reliability Model of Power Transformer

- In this study, the reliability model of power transformer using Weibull distribution was applied.
- Figure 1 shows the results of weibull analysis of the failure and maintenance data of power transformers from 1982 to 2012.

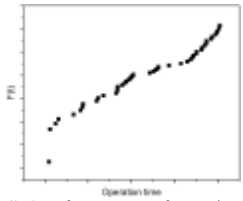

Fig 1. Weibull plot of power transformer(1982~2012)

- Power transformer consists of sub-systems as shown in figure 2.

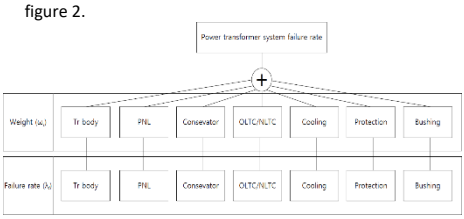

Fig 2. Sub-system relation ship diagram of power transformer

- Each subsystem requires individual management through failure rate evaluation.
- Figure 3 illustrates the weights for each sub-system.
- Figure 4 shows the weights of Figure 3 and the curves of the reliability evaluated by Figure 1.

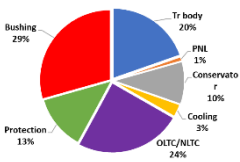

Fig 3. Weight of sub-system

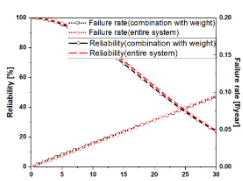

Fig 4. Reliability of power transformer

Economic Maintenance Planning

- Figure 5 shows an example of each cost for the frequency of maintenance over the target operating time.

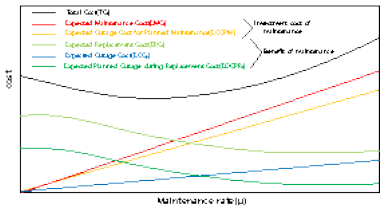

Fig 5. Example of total cost curve according to maintenance rate

- Investment cost of maintenance: Costs incurred as maintenance frequency increases.
- Benefit of Maintenance: Reduced costs due to increased lifespan as maintenance frequency increases.

Case Study

: Comparison of the entire system maintenance and individual maintenance application of subsystems.

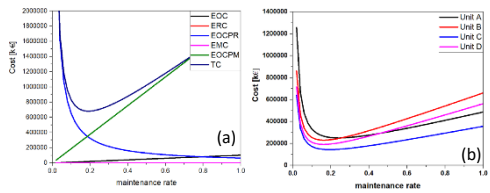

Figure 6. TC curve (a): entire system, (b): maintenance unit

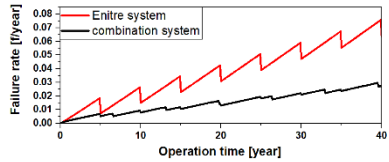

Figure 7. Failure rate by maintenance plan of power transformer

Conclusion

- In this paper, economical maintenance planning method for power transformers has proposed.
- In case study, the power transformer was divided into sub-systems and individual maintenances were performed.
- Individual maintenance plans are more reliable.
- Proposed maintenance planning can be applied to sub-systems of power transformers that are not covered by diagnosis.