

Study Committee A3

Transmission and Distribution Equipment

Paper 10644_2022

Recent digitization of GIS and sophistication of equipment condition monitoring and diagnosis applying AI technologies

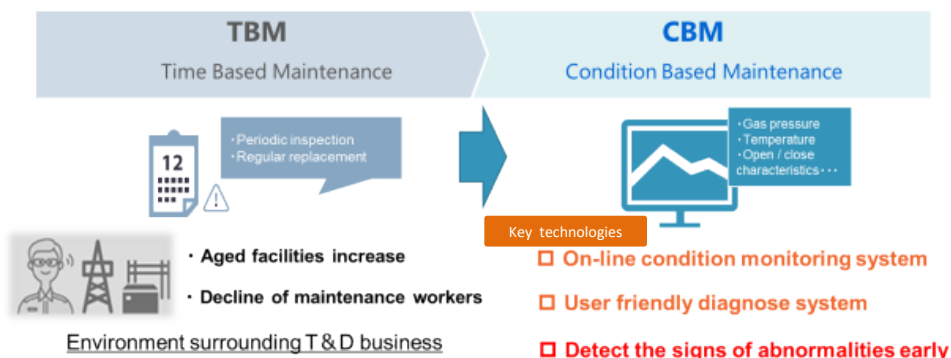
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1. Motivation

Acceleration of shift to CBM for saving labor in maintenance work

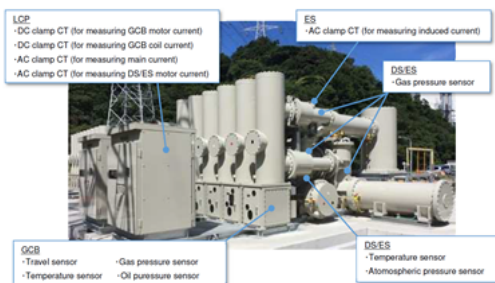


2. Approach

1) Digitization of GIS

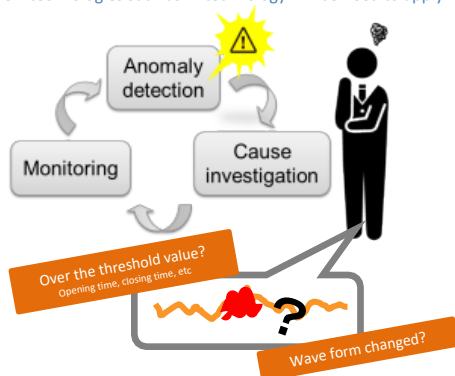
Application for diagnosis of equipment condition by multiple sensors sensing mounted on GIS have already started.

monitoring & diagnose application for GIS in TEPCO PG, since 2021



2) Sophistication of the equipment diagnosis

To achieve more sensitive and early abnormalities detection, new technologies such as AI technology will be need to apply.



3. Objects of investigation

Recent and further of GIS equipment diagnosis technologies

Recent

- User friendly indication of GIS condition
- Accurately diagnose the GIS condition by multiple sensors with different sensing items

Further

- More early and reliable detection of GIS abnormalities ~ possibility of applying AI technologies ~

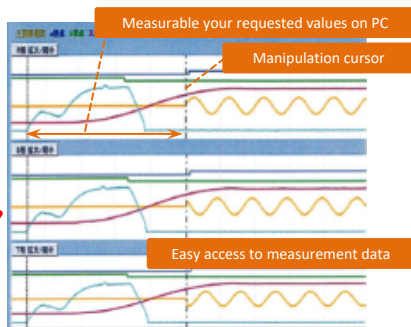
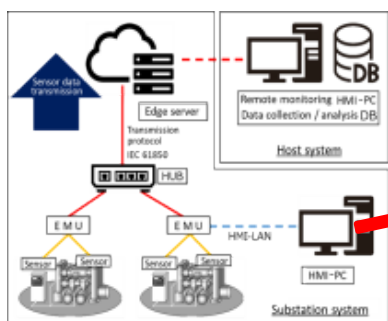
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4. Recent topics for equipment condition monitoring and diagnosis

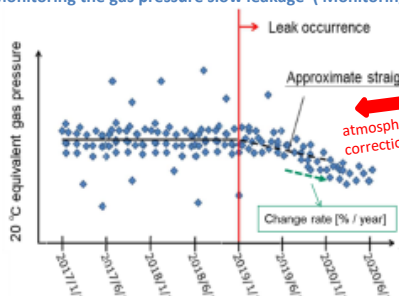
1) User friendly indication of GIS condition



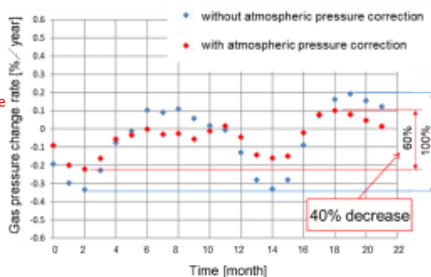
Sample of HMI-PC display

2) Diagnose the GIS condition by multiple sensors with different sensing items

a) Monitoring the gas pressure slow leakage (Monitoring: gas pressure & atmospheric pressure)

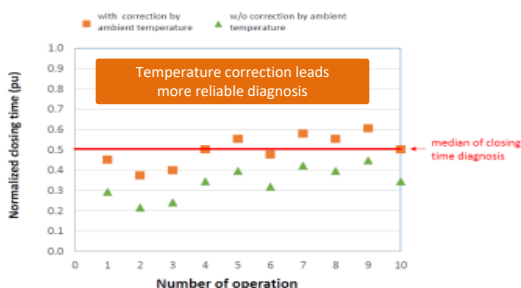


Slow gas leakage judgement



Comparison of gas pressure change with or w/o atmospheric pressure correction

b) Closing time of circuit breaker (Monitoring: closing time & temperature)



Comparison of closing time with or w/o ambient temperature correction

Discussion #1

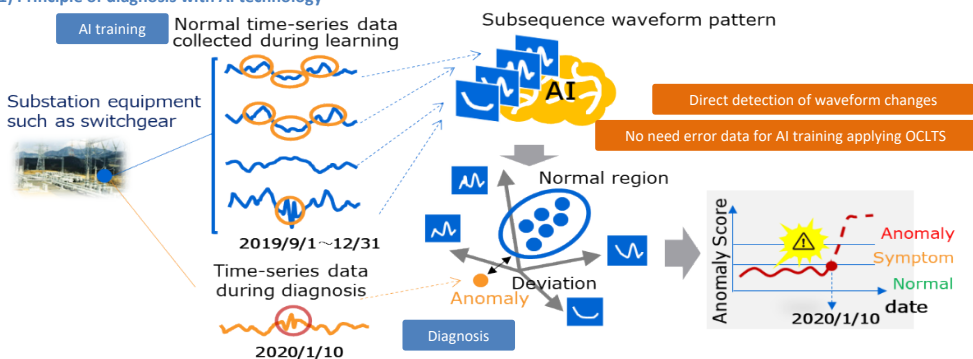
- User friendly indications
- Useful for determination appropriate real equipment maintenance timing
- To improve the reliability of equipment diagnosis
- The key is diagnosis based on evaluation or correction using results of monitoring with multiple sensing items



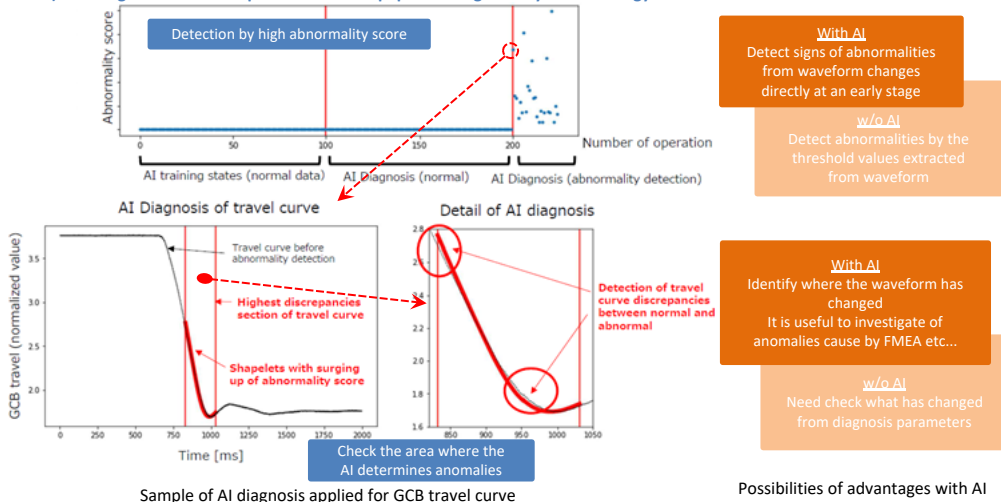
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5. Further sophistication on equipments diagnosis with AI technologies

1) Principle of diagnosis with AI technology



2) Challenges for further sophistication on equipment diagnosis by AI technology



Possibilities of advantages with AI

Discussion #2

- Possibility of future sophistication on equipment diagnosis by AI technology
We have confirmed the possibilities and advantages using AI technology which lead to more sophisticated diagnosis
- Future challenges for equipment diagnosis using AI technology
For examples; - Optimizing the number of training sessions by AI - How to evaluate and using AI diagnosis results

6. Conclusion

- It is necessary to diagnose the equipment condition comprehensively by monitoring results from multiple sensors with different sensing items
- The application of AI technology to equipment condition diagnosis has the potential to detect signs of abnormality at an early stage, which cannot be detected by parameter-based characteristic value management diagnosis