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cigre
For power system expertise

DETECTION OF OPERATION TIMING FOR GAS CIRCUIT BREAKER BY ACCELERATION SENSOR THAT CAN ELIMINATE WORK AT HIGH PLACES

SC A3

PS3 / Q4

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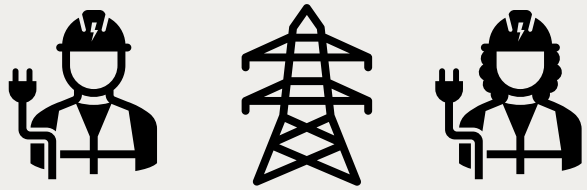
Inspire the Next

Detection of Operation Timing for GCB by Acceleration Sensor

Q4: The use of digital devices to enhance worker safety are shown in the reports 10105, 11133 and 10441. Can utilities show other examples where digitalization is being used to enhance worker safety?

Answer

To determine the operation timing of Gas circuit breaker (GCB) at site by using the acceleration sensors, workers' safety can be enhanced by eliminating work at high places.



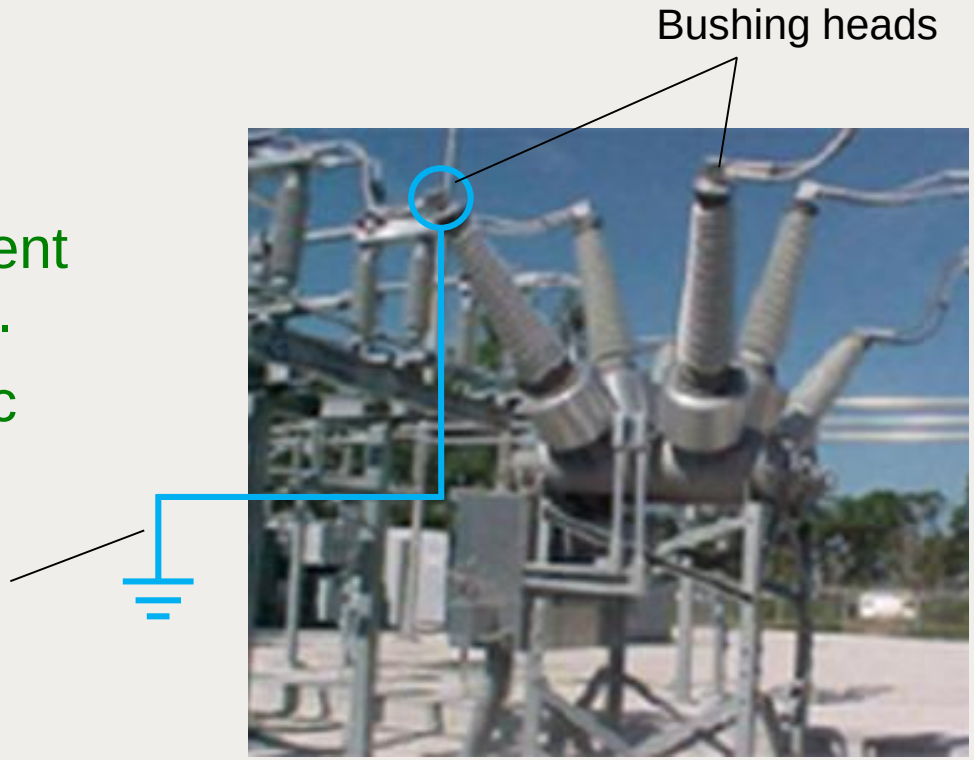
Detection of Operation Timing for GCB by Acceleration Sensor

Preface

For maintenance and inspection of GCB, it is common practice at site to test the opening and closing characteristics of GCB operations and then compare results with previous characteristics.

Operation test of GCB at site

- ✓It is necessary to connect the measurement wiring to the bushing heads at high place.
- ✓Take various measures to prevent electric shock.



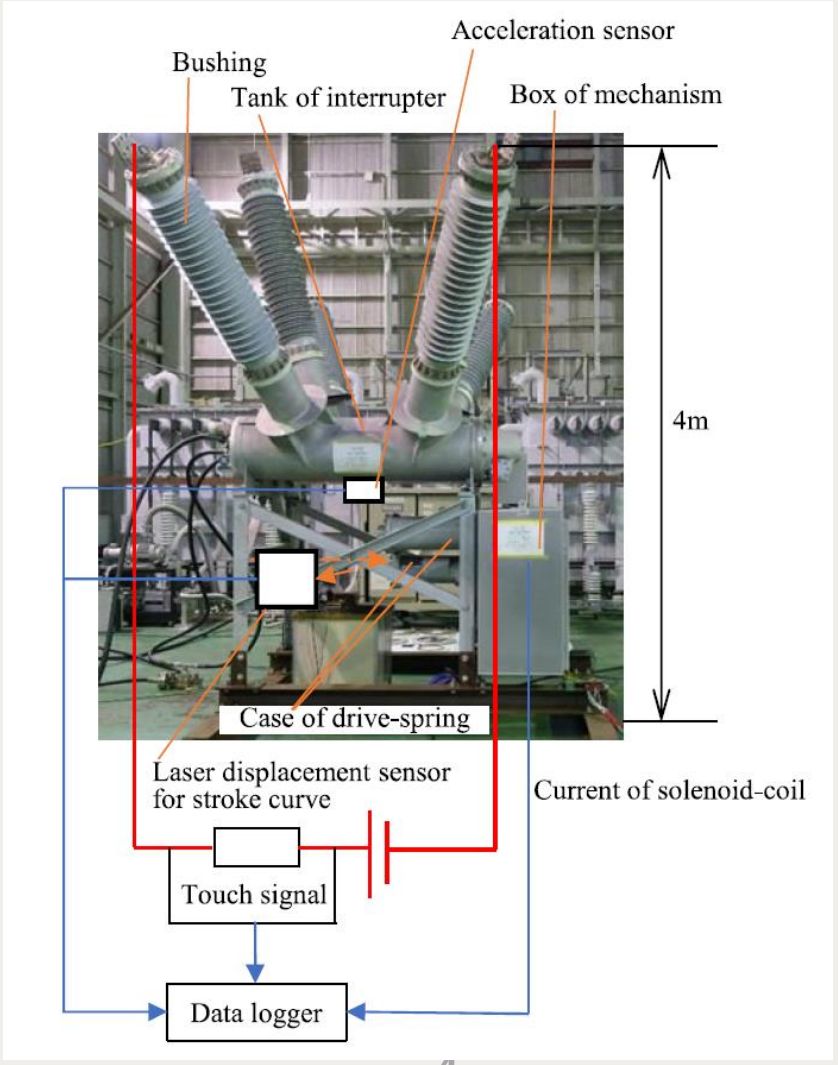
Detection of Operation Timing for GCB by Acceleration Sensor

Acceleration sensor measurement

In this study, acceleration sensor is installed onto 145kV GCB tank and detect the operation timing.

- Stroke start point
- Main contact closing point
- Stroke stop point

Solenoid-coil current, stroke curve, and touch signal as true value are measured and compared with acceleration sensor measurement.



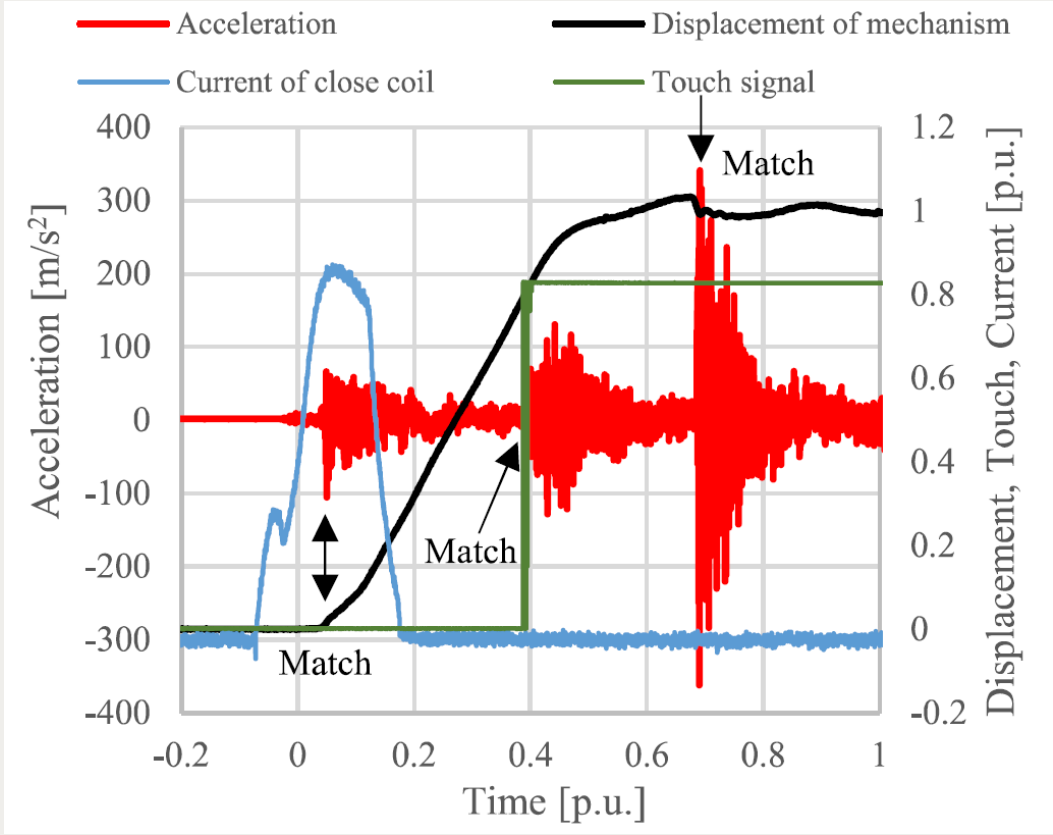
Detection of Operation Timing for GCB by Acceleration Sensor

Measurement results of closing operation

Three events of steep rise in acceleration are observed.

- ✓First rise matches moment of stroke start
- ✓Second rise matches moment of main contact closing
- ✓Third rise matches moment of stroke stop

Detection of main contact closing point almost matches the timing of second steep rise in acceleration.



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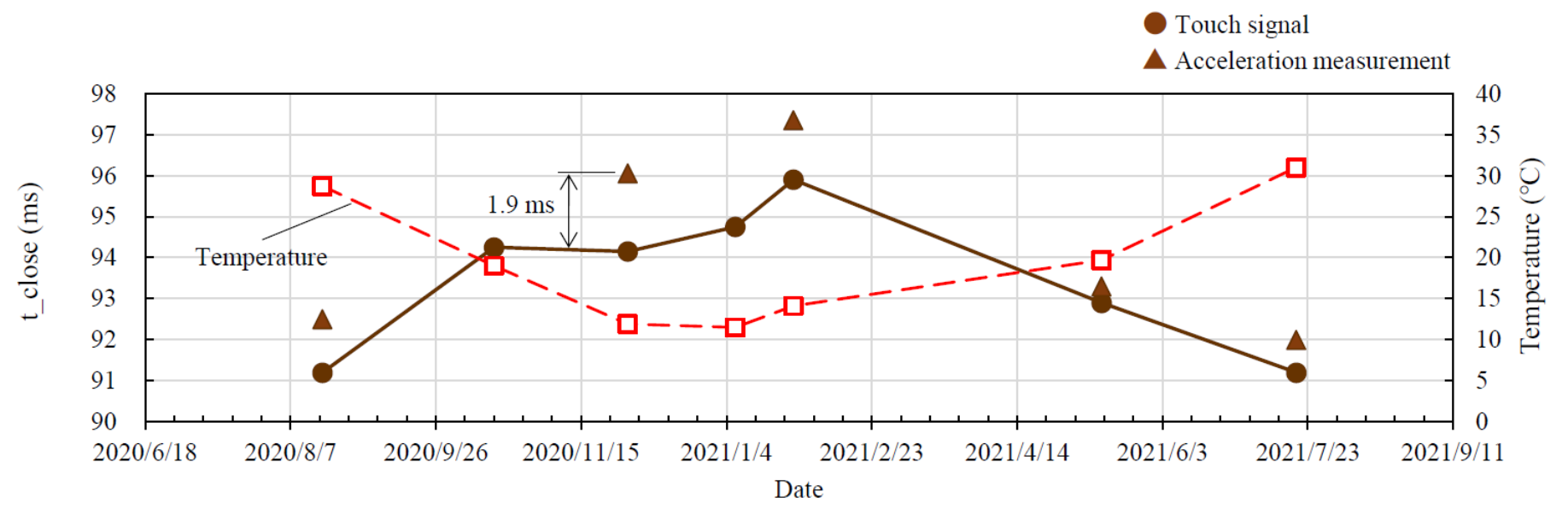
Measurement results of closing time of seasonal temperature change

Change of closing time obtained by touch signal, which is faster in summer and slower in winter, could be detected by acceleration sensor as well.



✓Maximum detection error of closing time is 1.9 ms.

✓**It is possible to easily determine closing time of existing GCB at site by using acceleration sensor.**

Detection of Operation Timing for GCB by Acceleration Sensor

Conclusion

According to this method;

- ✓It is possible to easily determine the closing time.
- ✓Acceleration sensor can be instead of taking touch signal.

  (Read time from moment of closing command to second steep rise in acceleration)
- ✓Eliminate high-place work, such as connecting touch signal lines to the bushing heads at site.
- ✓In on-site work, workers' safety can be enhanced.