

Study Committee A1

Title of Study Committee PS2

Paper ID_10125

Construction of the Partial Discharge Measurement History According to IEC 60034-27-2

Paulo Vilhena, Fernando Brasil

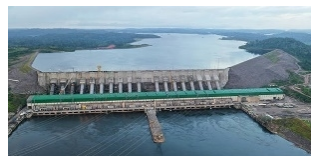
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Motivation

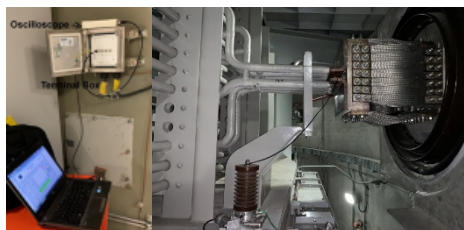
- Behavior evaluation of partial discharges in new generator;
- since the first generator excitation, generator unit operating range test, heating test, PD measurement after commercial operation;
- PD trend curve for maintenance predictive.

Belo Monte HPP

- For this, the tests were carried out on the commissioning of a generator with Francis turbine and nominal power equal to 611.1 MW of Belo Monte Hydroelectric Power Plant (HPP).



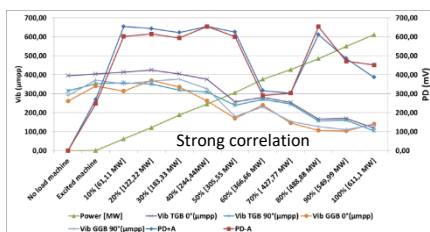
Experimental setup



- Measurement system and 1000 pF capacitive couplers

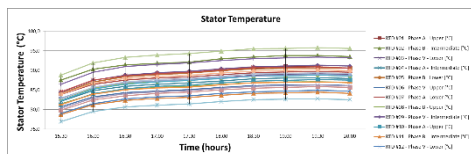
Operating Curve Test

- PD A (mV) vs Relative Vib TGB and Vib GGB (μm).

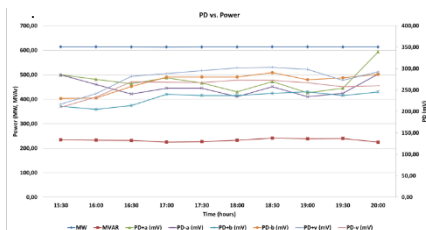


Generator Heating test

- In the heating test of the generator 100% of the load, the temperature of the stator and the bearings stabilized after 4.5 hours;
- Concerning PDs, the amplitude levels remained constant, between 200 and 300 mV, during the test for a rated active power ($P = 611\text{MW}$) and $\text{pf} = 0.9$.



Generator Heating test



Study Committee A1

Title of Study Committee PS2

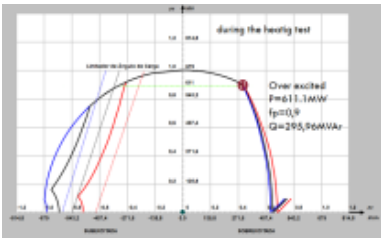
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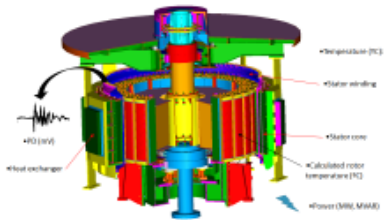
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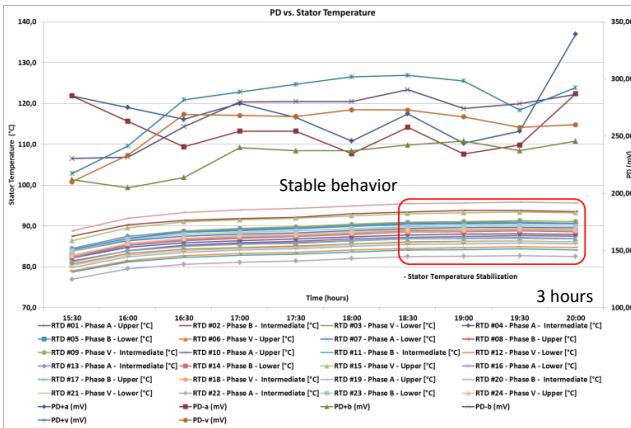
Capability Curve



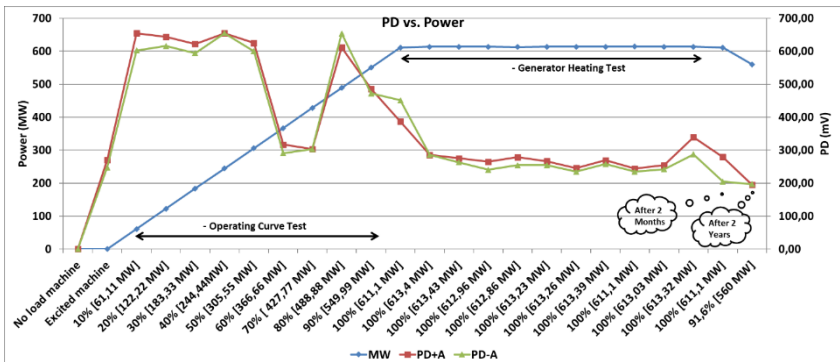
Parameters Available in Generator Heating Test



PD (mV) vs Stator Temperature (°C)



Partial Discharge Measurement over Time



- PD trend curve for maintenance predictive.

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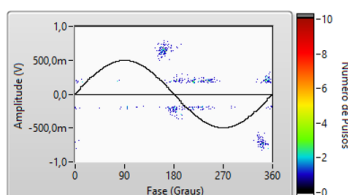
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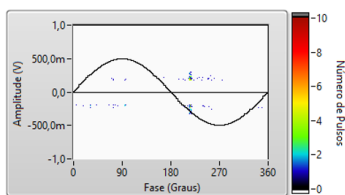
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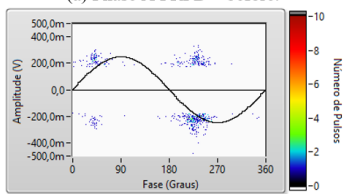
PRPD – Commercial Operation



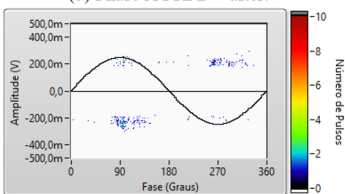
(a) Phase A PRPD – before.



(b) Phase A PRPD – after.



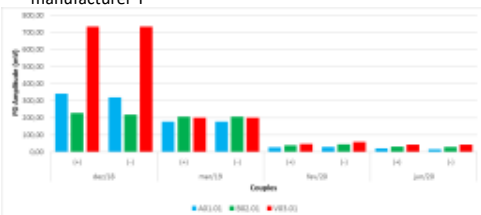
(a) Phase B PRPD – before.



(b) Phase B PRPD – after.

PD Amplitude (mV) Over Time

- manufacturer Y

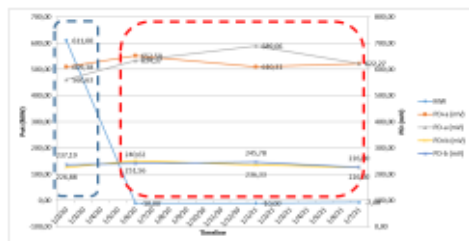


Conclusion

- For predictive maintenance, these measurements will be part of the PD measurement history, they will be the fingerprint of this unit and for this monitoring variable where no significant variation in the PD trend curve was observed.
- These measurements were made under specific operating conditions and, after the stator curing process, these levels decreased until they stabilize with the machine operating close to the rated power.

Operating

- manufacturer Z, unit operating as generator and synchronous compensator



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Thank you for your attention!