

DESIGN ISSUES IN GENERATOR BUS DUCT CT MOUNTING SYSTEM

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Introduction:

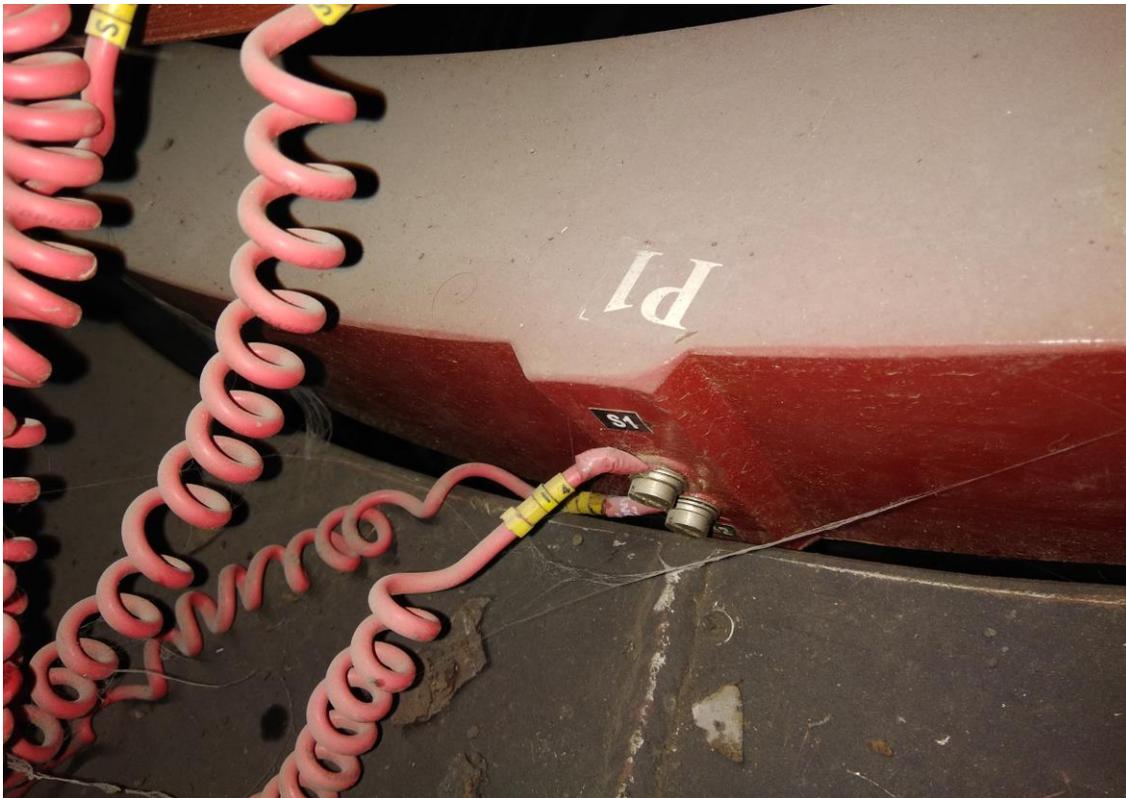
NTPC Mouda Stage#2 units are having 24KV rated Generator bus-duct for connection from 660MW generator to Generator transformers (3*260MVA) of M/s BHEL Rudrapur make. This unit#3 is in commercial operation since January 2017. For protection and metering of Generator, Current transformers (CTs) are mounted inside the vertical section the generator bus-ducts. Total 27no Cts (9no in each phase) have been mounted in bus-ducts.

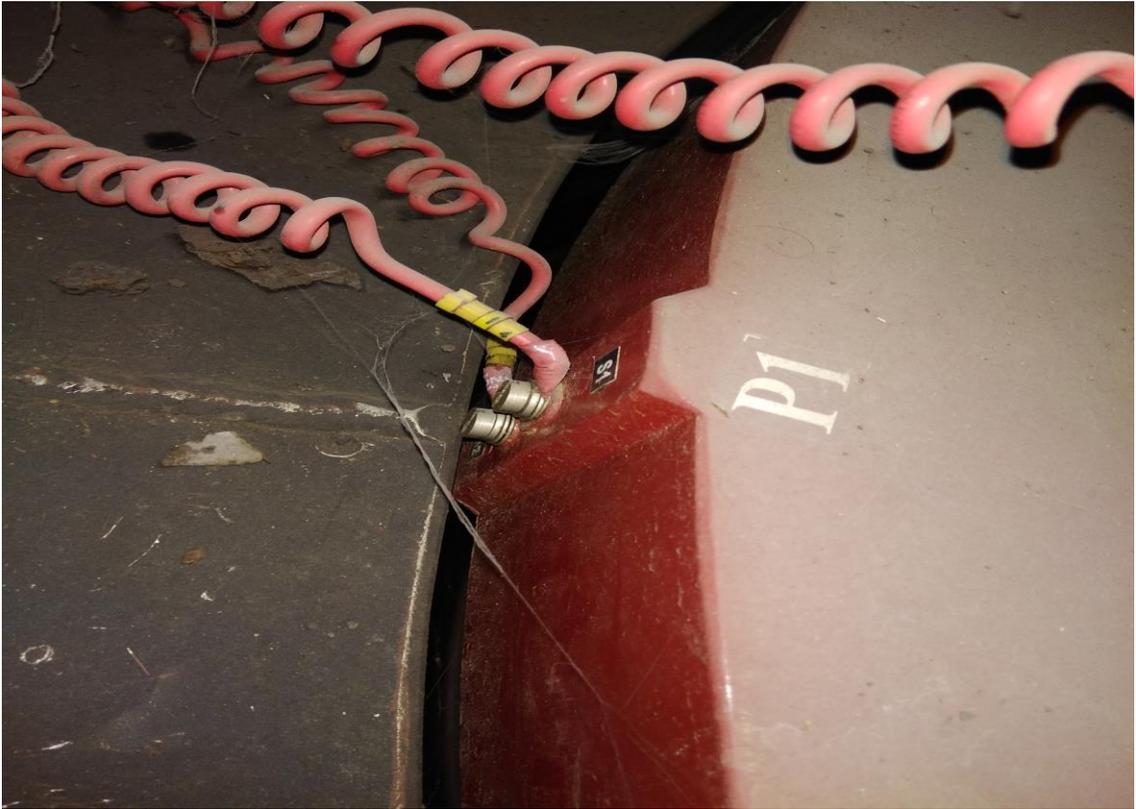
Failure Incident:

- 1)Unit#3 tripped on generator differential protection on 21/3/2017.
- 2) Generator differential protection at GRP in NTPC Mouda unit is realised in two redundant protection relays of different makes(ABB and Siemens) through different Cts.
- 3) ABB relay is using CT core-E&F and Siemens relay is using core-B&I for detection of differential.
- 4) Generator differential R phase was detected only in Siemens protection relay of generator.

Observation:

1. The ABB protection relay for generator differential using different CT has not detected the fault.
2. Disturbance Records(DR) were checked in all the protection relays and no abnormality was observed in the system parameters. It was identified from DR that R phase of core-I CT is suspected to be faulty. After thorough inspection & testing of CT circuit, it was found that the fault is in R phase core-I secondary wire which were showing shorted with bus duct enclosure.
3. After opening of Generator bus duct cover, it was found that many of the CTs are dislocated from their mounting positions and R phase CT of the phase side was found touching the metallic structure of bus duct causing the protection relay to operate. The CT got detached from the support and dislocated from normal position.
4. In Unit#3: The epoxy mounting neck in three CTs found damaged and in another three CTs cracks observed in epoxy mounting area.







Analysis:

1. It was observed CT mounting bolts with Busduct enclosure were of longer length. Apparently after getting in to service they were not able to sustain the large weight of protection CTs under magnetic forces and resulting stresses on CT epoxy mold leads to breaking of epoxy material of CT.
2. Also the CT secondary terminals were not insulated/protected for this incident.
3. After discussion with OEM it was concluded that the failure is due to the larger and unequal spacing between CT and bus duct enclosure.



Rectifications at site:

1. Replacement of existing long length adaptor with additional aluminum (nonmagnetic) bracket support and short length adaptor. An additional locking nut was also provided for additional support.
2. Damaged six number CTs have been replaced with new CTs. Mounting of the CTs were done after proper centering and then they were mounted on specially fabricated C type brackets as shown in the picture.
3. CT secondary terminals were protected by providing insulation to avoid similar occurrence.



Conclusion:

After carrying out above rectifications, the mounting arrangements were checked twice till date and nothing abnormal was observed. As some dislocations of CTs were also observed in unit#4, hence same modification has been done in unit#4 also.

The purpose of the paper is to highlight the deficiencies in design and erection of this critical electrical component of generating units. Such deficiencies can lead to major outage and damage to generating units. This may lead to considerable commercial losses to utilities. Generator bus duct CTs being critical components, designer should consider the weight, dimensions and insulation of components, in coordination with CT and bus duct manufacturer.