SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 19EE605 PROTECTION AND SWITCHGEAR

III YEAR /VI SEMESTER

Unit 3 APPARATUS PROTECTION

Topic: Protection of Alternator

- The generating units, especially the larger ones, are relatively few in number and higher in individual cost than most other equipments.
- Therefore, it is desirable and necessary to provide protection to cover the wide range of faults which may occur in the modern generating plant.
- Some of the important faults which may occur on an alternator are :

  (*i*) failure of prime-mover

  (*ii*) failure of field

  (*iii*) overcurrent

  (*iv*) overspeed

  (*v*) overvoltage

  (*vi*) unbalanced loading

  (*vii*) stator winding faults

(*i*) Failure of prime-mover.

- When input to the prime-mover fails, the alternator runs as a synchronous motor and draws some current from the supply system.
- This motoring conditions is known as “inverted running”.

(*ii*) Failure of field.

- The chances of field failure of alternators are undoubtedly very rare.
- Even if it does occur, no immediate damage will be caused by permitting the alternator to run without a field for a short-period.
- It is sufficient to rely on the control room attendant to disconnect the faulty alternator manually from the system bus-bars.
- Therefore, it is a universal practice not to provide †automatic protection against this contingency.

(*iii*) Overcurrent.

- It occurs mainly due to partial breakdown of winding insulation or due to overload on the supply system.
- Overcurrent protection for alternators is considered unnecessary

(*iv*) Overspeed.

- The chief cause of overspeed is the sudden loss of all or the major part of load on the alternator.
- Modern alternators are usually provided with mechanical centrifugal devices mounted on their driving shafts to trip the main valve of the prime-mover when a dangerous overspeed occurs.

(*v*) Over-voltage.

- The field excitation system of modern alternators is so designed that overvoltage conditions at normal running speeds cannot occur.
- However, overvoltage in an alternator occurs when speed of the prime-mover increases due to sudden loss of the alternator load.
- In case of steam-turbine driven alternators, the control governors are very sensitive to speed variations.
- They exercise a continuous check on overspeed and thus prevent the occurrence of overvoltage on the generating unit.
- Therefore, over-voltage protection is not provided on turbo-alternator sets.

(*vi*) Unbalanced loading.

- Unbalanced loading means that there are different phase currents in the alternator.
- Unbalanced loading arises from faults to earth or faults between phases on the circuit external to the alternator.
- The unbalanced currents, if allowed to persist, may either severely burn the mechanical fixings of the rotor core or damage the field winding.

(vii) Stator winding faults.

- These faults occur mainly due to the insulation failure of the stator windings.
- The main types of stator winding faults, in order of importance are :
  - **(*a*)** fault between phase and ground
  - **(*b*)** fault between phases
  - **(*c*)** inter-turn fault involving turns of the same phase winding

Assessment

In an alternator the voltage of field system is usually

A.More than 1000 V

B.Between 400 V and 600 V

C.Less than 200 V.

D.None of the above

References

1. SuniS Rao, “Switchgear, Protection and Power System (Theory, Practice & Solved Problems)”, Khanna Publishers, New Delhi, 2019.

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3. Badriram, Vishwakarma B.H, “Power System Protection and Switchgear”, New Age International Pvt Ltd Publishers, 2nd Edition 2017.

Thank You