

INTRODUCTION TO POWER SYSTEM STUDIES SESSION 2

Friday | 10th July 2020 | 3.30PM – 5.30PM
Free admission for members | Register online

OBJECTIVES

1. To reintroduce three old friends – the per unit system, Thevenin's theorem and symmetrical components or The Romance of the Three Sisters
2. To breathe new life into old formulas and to transform old equations into meaningful entities, which can then be related to Ohm's law for a clearer understanding
3. To be able to make simple, quick and reasonably accurate estimates of the results of power system studies

SYNOPSIS OF SESSION 2

Thevenin's Theorem

The use of a single voltage and impedance to represent a complex network is a most useful tool in power system studies. There are actually two such impedances. The Thevenin positive sequence impedance is simply the total upstream impedance while the Thevenin zero sequence impedance is the secondary zero sequence impedance of the last Dyn transformer. The two impedances are required for earth fault analysis.

Three-Phase Fault Analysis

The session starts with a discussion of the differences between strong and weak systems and the reason why a running motor can contribute a current to a nearby fault. The traditional estimate for a three-phase fault is based on the rated current and impedance of the last transformer. However, the estimate can be substantially higher than the actual value because it ignores the upstream impedance. It will be shown that the use of the data for the last two transformers will provide a better result. There will also be a discussion on the effect of cables on fault currents and the difference between the fault MVA and current.

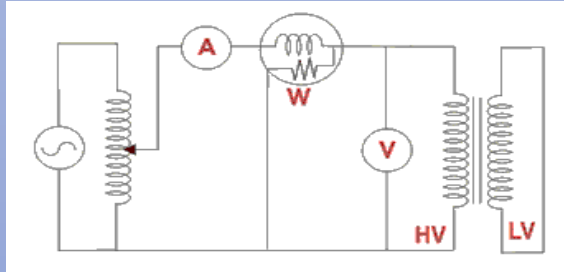
Pretalk Exercise

You are to attend a FAT for a 33/11 kV 10 MVA transformer with $Z = 10\%$ and $R = 1\%$.

This will involve a short-circuit test at the rated currents with results of the test voltage, current and power.

Calculate the following:

1. The primary voltage required
2. The expected power loss
3. The secondary current if the test voltage were to be increased to the rated value



The above is an exercise in understanding the concept of the per unit system

SPEAKER

Mr. Lee Chong Kiow is a 1974 electrical engineering graduate from Strathclyde University, Glasgow with 50 years of experience in the power supply industry. He specialises in providing technical training of electrical courses and performing power system studies. His previous experience included working as the Engineering Manager in a company manufacturing indoor medium- and low-voltage switchgear, Associate Director in a large consultancy practice and protection engineer with the former National Electricity Board. He is an Energy Commission certified competent/services engineer up to 275kV. Since 1997, he has trained about 7,000 participants from electrical utilities, petrochemical industry and multi-national companies in several countries in Asia and Africa on a variety of topics related to electrical engineering.

Webinar Session 3 on Earth Fault Analysis will be held on **8 August 2020** at 9.30 am - 11.30 am