



Swedish College of Engineering & Technology
Rahim Yar Khan

Affiliated with UET & IUB

Department of Electrical Engineering

Mat Lab Project

AC MACHINES

Instructor:

Engr. SHAHBAZ WARYA

Title:

Design of Single Phase Transformer:

Group Members:

- *Muhammad Imran (Leader)*
12EE08
- *Muhammad Awaís*
12EE35
- *Muhammad Umer Farooq*
12EE10
- *Samíullah*
12EE39

Theoretical Background:

A **transformer** is an electrical device that transfers energy between two or more circuits through electromagnetic induction. Electromagnetic induction, the principle of the operation of the transformer, was discovered independently by Michael Faraday in 1831 and Joseph Henry in 1832.¹ Also, Faraday was the first to publish the results of his experiments and thus receive credit for the discovery.¹The relationship between EMF and magnetic flux is an equation now known as Faraday's law of induction. his first type of transformer to see wide use was the induction coil, invented by Rev.Nicholas Callan of Maynooth College, Ireland in 1836. He was one of the first researchers to realize the more turns the secondary winding has in relation to the primary winding, the larger the induced secondary EMF will be. Induction coils evolved from scientists' and inventors' efforts to get higher voltages from batteries.

In the autumn of 1884, Károly Zipernowsky, Ottó Bláthy and Miksa Déri (ZBD), three engineers associated with the Ganz factory, had determined that open-core devices were impracticable, as they were incapable of reliably regulating voltage. The Ganz factory had also in the autumn of 1884 made delivery of the world's first five high-efficiency AC transformers, the first of these units having been shipped on September 16, 1884.This first unit had been manufactured to the following specifications: 1,400 W, 40 Hz, 120:72 V, 11.6:19.4 A, ratio 1.67:1, one-phase, shell form.

In both designs, the magnetic flux linking the primary and secondary windings traveled almost entirely within the confines of the iron core, with no intentional path through air . The new transformers were 3.4 times more efficient than the open-core bipolar devices of Gaulard and Gibbs.

Abstract:

A single-phase transformer is a type of power transformer that utilizes single-phase alternating current, meaning the transformer relies on a voltage cycle that operates in a unified time phase. They are often used to step-down long distance and localized transmission currents into power levels more suitable for residential and light-commercial applications. The ratio of primary transformers with a 1:1 ratio can be used to isolate circuits. Single-phase transformers abide by Ohm's law, and outside of minor inherent loss due to heat, do not create or remove power. Single-phase transformers are more popular than three-phase transformers in non-urban areas, as the cost of a three-phase distribution network is much higher, and the overall electrical demand is lower. The highest voltage available in a single-phase network is regulated by utility infrastructure and industrial regulations. A single-phase transformer is frequently used for power distribution and voltage reduction for residential and commercial applications. When used with appliances, the lower voltage output is often rectified into DC current before powering appliances, such as a computer .High-voltage systems typically employ three-phase transformers to power apartment buildings, retail centers, factories, offices, and other large-scale structures, as well as electric motors—single-phase power supplies do not produce the rotating magnetic field required to induce rotation. Three-phase power systems are more common in cities, where dense power supply demands require transformers that route hundreds or thousands of KVA.

Types

The following transformer types are commonly manufactured to accept and output single-phase AC power.

Autotransformer: typically used in low power applications to connect circuits with different voltage classes.

Distribution transformer: this is the oft-seen, pole-mounted transformer that steps-down current for light-duty electrical applications..

Rectified transformer: converts AC to DC.

Resonant transformer: a capacitor is placed across one or both windings to function so the circuit can be tuned.

Lighting transformer: supplies low voltages for lighting and other light-duty applications.

Industrial control transformer: supply power to constant-current or constant-voltage devices that may be sensitive to variations in electrical supply, such as solenoids, relays, or other electromechanical devices.

Interface transformer: isolates communication signals.

Isolation transformer: is not used to step-up or step-down voltages, but rather to buffer circuits from each other.

Multi-ratio transformer: a transformer with several outputs with each output tap corresponding to a different transformer ratio.

Energy Efficient Single Phase Transformers

Acme's single phase transformers are designed for use in industrial and commercial applications. Transformers rated up to 25 kVA are enclosed within an encapsulated, NEMA 3R enclosures. Standard transformers rated from 37.5 to 250 kVA are enclosed in ventilated, NEMA 2 enclosures (optional weathershields to meet NEMA 3R requirements are available). Acme's full line of single phase transformers include a range of options for primary and secondary winding voltages, stainless steel enclosures for use in corrosive environments, and 50/60 Hz rated models for export applications.

Procedure:

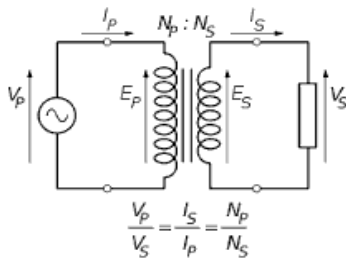
- First of all we open simulink in matlab.
- Take the linear transformer from element of simulink library.
- Take Ac voltage source from library and connect to the primary side of transformer through wires.
- Change the parameters of linear transformer .
- We remove the tick from three winding transformer .

- By this it become a single phase transformer .
- Changing the parameters of primary & secondary windings.
- Take the voltage measurement & one side is connected to the secondary side and other is to the scope.
- All the devices connected through wire.
- Change th simulation time and by run we check the result.

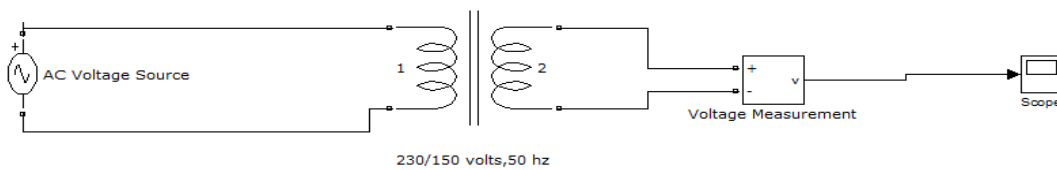
Matlab Tools:

- Powergui
- Ac voltage source
- Linear Transformer
- Voltage Measurement
- Scope
-

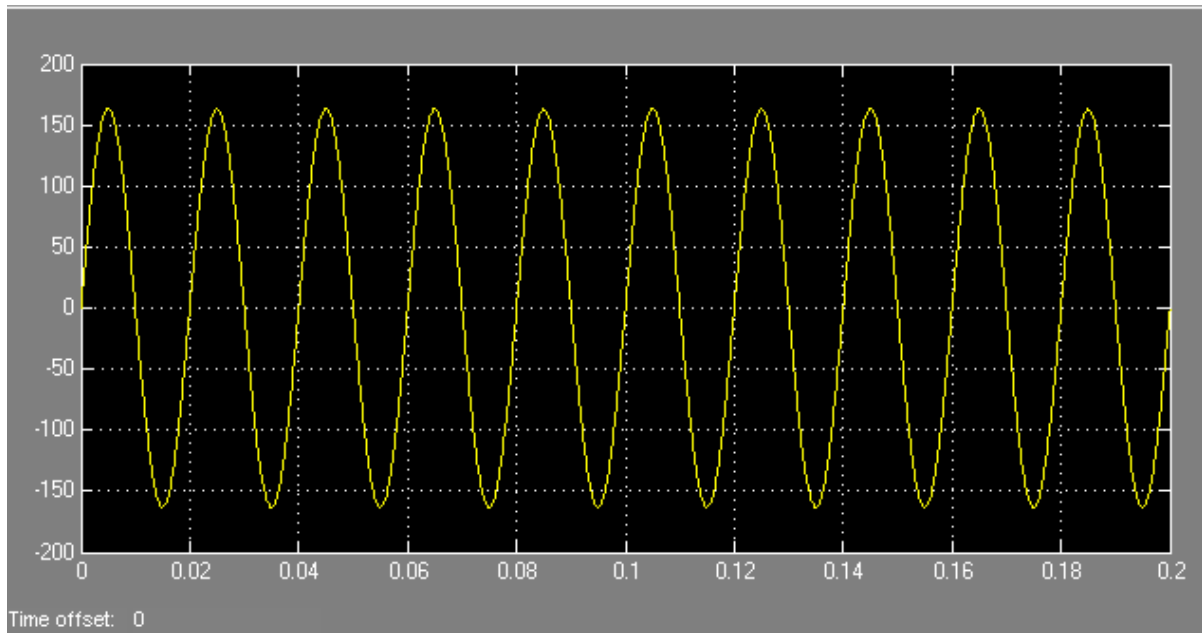
Diagram:



Matlab Diagram:



Result:



Conclusion:

Hence we conclude that transformer is a device that step down the voltage which shown in above graph.