CHAPTER 2

LITERATURE REVIEW

2.1 Existing Designs and Research Contributions

2.1.1 Digital Transformer Trainer (Ihedioha, 2017)

Ihedioha developed a digital transformer trainer designed to facilitate easy measurement and display of parameters such as voltage, current, and power. The trainer allows users to perform open-circuit and short-circuit tests and observe real-time data through integrated digital meters.

2.1.2 Transformer Mimic Panel Trainer (Sunday, 2023)

Sunday's work involved creating a transformer mimic panel that uses sensors and microcontrollers to simulate and display transformer operations on a panel. This trainer focused on improving student interaction with electrical concepts through visual aids and interactivity. It introduced the use of embedded systems in educational equipment.

2.1.3 AEL-TPTT Three-Phase Transformer Trainer (Clouds Domain)

This trainer, developed by a commercial education solutions provider, is a comprehensive solution for teaching and testing three-phase transformer configurations. It includes:

- Connection panels for star-star, star-delta, and delta-delta experiments
- Analog and digital meters for real-time data
- Protection units (fuses, relays) to simulate industrial standards

This system is particularly beneficial in advanced educational institutions and is aligned with modern engineering curricula.

2.1.4 Acumen labware’s Single phase Transformer Trainer

Acumen Labware's Single Phase Transformer Trainer is designed for educational purposes, providing hands-on experience with transformer operations and characteristics. Here are the key features of this trainer:

-Front Panel: Built with high-class insulated Bakelite sheet, featuring well-printed circuits and symbols for easy understanding.

-Safety Features: Short circuit protection with MCB and high voltage test points with 4mm safety sockets to ensure a safe working environment.

-Measurement Instruments: Includes voltmeter, ammeter, and wattmeter to measure electrical parameters.

-Components: Features a single-phase transformer unit (220V/110V) with copper winding, and a single-phase lamp load with switched control.

-Cabinets: Housed in a metal cabinet with a size of 36"x24" or 30"x24", depending on the model.

-Instruction Manual: Provided for guidance and patch cords (4mm heavy-duty) for connections.

The trainer is designed to operate on mains power 230V, 50Hz +10%, with optional DC power supply. It's an ideal tool for students to learn about single-phase transformers and their applications.

2.2. Gaps Identified in Existing Literature

- Many trainers focus only on single-phase transformers, limiting the breadth of experiments.
- Some models lack digital data logging capabilities or modern sensor integration.
- Safety considerations vary widely across different trainer models.
- There’s limited focus on remote monitoring and integration with e-learning platforms, which are crucial in contemporary education environments.

2.3 Educational Benefits

Transformer trainers offer numerous educational benefits, including improved understanding of transformer operation, enhanced problem-solving skills, and increased

student engagement (Kolb, 1984). Studies have shown that hands-on learning experiences significantly improve student outcomes (Prince, 2004).

2.4. Conclusion of Review

The existing body of literature and technological development on transformer trainers highlights significant progress toward making transformer education more interactive and practical. While early models focused on analog meters and basic testing, recent advancements have introduced microcontrollers, digital displays, and simulation environments.