Review of Development done in Computerization of Electrical Specifications for Transformers using CAD

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Abstract— In the past, the process of preparation of Electrical Specification for Transformers was carried out by drafting in AutoCAD and Transformer Design calculations were done manually based on output data obtained from Disintegrated Transformer Design programs. In today’s competitive environment, where design cycles have reduced drastically, it becomes imperative to fully computerize the Electrical Specification Document Generation for Transformer Design to speed up the whole design process.

Keywords: CAD, Transformers, Design Automation, Multiple Softwares, Electrical Specifications, Integrated, Knowledge Management

I. INTRODUCTION

Integrated Product Development (IPD) is defined as a systematic approach to the integrated, concurrent design of product and its related design processes.

Integrated Product Development aims to overcome problems related to traditional serial design process in which people from different sections viz Tendering, Electrical Design, Mechanical Design and Drawing Office work one after the other on successive phases of Product Design.

In Conventional Design process, various design calculations are done sequentially after getting Customer details from Commercial department. Usually this is a slow, costly and low-quality approach, leading to a lot of engineering changes and production problems, which results in a product that is less competitive than desired.

Transformer is a tailor made product. The cost of Transformer varies from about few Lakhs to several crores. It is manufactured from thousands of components and sub assemblies which vary considerably in size, shape and weight.

Electrical Specification is a vital base document, which contains the various design details of Transformer. It is a compilation of design parameters/features based on the final design of Transformer prepared with various Computer programs and manual processing.

Based on the Electrical Specification, manufacturing information like detail drawings & material procurement is taken up. Thus it becomes an important basic document and hence any error in this document may prove to be very costly.

II. BACKGROUND

The process of preparation of Electrical Specification was carried out serially by various scattered design groups resulting in interdependence of one group on other. Transformer design program is run by designer and output of program is further used to do various types of design calculations manually. Results of Design calculations are then used to Generate Electrical Specification. This complete process is sequential and error prone resulting in tedious and long Design cycle time.

In traditional serial design process people from different sections viz Tendering, Electrical Design, Mechanical Design and Drawing Office work one after the other on successive phases of Product Design. In Conventional Design, various design calculations are done sequentially after getting Customer details from Commercial department.

Usually this is a slow, costly and time consuming approach, leading to a lot of engineering changes and production problems, which results in a product that is less competitive than desired.

Till date the process of preparation of Electrical Specification for Transformers was carried out by drafting in AutoCAD and Transformer Design calculations were done manually based on output data obtained from stand alone Transformer Design programs.

III. OBJECTIVES

In today’s competitive environment, where design cycles have reduced drastically, it becomes imperative to fully computerize the Electrical Specification Document Generation for Transformer Design to speed up the whole design process. To automate the Generation of Electrical Specification for Transformer design, an Integrated & Parameterized System for Generation of Electrical Specification should be developed.

This system will drastically enhance the Capability of Transformer Design Process by automatically generating the Electrical Specification Design Documents.

Developed Integrated system would aid to exceed the current level of Design Productivity by enabling distributed information sharing and collaborative/cooperative design work.

It would take advantage of shared information and allows simultaneous focus on different phases of the Transformer design life cycle. Errors would be detected prior to being implemented in the product design by paying attention to all aspects of the design at each phase using developed system.
IV. LITERATURE REVIEW

A review of the literature on the Internet shows that there is no direct material or reference relating to Softwares pertaining to Online Generation of Electrical specifications for Transformers. There are links and references related to explaining what is a transformer, the various types of transformers, materials used and uses of transformers.

There is sufficient literature on the Internet on how to use VBA language (Visual Basic for Applications) for generating CAD drawings in AUTOCAD by passing data and parameters through front end user interface developed using Visual Basic.

Eleftherios I. Amoiralis, Member, IEEE, Marina A. Tsili, Member, IEEE, and Antonios G. Kladas, Member, IEEE [1] have shown that, with the fast-paced changing technologies in the power industry, new references addressing new technologies are coming to the market.

Ran Chen, Wen-Pei Sung and Jimmy C.M. Kao [2] presented a software tool used for designing Transformers in AutoCAD environment. The application allows the user to generate Transformer electrical design easily. DSTool application has been developed using OpenDCL and VisualLISP environment and runs in the AutoCAD environment.

N. Bilalis, J. A. Katsigiannis, P. S. Georgilakis, A. T. Souflaris [3], showed the development of a tool that automates the product design cycle for custom made products of Transformers. The 3-D Parametric Modelling System which has been used in this application reduces time and cost and integrates the whole production procedure, generating parametric parts and assemblies, drawings, bill of materials, and part programs.

Zhiqiang Li [4], Parameter design is very useful in machine product design. The transformer CAD system was developed based on ActiveX Automation and using VBA integrated by AutoCAD. This paper introduced the key technology of realizing parameterized drawing the optimization calculate and automatic drawing functions module of system were presented in detail, and demonstrated its feasibility through the concrete examples.

Ruohui Wang [5], presented to exemplify the basic design idea and show the design procedure of a parameter drawing. Use of AutoCAD ActiveX Automation to access AutoCAD objects and ADO to build up data communication between AutoCAD and Access the parametric drawing software program based on AutoCAD VBA.

Our approach for development of system covers varied aspects of Integrated Product Development like Object-oriented programming, constraint programming, knowledge-based systems, database management systems and CAD.

The Integrated system combines various phases of Transformer design viz Data Entry Screens and Reports for Knowledge Management, Design Calculations, Design Specifications and Parametric drawing Generation into a single platform.

The System Process Flow Diagram and DFD (Data Flow Diagram) for the Parameterized and Integrated Design Automation system for Transformer Design is depicted pictorially as below:

VI. CONCLUSION

There is a growing need in the manufacturing industry sector to gain insight into the significant aspects and parameters to apply new concepts of product design and development.

The Development of an Integrated System for Electrical Specifications Generation of Transformers in CAD would benefit the entire industry. This would not only improve productivity but also contribute towards quality, accuracy and design automation are as below:

1. Enable user to use the program interactively and carries out calculation and selection of the most optimized design. This would make the product more competitive.
Majority of intuitive data would be standardized and would enable the new design engineer to generate equally competitive designs.

After the development there would be considerable reduction in errors and this would result in decrease in rework and rejection at shop floor and thereby increased in shop floor productivity also.

The overall accuracy in Designing Electrical Specifications for Transformers would improve and lead to a fault free design.

This would form the basis for company’s new design standards and practices, in terms of Product planning and development.

The approach incorporated for the said Project will gain significant momentum, in terms of Product planning and development and can benefit the manufacturing set-up as a whole, thus making the company to move towards its ultimate goal leading to sustainability and profitability.

REFERENCES


