

CHAPTER 1

INTRODUCTION



1.1 Overview

Nowadays, application of computer in product design, and manufacturing process, such as Computer Aided Design / Computer Aided Manufacturing (CAD / CAM), are widely used everywhere because the cost of hardware and software are quickly reducing against the better performances. Following the tendency, product / part database is also being significant area that every business must develop properly in order to apply many existing manufacturing techniques to increase their competitive advantage.

Group Technology (GT) is one of the most widely known manufacturing philosophies that was first introduced by Russian gun manufacturers during World War I. Group Technology involves classifying similar products into groups for several advantages, such as design retrieval, automated product/process planning, and other manufacturing applications. The proper coding scheme is the key for describing products and a method for grouping or classifying similar product.

Many researchers have developed GT coding and classification systems over the last 50 years, including the popular Opitz, DCLASS, and MICLASS schemes. In each case the basic idea is to capture critical design and manufacturing attributes of a part in an alphanumeric string, or GT code that is assigned to that part.

During the past few years, tire manufacturing in Thailand has been growing rapidly because of the several important reasons as following:

- In the south of Thailand, there is natural rubber resource, which is the major raw material in tire manufacturing. Tire manufacturer in Thailand can save a lot of custom tax from importing natural rubber.
- Labor aspects: competency, availability, and cost, in Thailand are very competitive, comparing to North America, Europe, or even Asian country like Japan.
- There is a big opportunity of supplying to several car makers, investing and transferring their manufacturing in Thailand according to the political support from Thai government: Thailand Board of Investment.
- The forecast demand of tire is almost double to the current demand within the next 4 years because the world economics is returning good from the past few years.

One of the critical success factors of today's business is "*Time to market of new product*". To meet the challenge of supplying higher demand effectively and earlier than competitors, globalization, supply chain management, information systems strategy, TQM, or other business

techniques are the areas that every tire manufacturers have to deal with. It must be well constructed with the business strategy, manufacturing strategy of the company to achieve highest productivity and profitability.

Most people realize tire is just a black round thing putting on a wheel of car. Using rubber as a majority, tire can provide better driving than the other material. In fact, producing a tire today is not that simple. Tire technology has been developing over hundred years by several tire producers around the world to improve functionality of moving and carrying thing effectively and economically.

The major functionality of tire is to:

- Rolling, Revolving
- Carrying load of car, and people/thing in car
- Steering car
- Transmitting braking force and power output
- Absorbing noise and mechanical vibration
- Keeping air pressure (for Tubeless type)



Figure 1.1 Radial tire

In order to perform all the functionalities above effectively, tire has to be well-designed in every aspects since its components. Chapter 3 will present clearly the characteristic of all the Radial tire components and its function.

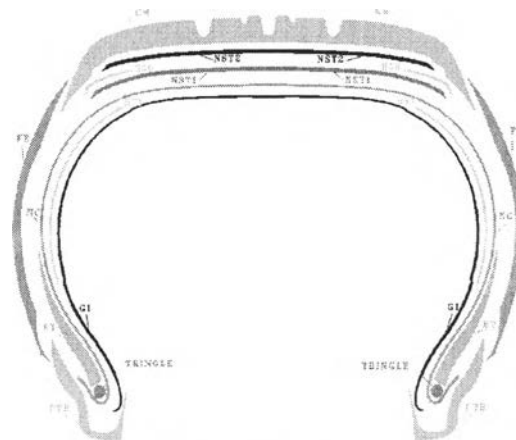


Figure 1.2 Radial Tire Components

Due to the high complexity of components in tire manufacturing process, a classification and coding (C&C) will potentially be an area that can

help designers in tire manufacturing to do the design effectively by applying the Group Technology (GT) concept to ensure the design will not drifting out of the standardization strategy from the following problems:

- Often introduce a new component even a similar one exists
- Often have engineering changes
- Inconsistent manufacturing instructions

1.2 Rationale and Statement of the Problem

There are the 4 crucial reasons that strengthen the importance of this thesis.

1.2.1 Product Design Strategy

The “Standardization” among factories in a company is one of the product design strategies in order to reduce the development cost and shorten the development time frame in the globalization market environment. Introduction of a product that has been studied thoroughly from one factory to another can significantly reduce the development cost and time frame. C&C and database of product will be an effective tool for part standardization.

1.2.2 Product Mix

The high complexity from many different products in production causes difficulty to manage and control the increasing of components from daily design activities. Lack of product database and appropriate indicator would make our product complexities are over control.

1.2.3 Production Planning

As we have high complexity in production line because of high product mix, the production planning is one of the difficult areas to manage. Using the proper C&C and product database, we can implement easily the application to improve production planning process, such as CAPP, MRP, Cell manufacturing.

1.2.4 Production Environment

In production environment of the 7 different product lines, we have to share the machines and facilitates in the factory. The more different of components we have, the more machine set-up we have to do. It would cost us many problems, such as high scrap and rework, low utilization of tools and machines, high inventory, and mistake of producing.

1.3 Objective of the Study and Expected Benefits

To fix the problems defined previously, the objectives of the study are:

- 1) To establish a Classification and Coding System for Radial Tires Components. The system will be used during the tire design process.
- 2) To create a Data Base of Radial Tire Components

- 3) To develop an Application software in for Classification and Coding for Radial Tire Components

From output of the study, the higher competitive advantages of performing tire design are following:

- Prevent proliferation of the number of components and assembled parts
- Improve productivity of green designer
- Use of database to make strategic decision in term of
 - Reduction of product complexity
 - Raw material cost reduction
 - Performance requirement
 - Extension of the study to the specific component, such as die process

1.4 Scope of the Study

- 1) The products from the study are;
 - A Classification and Coding System of Radial Tire Components
 - A Data base of Radial Tire Components
 - An Application software, consisting of a program that facilitates components coding and retrieval
- 2) The Classification and Coding system covers all green Radial Tire Components that are made from Preparation Process. The System will not cover any Components after Curing System.
- 3) The Database includes only green design data of Radial Tire Components from Preparation processes and assembles part from Tire Building Processes

1.5 Thesis Report Organization

This thesis report is organized into 6 chapters contained details as follows:

Chapter I, "INTRODUCTION", introduces the general idea of the thesis, the rationale and statement of the problem, objective of the study, expected benefits, scope of the study, and methodology.

Chapter II, "LITERATURE REVIEW", reviews in general the concept of group technology, part standardization, classification and coding system, and application selection and implementation.

Chapter III, "SYSTEM ANALYSIS AND DESIGN", presents all the radial tire components and complexing parts, requirement analysis and design of: (1) Code structure based on functionality analysis, characteristic analysis, material analysis, dimensional analysis, and others, (2) Data base of radial tire components, and (3) Application for coding and retrieving existing design based on the defined code structure.

Chapter IV, "SYSTEM VALIDATION", presents how the application of C&C work, how to create database for radial tire components, and how the existing data is retrieved during tire design process.

Chapter V, "RESULTS ANALYSIS", presents the indicators to measure the performance of the defined C&C application and data base for radial tire components whether it can meet the objectives.

Chapter VI, "CONCLUSION AND RECOMMENDATION", contains two sections which are conclusion and recommendations for further study.