Chapter 1

Introduction

1.1   Background of the Research

At present competition in every industrial sector, including paint industry is drastically. Therefore, every firm try to be world class manufacturer in order to gain market share, profits, and even to ensure its own survival.

This involves changes in every part of business from strategic management process, finance, product design, manufacturing, distribution, marketing, and service, as well as environment aspect.

"New concept for "How to make a world class paint maker" will flourish for five reasons:

1.   World class paint makers give their customer superb quality and service.
2.   Quality and service will enable world class coating manufacturers to maintain price despite competition.
3.   The world class paint makers will be low cost producers.
4.   Inventory control is an essential aspect of modern manufacturing.

The World-class paint makers will release capital by minimizing inventory. Toxic waste is a result of bad quality and is a significant part of manufacturing cost." (Charles Rooney 1990)

For this concept, company must focus on quality and cost of products to compete in the globalization. Right First Time concept is the only way that leads to manufacturing target in terms of quality and cost.

This thesis presents a study of application of a method Failure Mode and Effect Analysis (FMEA) in paint manufacturing to reduce manufacturing defect that deviate from the manufacturing specification and production time by doing it right first time.

Figure 1.1 : **Process of paint manufacturing**
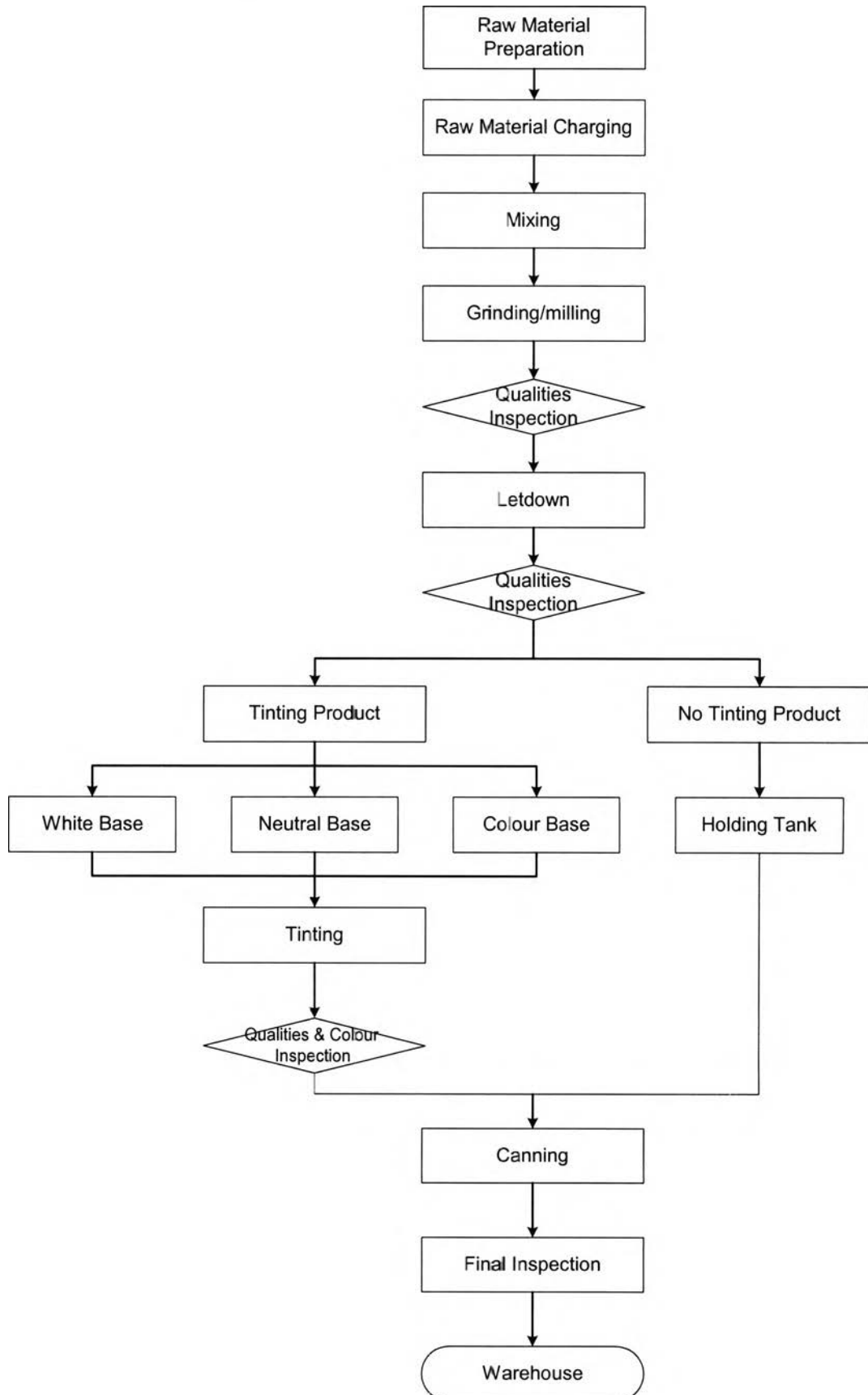
Paint: The following definitions are based on ISO standard 4618/1 (Paint and Varnishes-Vocabulary- Part 1 general term)
Paint is a product, in liquid or powder form, containing pigment(s), which , when applied to a substrate , forms an opaque film having protective , decorative or specific technical properties.

The most important constituents of paints are binders, pigments and extenders, solvent/diluents/thinners and additives.

Process are shown as in the table below :

Table 1.1   : Paint Process

Process Step	Details
• **Raw material preparation**	: Raw material will be prepared and feed manufacturing line.
• **Raw material charging**	: Raw material will be charged in the batch as the follow process instruction.
• **Mixing**	: All of raw material that charged in the batch will be stirred at high speed by dissolver machine to wet the pigment and extender prior to grind.
• **Grinding**	: To deflocculate and deagglomerate the pigment and extender.
• **In process quality control**	: The process will be controlled through some factors in the production line to conform to our quality. It will be done by production operator.
• **Let down**	: The remaining raw material the formulation will be loaded in the batch. It will be stirred at only low to medium speed to homogeneity.
• **Quality control inspection**	: Final inspection for finished goods.
• **Tinting**	: Color will be adjusted to be standard shade.
• **Color control**	: Color will be controlled and adjusted by spectrophotometer to conform standard shade.
• **Canning**	: Paint will be canned as the follow required packaging size.
• **Final inspection in filling line**	: This step is random checking about weight of paint that filled in can.

From the above process, the product can be classified into 2 categories:

**1.   Tinting products   :   **The products that need to be shading and control color shade as following the standard color such as yellow, red ,brown tone. Main ingredients of colored paint are:

1.1	White Base	:	Paint that consists of Titanium Dioxide as the main pigment in order to give whiteness and opacity.
1.2	Neutral Base	:	Paint that consists of extender only in order to reduce whiteness of white base. It is applied for medium to dark shade.
1.3	Colored Base	:	Paint that consists of color pigments to make the saturated shade.
1.4	Tinter	:	Paint that consists of high concentration of color pigment. It is applied tinting and color adjustment.

**2.   Non tinted products   :   **Product that finished itself. They don't need to work out for color adjustment for example primer, white. From the paint manufacturing process, both of products will be inspected and adjusted by Finished Goods Controller.

For non tinting products, some products need 1-2 time for quality adjustment, while some products conform standard without quality adjustment. Generally, tinted products need color adjustment average 2-3 times per shade. So it is the critical point for paint manufacturing line. It was found that process time of color control consume 70% of manufacturing process time. It takes average 2-3 days. Consequently, it leads to production capacity shortage in production line.

1.2   Company Background

The company of this research is the international paint manufacturing that developing, manufacturing, marketing, and selling coating systems for marine market, industrial and decorative sector. Main products consist of   :

- Antifouling and marine coatings
- Advanced corrosion protection for industrial and offshore use
- Decorative paints

The company established originally in 1968 in Samutprakarn. By 1995, business was blooming and the demand for their products had increased drastically. So company made decision to move the factory to new location at Chonburi in year 1999 to support continually expanding operations. The company understands the importance of meeting international quality control standards and environmental management. So company also implemented both of the ISO 9002 Quality System in 1996, and ISO 14001 Environment Management in 1999.

1.3   Statement of the problem

From the paint manufacturing line, tinting process is the part of manufacturing line to add value into the products. But in process takes 2-3 times for color adjustment. It consumes for 2-3 days per shade. Consequently, it impacts to productivity in production line. One way to make it more efficiency is to make it shorten and control cycle time. **"Failure Mode and Effect Analysis is an engineering technique that used to define, identify, and eliminate known and/ or potential failures, problem, errors, and so on from the system, design, process, and/or service before they reach the customer."**[2] So Failure Mode and Effect Analysis will be used for quality control tools to minimize cycle time in colour control. Factor that are controlled are shown as below :

1.   Formulation

- Tinting formula
- Raw material and semi product such as white base, neutral base and tinters.
- Process instruction

2.   Process in production (Only tinting section)

- Weighing the raw material
- Mixing process

3.   Color control

- Color panel preparation
- Color measurement

1.4   Objective of the Research

Developing process standard for color control in tinted products in paint manufacturing.

1.5   Scope of the Research

The FMEA method is applied to solve the problem only in alkyd paint. This research will study all of process in each step that start from semi products (White base, Neutral Base and tinter) until to tinted paint in alkyd product

1.6   Expected results

The standard procedure of the color control processing in tinted product.
Time reduction in tinting section.

1.7   Research Procedure

1.   Study related literature.

2.   Collect data of correction time each color before starting Failure Mode and Effect Analysis project .

3.   "Use Failure Mode and Analysis approach

       3.1   Select the team and brainstorm.
       3.2   Make the process flowchart to focus on problems.
       3.3   Set priority of problems.
       3.4   Collect data of the failures and categorizes them appropriately.
       3.5   Analyze problems and discuss the estimation of severity, occurrence, and detection.
       3.6   Propose improvement for the failure mode
       3.7   Monitor the proposed improvement

4.   Measure batch adjustment times after Failure Mode and Effect Analysis implementation.

5.   Create standard procedure of color control in tinted product.

6.   Compare batch adjustment time of tinted product data before and after improvement.

7.   Conclusion of the thesis.

8.   Final examination.

The Research Schedule

Procedure	2002										2003	
	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb
1 Study related literature.	■	■										
2 Collecting data of correction time each step before starting Failure Mode and Effect Analysis project.	■	■	■									
3 "Use Failure Mode and Analysis approach												
3.1 Select the team and brainstorm.			■									
3.2 Make the process flowchart to focus on problems.			■									
3.3 Set priority of problems.				■								
3.4 Collect data of the failures and categorizes them appropriately.				■	■							
3.5 Analyze problems and discuss the estimation of severity, occurrence, and detection.						■	■					
3.6 Propose improvement for the failure mode.								■				
4 Measure of batch adjustment time after Failure Mode and Effect Analysis implementation.									■	■		
5 Create the standard procedure of color control in tinted products.										■		
6 Compare batch adjustment time of tinted product data before and after iimprovement.											■	■
7 Conclusion of the thesis.												■

Table 1.2 : The timetable for research schedule