Chapter 7

Conclusion and Recommendation

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7.1 Conclusion

This thesis aim to develop the standard process for color control in tinted products in paint manufacturing by means of FMEA technique. The alkyd products are designed as the representative for this study. The existing tinting process in the ABC Company is explained in the Chapter 3.2. The data collection of the previous project have been collected and expressed in the Chapter 3.5.

The quality tool named Cause and Effect Analysis and the engineering tool as the Failure Mode and Effect Analysis (FMEA) were used in the problem identification and analysis as the Chapter 4.1.5. The result of analysis shows in the Appendix I and II respectively. Based on analysis, there are 33 high-risk areas in tinting section (Table 4.3) All of them are defined as the processes where their risk priority number (RPN) are greater than 100.

The main problems in the tinting section can be categorized into five majors items as following :

1. Quality of raw material

1.1 White base and neutral base

- Uncontrolled color strength of white base
- Long drying time of white base and neutral base

1.2 Tinter

- Color strength control in tinters are board (± 10%)
- Unsuitable storage condition of tinters such as lack of tinter level control for storage, stirring efficiency of tinter storage tank

2. Tinting formulation is not precision

- CIE of starting formulation is high.
- There is no verification for tinting formulation in the lab scale after color shades conform standard.

3. Inaccuracy of dispensing machine for tinter loading

4. Insufficiency work instruction

- Tinting process such as mixing time, mixing speed, batch size.
- Color panel preparation process

5. Human error

- Low operator skill
- Discipline of operator

The FMEA team has discussed and recommended the solution for solving these problems. All of recommendation actions are generated into the recommended action column in process FMEA form as the Appendix 2 to improve the tinting section. The newly revised tinting procedures and controlled documents serve as the quality assurance for tinting section.

The FMEA project for tinted alkyd products has been introduced from October 2002 as mentioned in Chapter 6.2. The results of the implementation were the improvement in color adjustment and process time in tinting section.

Based on the result, process time in tinting section reduce from 233 min to147 min per batch. In the view of changing in the terms of RPN comparing between before and after implementation range from 73% to 95%.
The evaluation of the FMEA project was discussed in the Chapter 6.2 as the following items :

- With the Failure mode and Effect Analysis
- Color adjustment and process time in tinting section

From the implementation of the FMEA project in tinted alkyd products, I have found that there are still some chances for further development. These points are discussed as the following section.

7.2 Recommendation

There are some of recommendations for the FMEAA project in tinting sections for the ABC Company. The details show as follow :

1. It should be updated to create continuous improvement.

By definition of the FMEA is the way to eliminate and/or reducing known or potential problems. After the FMEA starts, it becomes a living document and never really complete. This is the dynamic tool for continuos improvement. So it is necessary to continually update. At the present, the RPN is set up at level 90% confidence and a 1 to 10 guideline. So some of potential failure modes in some color shades are not fully successful. The threshold of the pursuing failures/problems should be decrease until all failure has been resolved. I recommend increasing the RPN from 90% to 95% confidences (at a 1 to 10 guideline). It means that the potential failure mode that its RPN exceed to 50 must be addressed. This leads to reduce the potential problems and perform continuos improvement in tinted products.

2. This concept should be applied into the upstream process

In order to reduce the total process time in paint manufacturing line especially in tinted products, right first time for quality control in raw material in terms of white base, neutral base and tinters should be happened. So I also recommended that the FMEA technique should be implemented in the grind section. This leads to ensure the quality all of raw material such as white base, neutral base, and tinters without quality adjustment prior to release to tinting section. Consequently, total process time in tinted product lines will be short.

3. After project finish, the training need for tinting section should be defined.

Human error is the one of potential failure mode in tinting section. This causes of problems stem from low skill and discipline of operator. In this task need the skill operators. So training is the most important for tinting operator and Color eye controller. I recommend the training session for tinting operator as following :

- Color technology
- Tinting process
- Machine and equipment operation
- Color panel preparation
- Problem in tinting process

The training period should be set up at least one month prior to they start in tinting section.

I also recommend the training session for the Color eye controller as following:

- Color technology
- Tinting process
- Color panel inspection
- Color eye operation

For Color eye controller, the training period should be at least 6 months. This reason is that this position needs very high skill operator. He/She should understand both of color technology in detail and machine operation.

4. This concept can apply in the other tinted product lines in solvent base

In order to improve the tinting section line in the ABC Company, it is better to apply the Cause and Effect Analysis and the FMEA technique into whole solvent base products. At the present, the FMEA project just start only in alkyd products, it enables to use this technique in other solvent base products under the same analysis. I recommend starting from the one pack (Acrylic base, Chlorinated Rubber base) product first, because it dry based on the physical properties. It does not impact from the chemical reaction as the same as alkyd products. Then move to 2 pack products (Epoxy base, Polyurethane base)

If the ABC Company can implement the FMEA technique whole tinting line, they can save the process time in tinted products. This leads to productivity improvement.

5. The FMEA team should include people who are expert in accounting and purchasing to support in terms of financial

This research concentrates on technical analysis, while financial perspectives are ignored. So some recommendation might be not reasonable in terms of cost. It should be better to select people who are expert in accounting and purchasing to join in FMEA team.