

The Effects of Desiccant Air Dryer on Quality of Automobile Painting Process: A Case Study of Million Colors Co., Ltd. (THAILAND).

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Abstract

The objective of this work was to study the effects of desiccant air dryer used in automobile painting process in Thailand. The quality problem cause of spray painting usually found in automotive industry in tropical country. The main problem of the old system was the valueless quality class of air mixer. This study utilized desiccant air dryer, MiDAS model to improve the quality of air. Thirty family cars with the white color spraying were tested in this work. The results from this study were compared with the quality class of compressed air and the number of scratched point per ft² between the before and after used desiccant air dryer. The average value obtained from the previous system was 31 scratches/ft². Therefore, the measured values of this improvement was the outlet air in quality standard class no. 1.2.1 of ISO 8573.1 (dirt < 0.1 micron, pressure dewpoint < -40°C at 7 bar g, and oil including vapour < 0.01 mg/m³) and wasn't scratched from the painting process. So, this improvement saved the factory cost about US\$ 2,000 per month.

Keywords: desiccant air dryer, scratch, automotive painting process, compressed air, dirt, pressure dewpoint, oil including vapour

1. Introduction

One of industrial engineer's main activities is quality management. Quality represents an essential factor of contemporary interests in any comprehensive effort to improve operations and processes. Industrial engineers have traditionally designed production and controlling systems, but they have not typically borne responsibility (Hicks, 1994). Quality of design involves designing quality characteristics into product or service. Quality from the producer's perspective is able to conform to the specifications required by the design referred to as the quality of conformance (Heizer and Render, 1993). The costs of quality fall into two categories, the cost of achieving good quality, also known as the cost of quality assurance and the cost associated with poor-quality products, also referred to as the cost of not conforming to specifications. Prevention costs are the costs of trying to prevent poor-quality products from reaching the customer. Costs associated with poor quality are also referred to as the cost of nonconformance, or failure costs. The cost of poor quality can be categorized as internal failure costs or external failure costs. Internal failure costs are incurred when poor-quality products are discovered before manufacturers are delivered to the customer. Examples of internal failure costs include scrap costs, rework costs, process failure costs, process downtime costs, and price-downgrading costs. External failure costs are incurred after the

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customer has received a poor-quality product and are primarily related to the customer service, such as, customer complaint costs, product return costs, warranty claims costs product liability costs, and lost sales costs. (Russell and Taylor III, 2000)

Thailand is an agricultural and new development industry country. Foreign investor jointly invested with Thai businessmen to produce various goods for export and used in the country. One of main businesses, Automobile industry was increasingly grown in Thailand. Significantly, manufacturers are working toward the localization of production set-up and production process, while at the same time increasing local procurement ratios of quality and part, and there is growing likelihood that efforts to achieve goals will lead to the transfer of process engineering and design modification processes in Thailand. However, the local content requirement that was scraped on quality characteristics both of brand-name producer and repaired-car workshop. The quality painting defect usually found in used-car garage caused from valueless equipment. Therefore, we should study the ways to reduce or improve them better and better for our businesses (Pachon, 2002).

2. Methodology

2.1 Background of Problems

More and more car defects occurred from the spray painting process. The commonly damage



Figure 1 The Million Colors Co., Ltd. (THAILAND).

caused from the redundance of air mixture- dirt, oil and water vapor as well. Moisture of spray effects on the quality characteristics in painting process. So, Million Colors Co., Ltd. (THAILAND), the middle car garage (see in Figure 1) was selected to analyze in this work. The working process before the improvement is very difficult to do for painter. The operators often face the problem on the enough of water and oil mixing. Therefore the painting car have a lot of scratches or defective points. So, this problem can fix by scrubbing and rework by spraying its again. Absolutely, the old spraying process done caused a big loses- used much paints, times and etc.

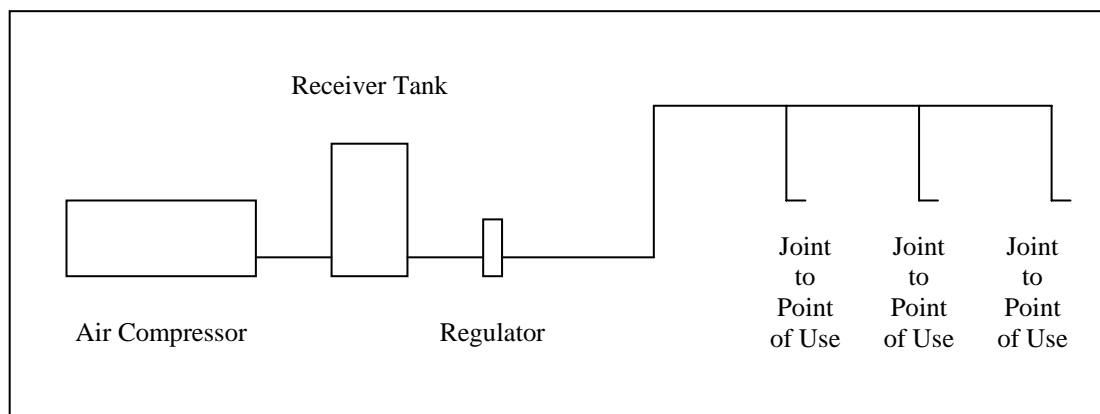


Figure 2 Spray painting process before this study

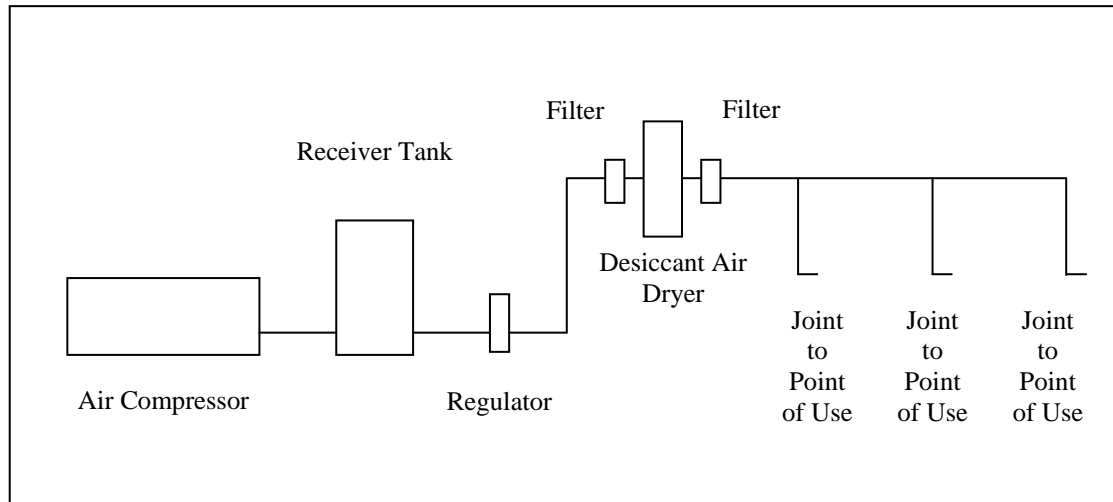


Figure 3 Spray painting process after the improvement



Figure 4 The worker is spraying the tested car.



Figure 5 The air purity tester was used to measure the mixture of air

2.2 Equipment

2.2.1 Hygrometer, domnick hunter

2.2.2 Air Purity Tester, domnick hunter

2.2.3 Desiccant Air Dryer: domnick hunter,

Model: MiDAS 5

2.3. Procedures of the study

This experiment was conducted to measure the quality variables of air mixture that effect on the spraying car in automobile painting process. Then, results obtained form the before and after this study was compared to show the difference between the old spray painting system and the new system which used the desiccant air dryer equipment. The previous and current system were illustrated in the

Figure 2 and 3, respectively. Figure 4 presents the operator doing with the tested car. This test used air purity tester to measure the properties of air (see in Figure 5).

In addition, the new system utilized the desiccant air dryer and 2 filters to reduce the water and oil mixture from the spraying air.

Results

This study used thirty family cars with the white color painting. The average values obtained from measuring air properties were illustrated in Table 1. The results were compared with the quality class of compressed air and the number of scratched point per ft² between the before and after used

Table 1 Quality characteristics of air in each stage of spray painting process

Conditions	After pass compressor air	After pass receiver tank	After pass air filter & desiccant air dryer
Mixture of air			
Moisture water (mg/m ³)	10	1	0
Oil vapour (g/m ³)	36	9	1
Temperature (°C)	50	40	30
Dewpoint (°C at 7 bar g)	12	-19.8	-40
Compressed air (bar g)	6.7	6.5	6.1

desiccant air dryer equipment. The collecting data from the previous system was about 31 scratches/ft². whenever, the measured value after this improvement was the compressed air quality class no. 1.2.1 of ISO 8573.1 (dirt < 0.1 micron, pressure dewpoint < -40°C at 7 bar g, and oil including vapour < 0.01 mg/m³) and wasn't scratched from the painting process.

Conclusions

This improvement done caused a better quality of air for the automobile spraying process. Due to the results above, the compressed air quality was the class no. 1.2.1 of ISO 8573.1, which is the one of air world class standard. In the new spray paint process, the paint was reduced about 50% of the old one or about US\$ 5 a car and saving working time around 30 minutes per car or it can reduce 20% of the old labour standard time. Normally, this garage had to paint 10 cars per day and working for 25 day per month. The labour cost was US\$ 3 per hour, so, the labour expense was saved about US\$ 30 per day, or US\$ 750 per month and reduced US\$ 50 of material cost per day or US\$ 1,250 per month or decreased about US\$ 2,000 per month. However, the cost of new spraying process was about US\$ 2,500. That isn't expensive investment when it compared with the previous loses. Therefore, the desiccant air dryer done caused a big saving of new spray painting process in long term.

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