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The Effect of Variations In Clear Coat Application Distance On The Glitter of The Painting Results

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Abstrak

Painting defects in the *repainting* process in the vehicle body repair industry are still a common problem. The main factor causing painting defects is manual application that is not in accordance with standard operating procedures. Painting the vehicle body functions to protect the surface and increase aesthetic value, but there are still frequent painting defects such as rough surfaces, spots, and melting due to improper application. This study aims to examine the distance of application of *clear coat* to the quality of painting results with minimal defects. The research design used was *an experimental research design* with a variety of spraying distances of 10 cm, 15 cm, 20 cm, 25 cm and the measurement of the gloss value was carried out using *a gloss meter.* The results of the study show that the spraying distance greatly affects the gloss value of the painted results. A distance of 15 cm results in the best gloss value of 90.94 GU with no paint defects, while a distance of 25 cm results in the lowest gloss value of 58.50 GU with rough and dull surfaces. Too close a distance increases the shine power but has the potential to cause defects in the form of *a melted clear coat* layer. This study concluded that the optimal distance for spraying *clear coats* is 15 cm to achieve high-quality painting results.

1 Introduction

Painting the body of an automotive vehicle is necessary to protect the vehicle body and beautify the appearance of the vehicle body [1]. In the vehicle body repair industry, the automotive industry sets structured repainting stages so that the painting process is optimal with maximum results [2].

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The optimal painting process is a painting process that is in accordance with standard operating procedures which consists of six methods, namely surface preparation, *Color matching*operation *pistol semprot, masking*, *Spraying* and *Polishing* [3]. Process *Spraying* In the process of painting the vehicle body which is carried out optimally, it is able to provide the painted surface with maximum quality [4]. Maximum paint quality can provide a smooth paint surface and provide maximum aesthetic value through the *Spraying* good and true [5].

Method *Spraying* Improper treatment can cause the results of the painting process to be less than optimal and cause painting defects [6]. Painting defects caused by the *Spraying* It consists of several factors including the *pistol semprot,* spraying angle, step speed, overlap pattern and distance *pistol semprot* [7]. The painting distance in the painting process must be considered in accordance with the recommendations of the standard operating procedures on a paint product used and also from the human factors that apply it to the painting process [8]. In the painting process with maximum quality, it can be seen visually, among other things, it has good luster, the surface is not rough, and there is no melting paint [9]. Painting that has good gloss power and smooth surfaces is very determined by several factors, namely material factors and human factors that apply it [10].

Improper painting will cause painting defects that cause the painting process to be redone so that it has an impact on production time, materials needed and predetermined targets so that it will have an impact on the achievement of service targets obtained by the painting industry [11]. The painting industry in innovating from the less than optimal painting process will conduct a root cause analysis of the painting defects that occur. Painting defects such as rough paint surfaces, spots, and melting occur in the outermost layer of a surface [12]. The outermost part of the paint surface is a clear layer that serves as a protector from the coating *Base layer* called the layer *Clear coating* [13].

Layer *Clear coating* in the painting process greatly affects the quality of the good surface result, because the coating *Clear coating* is located on the outermost part of the paint surface that is able to provide aesthetic value through light reflection [14]. The reflection of light seen visually will be a person's parameter in assessing the results of the painting process through the reflection of light arising from a surface [15]. Surfaces with paint defects such as dull, rough paint surfaces, spots, and melted paint occur on the coating *Clear coating* which is due to the lack of precision in the application method which results in the surface having less than optimal luster power [16].

Less than optimal gloss power is caused by several factors including rough paint surfaces and melted paint surfaces caused by human factors that do not pay attention to air pressure, paint viscosity, step speed, and especially paint spray distance [17].

Painting distances that are too far will cause the paint surface to become dull and the surface rough, while a distance that is too close will cause paint to melt which results in the process *Polishing* because the surface is too thick, so the distance in the painting process is still often ignored, especially in the application process *Clear coating* which is done by humans who have less than optimal results that can be seen through the effect of light reflection or luster power produced by a surface [18]. Therefore, this research aims to examine the influence of variations in application distance *Clear coating* against the value of the shine of the paint. Thus, this research is expected to make a significant contribution in improving the quality of optimal automotive painting results.

2 Research Methods

The research was carried out at Irawan Garage, Brangsong, Kendal, from October 2024 to December 2024. The research design used is an experimental research design that aims to examine the cause-and-effect relationship between the variables being studied. In this design, manipulation of one or more independent variables (causal variables) is carried out to observe their effect on the dependent variables (causal variables) in each specimen.

The specimen testing method is carried out using a glossmeter test device, which serves to measure the level of gloss. The results of the gloss measurements are recorded in the data table, then analyzed and summarised in the form of descriptions to identify the relationships between variables.

The object of the research used was the front hood of the Toyota Rush car. This study used a variety of clear coat spraying distances, namely 10 cm, 15 cm, 20 cm, and 25 cm, using the Meiji F100 brand spray gun. The type of clear coat used in this study is the Cromax 1200S brand clear coat.

3 Result and Discussion

The gloss value test on each specimen was carried out to determine the level of gloss on the surface to which *the clear coat* was applied with different distance treatment. After the test is performed, the data of the luster value obtained is recorded in the research table.

After testing each specimen, the results obtained from each specimen are then calculated and averaged. Thus, the luster value of each test specimen can be clearly known. The data from the test results of the luster value on the specimens is presented in Table 1 as follows:

Table 1. Specimen Test Results Table

No	Painting Distance	Specimen Gloss Value (GU)					Average
		Titik 1	Titik 2	Titik 3	Titik 4	Titik 5	
1	10 cm	90,8 GU	91,2 GU	95,4 GU	93,5 GU	92,4 GU	92,66 GU
2	15 cm	88,9 GU	92,9 GU	90,4 GU	94,2 GU	88,3 GU	90,94 GU
3	20 cm	80,3 GU	74,7 GU	88,3 GU	88,9 GU	76,7 GU	81,72 GU
4	25 cm	42,5 GU	49,5 GU	68,9 GU	74,7 GU	56,9 GU	58,50 GU

Based on the graph of the results of the gloss value test shown in Table 1, it can be seen that there is a decrease in the gloss value in each variation of *clear coat application.* The first decrease occurred at the spraying distance from 10 cm to 15 cm with a difference of 1.7 GU, followed by a more significant decrease from 15 cm to 20 cm of 9.24 GU, and the most drastic decrease occurred at a distance of 20 cm to 25 cm, which was 23.22 GU. The decrease in gloss value is affected by the quality of the paint results, especially the level of surface smoothness of the paint after the spraying process.

Based on the results of the gloss value test that has been carried out on each specimen, the average gloss value is obtained for each variation of the clear coat application distance . The spraying distances used in this study consisted of 10 cm, 15 cm, 20 cm and 25 cm, where each variation in distance showed a difference in the level of shine produced. Details of the results of the gloss value measurement for each specimen can be seen in the following Table 2:

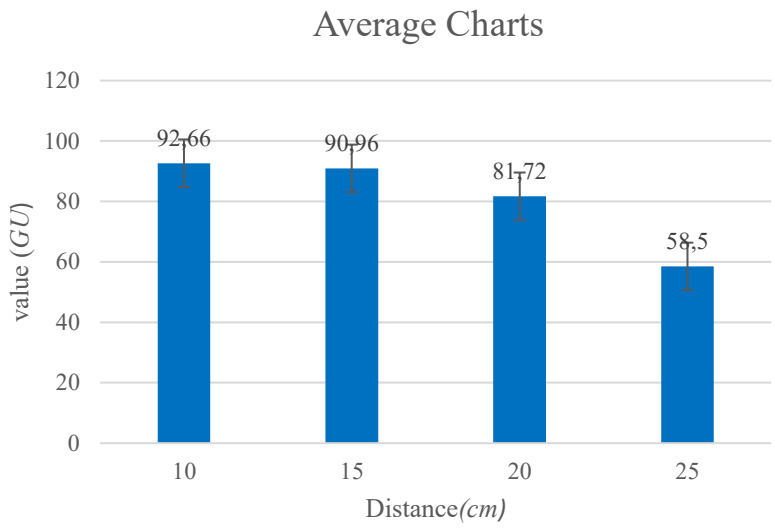

Figure 1. Research Data

Based on the graph of the results of the gloss value test shown in Figure 1, it can be seen that there is a decrease in the gloss value in each variation of *clear coat application.* The results of the study show that the variation in distance in the application of *clear coat* affects the level of shine produced in the painting process. Variations in spraying distances (10 cm, 15 cm, 20 cm, and 25 cm) provide different gloss results, suggesting that spraying distances have a significant impact on the final paint results. The *clear coat* mixture used consists of *clear coat, hardener,* and *thinner* with a ratio of 2:1:0.3. The mixing process is carried out with precision using digital scales and measuring cups, then filtered before being put into a spray gun to ensure material quality and avoid foreign particles.

The measurement of the luster value is carried out with *a gloss meter* on each specimen. The results showed that the optimal spraying distance to achieve the best gloss value was 10 cm, with the highest gloss value being 92.66 GU. At this distance, the *clear coat layer* is able to cover the surface to the maximum, providing an optimal light reflection effect, although there is a risk of defects in the form of melting layers (*runs*) due to excessive thickness.

Figure 2. Research Specimen 10 cm Distance

In figure 2, A spraying distance of 15 cm results in a gloss value of 90.94 GU with more even results and minimal defects. The distribution of particles at this distance is more stable, resulting in a fairly thick layer but still dries well, resulting in a smooth and uniform surface without melting effects.

Figure 3. Research Specimen 15 cm Distance

At a distance of 20 cm, the luster value decreases to 81.72 GU. At Figure 3, the surface results look drier and slightly dull as the *clear coat* particles dry out before fully fusing with the previous coat. Despite this, this gloss value still meets automotive industry standards (minimum 70 GU).

Figure 4. Research Specimen 20 cm Distance

Figure 4, A spraying distance of 25 cm results in the lowest gloss value, which is 58.50 GU, with a rough, dull-looking surface. This is caused by the uneven distribution of particles due to clear *coat* particles drying out before reaching the surface. This distance is not recommended because it results in low paint quality, both in terms of aesthetics and coating resistance as shown as figure 5.

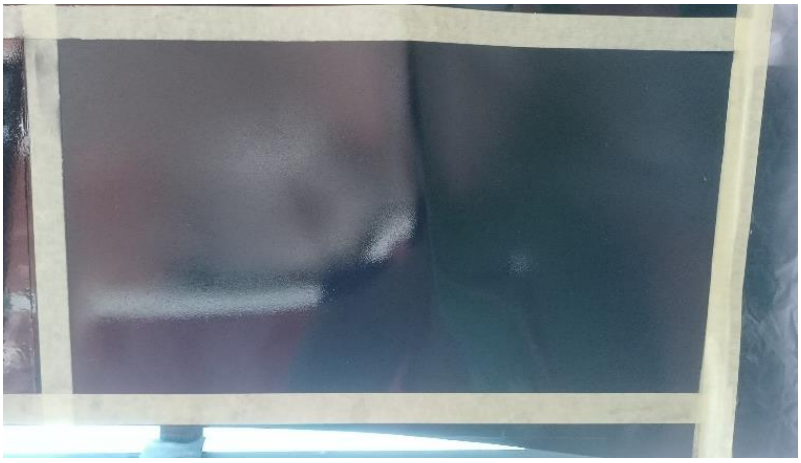

Figure 5. Research Specimen 25 cm Distance

Overall, this study shows that the spraying distance of *clear coats* greatly affects the quality of painting. The optimal distance is 10 cm for the highest shine results, but a distance of 15 cm provides more stable results with minimal defects. The selection of spraying distance needs to consider the balance between luster power, surface smoothness, and potential paint defects.

This is in line with previous research (Kristanto et al., 2017) which stated that too close a spraying distance can cause the paint layer to melt, while too long a distance results in a rough surface.

4 Conclusion

Based on the results of research and gloss value testing, the spraying distance greatly affects the painting results. A *clear coat* application distance that is too close has a high luster power, but can cause painting defects in the form of *runs* or melted surfaces. On the other hand, too long an application distance will create a rough and dull surface. Based on the results of the luster value test, the application of the Cromax 1200S brand clear coat shows good luster power and quality. The best gloss value without any painting defects was obtained at a spraying distance of 15 cm with a gloss value of 90.94 GU. Meanwhile, the test results showed that the lowest gloss value in the application of *clear coat* was 58.50 GU, which occurred at a distance between *the spray gun* and the surface of 25 cm. Advice for future researchers Paint viscosity has an important role in determining painting quality. For further research, it is recommended that viscosity selection be carried out in a measured manner to obtain smoother and more even painting results.

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