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Development of High Performance Corrosion Resistance Paint for Truck Frames

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Purpose

In recent years, as the reliability of automotive parts has been improved, the usage period of automobiles has been lengthened, and customers' demands for corrosion resistance quality have been increasing. Powder coating has excellent corrosion and weather resistance due to its thick film thickness. On the other hand, however, it has the disadvantage that the coating film does not adhere to the inner surface of the structure, so electrodeposition coating is still highly required. However, electrodeposition coating has limitations in increasing film thickness. The main component, epoxy resin, is vulnerable to ultraviolet rays. In addition, surface tension during heat curing tends to thin the film thickness at the edges. Therefore, we have developed an electrodeposition coating that significantly improves corrosion resistance while maintaining a certain level of gloss.

Evaluation Method

As shown in Table 1, we evaluated the existing paints by varying the amounts of resins, pigments, and additives based on the existing paints. The ratio of base resin was increased to the extent that coating film performance was not compromised. The ratio of epoxy resin was increased to improve corrosion resistance. The pigment concentration was increased or decreased to check the trend, and the anti-corrosion pigment was changed from metal A compound to a further improved modified metal A compound. UVA and HALS were increased to improve weather resistance. Viscosity agents were added to ensure edge corrosion resistance, and the range compatible with gloss was examined. Corrosion resistance and weather resistance were then evaluated after a predetermined time evaluation.

Results and Observations

Analysis using statistical quality control techniques revealed that the ratio of epoxy resin and pigment concentration contributed to both corrosion and weather resistance. Furthermore, the applicable ranges of viscosity and pigment concentration were verified for gloss and edge corrosion resistance. As shown in Figure 1, it was confirmed that the concentration ratio of epoxy resin to pigment determines the performance tolerance for corrosion and weather resistance. Since pigment concentration varied in the actual line, the amount of corrosion inhibiting pigment and the amounts of UVA, HALS, and viscosity agent were adjusted to determine the composition range with high fastness.

Conclusion

By optimizing the composition and fastness of the paint through statistical quality control methods, the corrosion and weather resistance of not only the general surface but also the edges are greatly improved.

Table.1 Tests Level

	Factor	Control	Tests Level
Resins	Base Resin Ratio	1	1.0～1.1
	Epoxy Ratio	1	1.0～1.75
Pigments	Pigment Concentration	1	0.7～1.5
	Corrosion Resistance Pigment	Metal A	Modified Metal A
Additive	UVA	1	1.0～3.0
	HALS	1	1.0～3.0
	Viscosity Agent	None	1.0～3.0

Unit: Index

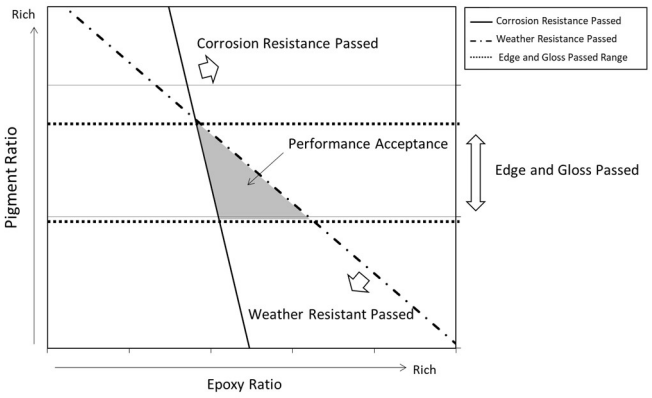

Fig.1 Composition Range of Developed Paints