Title:	**Sag & Appearance performance optimization of polyester/acrylic base solventborne clear coat for the automotive OEM market**
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Date:	January 2020
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The visual appearance of car paint is a substantial feature in the automotive market, especially in Premium brands that aim to stand out from their competitors. The major requirements for a clear coat, the last layer that is applied to every piece of a car, is to have a perfectly smooth surface after the curing process. A really important factor related to clear coat appearance is the levelling. To ensure a good levelling, clear coat viscosity must decrease, and film thickness of application must increase. A too fast film levelling generates sagging. Sagging is the clear coat drop at the end or at vertex of a piece. On the other hand, a too slow film levelling generates a ripple defect known as orange peel.

If all product parameters are within specification, no levelling and sagging issues are although expected. Sometimes there still are. Often the system is complex, and the focus of the problem may not be easily located. So, it is necessary to study the system in depth. The studied clear coat contains mostly four polyester and acrylic resins. One of them contains a polyurea Sag Control Agent (SCA) in addition to the base polyester. SCA resin, as well as clear coat, has a non-Newtonian viscous behaviour, and its rheological properties are not stable over time. Therefore, it is considered to study the rheological properties of some SCA resin batches and some clear coat batches over time by a specific method. The knowledge of the SCA resin rheological properties allows us to predict the clear coat sagging and levelling behaviour after its application. Nowadays, there is not a directly proportional relationship between these factors; so, finding a connection between them would be very significant in quality control terms.

Moreover, the analysis of polymer molecular mass distribution of SCA resin by Gel Permeation Chromatography may help to detect why a batch generates a clear coat with a bad final appearance.

Previous studies have shown that SCA resin has a significant effect on the final product appearance, but the rest of resins may also be influential. There are suspicions that exist other

factors that make both sagging and levelling performance worse even if the SCA resin is perfect in terms of viscosity and rheological behaviour. So, a complete factorial experiment design is proposed to evaluate the effect of clear coat resins on rheology, sagging and levelling of the final product.

In parallel, and to keep moving forward and innovating in the clear coat composition field, the introduction of a new rheological additive in the clear coat formula is also proposed. This new additive is a polyurea type as well, but it requires an intermediate polarity system.