



Achieving anti-soiling properties with automotive leathers

Leon Krings, Stahl Automotive Leather Chemicals



Designers have always been attracted by the use of light and bright colours. For articles such as domestic and automotive upholstery, with surfaces that are subjected to high wear and tear conditions, anti-soiling and anti-staining have become an important requirement in achieving optimum customer satisfaction and avoiding warranty issues.

Especially in the automotive interiors, light coloured leather for luxury models has become quite popular over the last few years. As a consequence OEMs have been looking intensively into adapting the specifications for soiling and staining in order to try to assure the car owner a long lasting clean leather surface experience.

One of the difficulties of this subject is that soiling and staining are often seen as the same issue. However, from a chemical and physical perspective there is a clear difference between the two.

- Soiling is the process of dirt (sebum, oil, dust) being collected on the surface over a period of time. The dirt collected in this way can typically be removed by using a special cleaning agent or just a simple soap solution.
- Staining is characterised by the process of dye penetration (indigo from jeans, coffee, ketchup or other foodstuffs) onto and into the surface of the finished leather. Once the dye has been trapped within the finish it is very difficult to remove with a cleaning procedure because most of the dyes are difficult to dissolve.

In order to tackle these different types of staining and soiling processes and to get the best correlations with real life

experience, individual OEMs have designed their own test methods based on their own experience. In most cases these are based on the use of well defined test materials consisting of a certain type of textile (jeans, cotton, polyester/cotton blend etc), and contaminated in a controlled way with “dirt” such as carbon black, olive oil, sebum etc. Test materials that are often used are EMPA 128, EMPA 170 and EMPA 104 and a specified type of jeans (e.g. 2550Y) for indigo dye transfer.

Panel I



This illustrates the complexity of designing an anti-soil and anti-stain finish that works for all the different test methods and for all different types of soiling and staining.



The test methods have been designed to focus on soiling only or on soiling and cleaning. Additionally most methods include an ageing step using an oven at temperatures up to 80°C for up to 24 hrs.

A new approach for anti-soiling top coats

It should be realised that on top of the anti-soil requirements all the other requirements for automotive upholstery finishes have to be fulfilled. This puts some constraints on the design of the best system. Due to these stringent and often contradictory requirements it is nearly impossible to design a system that meets all of these requirements. The best system will appear to be the best compromise between the various attributes of the finishing system.

One way to approach this complex issue is to separate the basic finishing requirements from the anti-soil or anti-stain requirements. This can be achieved by designing the best base and colour coat for meeting the essential requirements.

In many automotive finishes the top coat is applied in two passes using the same recipe in both applications. However, in this new approach the topcoat is also applied in two passes, but with each pass comprising different formulations.

Here, the first layer is a one pass full top coat system to achieve the basic requirements as specified by the OEM. The second layer is a relatively thin coat and can be considered as an over spray that takes care of the anti-soil requirements. This anti-soil top has been designed in such a way that it is very effective in avoiding dirt pick-up. It has proven to give excellent results for soiling tests using test materials like EMPA 128, EMPA 104 and EMPA 170.

The first of these two layers uses typical polyurethane and acrylic resins pigments and auxiliaries to meet the regular physical and chemical requirements for flex abrasion, UV and temperature. The anti-soiling top layer consists of mainly acrylic binder material, specially selected silicones and some additives that together provide excellent anti-soil resistance.

Nevertheless, for optimum anti-staining performance - such as indigo dye penetration - it is important to also optimise the composition of the first layer. The use of mainly high performance acrylics as binder material has proven to be the key factor in providing the best results in resistance against dye penetration.

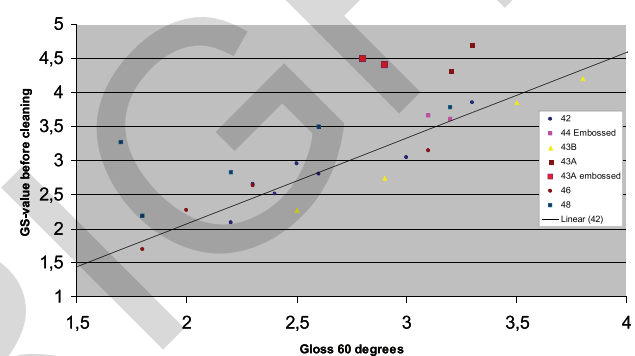
Achieving good anti-soil results with less matting agents

Another important parameter for automotive finishes is the final gloss of the system. In automotive upholstery leather it is

common practice to choose low to very low gloss levels of the leather. This holds for both dark colours and light colours.

To achieve these low gloss values a lot of matting or dulling agent, such as silica, has to be built into the topcoat. However, it has been observed that high amounts of matting agent do not help in achieving good anti-soil results. For indigo staining performance a clear correlation has been found between the gloss level of the finish and the achieved staining result. Unfortunately this correlation works in the wrong direction and it shows that low staining values are best achieved at high gloss.

Panel 2: Correlation of surface gloss and dye penetration.



Nevertheless, a way has been found to overcome this correlation. Using an isocyanate cross-linker that combines excellent cross-linking performance with intrinsic matting properties, it is possible to lower the amount of matting agent needed to achieve low gloss targets. Using the anti-soil top coat in combination with these specific isocyanate cross-linkers provides the opportunity to achieve excellent anti-staining results while using low gloss values.

This use of a balanced two top system of a "regular" first topcoat followed by a specially designed anti-soil overspray-top, then combined with an isocyanate cross-linker with intrinsic dulling properties is a breakthrough. It has been proven to give excellent overall performance when looking at whole package of automotive requirements in the area of flexes, rubs, abrasion, thermal ageing, then in addition, the various types of soiling and staining tests. ☺

Panel 3: Less matting agents and good anti-soil results.

