Specialist Article

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Sand and Polish Glossy, Self-Healing PU Coatings in a Cost-Effective Manner

The sanding and polishing of decorative inner components produced using the RIM (reaction–injection molding) technique represents a considerable challenge for automotive suppliers. While the PU coating applied is self-healing and glossy when it exits the mold, it often features an uneven surface. Improving the surface quality is often barely feasible for automotive suppliers. Due to its thermoplastic properties, the coating is extremely hard to polish and sand. Working on behalf of a leading PU coating manufacturer, Menzerna has developed a sanding and polishing process that makes it possible to meet the quality standards of OEMs in a cost-effective manner.

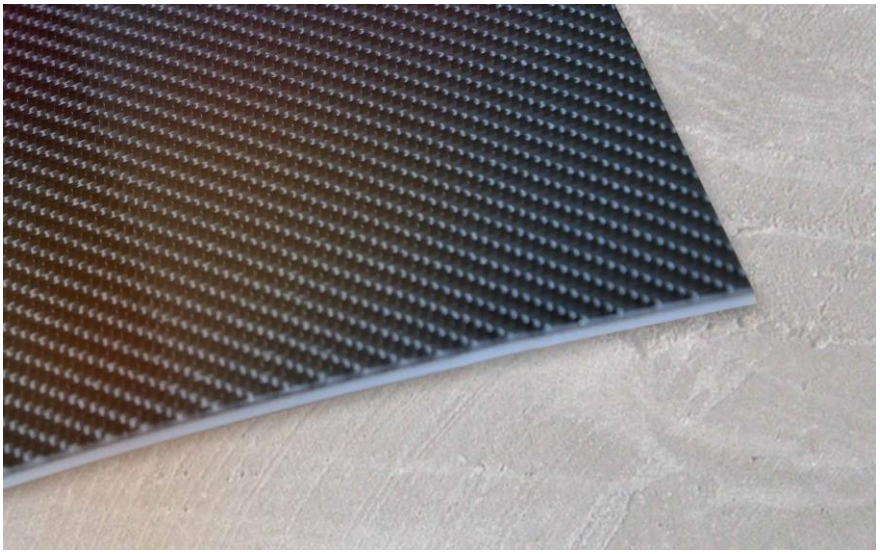

Figure 1: PU-coated surface with a structurally robust carbon-look finish

Key Insights at a Glance:

- Decorative components for vehicle interiors are often produced using the RIM method
- While these PU-coated surfaces are already glossy when they exit the mold, they exhibit unevenness
- Self-healing PU coatings are hard to polish and sand
- Suppliers need to meet the high quality standards in as cost-effective a manner as possible
- Systematic development facilitates a cost-effective sanding and polishing process
- Coating manufacturers can not only offer automotive suppliers innovative coatings, but also the right sanding/polishing processes to go with them

The Properties of PU Coatings Pose Major Challenges When it Comes to Polishing

While automated polishing was being performed on knife steel during testing at knife manufacturer Giesser, heavy smoke built up in the robot cell. Therefore, the desired surface quality could not be achieved. It was not possible to identify the cause at first.

Reproduction of the Polishing Process

There is significant pressure on automotive suppliers. OEMs impose high quality standards on the components supplied. Suppliers have to work in an extremely cost-effective manner in order to comply with the quality and price specifications issued by OEMs.

Nowadays, suppliers produce decorative parts using the RIM (reaction–injection molding) technique. While these parts are already glossy when they exit the mold, they often exhibit a certain unevenness. The release agent is already integrated and is automatically “sweated out” during the process. This saves a step in itself, as the release agent has to be applied separately in conventional processes.

The automotive industry requires the use of self-healing polyurethane (PU) coatings. However, the surface quality of these coatings often fails to meet the quality standards of OEMs when they are used on components produced using the RIM method. The uneven sections have to be removed using a suitable sanding technique and subsequent polishing.

This puts significant pressure on suppliers. The viscoelastic properties that allow the coating to self-heal are an obstacle to the polishing process, as the heat generated tends to counteract a glossy finish on a self-healing coating. The thermoplastic properties of PU coatings hamper the sanding process. That’s because the shavings produced during sanding clog the cavities of the sanding belt, which generates additional heat and causes sanding errors.

In summary, processing state-of-the-art PU coatings is a costly undertaking for automotive suppliers. The price levels set by OEMs result in such tight margins that it is not possible to polish and sand in a cost-effective manner.

Coating Manufacturers Can Offer Coatings and Process Recommendations as a Package

Anyone wishing to process these complex coatings in a cost-effective manner needs to carefully select the sanding/polishing process and the consumables used (sanding belt, polishing compound) and precisely tailor them to this process. In particular, cost-effectiveness is ensured when only the precise amount of sanding actually necessary is performed at all upstream stages of the process, meaning that it’s essential to choose the right abrasive. Whenever coating manufacturers can draw on the expertise of sanding and polishing experts, they benefit in two different ways. They not only supply automotive manufacturers with an innovative PU coating, but also a suitable and cost-effective process – a key sales argument.

Process Optimization Step by Step

Menzerna can systematically develop sanding and polishing processes at the technical center, using standardized tests and the Menzerna fingerprint process. The data generated during the tests is used as a basis for making recommendations about the choice of abrasive, sanding additive, buff, polishing compound, and the optimum process specifications.

In the case of self-healing, scratch-proof PU coatings, the process has to be developed in reverse. First of all, the finish specifications are considered, followed by those for pre-polishing, fine sanding and, finally, rough sanding. The reason for this approach is the need for a guarantee that traces left by individual steps will be eliminated during subsequent steps.

At the finish stage, the first step is to compare polishing compounds with different specifications. The aim is to achieve at least the same degree of gloss as when the part exits the mold during the RIM process. The surface unevenness due to the RIM process is initially ignored.

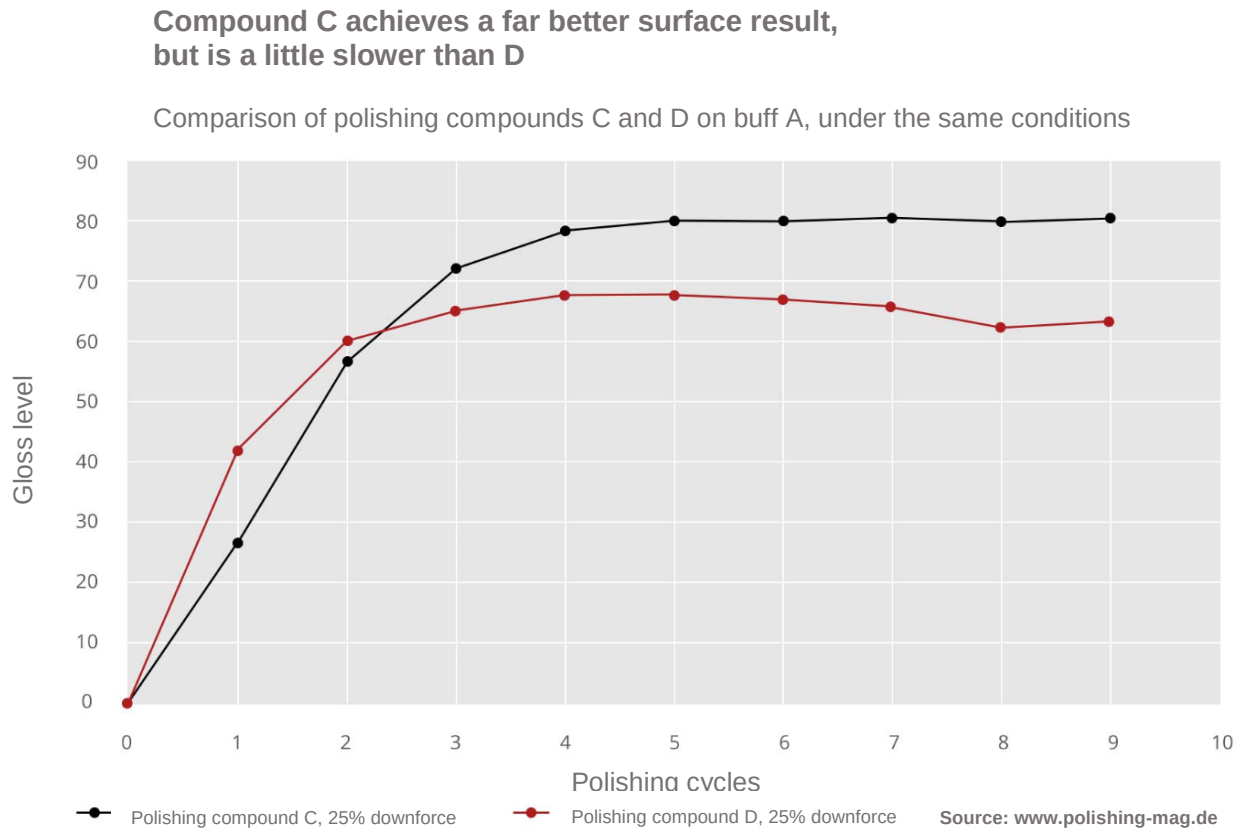

Figure 2: A comparison of the gloss level of two polishing compounds, under the same polishing conditions and using the same buff

In the “pre-polishing” stage, the specifications – including the degree of abrasion of the polishing compound – are set in such a way that any resulting streaks can be eliminated during the following step, the high-gloss finish. The upstream fine sanding plays a crucial role. It’s only after the finish that it becomes clear whether the correct sanding specifications have been selected and that all streaks have disappeared. The optimum specifications are determined by means of testing at the Menzerna technical center. During the subsequent stages of the process, it can then be precisely verified whether the fine sanding is actually suitable for the subsequent polishing process. Depending on the unevenness of the surface, it may be necessary to pre-sand more roughly. In the case of the coating manufacturer, two stages of sanding and two stages of polishing were sufficient to remove the surface unevenness caused by the RIM method and to achieve the desired level of gloss.

High Cost-Saving Potential Thanks to Process Optimization

Automotive suppliers benefit from cost savings, as the setting of the process specifications is based on solid data. This ensures that the desired surface result is achieved with the most cost-effective process. As various consumables are tested during process development, it is possible, for example, to identify which abrasive and which buff deliver the longest service lives and therefore represent the most cost-effective option.

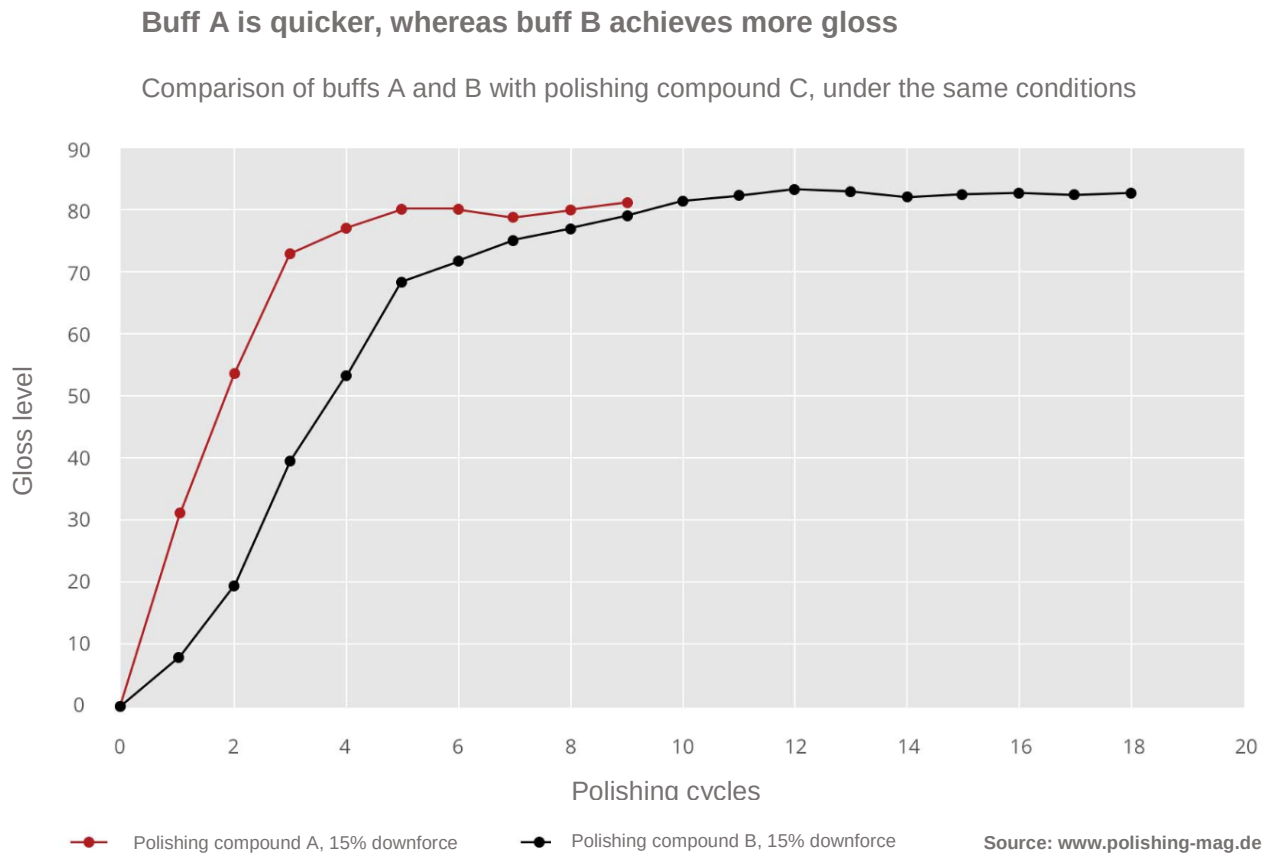

Figure 3: A comparison of two buffs in terms of the gloss level that can be achieved under the same process conditions

The Optimum Conditions for Belt Sanding Can Also Be Determined

In the near future, Menzerna will study the smoothing of PU coatings by means of belt sanding. Components with a very high degree of coating inconsistency require belt sanding. Menzerna is currently laying the technical foundation to enable the use of the Menzerna fingerprint process in tests performed at the technical center.

Conclusion

A major challenge for automotive suppliers lies in the sanding and polishing of decorative components that have been produced using the RIM technique and that feature a PU-coated surface. On account of their self-healing properties, these surfaces can only be processed mechanically at considerable cost. Thanks to analytical testing at the technical center using the Menzerna fingerprint process, a cost-effective sanding and polishing method has been developed for an innovative PU coating. By virtue of this method, automotive suppliers can reliably and cost-effectively meet the high quality standards imposed by OEMs. In turn, this gives PU coating manufacturers persuasive arguments when selling to automotive suppliers.

About the Author

Menzerna is the specialist when it comes to developing and optimizing sanding and polishing processes – and knows exactly what to do when it comes to hard-to-polish PU surfaces. With suitable measuring equipment and proprietary processes, Menzerna is able to pinpoint potential savings in existing workflows – good news for industrial companies and coating manufacturers alike.

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