Process strategies for polished steel surfaces

B. Behrens[1], R. Zunke[1]

[1]Fraunhofer Institute of Production Technology IPT, Aachen, Germany

INTRODUCTION: According to DIN 8589, polishing is not a manufacturing technique in its own right and is only used in combination with other manufacturing processes such as grinding, honing or lapping. In the mould and die making industry, the different "polishing levels", e. g., brush finish, gloss or high-gloss, are considered the subjective opinion of the polisher. The divergence in quality standards often leads to disputes or even legal proceedings between steel manufacturers, polishing specialists and the plastics processing companies.

Furthermore to improve the surface quality, the fundamentals of the polishing process have to be understood; especially the origins of different types of defects and defect structures, which still lack of sufficient explanatory models. The Fraunhofer IPT has scientifically analysed the factors influencing the polishing process. The aim was to determine a conclusive explanation for the causes of polishing defects.

METHODS: Process technological experiments on ten tool steels were performed to get better explanations of the origin of defects. The final goal was to find a system that will minimize the manual polisher's monotonous work under unhealthy conditions [1].

The polishing experiments were accomplished on two different polishing machines; one from the metallography for plane samples and one typical manual polishing system for free formed surfaces.

The samples were qualitatively assessed with a light microscope, a SEM (scanning electron microscope) and measured with a white light interferometer, to get quantitative roughness parameters e.g. S_a and S_z (arithmetical mean height and maximum height of the surface) [2].

RESULTS: One main result of various polishing experiments was the classification of surface defects. In cooperation with Halmstad University in Sweden, the Fraunhofer IPT has taken a first step towards standardising the vocabulary involved in polishing through the creation of the defect chart according to the European Standard EN ISO 8785.
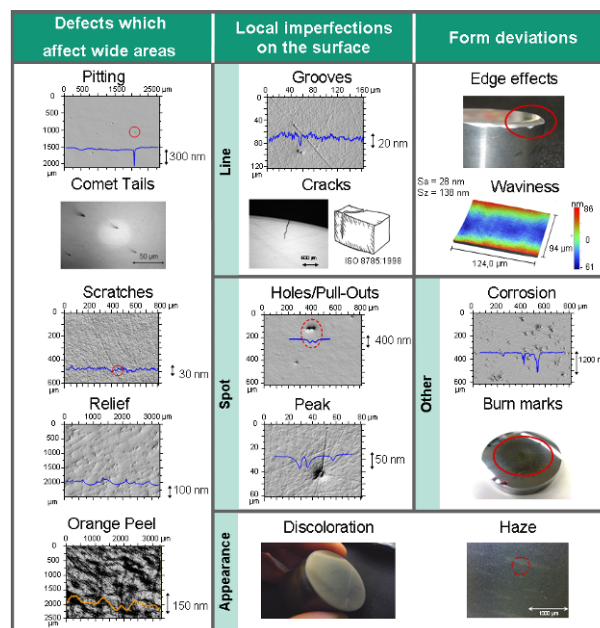

Fig. 1: Defect Chart

DISCUSSION & CONCLUSIONS: This table was used in the project to derive strategies in order to prevent polishing defects. The strategies can be found at www.polierstrategien.de. For future projects, these strategies will be expanded to include more materials, e. g., plastics, and ceramics.

REFERENCES: [1] Tsai et al., Development of an Automotive Mold Polishing System, 2005, IEEE Transactions on Automation Science and Engineering, pp. 393-397.
[2] Deutsches Institut für Normung, DIN EN ISO 25178, Oberflächenbeschaffenheit: Flächenhaft – Teil 2, 2008.