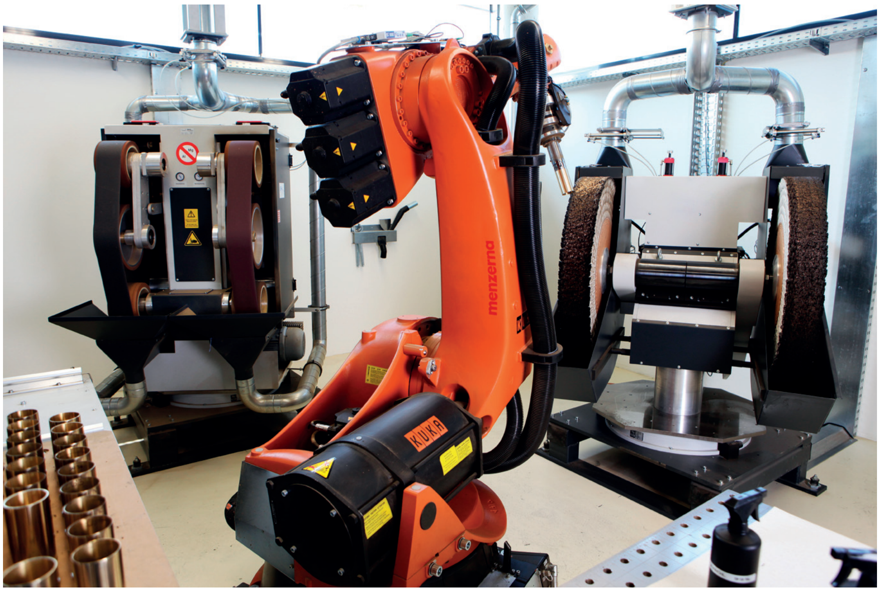

Figure 1:
Robot-based polishing line in the Menzerna Technical Centre

Shorter cycle times for polishing with solid compounds

Summary

By systematically coordinating polishing tools and polishes with the respective application, the processing time for polishing zinc die cast parts was reduced by nearly 20 % and the roughness values of the surfaces were improved in a series of tests. These results are particularly relevant when the acquisition of additional polishing equipment can be avoided as a result of this productivity increase. The tests were conducted in the Technical Centre of Menzerna Polishing Compounds.

In view of the high acquisition costs for automated polishing lines and the peripherals required to operate them, the costs of consumables – polishing tools and polishing agents – are negligible when calculating the polishing cost per unit. This means that the system throughput per unit of time, i.e. the number of parts processed per hour, is all the more important for the economic efficiency of the process. In addition to optimising the surface quality, the objectives of process optimisation therefore have to include increasing the throughput by reducing the cycle times. This applies even more so when the capacity is fully utilised, since investments in additional equipment

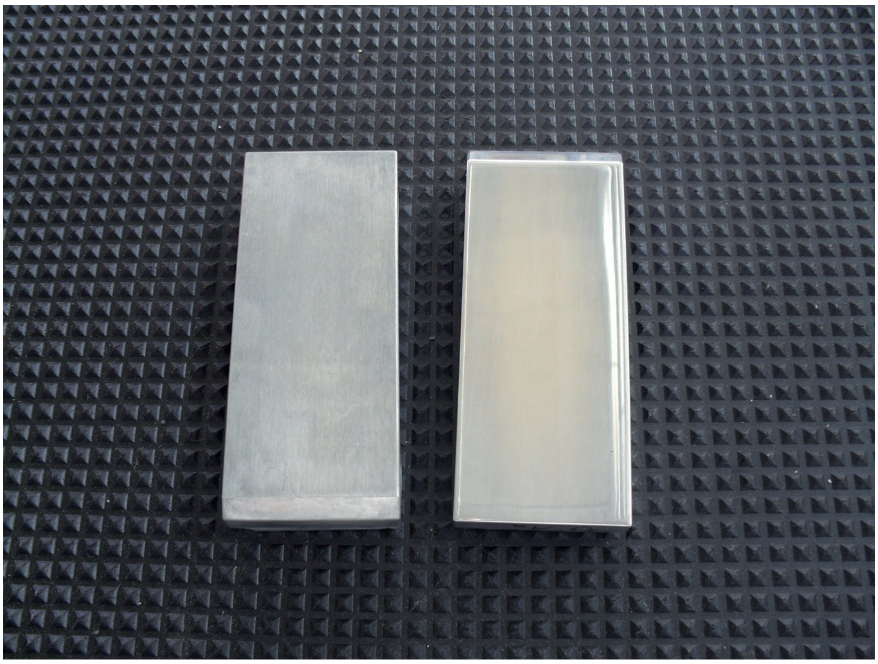

Figure 2:
Work piece sanded / work piece polished

Polishing compound		Polishing wheel A (Polishing disc)	Polishing wheel B (Wave ring)
Solid compound	Al_2O_3 (fused alumina)	Processing of 10 work pieces respectively in 45, 55 and 60 seconds	
	Tripolite		
Polishing emulsion	Al_2O_3 (fused alumina)		
	Tripolite		

Table 1: Combinations of polishing compounds and polishing wheels examined

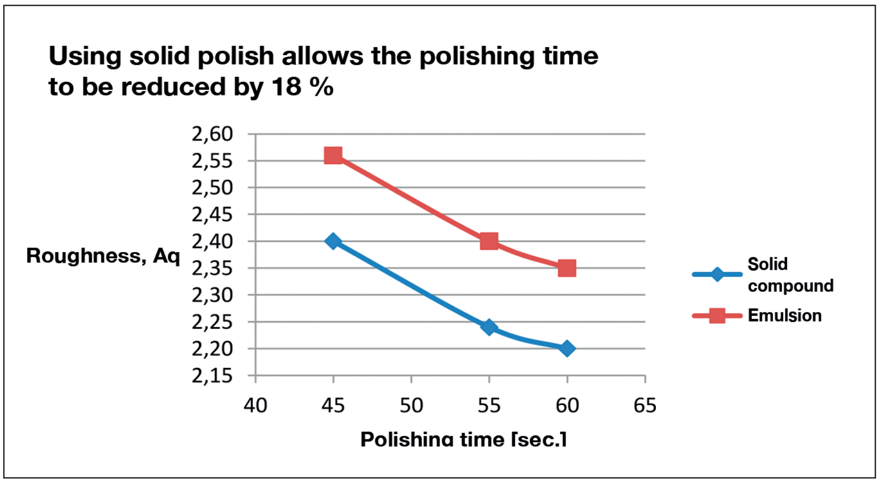

Figure 3: Roughness depending on the polishing time with solid compound and emulsion

can be avoided by increasing the productivity of the existing lines.

Test setup

In the case described here, zinc die cast work pieces were used to investigate what influence the combination of solid and liquid polishing compounds with two different polishing rings has on the polishing time per part and the surface roughness. The solid and liquid polishing compounds contained the same polishing minerals. This resulted in eight test configurations that were run with 10 work pieces each.
The tests were conducted on a robot-based polishing line, guaranteeing consistent test conditions. The surface quality was determined using a scattered light measurement system. After polishing, all parts were chrome-plated to determine whether parts with a rough surface exhibit defects after coating. The objective of this comparison was to determine to what extent surface roughness can be increased through reduced polishing without impairing the quality of the chrome-plated surface. The chrome-plated parts were inspected visually.

Results

When using solid compounds, the same surface roughness was achieved under identical conditions with a 20 % reduction in polishing time compared to polishing emulsions. The roughness value (Aq) of 2.4 was measured with solid polish after just 45 seconds, while the part processed with polishing emulsion only reached the same value after 55 seconds. This is due to the much higher proportion of polishing minerals in solid polishes, as well as the higher adhesion of the polish compound compared to emulsions, enabling a more effective use of the abrasives.
The figures below illustrate that the scattered light measurement system not only allows differences in surface quality to be determined with great precision, but that they can also be visually presented very well. 105,000 measuring points were recorded per work piece and combined into an area diagram. Areas with very low roughness are shown in blue, while high roughness is coloured red.
The two figures confirm the roughness values mentioned above and also visually demonstrate that the surface polished with solid compound reaches

Figure 4: Scattering light diagram, work piece polished with solid compound

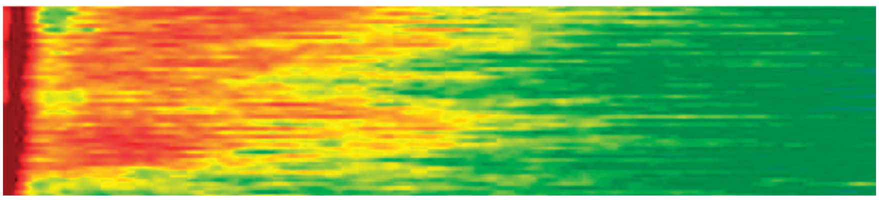

Figure 5: Scattering light diagram, work piece polished with emulsion

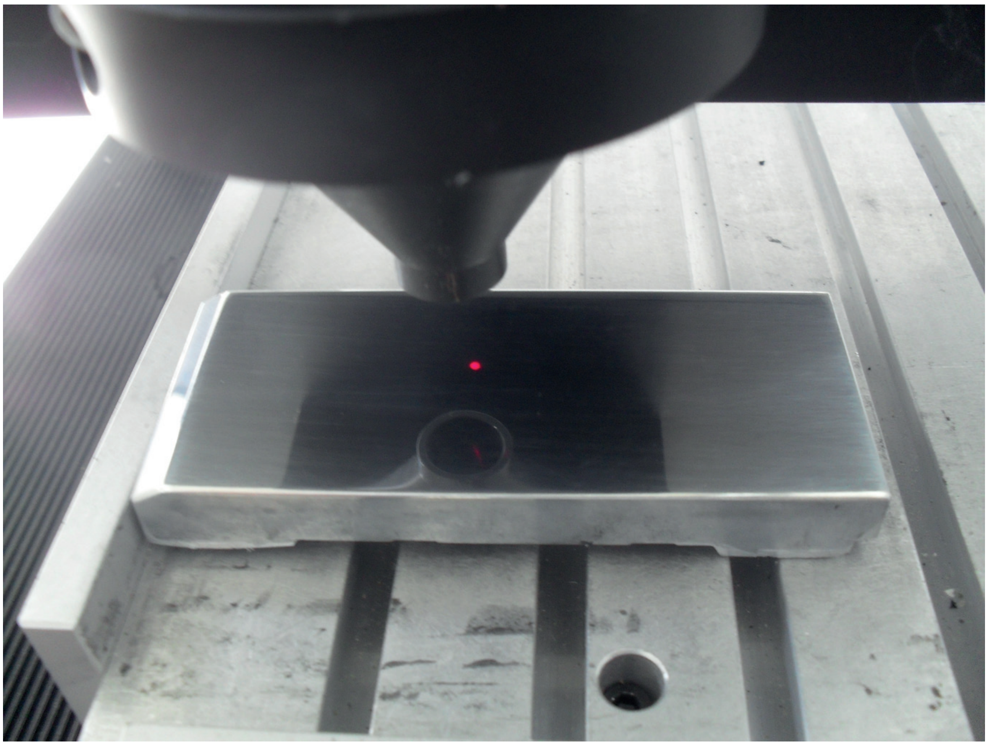

Figure 6:
Surface measurement of the polished
samples with scattered light

the desired quality after less polishing time.
Furthermore, the tests confirmed that the quality of the polished surface is greatly influenced by the polishing tool. In this case, it turned out that the best gloss level with solid compound could only be achieved when using the "polishing wheel new". Using the same polishing wheel and emulsion did not achieve anywhere near the same roughness.
A polishing wheel that achieves very good roughness values with emulsion, because it polishes a given grinding pattern extremely well, may exhibit less favourable results with solid compound. This relationship can be noted here. The precise causes and interdependencies have to be clarified in the course of further studies.

Conclusion

The test results show that the polishing times can be reduced by approximately 20 % when using solid compound on zinc die cast parts. While the results on other materials may vary, they should not be fundamentally different. This is why the use of solid instead of liquid polishing compound should be reviewed regularly, notwithstanding the shorter unmanned runtimes of polishing lines with solid compound. If the cycle time reductions obtained in the technical centre test are confirmed in actual application, a productivity increase of 20 % could justify the increased staffing required for a line operated with solid compound.
Under otherwise identical conditions, the surface quality achieved with polishing wheels using comparable fabrics but different processing methods may vary significantly. Systematic tests with different polishing wheels therefore pay off when it comes to improving the quality of the polished surface.

	Polishing emulsion	**Solid compound**
Polishing wheel A (Polishing disc)	2,55	2,75
Polishing wheel B (Wave ring)	3,05	2,25

Table 2:
Roughness value Aq when using solid and liquid compounds with different polishing wheels (plant photos: Menzerna, Ötigheim)