



## IMPROVING COLD FORMING OF ZE STEELS BY LOCAL LASER HEAT TREATMENT

### Task

Political and economic demands to conserve resources, to use energy more efficient and to reduce the CO<sub>2</sub> footprint aggravate the requirement for new lightweight concepts. In case of cold-rolled steels thickness reduction is a way to reduce weight which is accompanied by an increase in strength. However, such high strength steels still should allow complex forming operations. BILSTEIN has developed micro-alloyed steel grades called "ZE", which achieve a yield strength up to 1200 MPa. However, the formability is limited at such a high strength. Within the BMBF project KLASSE local laser heat treatment is investigated as a method to improve cold forming ability of such ZE steels but preserve the overall high strength. Softening will be achieved by recrystallization.

### Procedure

Cold rolled sheets are locally laser heat treated. A 12 kW diode laser with a rectangular beam profile and a top hat intensity distribution is used. To ensure a homogeneous heat treatment the process is temperature controlled.

### Result

The laser heating leads to recrystallization of the strongly deformed microstructure. In the case of ZE 1100 the ultimate elongation A<sub>80</sub> is two to three times higher than for the cold rolled state while the strength is reduced significantly. The cold forming performance is tested by standard collar forming and simple bending. For a cold rolled sample a collar height without cracking of only 4.6 mm can be reached. When an area of 15 x 15 mm<sup>2</sup> is softened the collar height increases about 70 % and with 20 x 20 mm<sup>2</sup> softened area even 100 % increase is possible. A bending test revealed an increase of the bending angle from 30 ° in the as-rolled state to 127° in the softened state before cracks occur.

### Applications

The main field of application is the automotive industry (car body, chassis). Of interest are also parts in the furniture industry such as slides and profiles.

### Contact

Dipl.-Ing. Sabrina Vogt  
Phone: +49 241 8906-633  
sabrina.vogt@ilt.fraunhofer.de

Dr. Andreas Weisheit  
Phone: +49 241 8906-403  
andreas.weisheit@ilt.fraunhofer.de

1 Collar-drawing experiments without (top)  
and with local softening (bottom).

2 Bending tests without (left)  
and with local softening (right).