

Why buying tool steel plates at Industeel ? Stress relieving

The plates in tool steels produced at Industeel are systematically stress relieved at the end of the manufacturing process. Only few steel producers perform a systematical stress relieving treatment before delivering their products.

Why performing stress relieving?

Stress relieving is performed to eliminate or at least significantly reduce internal stresses to the material or parts. These tensions are largely the result of non-uniform influences of the temperature during rolling, forging, welding, machining, cold forming and casting, and can also occur in the event of impeded deformation and mechanical stress.

A picture is more explicit than a long story:

At the end of the heat treatment process (quenching and tempering) the plates (especially the thinnest) are wavy as on the picture here under.

In order to meet the geometrical requirements these plates are straightened, and this is easy to understand that the straightening process will induce some stress along the plates and the level of stress is also depending on the location inside the plate.

At Industeel after straightening for all the mold tools and die steels (Superplast® and also all the grades including the conventional) the plates are systematically stress relieved with a procedure and parameters optimized to guaranty the lowest level of residual stress at the time of delivery.



When done correctly, stress relieving leads to an important reduction in stress without noticeable alteration of other material characteristics, such as its strength and toughness.

The internal stresses of the workpiece can only be reduced by means of plastic deformation at the microstructure level. This means that internal tensions are removed to the limit at which the stress relieving was carried out.

Without stress relieving during the further steps (sawing, machining, forming...) as soon as the addition of the residual stress and the stress induced by the further processing steps will exceed the yield strength the part will bent and if the total level of stress is higher than the tensile/compressive strength then the part will crack as shown on the picture here under (Steel 1.2312 quenched and tempered without stress relieving).

For which parts?

The deformation or crack in plates without a stress relieving treatment is a common and general problem but it could lead to accurate and expensive problems especially on:

- Long, tapered pieces.
- Complex-shaped parts (that must be reworked to reach the correct geometry)
- Workpieces with large cross-sectional differences
- Expensive Parts/Tools (there is a risk of scrapping the parts if it could not be reworked)
- Parts with large volumes of metal removed: the volume of metal removed is improved with stress relieved steels (no hard areas, less wear on the tools, uniform cutting parameters)



Conclusions:

The stress relieving of plates in tool steels is a safe method to guaranty the stability of the part during machining and avoiding the risk of stress cracks.

This extra heat treatment is for sure costly but less expensive than reworking the machined parts or scrapping them and it should be considered at the time of buying the steel especially when the cost and time for reworking or machining a new part could leads to high costs for the machining company and the final customer.

At Industeel 100% of the Mold- Tool and Die Steels are stress relieved

Your contacts

Jean-Michel Machefert

jean-michel.machefert@arcelormittal.com

Carolina Bicego

carolina.bicego@arcelormittal.com

Perrine Lavalley

perrine.lavalley@arcelormittal.com

industeel.arcelormittal.com



All information in this brochure is for the purpose of information only. Industeel reserves the right to change its product range at any time without prior notice.

