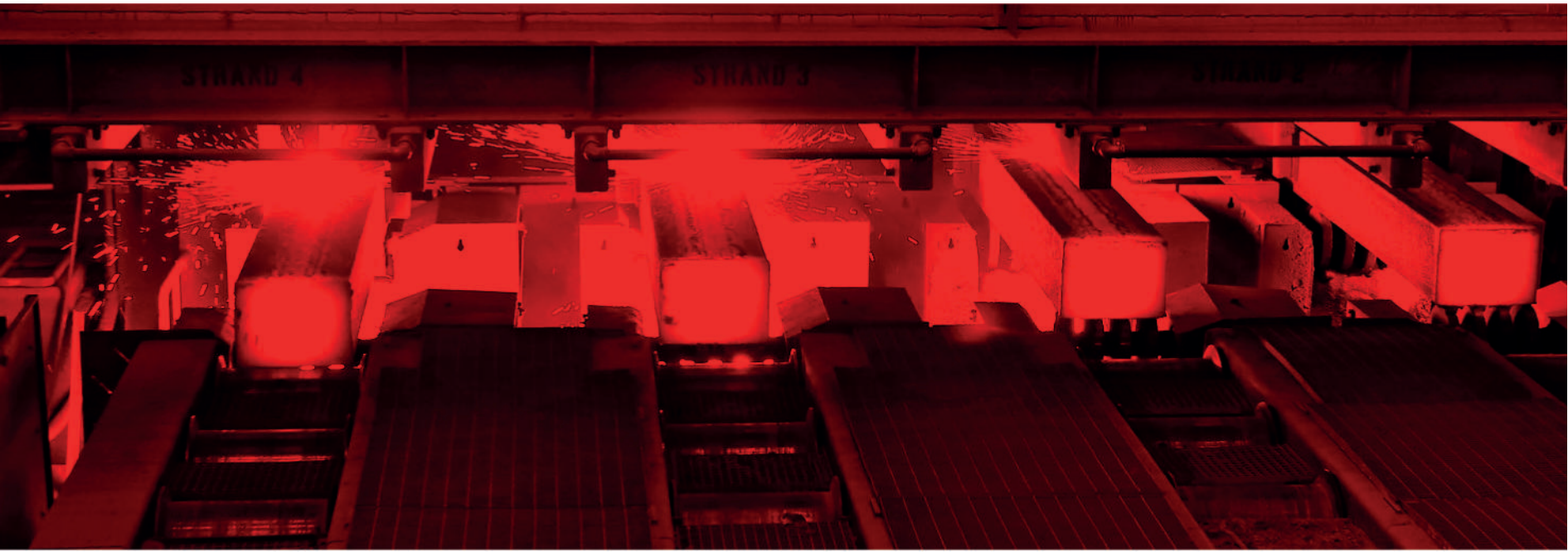
sidenor steel

Improving the isotropy of steels for automotive components subjected to multiaxial loadings



6th SCT2022

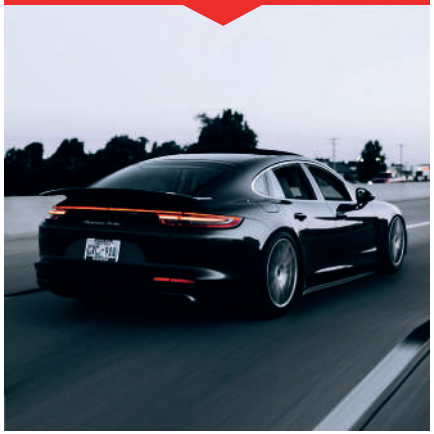
6th International Conference on Steels in Cars and Trucks
June 19-23, Milan (Italy)

Downsizing: A must for any vehicle configuration

In ICE vehicles for **CO_2 reduction**

In BEV vehicles for **range extension**

In FCV because **space required**



Downsizing implies that **to keep the component performance, its properties must be improved**. This is especially relevant in components subjected to complex loadings. In those cases, the **isotropy enhancement appears as a very attractive alternative to improve the performance**

Sulphur in the steel

- Machining costs represent an important part of the component total production costs
- **To reduce machining costs, S is added to the steel** in order to form MnS inclusions which present the following beneficial effects on the steel machinability:

Lower power consumption

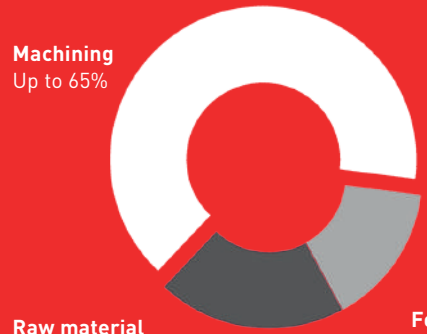
Shorter chips

Longer tool life

- After the steel rolling **the MnS are found as elongated inclusions**

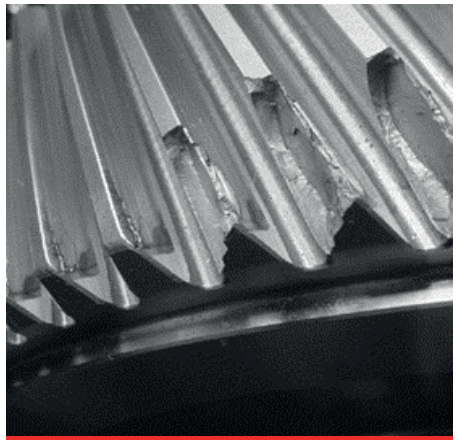
[1] *N. Anmarket al. "The effect of different non - metallic inclusions on the machinability of steels". Materials. Vol. 8, 751 - 783.2015*

Example of the production costs distribution for an automotive piece (gear shaft)[1]



Reasons to reduce the Sulphur content

The elongated shape of **MnS notably deteriorates the steel isotropy**



This deterioration is especially relevant for components subjected to multiaxial loads, **increasing the risk of catastrophic failures**

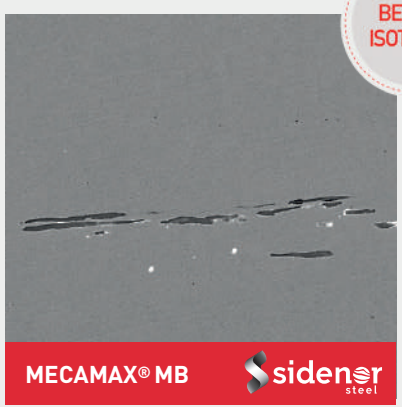
To avoid this problem **S content could be reduced**. However, this would deteriorate the steel machinability, **drastically increasing the production costs**

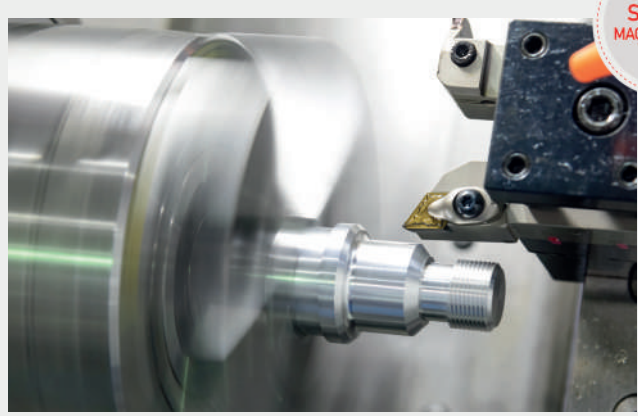
A compromise between the steel isotropy and machinability must be found

MECAMAX® MB: a solution to improve the isotropy

- The **MECAMAX® MB technology** is the innovative solution developed by Sidenor to face this problem

- This technology is based on the bismuth addition to the steel. The especial properties of the **bismuth inclusions allow to reduce the sulphur content**, improving thus the steel isotropy, **without deteriorating its machinability**

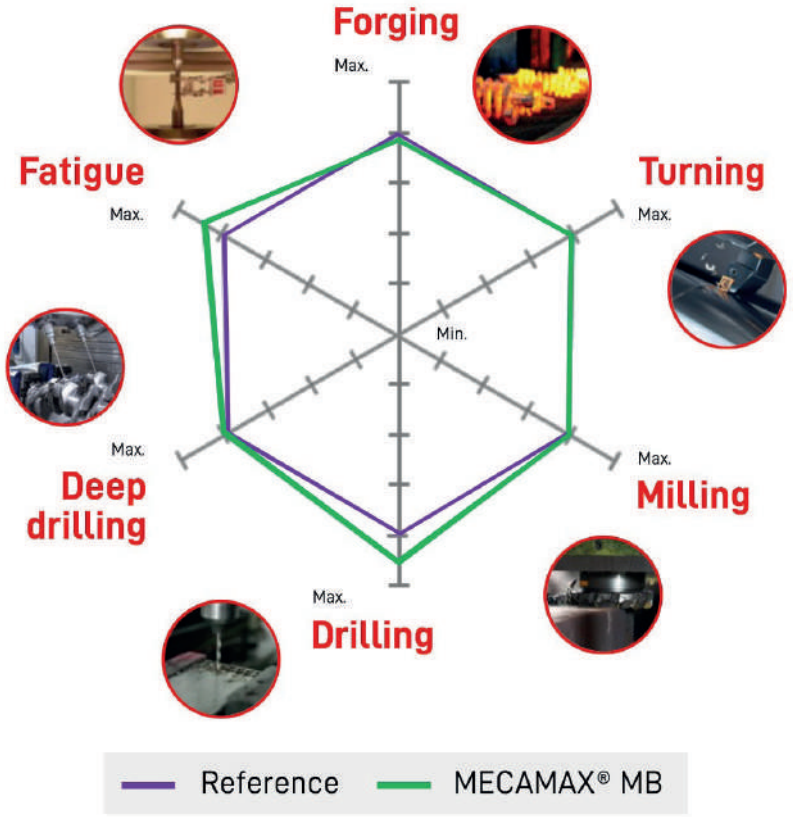




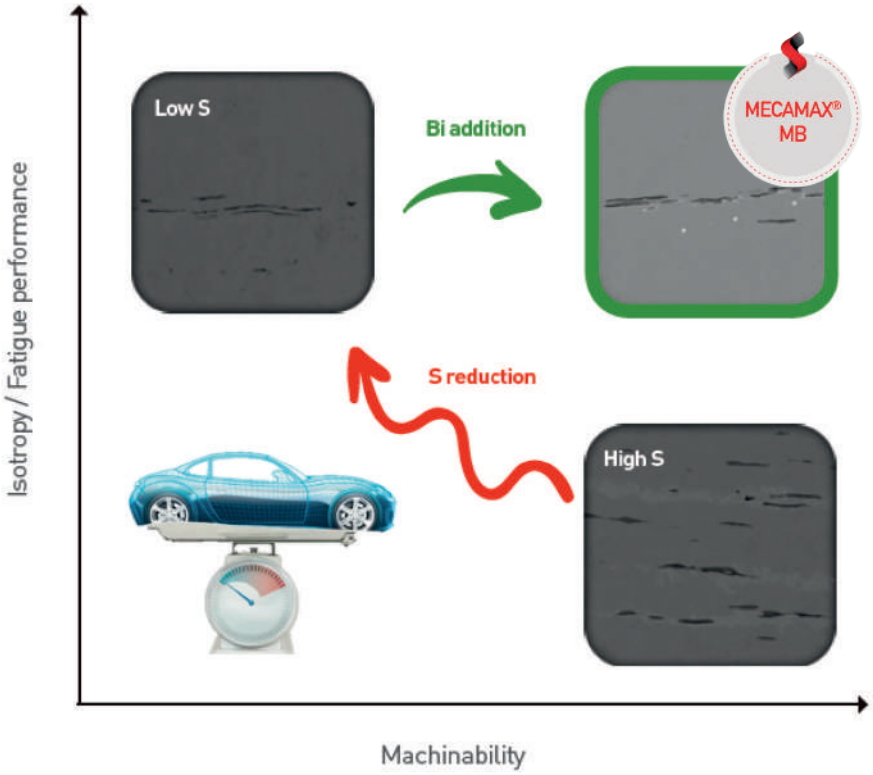
Study of the steel performance at laboratory scale

The results showed that steel...

- is **perfectly forgeable** at high temperature
- presents **similar machinability** than the reference (even with notably lower S content) **in turning, milling and deep drilling**
- shows **better machinability in drilling**
- **increases the fatigue limit of the reference steel in about 10%**



Summary



MECAMAX®MB:
THE BEST COMPROMISE BETWEEN MACHINABILITY AND ISOTROPY!

- Lower power consumption
- Shorter chips
- Longer tool life
- Improved isotropy
- Excellent fatigue performance

sidenor steel

Thank you very much

www.sidenor.com
sidenor-marketing@sidenor.com