

HARDOX®

TechSupport

Information from
SSAB Oxelösund.

#51

HARDOX in Rubber Recycling



TechSupport is a series of publications about HARDOX wear plates and WELDOX structural steel plates from SSAB Oxelösund. For more info, contact Customer Service, www.ssabox.com

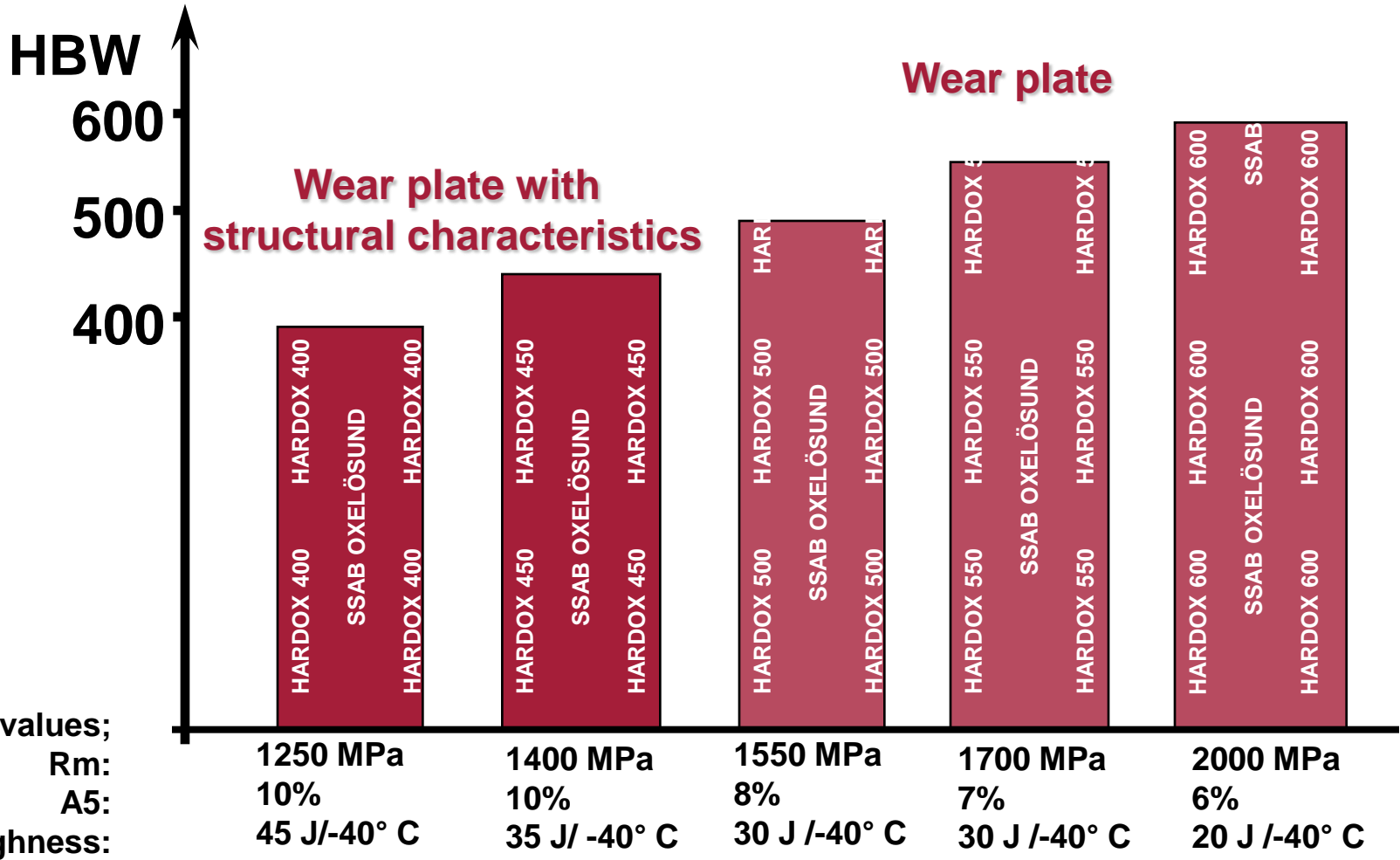
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Editor: Jesper Gordon. Date: 09/02/2009. Version: 1.0. Page 1

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HARDOX®
WEAR PLATE

HARDOX

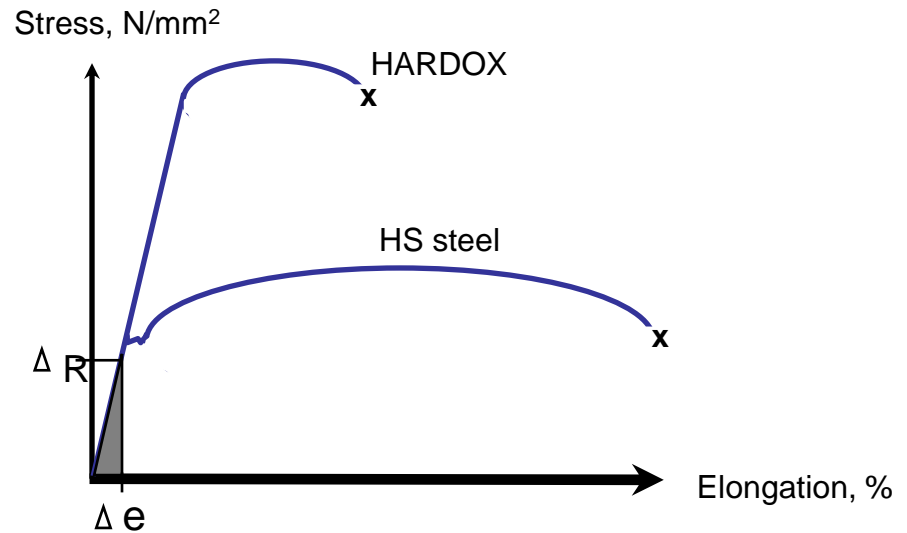


Typical values;
Rm:
A5:
Impact toughness:



Definitions

- **Elasticity** is a materials tendency to deform in a way that the deforming energy transforms into potential energy. A material with elastically behaviour revert itself to its original shape and the energy is reverted into kinetic energy.
- **Plasticity** (opposite to elasticity) is a materials tendency to deform in a way that the deforming energy transforms, through inner friction, into heat. A material with plastically behaviour do not revert itself into its original shape.
- **Young's modulus or modulus of elasticity** is within the science of the strength of materials the relationship between mechanical stress and deformation in the elastic region.





TYRE – steel and rubber

Rubber

- Organic substance with elastic behaviour
- Not an abrasive material

Steel cord

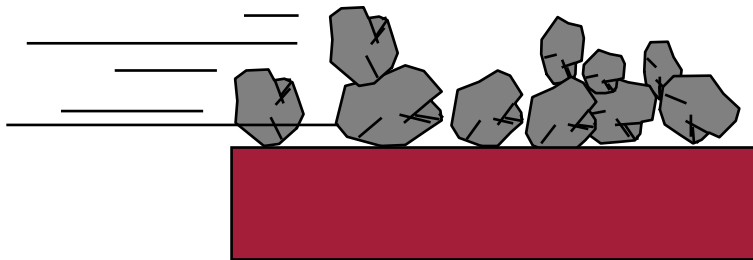
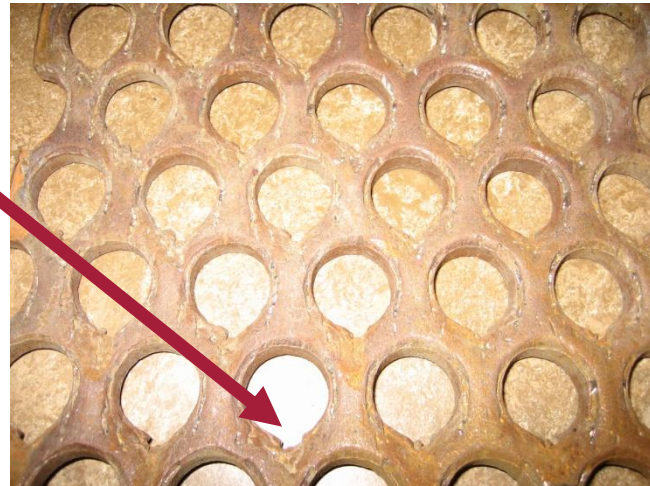
- Metal with elastic – plastic behaviour
- Web of thin wires
- An abrasive material, hardness of up to 700 – 800 HV



Abrasive sliding wear



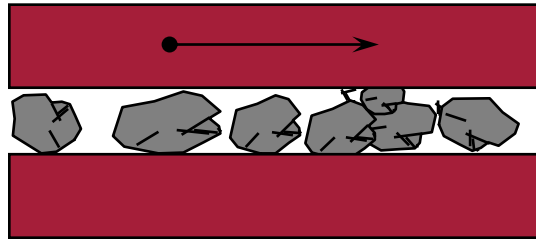
- On cutting edges
- On spacer discs
- On screens





Abrasive squeezing wear

- Between shears and spacer discs
- Between shears and shears





The tyre shredding process

Shredding tyres differ from most other materials as the sharpness of the shears cutting edges are of greater importance

Sharp cutting edges

- ➔ Higher quality of the fragments
- ➔ Less force required when the steel cord is cut
- ➔ Less heat in the process

Unsharp cutting edges

- ➔ More wear
- ➔ The fragments will enlarge





The tyre shredding process

Parameters that effect the size of the fragments

Counter rotating shears

- Thickness of the shears
- Distance between shear and spacer disc
- Sharpness of shears
- Tolerances between the shears

Anvil shears

- Size of screens
- Size of shears



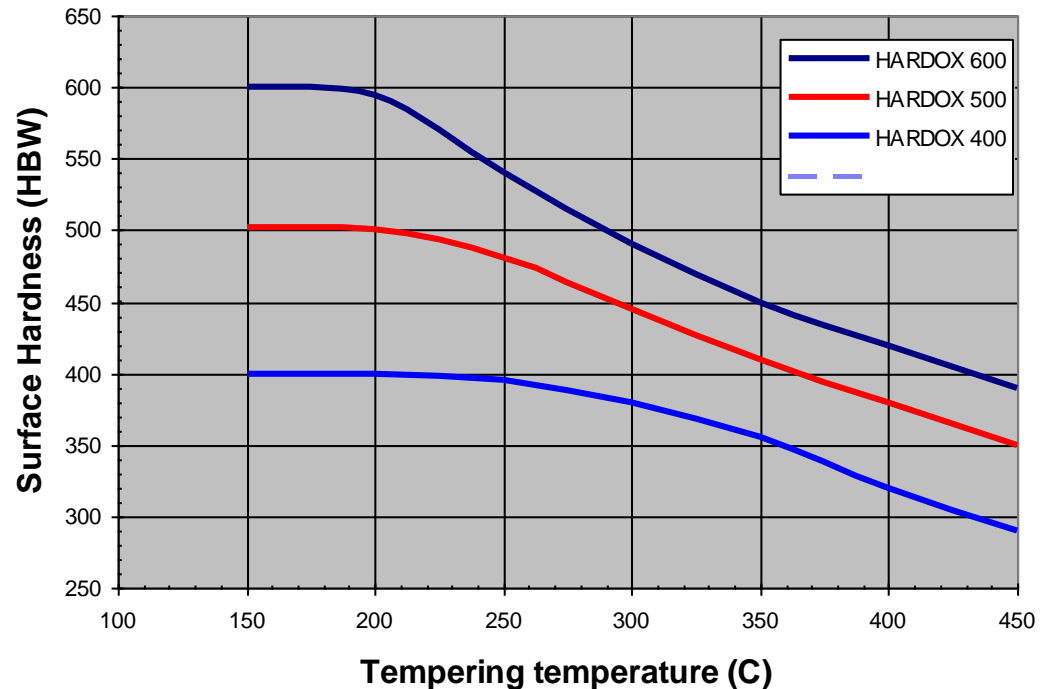


Heat – A factor not to neglect

In high enough temperatures all low alloyed steels have the same properties

However in reasonable temperatures a harder steel still have more hardness

Surface Hardness vs. Tempering temperature



Shredder shears



Reasons why HARDOX 600 in shears

Against tool steels

Wear life ~20 % shorter

but

Material cost ~2 – 4 times lower

Can be produced locally



Less transportation cost

Fewer production processes



Shorter lead time

(only abrasive water jet)

Better impact toughness



Less risk of failure

But if failure occurs



Less capital lost

Total economy

In a non bottleneck less total cost / ton fragmentized tyre

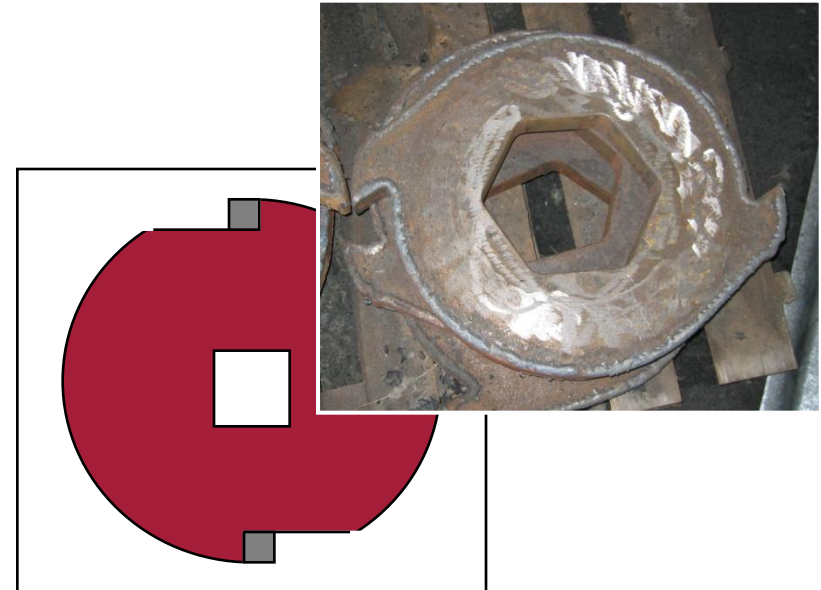
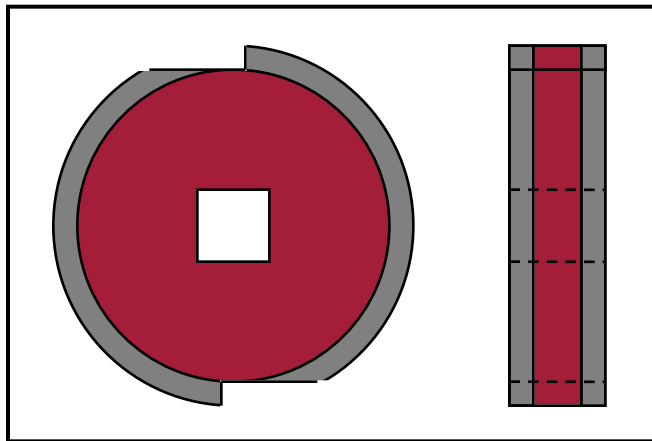


Shredder shears

Design solutions – the future

Two different kinds of wear situations

- Cutting edge exposed to heavy sliding wear due to the hardness of steel cord
- Squeezing wear in between shears and spacer disks



HARDOX 600 in combination with tool steel or hardfacing in cutting edges result in the longest wear life



Shredder shears

How to produce the shears

When cut HARDOX 600 for shears abrasive water jet cutting is to recommend

- This as cutting edge sharpness is of major importance when shredding tyres, no HAZ (heat effected zone)
- The risk for hydrogen cracks is minimized

Cutting method	Thickness	Cutting speed	Kerf	HAZ	Dim.tolerance
Abrasive water jet	4 – 150 mm	8 – 150 mm/min	1 – 3 mm	0	+/- 0.2 mm

Shredder screens



Reasons why HARDOX 500 in screens

Longer service life due to

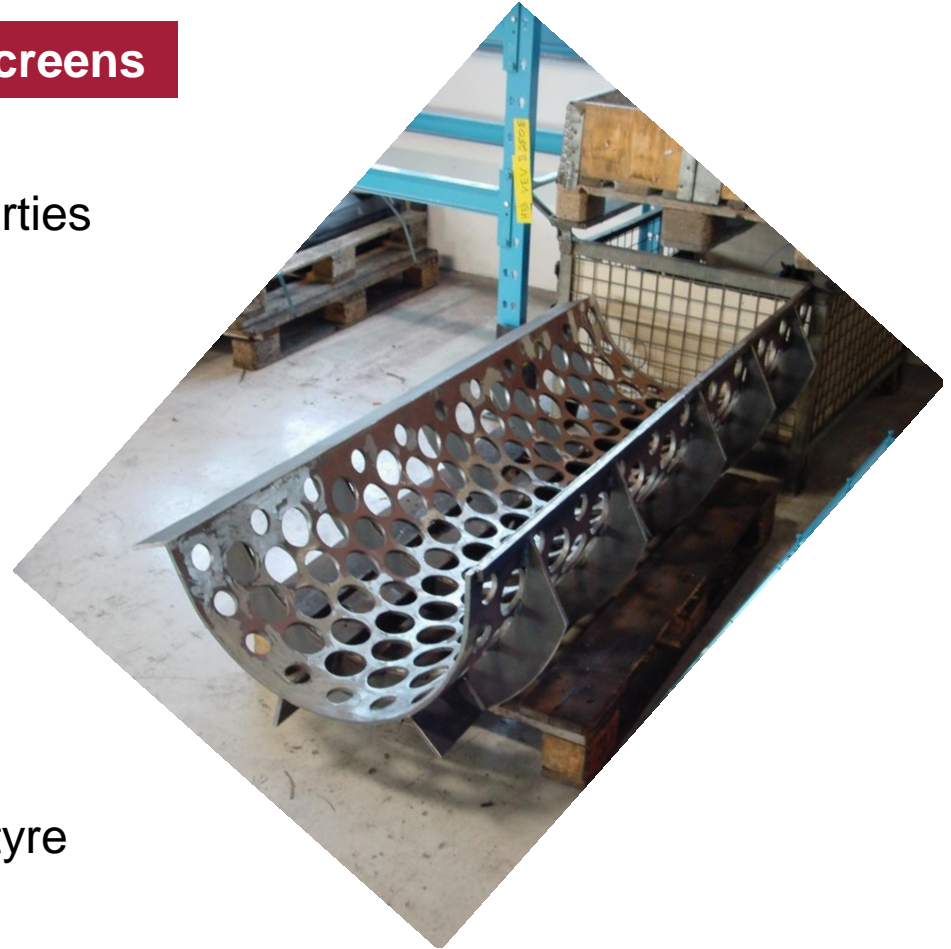
- Best homogeneity hardness properties
- Best thickness tolerances

Manufacture properties

- Better bendability
- Better weldability
- Better cuttability

Total economy

- Less total cost / ton fragmentized tyre





Shredder screens

How to produce the screens

- When cut **HARDOX**, use laser or thermal cutting under water in order to remain hardness
- It is recommended to cut holes in irregular order

Cutting method	Thickness	Cutting speed	Kerf	HAZ	Dim.tolerance
Plasma	4 – 40 mm	1200 – 6000 mm/min	2 – 4 mm	2 – 5 mm	+ - 0.2 mm
Laser	4 – 20 mm	600 – 2200 mm/min	>1 mm	0.4 – 3 mm	+ - 1 mm

- When roller bend **HARDOX 500**, use smaller rolls because of material spring back
- When not able to roller bend, free bending is an alternative

Avantage HARDOX



**The best wear plate in the world
is
a part of your success**