



Cement Industry

This presentation contains general suggestions. SSAB hereby expressly disclaims any liability for their suitability for individual applications. It is the responsibility of the user of this brochure to adapt the recommendations contained herein to the requirements of individual applications

The raw materials

- Limestone*, a rock based on Calcite and some other minerals. The hardness (as a rule of thumb) is 150 HV.

Ex 1 - NUH cement Turkey.

96 % Calcite	60 HV
3 % Illite	530 HV
1% Hematite	940 HV

Ex 2 - Blue Circle UK

97 % Calcite	60 HV
2 % Quartz	1070 HV
1 % Illite	530 HV

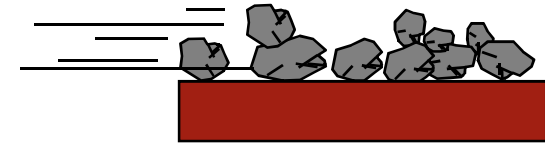
- Clay (or fly ash, slate, sand**)

*) Limestone is sometimes exchanged with shells or chalk

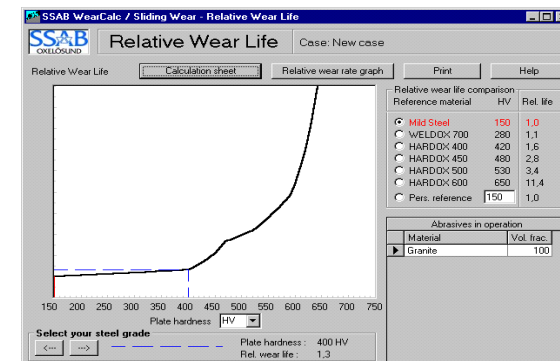
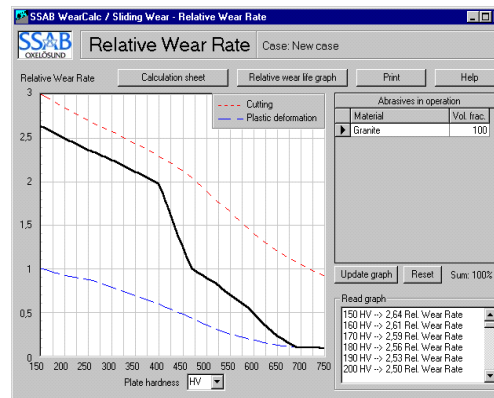
**) Fly ash, shifter, sand



WearCalc- software only by SSAB



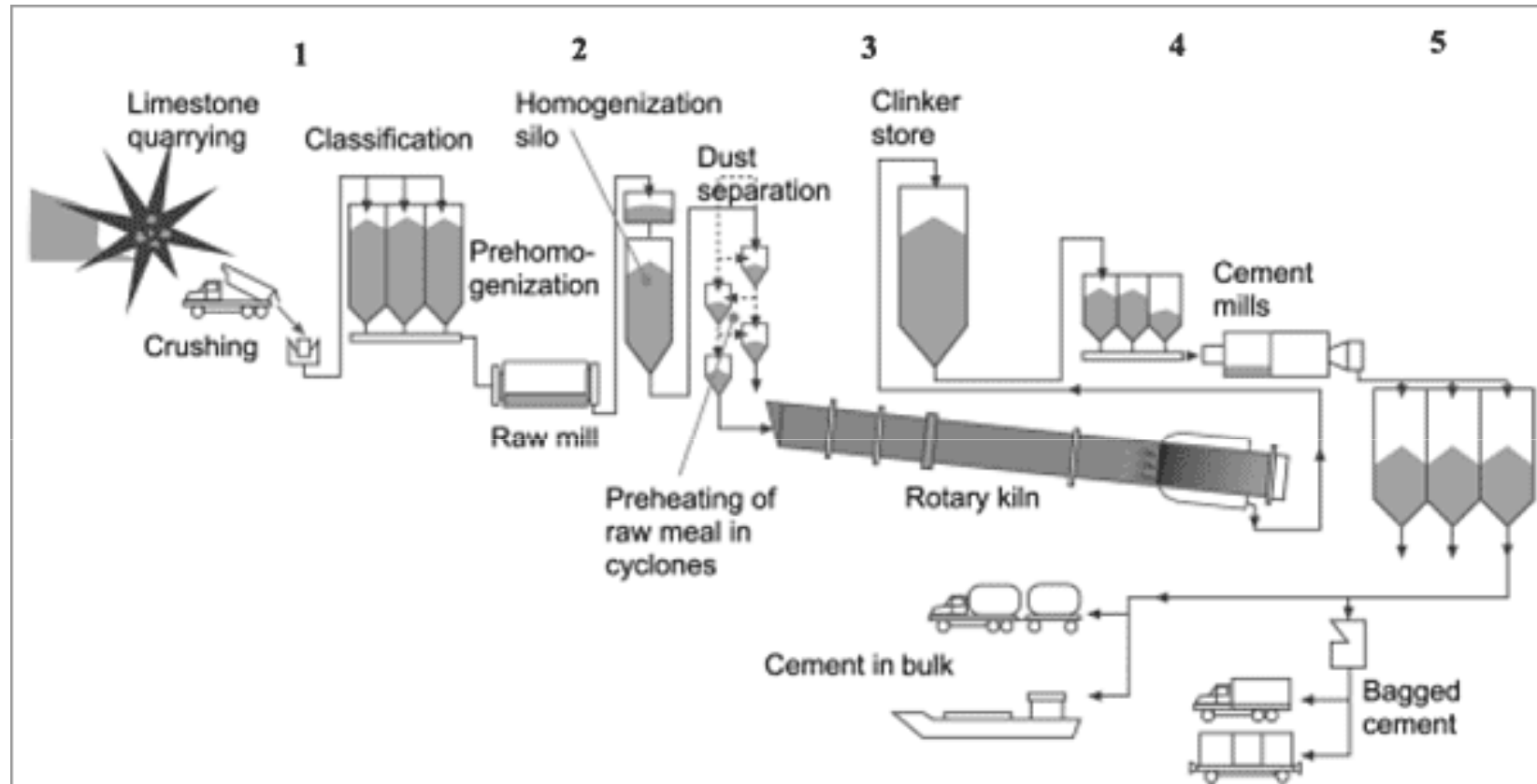
.....Relative Wear



Relative Service Life.....

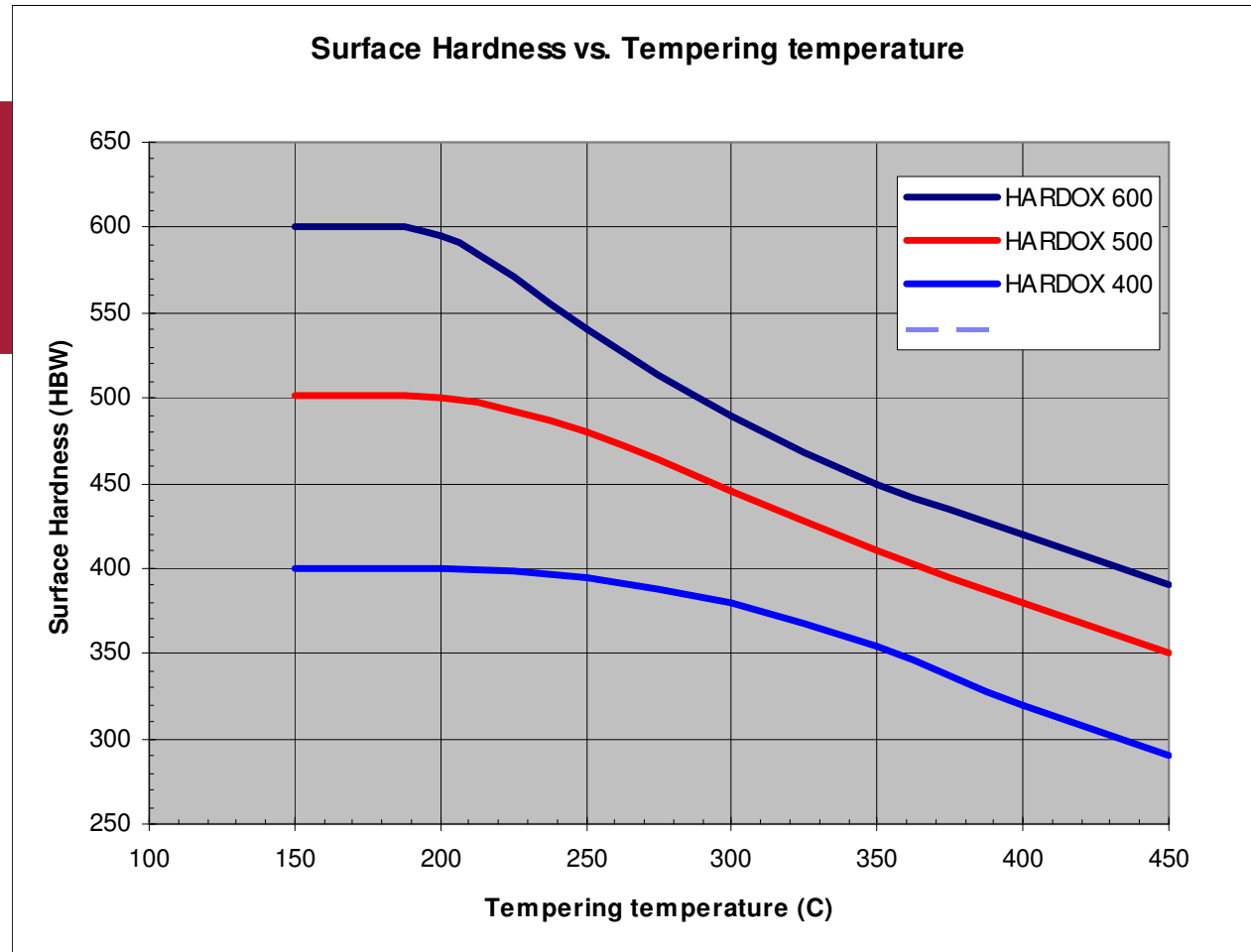
Makes you choose the right material for your specific wear situation

Process flow chart

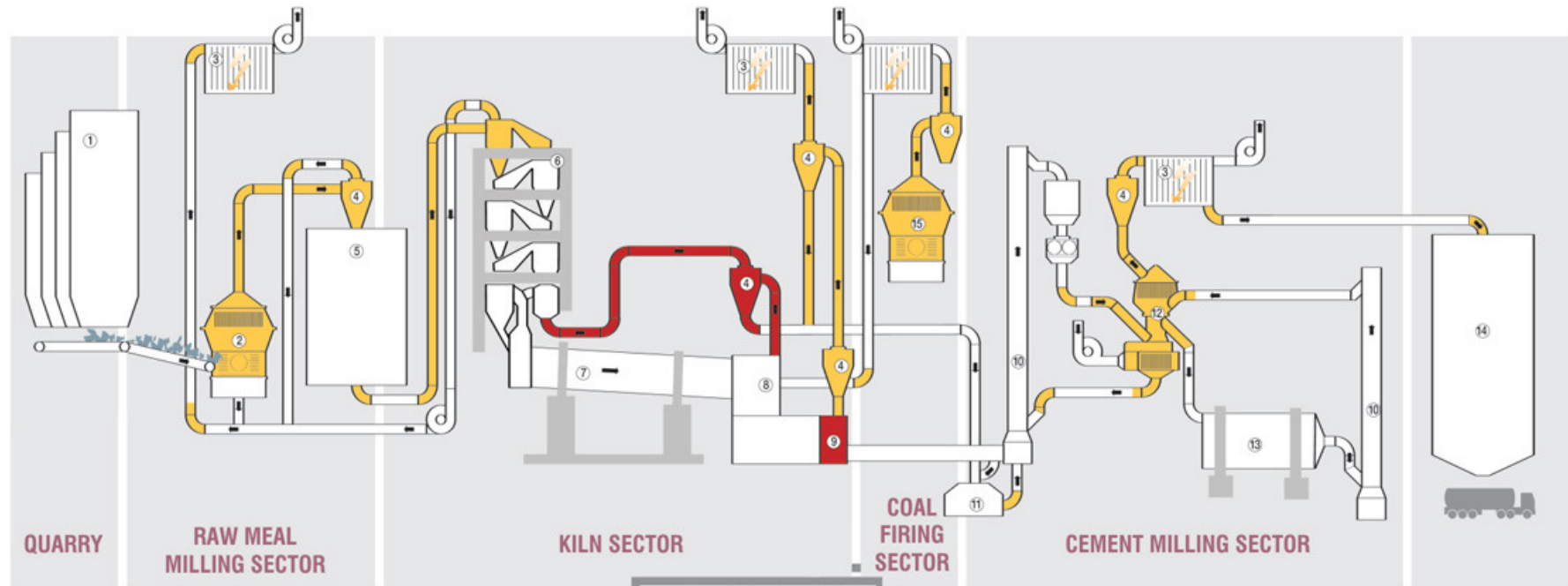


Hardness reduction due to tempering

Above 200°C to 250°C HARDOX starts losing hardness!



The Cement Industry



Areas applicable for DENSIT®

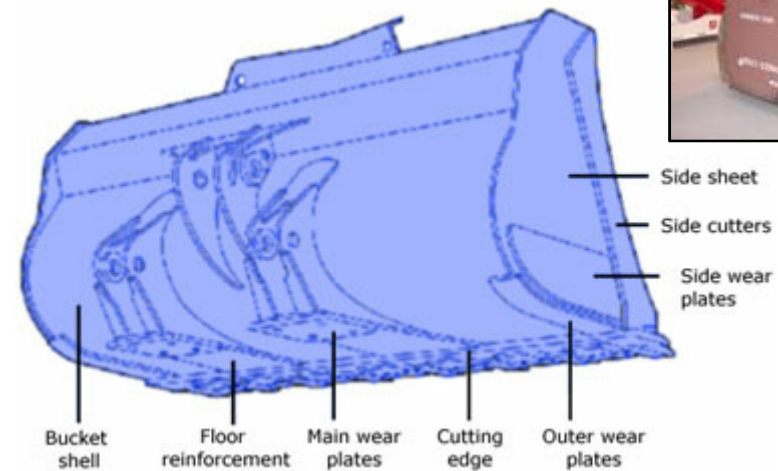
Shade matches operating temperature:	0 – 400°C (32-750°F)
	400 – 1200°C (750-2190°F)

1. Rawmill storage.
2. Raw mill.
3. Filter.
4. Cyclone.
5. Raw mill silo.
6. Pre-heater tower.
7. Kiln.
8. Cooler hood.
9. Clinker dedusting.
10. Elevator.
11. Clinker storage.
12. Separator.
13. Cement mill.
14. Cement silo.
15. Coal mill.

The Quarry - loaders



Part	Steel grade
Cutting edge	HARDOX 500
Bucket Shell	HARDOX 400
Side sheets	HARDOX 400
Side cutters	HARDOX 500
Main wear plates	HARDOX 500
Outer wear plate	HARDOX 400
Floor reinforcement	HARDOX 400

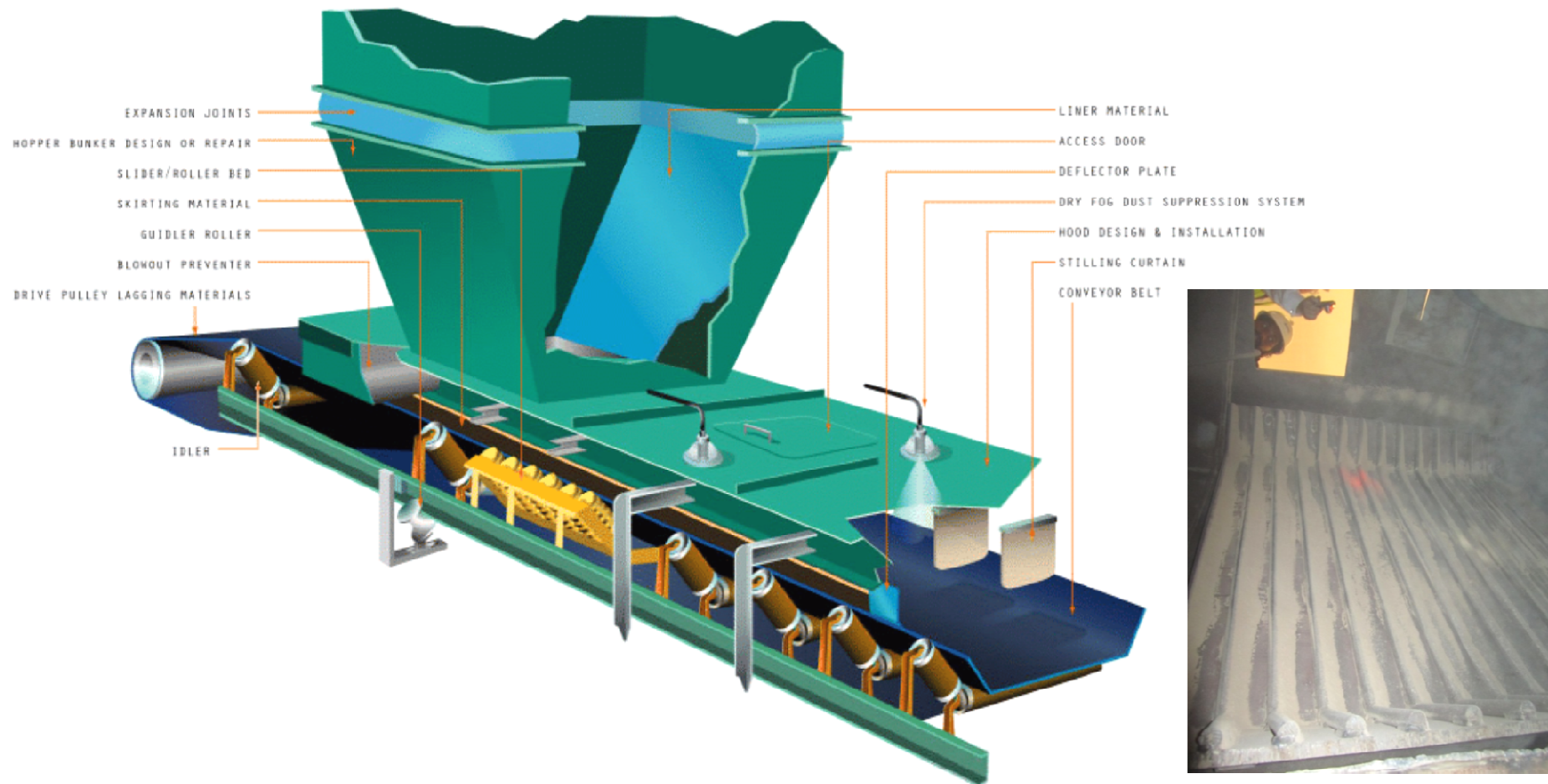


Crusher Feeder & Chute

- Feeder and Hopper to the primary crusher.
- Liner plates in HARDDOX 400-600

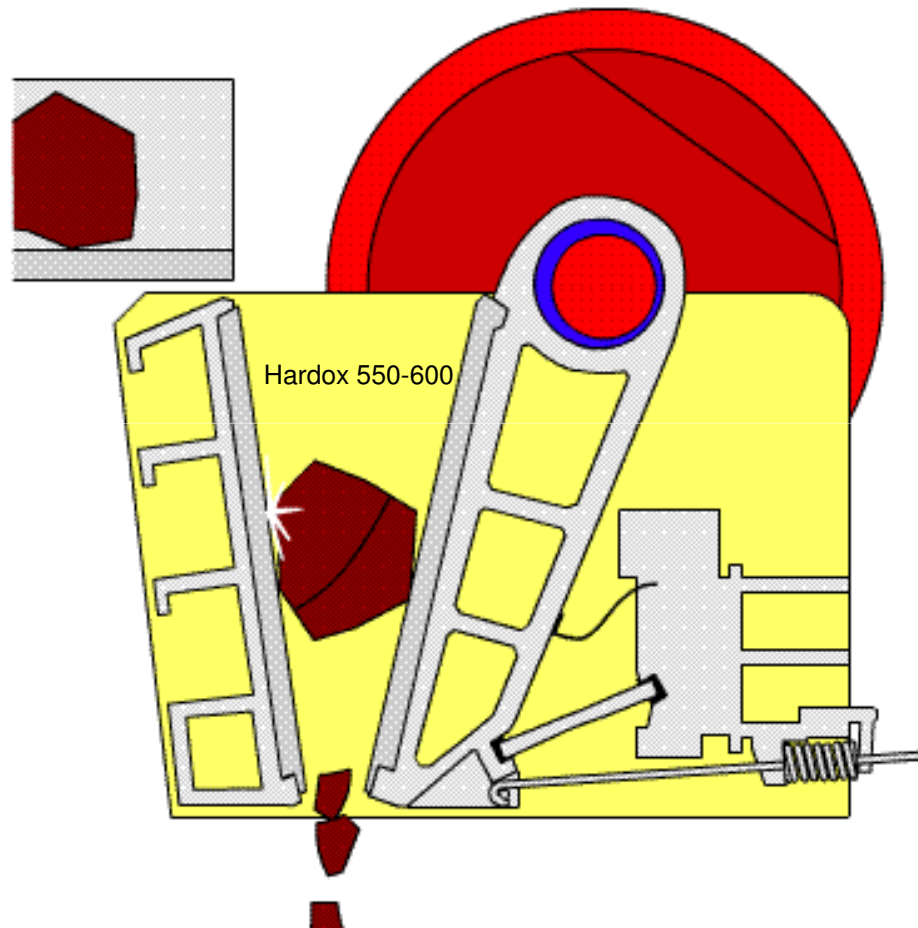


Deflector plates to cement plants made by Hardox 600, UAE

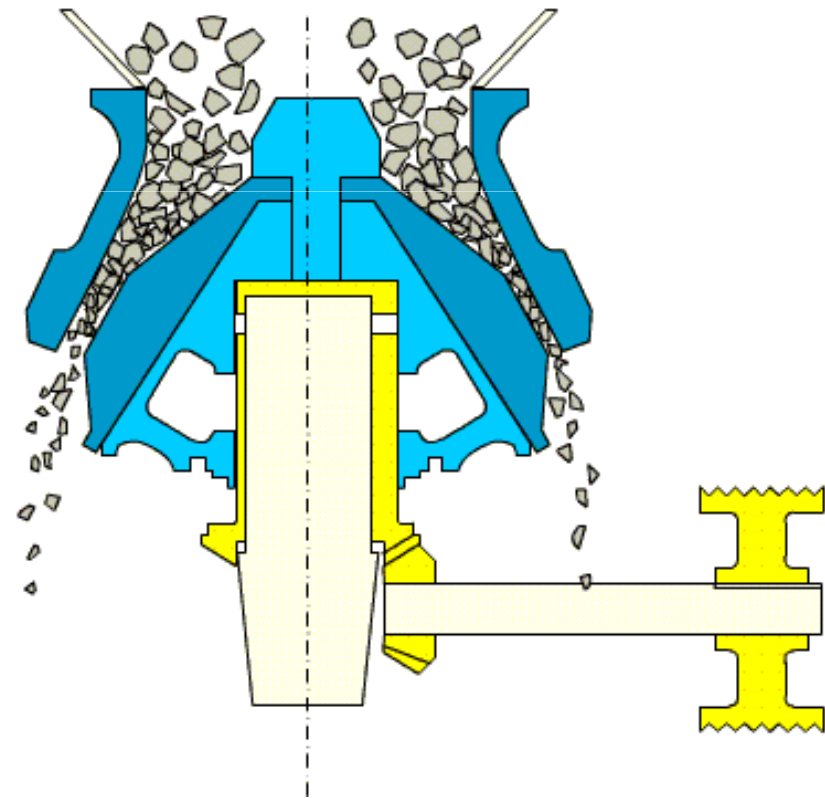


The present Hardox 600, 20mm & 25mm, deflector plate is under observation. The Deflector plates are fixed at the end of the conveyor belts. The limestone continuously hits the deflector plates and falls down on the hopper. The previous deflector plates were manufactured with AR 400 and could not perform

Primary crusher-Jaw crusher

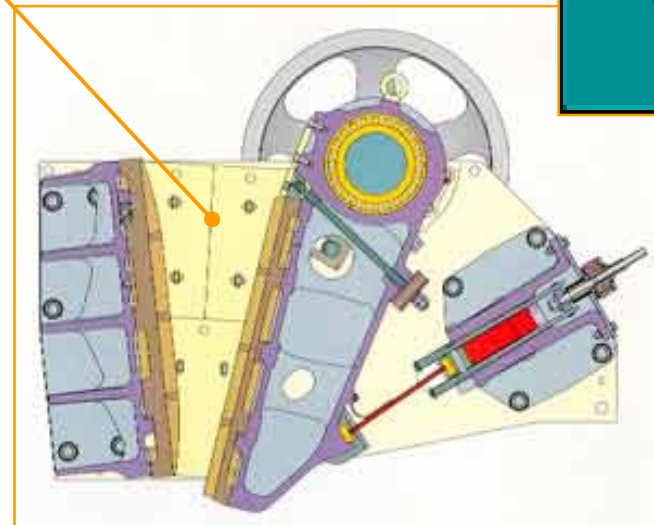


Secondary crusher-cone crusher



Primary crusher-Jaw crusher

- ➡ Linear plates in HARDOX 550 or HARDOX 600.





Side wedge in stone crusher

Steel grade

Hardox 550

Thickness range

30 to 60 mm

Industry segment

Mining & Quarry

Type of application

Crusher

Description of the application

Wedge-shaped plates for stone crushers

made from Hardox550, 35 mm thick.

Manufacturing steps

Cutting method - Gas cutting; Drilling -

Status

Success

Reason for failure or success

Lifetime is more than double compared to the plates made from 12% Mn-steel.

Comments

A very good solution for stone crushers

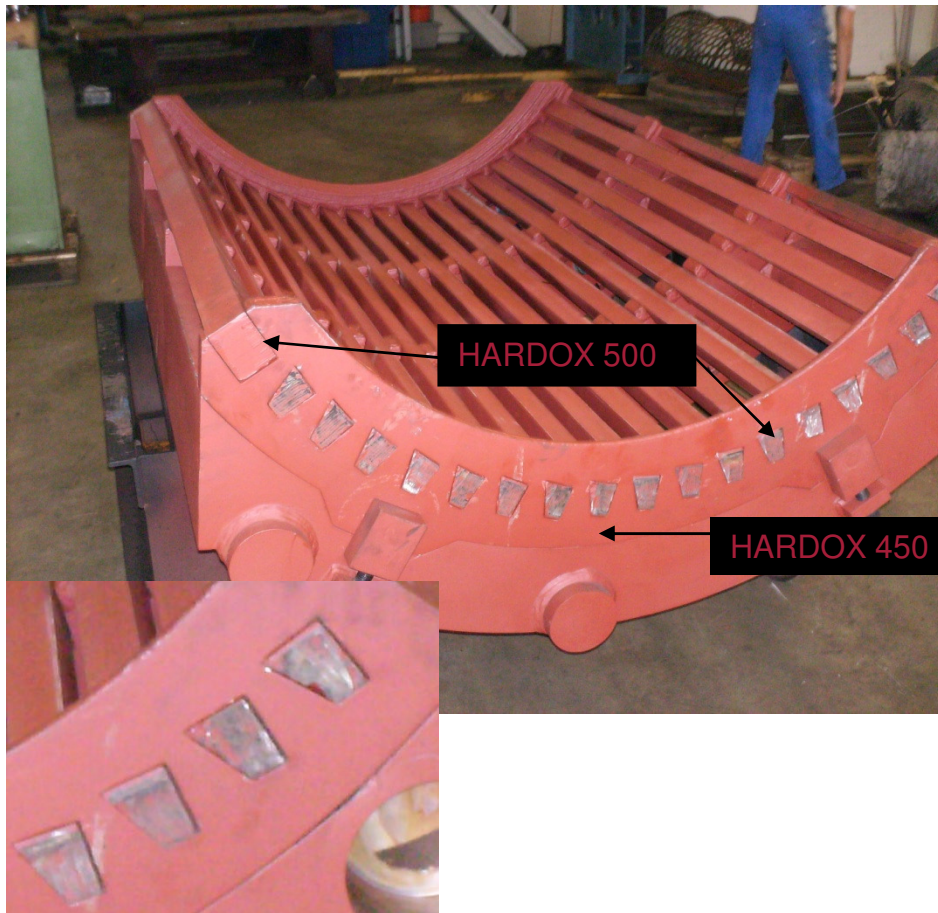
Crusher at a limestone quarry and cement plant

- ▶ Breakage is common in both segments and wear bars, both usually made out of 12 %Mn-steels. With the HARDOX 500, breakage is reduced to zero and wear life increased.
- ▶ Segments for the grate basket and the perpendicular wear bars are made of HARDOX 500. The wear bars are 75 mm.



Success trial runned in Turkey. Hardox 500(76mm) bars lasted 1380 hrs whereas average service life for Mn-castings was 700 hrs

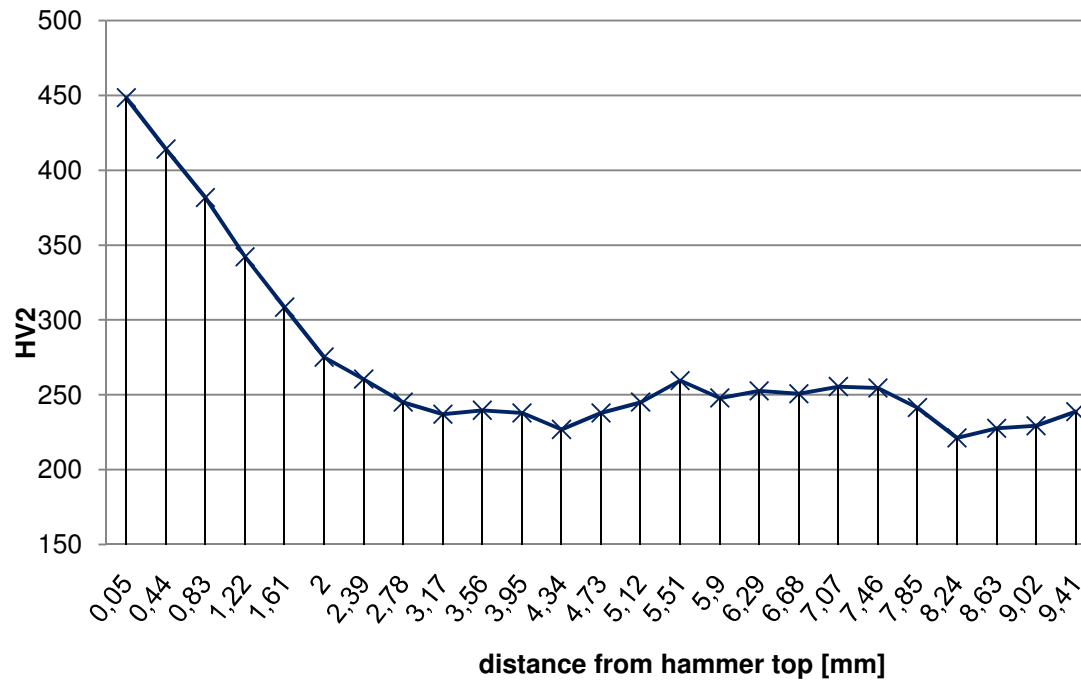
Grizzly bars to secondary crusher



- ▶ **Description:**
The grizzly bars is the screening unit in a hammer mill which is used mainly in the cement industry. The grain size is determined by the gap.
- ▶ **Technical data:**
The velocity of the hammer mill is 600 rpm and it runs for 16 hours a day
- ▶ **Abmessungen und Mengen:**
Impact bar: 80 x 130 x 2230mm, HARDOX500
Roststäbe(bars): 60/30 x 80 x 2230mm, HARDOX500
Side gables: 50 x 350 x 2100mm, HARDOX450
- ▶ **Life time:**
The life of the grizzly bars is 6-12 months depending on the material impact. The side panels have a lifespan of 3-4 years. The total demand of the grizzly bars is several 1000 units per year.
- ▶ **Contact person:**
Heinz Höllerbauer / SSAB Hamburg / Deutschland

Original hammer made by 12%
Carbon-Mn steel
Weight: 90kg
Abrasive: Limestone in a cement plant
Estimated life-time: 2 months

A test piece (blue area) was sent to laboratory



The SSAB hardness measurement shows that the hammer effect is reaching a hardness of maximum 500 Brinell !



A thin hammer is usually performing the same as a thicker one and is much easier to manufacture





Lime stone hammers

Steel grade

Hardox 500, 30 to 60 mm

Industry segment

Cement

Previous material

12% Mn steel

Service life

Ca 3 months

Competitive advantage

Availability of plate

Volume

82 pcs, 60x220x320 mm, for one set

Manufacturing steps

Cutting method - Gas cutting;
Machining -

Status

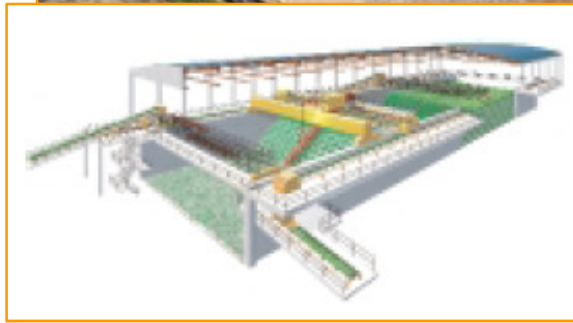
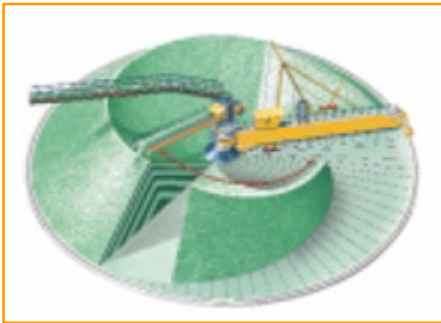
Success, Roughly the same lifetime as 12% Mn steel, better availability.

Comments

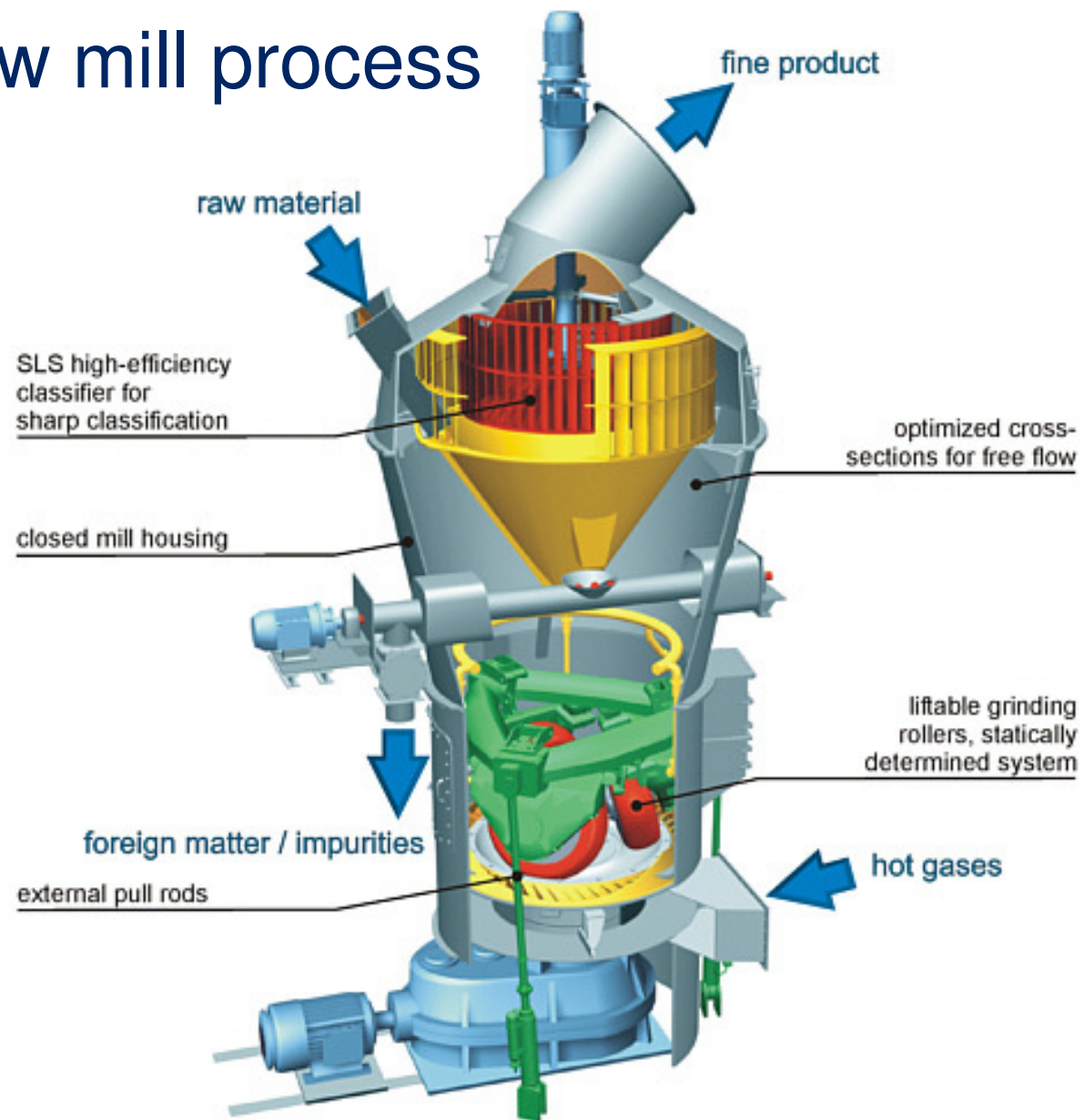
Cutting and machining represent ca 30 % of total price

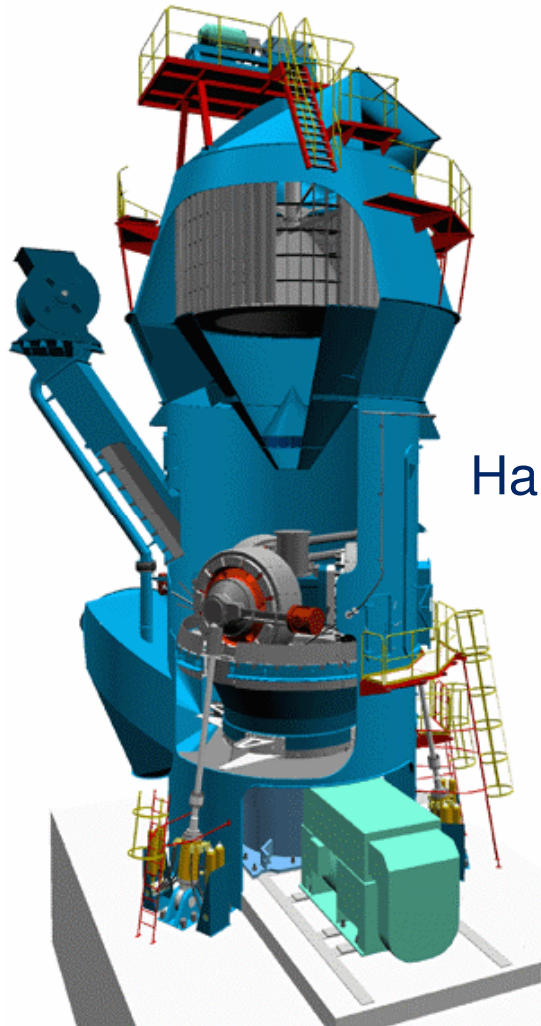
Stacker/ reclaimer

- Wear in conveyors and scrapers



The raw mill process



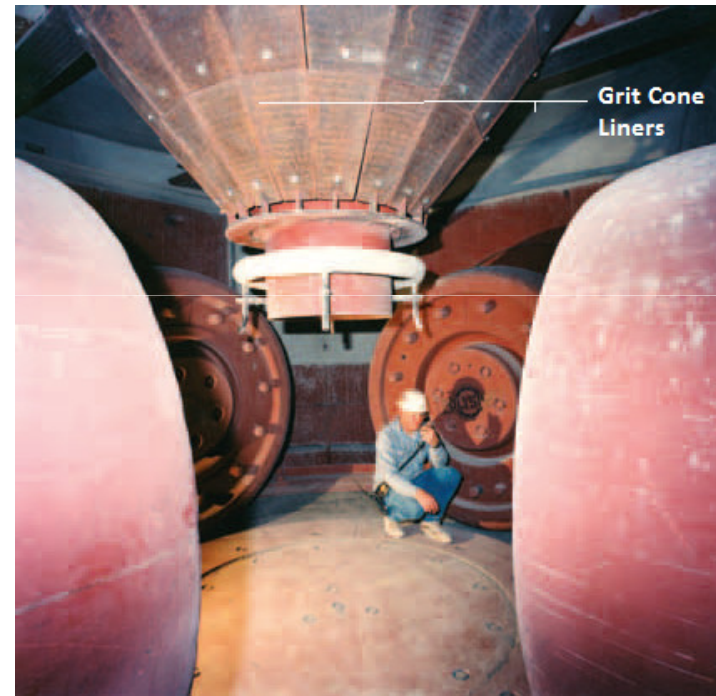
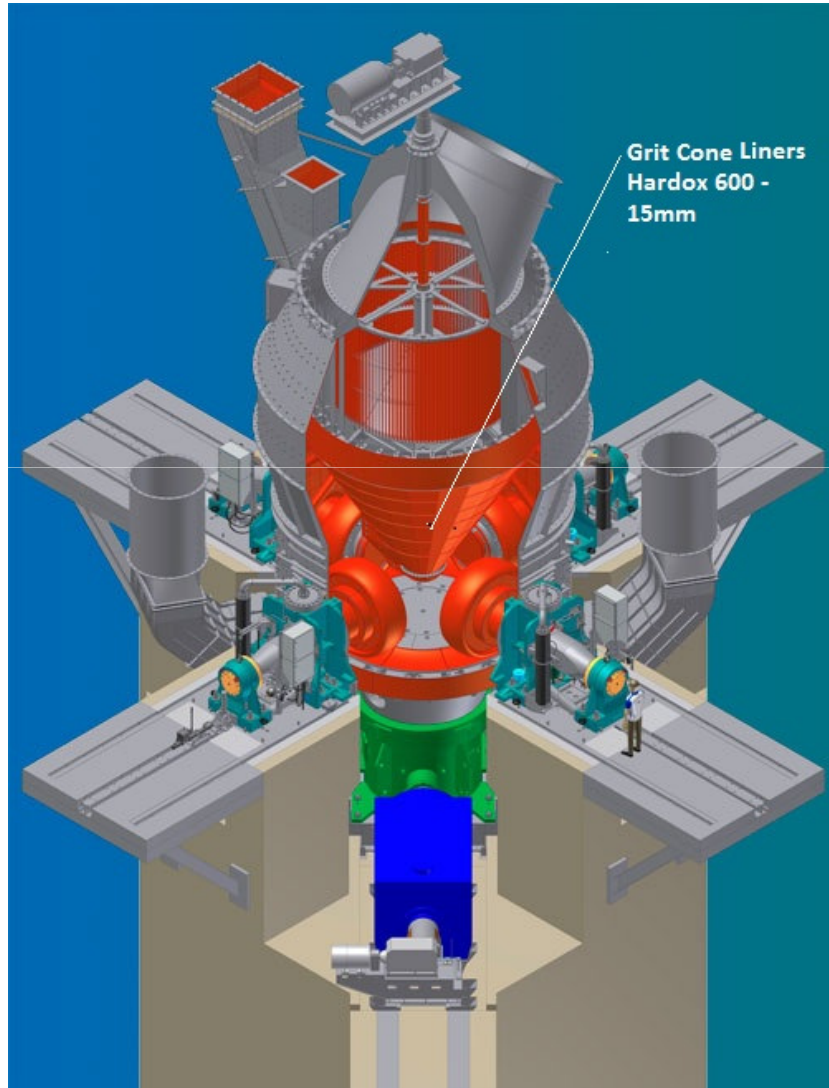


Hardox 500, 50mm



UAE, Grit cone made by Hardox 600, 15mm

Success application: Hardox 600 has been used in the so called grit cone of the vertical roller mill. It has replaced the Cr-Carbide hard faced plate which used to worn out (develop holes) within 1 month. The wear life improved from one month to three months. The demand is one plate per month.



Raw meal conveyors

- ▶ **Bucket elevator**
- ▶ **HARDOX 400, 450**

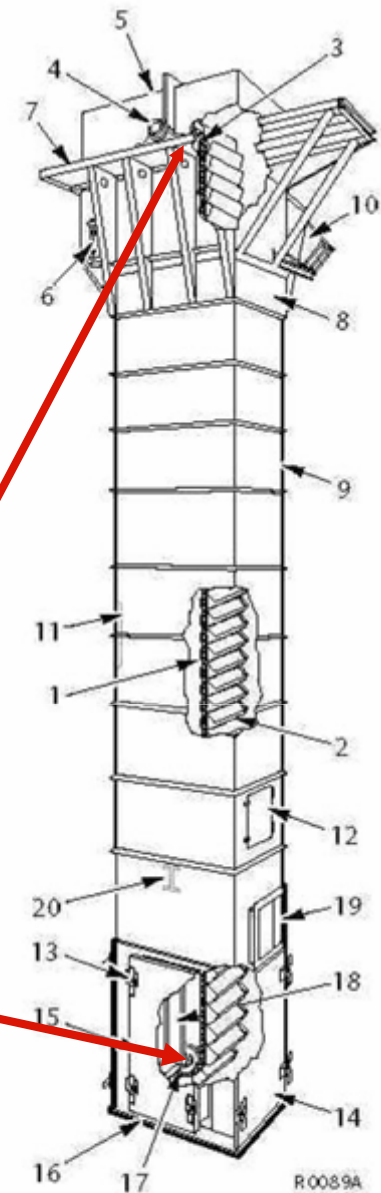


Raw meal conveyors

Other possible applications for HARDOX:

- Sprockets in HARDOX 500
- Reinforced chain parts in HARDOX 400 & 450
- Wear protection on elevator housing

Sprocket wheels



Raw meal silos for homogenising



Hopper

- ▶ Bottom part made in HARDOX 400 or HARDOX 450



Preheating tower

- ▶ Raw meal conveyed to the top

- Gas pipe from clinker cooling bed

- Kiln



Preheating tower feeder

- Raw meal flows through the chute into the air suspended preheater cyclones

**Liners made of
HARDOX 400**



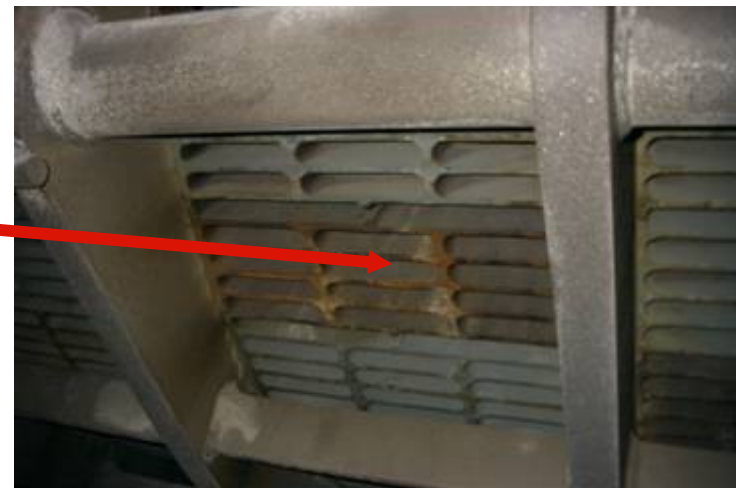
Clinker crusher

- ▶ Directly after cooling bed
- ▶ Temperature ~100°C

Liner plates
HARDOX 450
HARDOX 500



Grating
HARDOX 450
HARDOX 500





Guide plate

Steel grade
Hardox 500

Thickness range
10 to 30 mm

Description
Cooler bed for clinker cooling
after kiln

Manufacturing steps
Cutting method - Water jet
cutting; Drilling -; Machining -

Status
Success

Clinker conveyor

- Clinker conveyor from cooling bed to chute

Clinker is loaded through tube from cooling bed



**Plates
Mild steel
HARDOX 450 +40% wear life**



Clinker chute

- ▶ Clinker loaded from conveyor into chute
- ▶ Often made in hard faced material

HARDOX 550
HARDOX 600



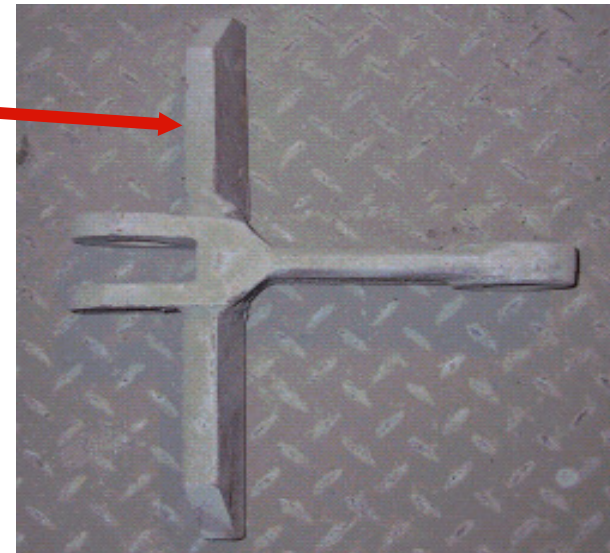
Clinker chute made by Hardox 600



Clinker conveyor

- ▶ Chain of scrapers
- ▶ Sliding wear

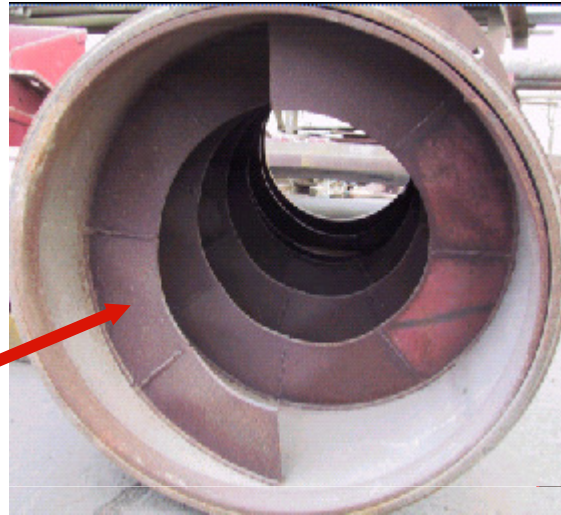
Scrapers
HARDOX 400
HARDOX 450 +30% wear life



Screw conveyors

- For crushed clinker or cement

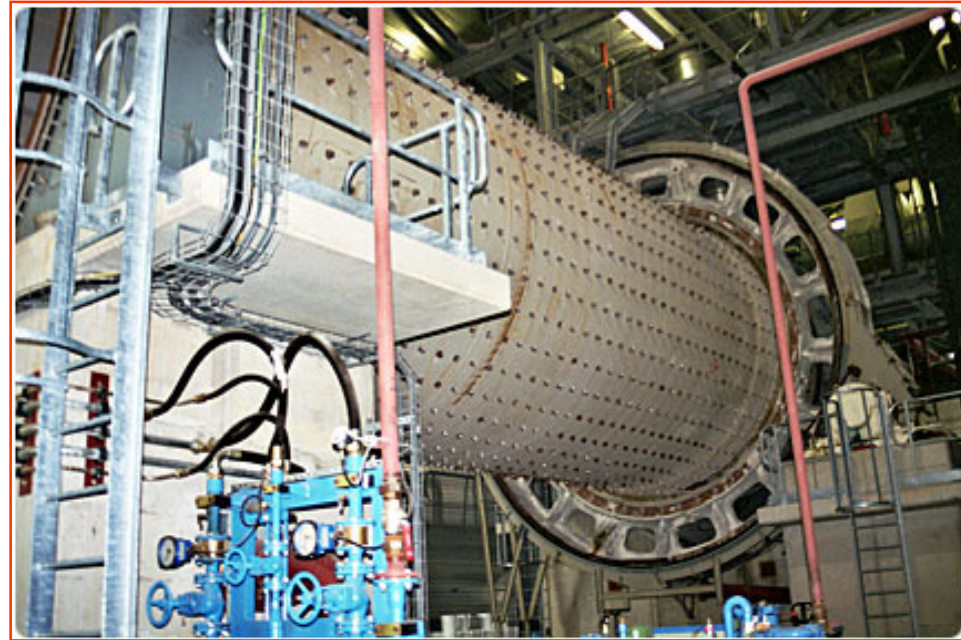
Flanges made in
HARDOX 400
HARDOX 450 +30% wear life



Flanges made in
HARDOX 400 or 450
Could also have wear protection
plates on the centre axle



Ball mill



**Wear protection at inlet and
outlet chutes
HARDOX 500
HARDOX 550**

Air separator

Assemblage of a separator

Hardox 400

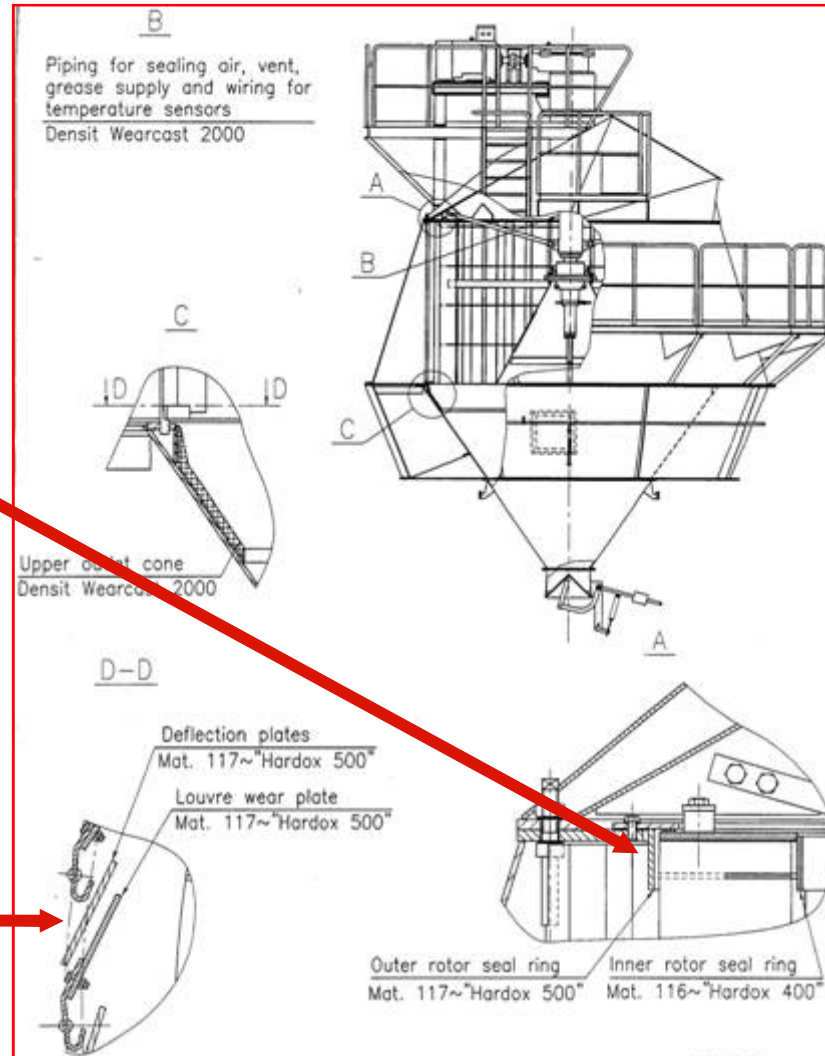


Air separator

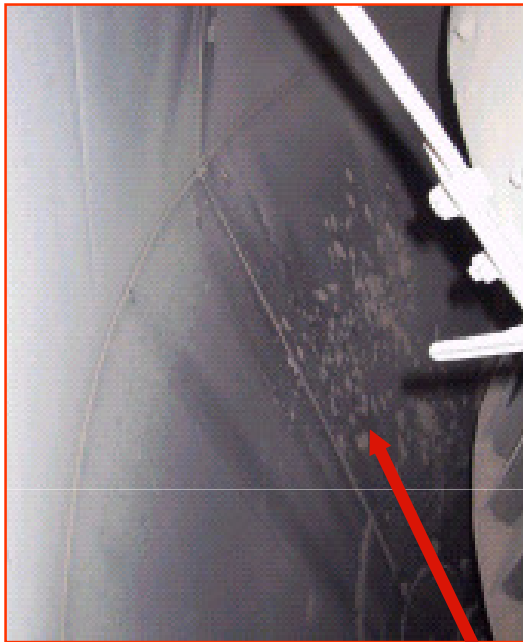
- ▶ Guide vanes
- ▶ Deflection plates
- ▶ Wear protection

HARDOX 500
HARDOX 400

HARDOX 500
Wear life appr. 2 years



Air separator



Liner plates on walls
Erosive wear
HARDOX 400, 450



Fan blades
Erosive wear
HARDOX 500



Cement mill intake scroll

Steel grade: Hardox 400 & 500

Industry segment: Cement

Description of the application

Cement Mill Inlet Scroll.

Shell 12mm Hardox 400

Flights 12mm Hardox 500

Manufacturing steps

Cutting method - Gas cutting;

Bending method - Roll bending;

Bending method - Press forming;

Welding method - MAG

Status: Success

Fan blades made of Hardox 400, 450, 500



For further information on performance, production recommendations and selection of materials, please get in touch with your local technical SSAB contact.

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