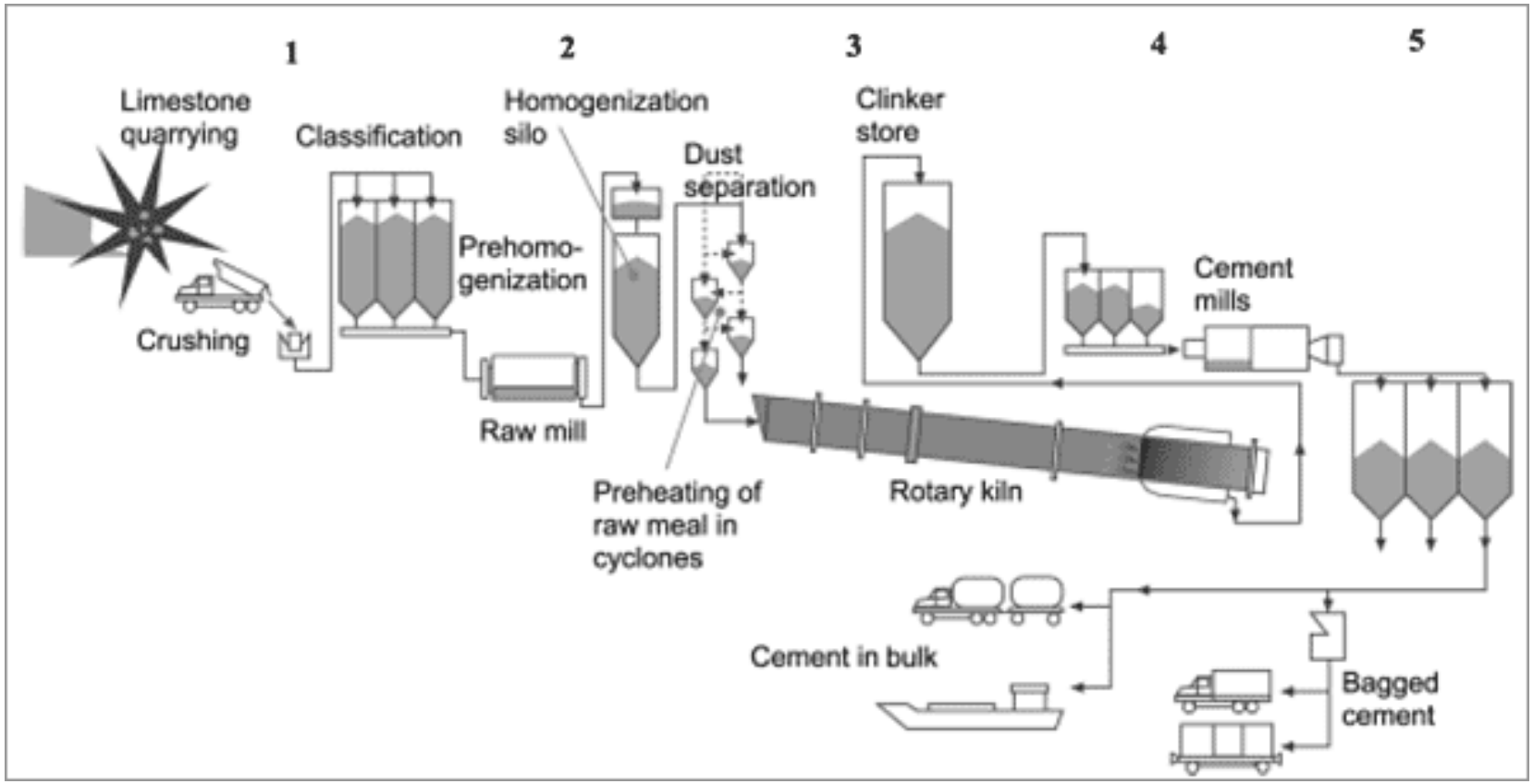
The cement process from crushed raw material to clinker and cement

SSAB

Process flow chart



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

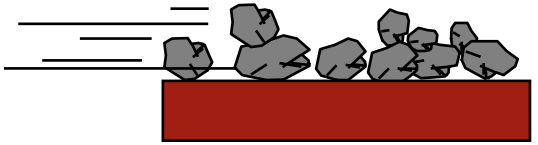
97 % Calcite	60 HV
2 % Quartz	1070 HV
1 % Illite	530 HV

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

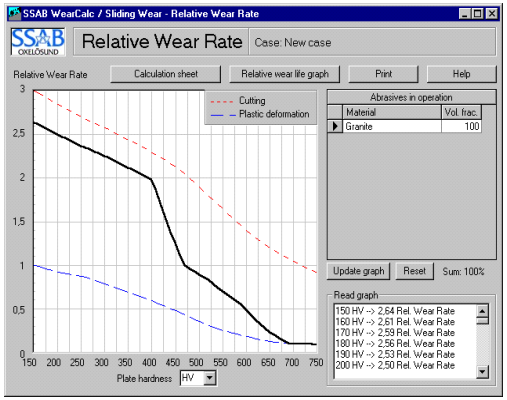
*) Limestone is sometimes exchanged with shells or chalk

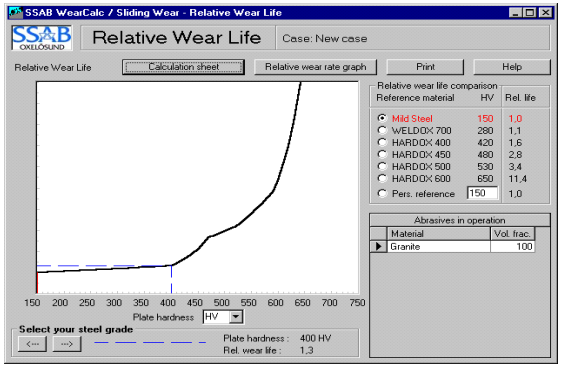
**) Flyg aska, skiffer, sand

WearCalc- software only by SSAB



……Relative Wear





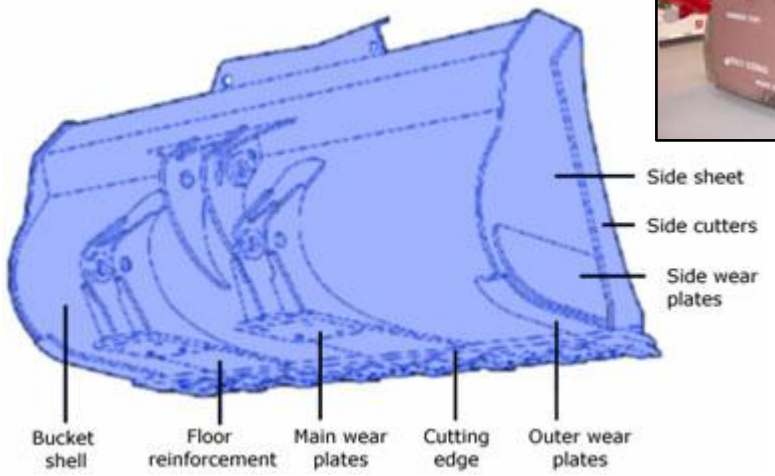
Relative Service Life……

Makes you choose the right material for your specific wear situation

SSAB

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

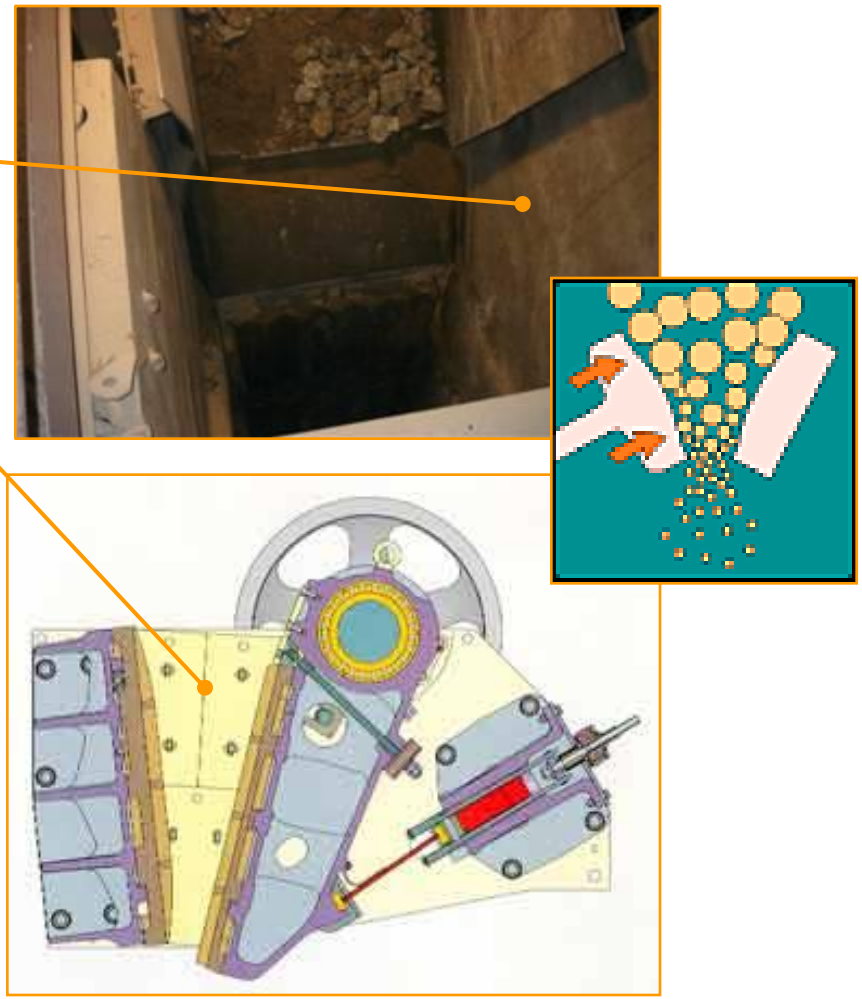


Crusher Feeder & Chute

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

Primary crusher-Jaw crusher

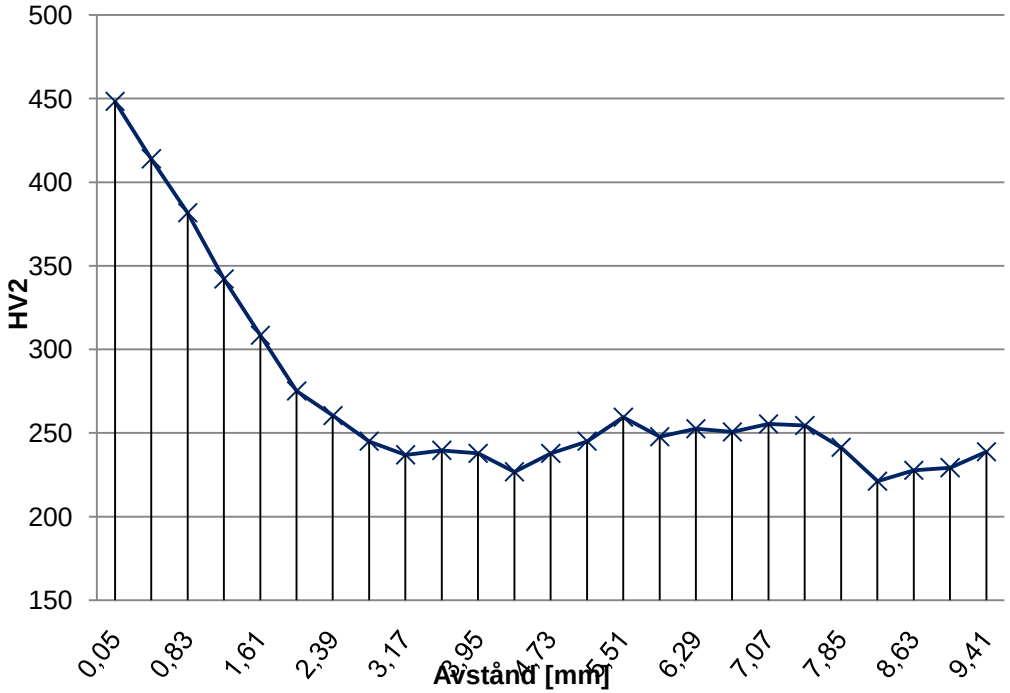
- Linear plates in HARDOX 550 or HARDOX 600.



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.

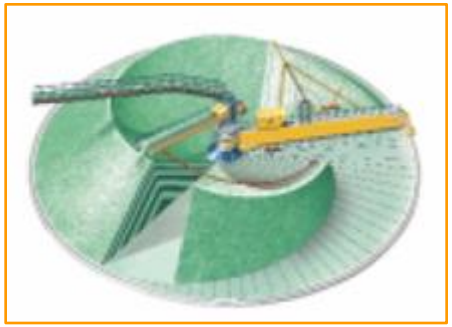
Hammers made by carbon manganese steel after only two months. The deformation hardening process tested by the SSAB metallografic laboraory



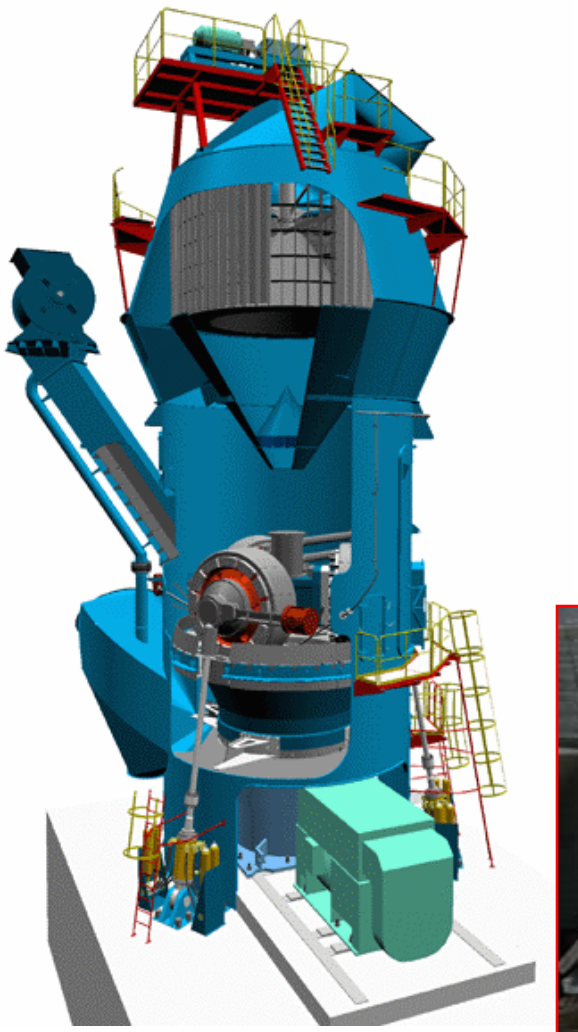
A thin hammer is usually performing the same as a thicker one and is much easier to manufacture

Stacker/ reclaimer

- Wear in conveyors and scrappers



The raw mill process



Raw meal conveyors

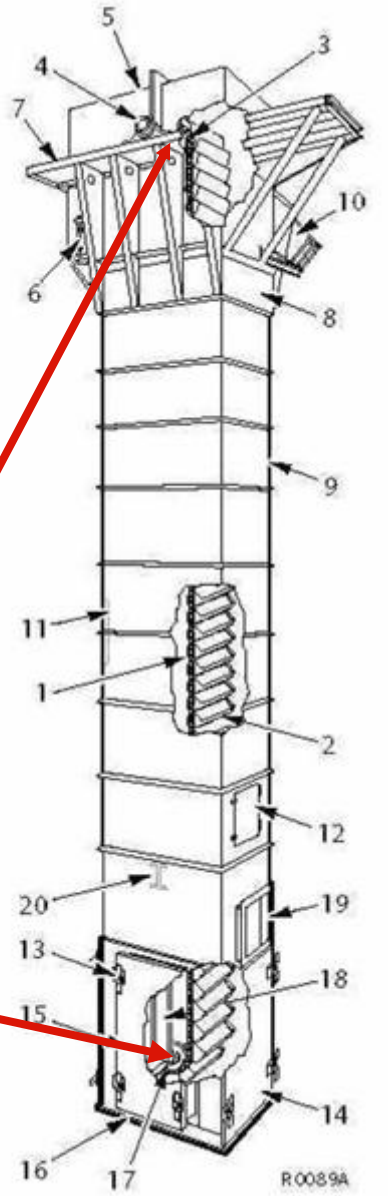
- **Bucket elevator**
- **HARDOX 400, 450**

Raw meal conveyors

Other possible applications for HARDOX:

- Sprockets in HARDOX 500
- Reinforced chain parts in HARDOX 400 and 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

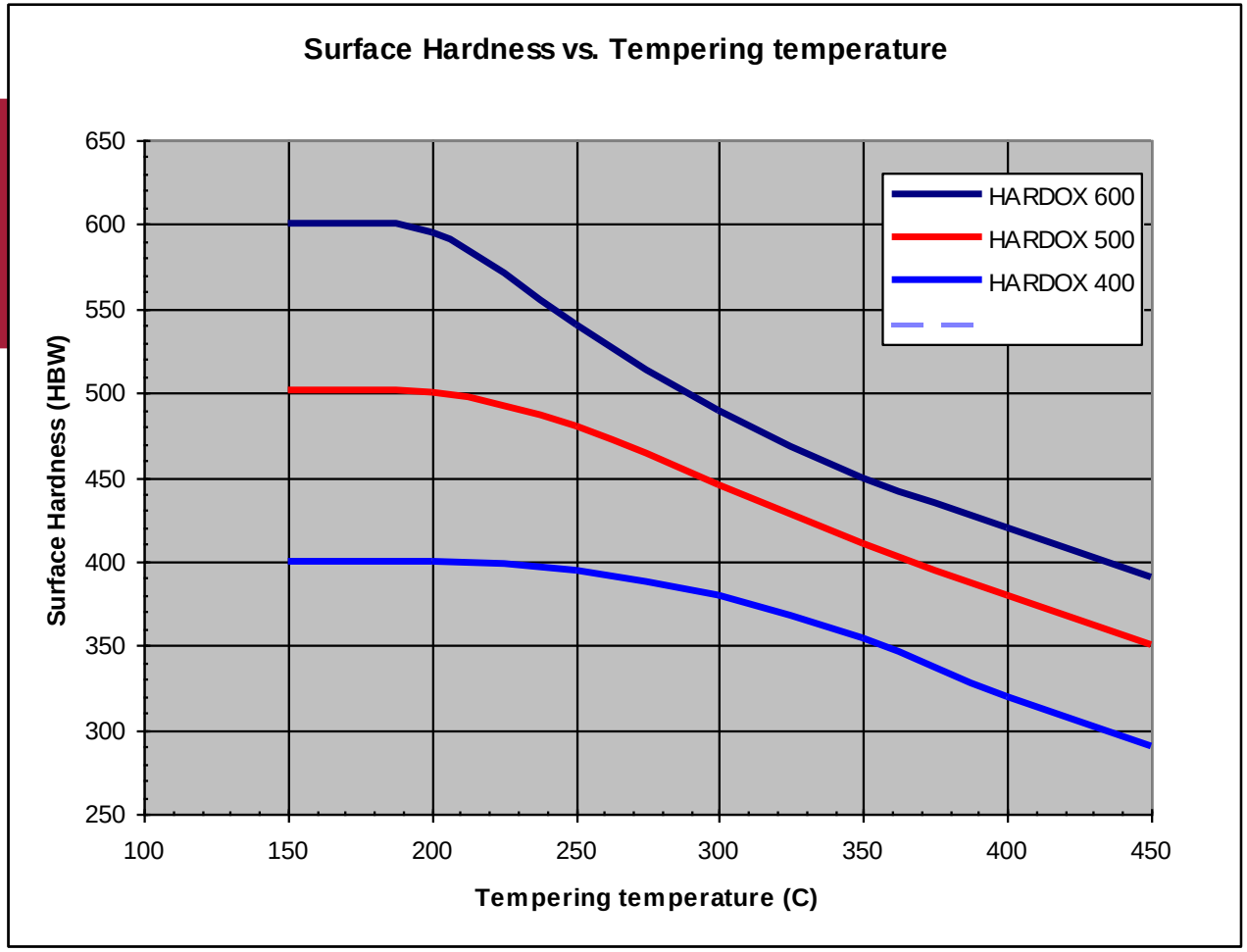
- **Raw meal conveyed to the top**

- **Gas pipe from clinker cooling bed**

- **Kiln**

Hardness reduction due to tempering

Above 200 C to 250 C HARDOX starts losing hardness!



Preheating tower feeder

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

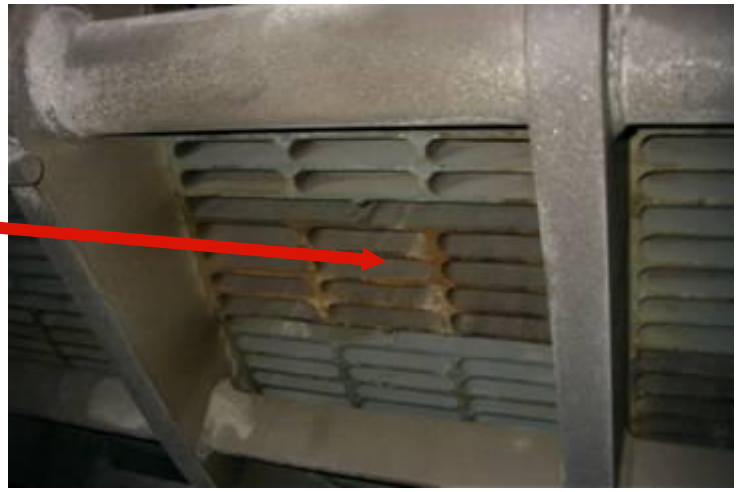
Liners made of HARDOX 400

Clinker crusher

- Directly after cooling bed
- Temperature ~100 C

Liner plates
HARDOX 450
HARDOX 500

Grating
HARDOX 450
HARDOX 500



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
- To compete with this we have try HARDOX 550 or maybe even HARDOX 600

HARDOX 550

HARDOX 600

Clinker chute made by Hardox 600

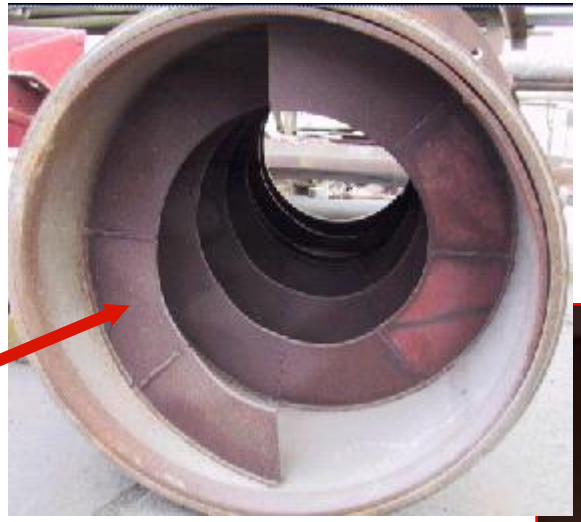
Clinker conveyor

- Chain of scrapers
- Sliding wear

Scrapers
HARDOX 400
HARDOX 450 +30% wear life

Screw conveyors

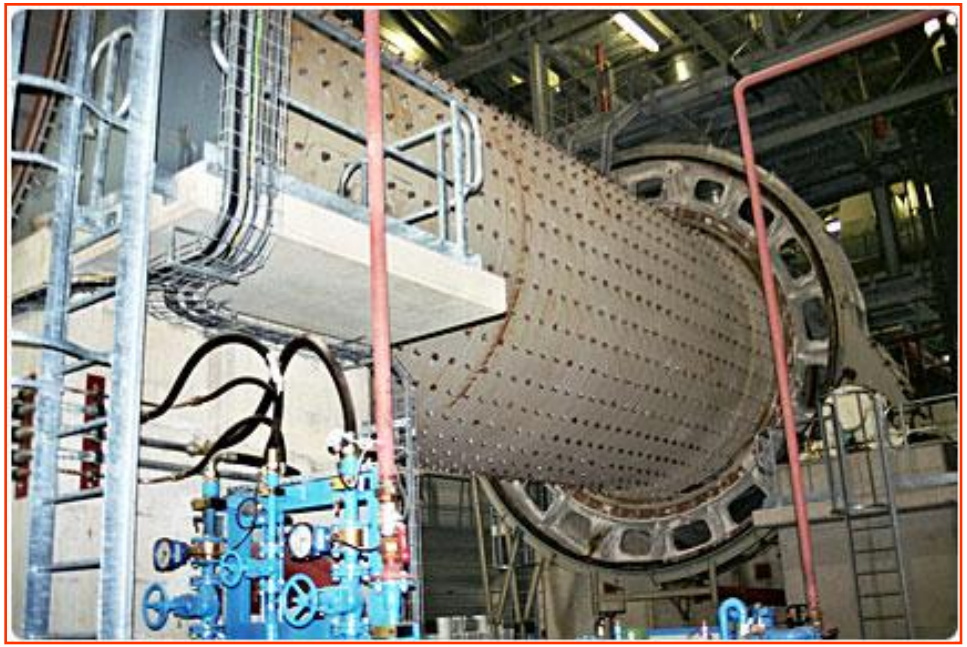
- For crushed clinker or cement



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

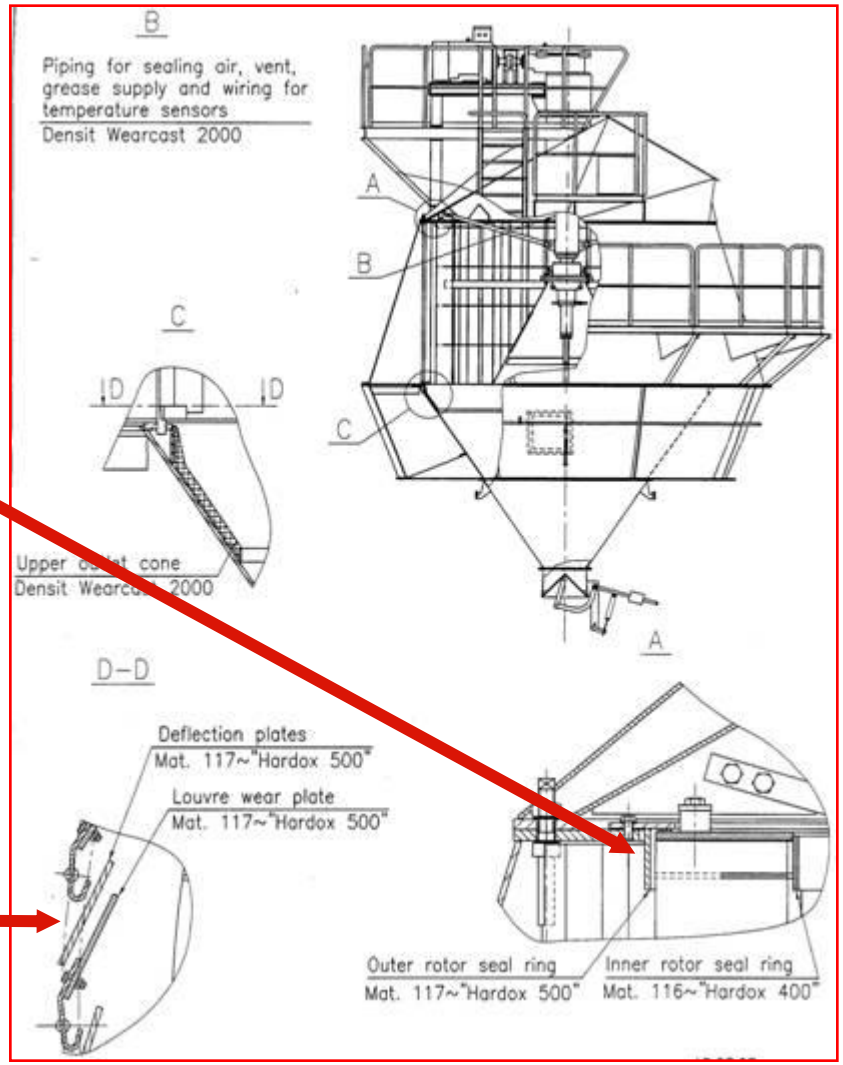
Hardox 400

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

Fan blades made of Hardox 400, 450, 500