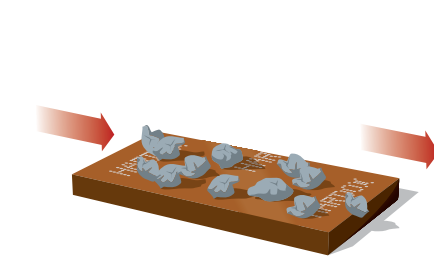


# Wear: THE INSIDE STORY

## Hard and tough throughout

Hardox® maximizes the wear performance of your equipment and machines, reducing workshop lead times and increasing the overall productivity of your operations. Thanks to its consistent properties, Hardox performance remains constant over its lifetime. That also makes its service life very predictable, allowing you to rationalize your maintenance work. Hardox can be used in a variety of operations that include loading, transport and crushing of hard materials. What's the secret of its performance? The production processes include state-of-the-art metallurgical cleaning of steel and a unique hardening process, resulting in wear plates with outstanding hardness, toughness and workshop friendliness.

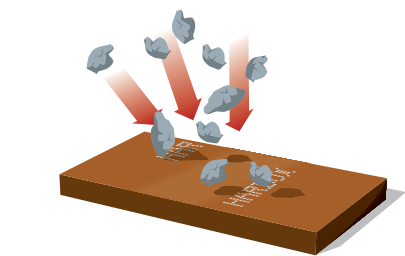


## SLIDING WEAR

In sliding wear abrasive bodies such as aggregate rock are free to slide and roll. By selecting a harder Hardox grade, service life is often improved considerably.

## Expertise at your service

In addition to wear plate, SSAB provides wear expertise through our Technical Support functions. The Technical Support wear specialists can help to optimize your product from a design perspective and are committed to developing the technical knowledge of wear. We offer you access to Ph.D.'s and experts with decades of experience in solving wear challenges. You will receive applied support and information on wear-critical components.

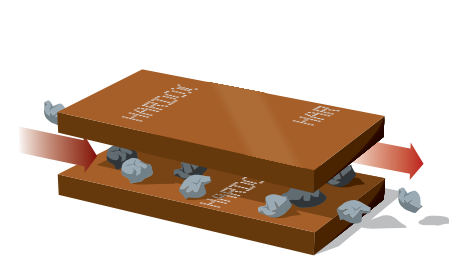


## IMPACT WEAR

With impact wear the aggregate rock hits the surface of the wear component at various angles. A harder grade of Hardox will also deliver a longer service life here. The increase in service life is not of the same order as for sliding wear.

## Information about wear

Wear comes in different forms and each has a different impact on the service life of your application. The most common wear types are sliding and impact wear. Abrasive particles trapped in a narrow gap between two rigid surfaces cause squeezing wear, which also is a common wear type. Each variety of rock is composed of a unique set of minerals that contribute to the specific type of abrasive wear damage. WearCalc software, available from our Technical Managers, describes and calculates the relative differences between materials. It allows you to predict relative wear life and compare different wear solutions. Whatever your application and wear situation, Hardox is your ticket to outstanding wear performance.



## SQUEEZING WEAR

The improvement in service life of wear components subjected to squeezing wear is more difficult to quantify. As a rule, an increased Hardox plate hardness improves the service life significantly.

## HARDOX — A Complete Product Program

Whatever wear challenge you face there is a Hardox plate to match. The wide range of hardness grades, thicknesses and widths enables you to maximize the performance of your application.

Hardox 400 and Hardox 450 are versatile wear plates with high toughness, good bendability and excellent weldability.

Hardox 500 is a tough, bendable and weldable wear plate for applications that require high abrasion resistance.

Hardox 550, with a hardness of 550 Brinell and a toughness equal to Hardox 500, is designed to increase wear life, but not at the expense of crack integrity.

Hardox 600 is the world's hardest wear plate for extreme conditions. It competes with materials such as high chromium white alloy castings, Ni-hards and hardfacing.

Hardox HiTuf is a wear plate with extra high toughness intended for heavy section wear parts where there are extra high demands on the combination of wear and crack resistance.

Hardox Extreme is intended for applications requiring extremely high abrasion resistance. It can replace costly wear products such as hard-faced overlay plates and high chrome white iron.

**HARDOX®**  
WEAR PLATE

SSAB is a Nordic and US-based steel company. SSAB offers value added products and services developed in close cooperation with its customers to create a stronger, lighter and more sustainable world. SSAB has employees in over 50 countries. SSAB has production facilities in Sweden, Finland and the US. SSAB is listed on the Nasdaq OMX Nordic Exchange in Stockholm and has a secondary listing on the Nasdaq OMX in Helsinki.

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**HARDOX®**  
WEAR PLATE

# HARDOX ON SITE CEMENT

130-en-Hardox on site cement-VI-2015-AplusM



/ **SSAB**

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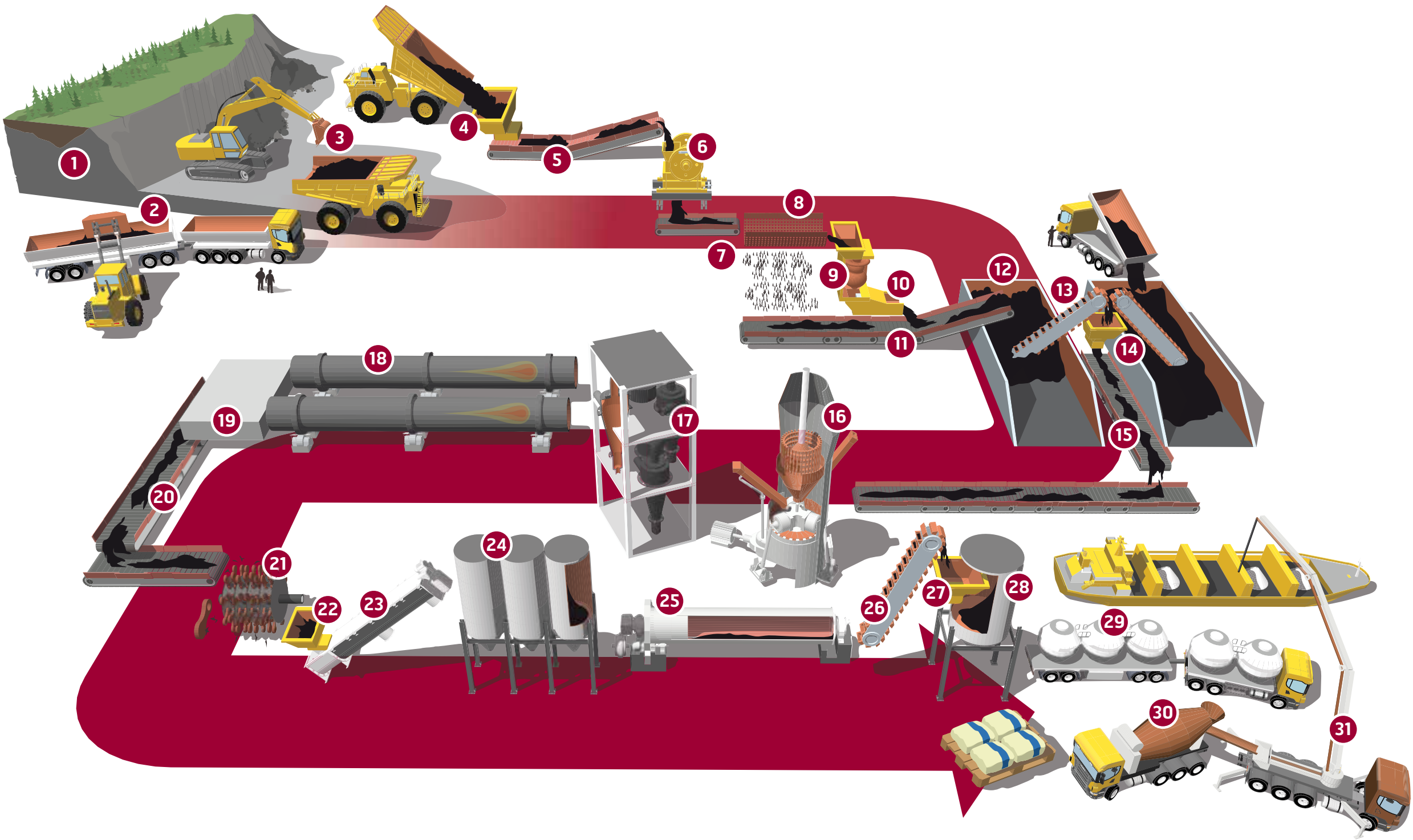
# MORE UPTIME AND REDUCED MAINTENANCE ALL THE WAY

Hardox® wear plate delivers great advantages through the whole production flow. Its superior wear resistance translates into bottom line benefits such as more uptime, higher productivity, longer service life and reduced maintenance.

Hardox cuts down on weight and extends the service life of steel structures in comparison with regular steel. A common limestone rock has an average hardness of 150 HV. With relative sliding wear the service life is approximately 3 to 4 times longer with Hardox 500 than with a standard S235 steel. Translated into thickness, a 25 mm plate of S235 is equivalent to 8 mm Hardox 500, reducing weight dramatically and makes it a lot more workshop-friendly.

The hardness of Hardox minimizes wear because it is difficult for the ‘edges’ of abrasive material to cut into the material. Hardox delivers the same wear resistance during the plate’s entire service life, since it remains equally hard throughout. Toughness is the other strong point of Hardox. While hardness makes it wear resistant and strong, toughness is what makes it possible for Hardox to be bent, formed and welded without cracking.

Its unique combination of hardness and toughness also allows Hardox to perform as a load-carrying part in many applications. With Hardox, steel structures for the cement industry can be wear-resistant, strong and lightweight at the same time.

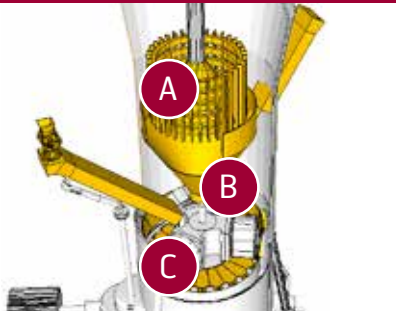


## CEMENT PRODUCTION FLOW

- |                             |                          |                            |                                   |
|-----------------------------|--------------------------|----------------------------|-----------------------------------|
| 1. Open pit                 | 9. Cone crusher          | 17. Preheating in cyclones | 25. Ball mill                     |
| 2. Loader and tipper        | 10. Chute                | 18. Rotary kiln            | 26. Elevator bucket               |
| 3. Excavator and dump truck | 11. Conveyor belt rubber | 19. Clinker cooler         | 27. Hopper                        |
| 4. Hopper                   | 12. Storage bins         | 20. Conveyor belt rubber   | 28. Silo                          |
| 5. Conveyor belt            | 13. Elevator buckets     | 21. Hammer crusher         | 29. Transport of finished product |
| 6. Jaw crusher              | 14. Hopper               | 22. Hopper                 | 30. Concrete transit mixer        |
| 7. Conveyor belt rubber     | 15. Conveyor belt rubber | 23. Screw conveyor         | 31. Concrete pump truck           |
| 8. Crusher screen           | 16. Raw mill             | 24. Silos                  |                                   |



**Jaw crusher**  
For the cheek plates in a jaw crusher Hardox 500, 550 and 600 are all suitable to battle the wear and impact loads generated by crushing limestone.



**Vertical raw mill**  
Hardox 450 and 500 protect against wear of the guide vanes, frame, deflection plates and air separator (A). Hardox 600 is used as liner plates in the cone (B) and in the grinding table (C).



**Guide plates**  
Hardox 500 is the common choice for guide plates in the clinker cooling bed.



**Concrete mixer drum**  
Hardox 400 and 450 in the drum shell, spirals, chutes and hopper of a concrete mixer truck are the perfect choice for a durable and lightweight solution.



**Liner plates**  
Hardox 500, 550 and 600 are versatile grades for liner plates in all types of mills, chutes, hoppers, crushers, silos, and other applications in the cement production chain.



**Ball mills**  
Hardox 500, 550 or 600 are the recommended materials for wear protection at the inlet and outlet in ball mills.