

The use and development of
Wear Resistant Plates to prolong wear life
on New DEM Style Chutes for Materials
Handling in Mining and Minerals
Applications
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Agenda

- Discrete Element Modeled (DEM) chutes for bulk materials
- Tribology:
 1. Wear is not a material property
it is a property of a system
 2. Chart of Mechanical processes
 3. Base body versus Counter body
 4. Influence of the movement
 5. Definition of Upper and Lower shelf

Agenda

- Wear plates – low cost solution for linings and large area wear protection:
 1. VAUTID Wear Plate production in Germany
 2. VAUTID-METALARC welding process
 3. Difference between METALARC and flux cored wire welding
 4. Overlaid VAUTID wear plate versus HARDOX wear plate
 5. Qualities of the VAUTID wear plates
- Case story

Discrete Element Modeled (DEM) chutes for bulk materials

Definition of DEM:

The discrete element method (DEM) is any family of numerical methods for computing the motion and effect of large number of small particles

DEM is becoming widely accepted as an effective method of problems in granular and discontinuous materials, especially in granular flows, powder mechanics, and rock mechanics

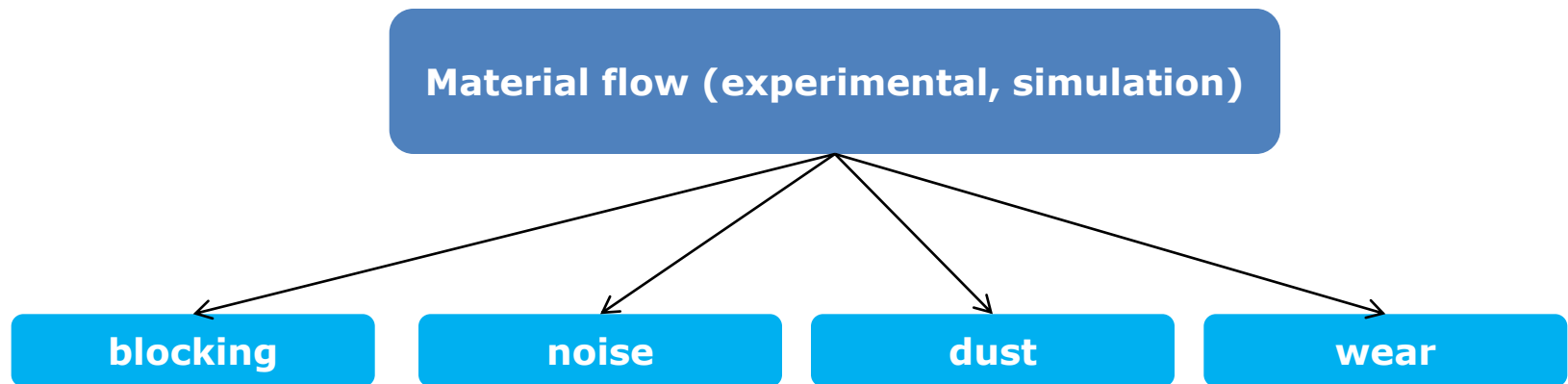
The fundamental assumption of this method is that the material consists of separate, discrete particles and these particles may have different shapes and properties

Discrete Element Modeled (DEM) chutes for bulk materials

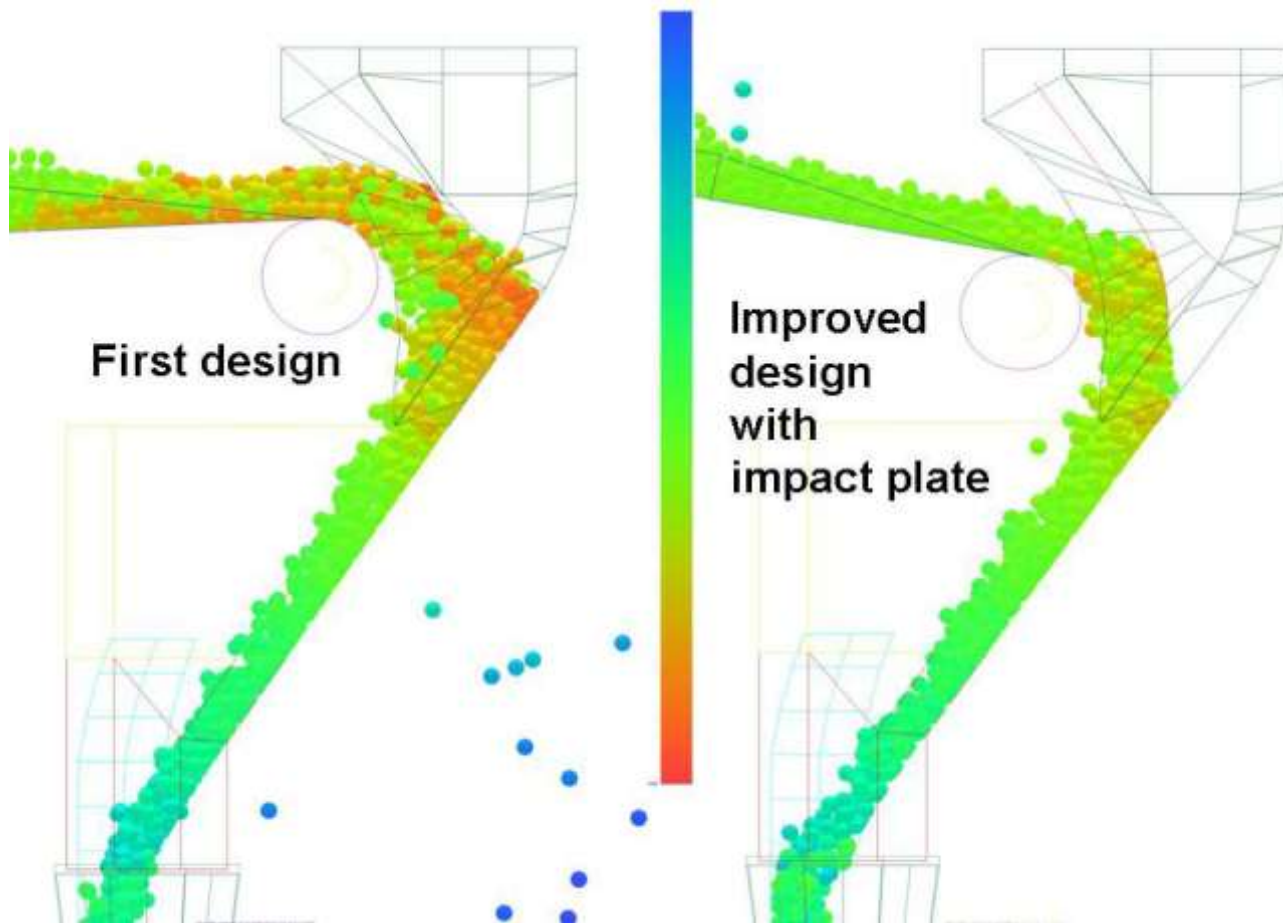
Why to use DEM for chute works in the bulk material handling:

The goal is to optimize the material flow

A simulation will lead to the right design of geometry



Discrete Element Modeled (DEM) chutes for bulk materials



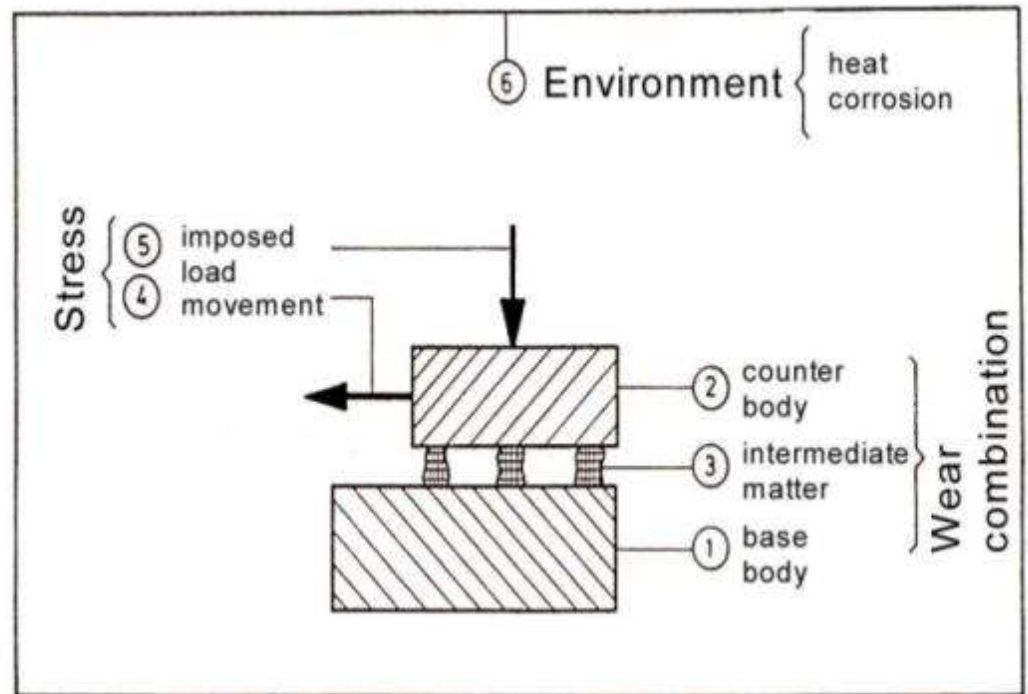
Tribology: Wear is not a material property it is a property of a system

Definition of Tribology:

Tribology is the science and technology of interacting surfaces in relative motion.

It includes the study and application of the **principles of friction, lubrication and wear.**

The word "tribology" derives from the Greek language:
Tribo = friction and logos = principle.



Tribology: Chart about the mechanical processes



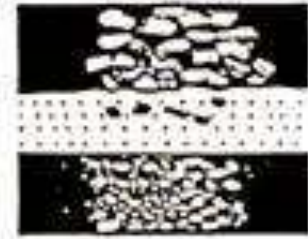
Crushing



Grinding



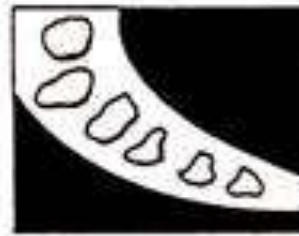
Mixing



Screening



Washing



Drying



Transporting



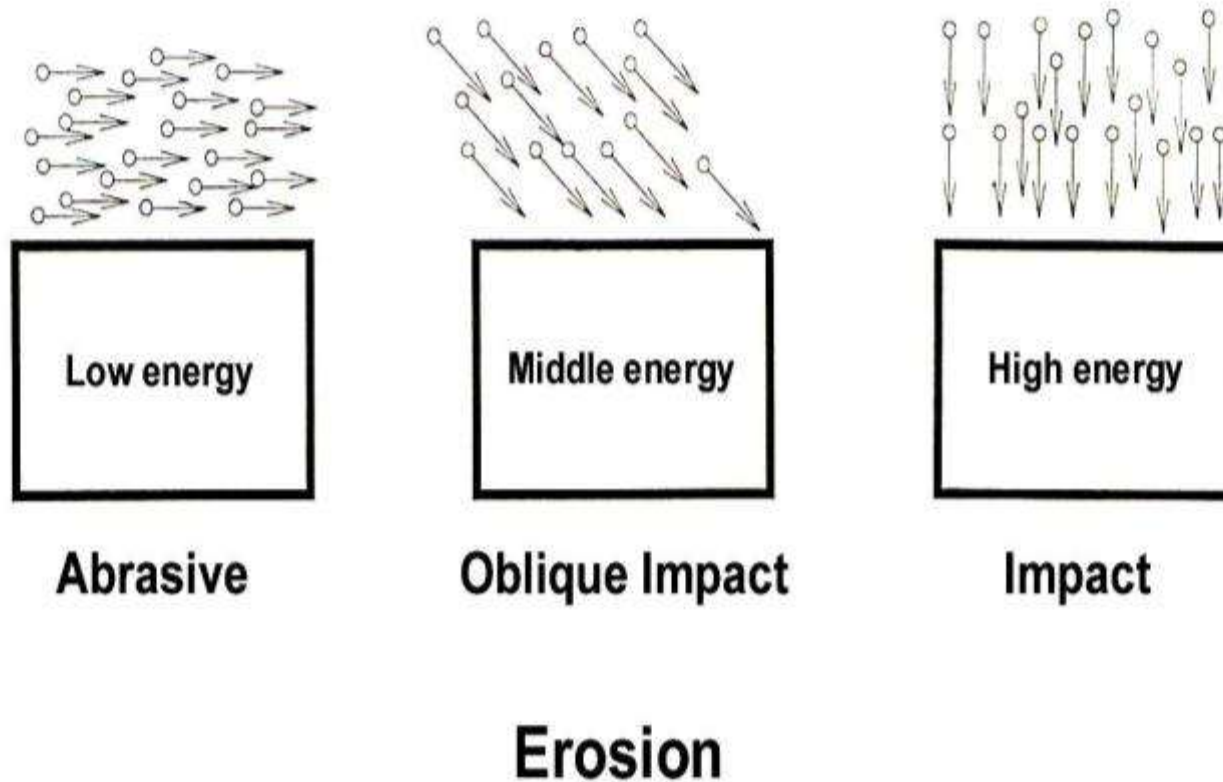
Feeding

Tribology: Base body versus Counter body

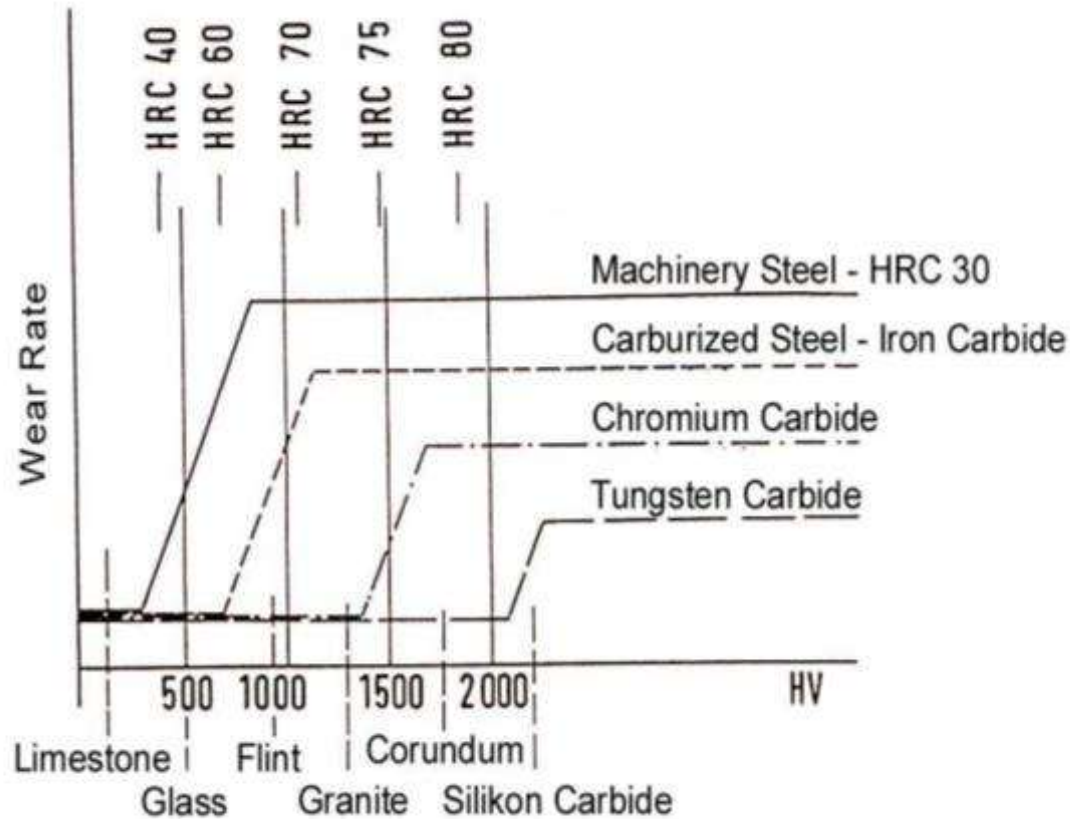
| Material | Hardness |
|-------------------------|----------|
| Fingernail | 2,5 |
| Copper p. | 3,5 |
| Glass | 5,5 |
| Constr. St. | 6,5 |
| Quartz | 7 |
| Hard.Steel | 7,5 |
| Cr_7C_3 | 9 |



Tribology: Influence of the movement



Tribology: Definition of Upper and Lower shelf



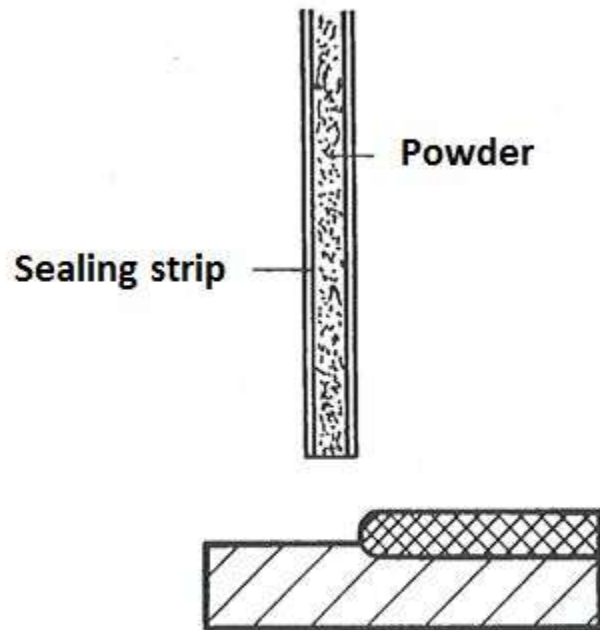
Wear plates – low cost solution for linings and large area wear protection



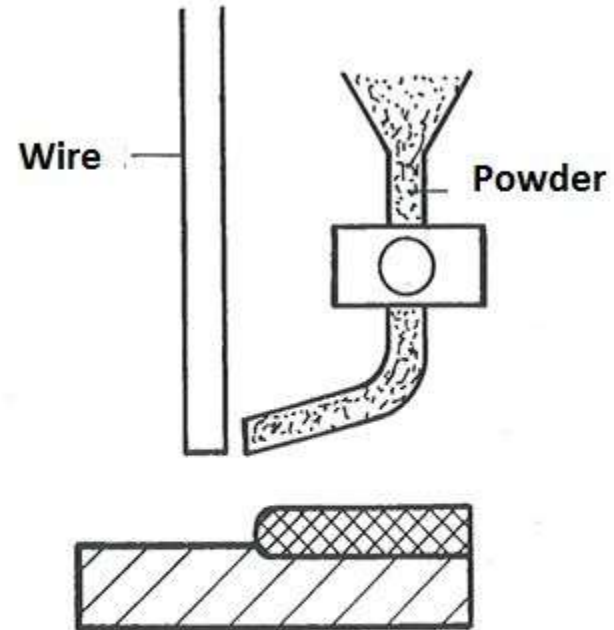
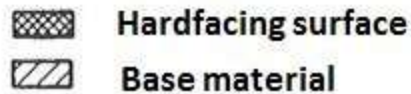
VAUTID Wear Plate production in Germany:

The overlaid wear plate is an large area wear protection, made out of a weldable base steel and a chromium carbide base hardfacing alloy which will be applied with the VAUTID-Metalarc-Welding-Process

VAUTID-METALARC welding process

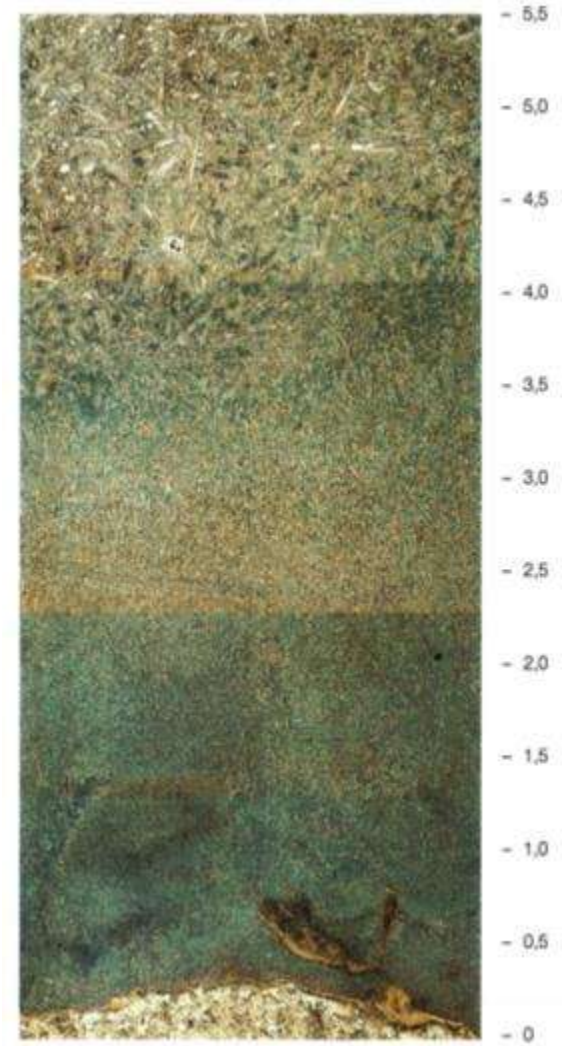
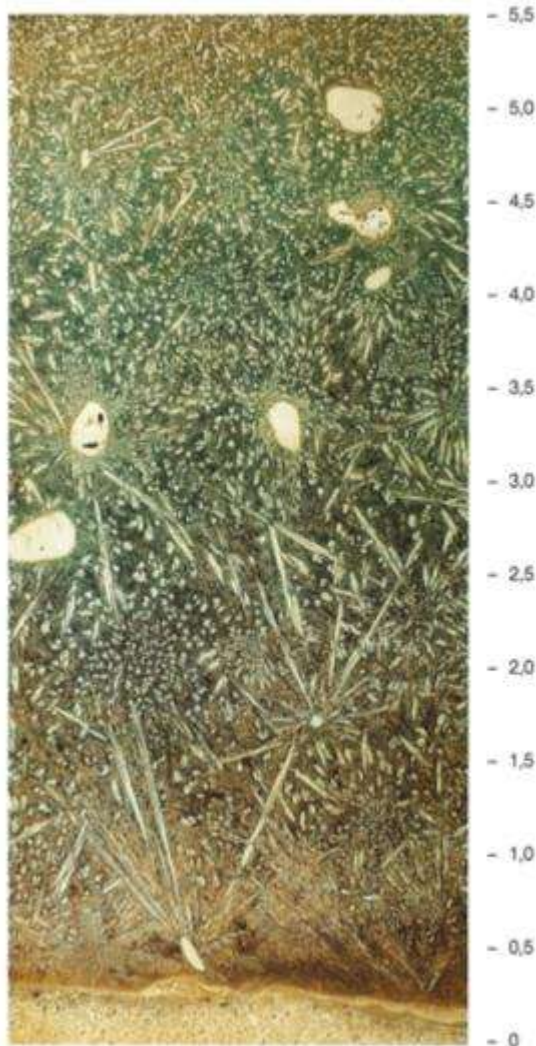


Flux core wire



VAUTID-METALARC

Difference between METALARC and flux cored wire welding

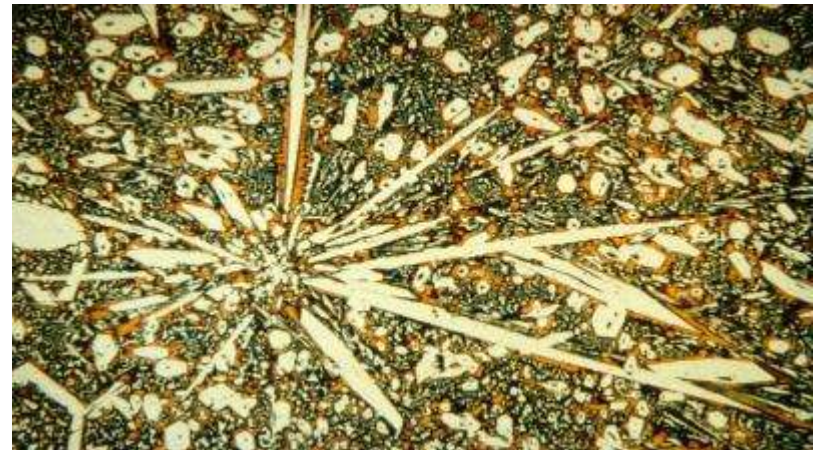


Overlaid VAUTID wear plate versus HARDOX wear plate

Material: Fine grain steel
Martensitic structure,
Hardness 500 HB =
approx. 51 HRC



Material: VAUTID-100
primary chromium
carbides in an austenitic
-carbide eutectic ,
Hardness approx. 60 HRC



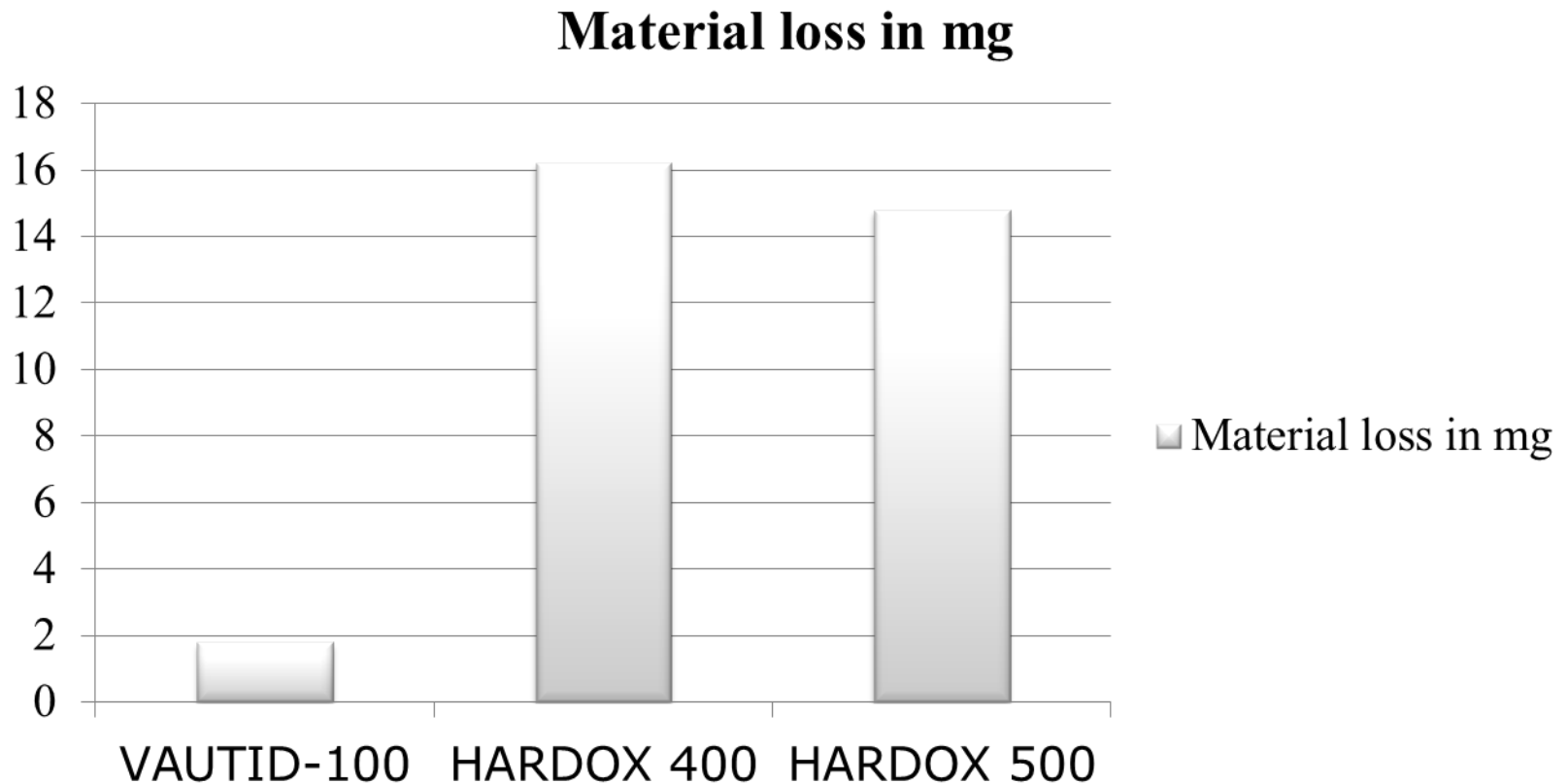
Overlaid VAUTID wear plate versus HARDOX wear plate

“Pin on Disc Test”



- 100% abrasion
- Quality of the wear resistant material is determined by the weight loss of the sample
- Sample diameter 2 mm
- Abrasive paper with SiC grains of different size and hardness

Overlaid VAUTID wear plate versus HARDOX wear plate



Qualities of the VAUTID wear plates

| Quality | Hard material | Binder phase | Binder alloy | Hardness in Vickers |
|-------------|-----------------------------|-------------------|--------------|---------------------|
| VAUTID 100 | Chromium carbides | Fe/austenite | Mn | approx. 60HRC |
| VAUTID 100T | Chromium carbides | Fe/austenite | Ni, Mn | approx. 60HRC |
| VAUTID 143 | Chromium+ Nb carbides | Fe/austenite | Mn | approx. 62 HRC |
| VAUTID 145 | Chromium+ Nb, W, V carbides | Fe/austenite | B | approx. 65 HRC |
| VAUTID 147 | Chromium carbides | Fe/austenite | Mn | approx. 67 HRC |
| VAUTID 150 | Chromium+ B carbides | Fe/austenite | B | approx. 62 HRC |
| VAUTID 200 | Chromium+ Ti carbides | Fe-base Austenite | B | approx. 65 HRC |

Case story



Transfer chute for cooking coal

After the analyses of the material-flow the customer and VAUTID decided to implement VAUTID-143 wear plates 3/8" on 3/8" (10+10mm)

Case story



after 1 month
in operation



after 4 month
in operation



after 6 month
in operation



Transfer chute for cooking coal
after 12 month in operation
VAUTID-143 wear plates 3/8" on 3/8" (10+10mm)

Case story



HARDOX 450
After 6 month

VAUTID-143
after 12 month



Case story

SUMMARY

The VAUTID overlaid wear plate is an economical wear solution to prolong the lifetime of transfer chutes

If you considering maintenance costs you should always consider as well the still stand costs and the cost for the exchange of wear parts

Is HARDOX or similar material the right wear material?

NO!

We can guarantee 3 – 5 times longer lifetime against HARDOX with our VAUTID overlaid wear plates*



VAUTID is the right partner to fight against wear!

Join us to “The road To **Now Wear”**

Thank you for your attention!

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