Wear Parts for Cone and Jaw Crushers
How to choose wear parts?

- Castability of wear part?
- Abrasiveness of rock material (AI)?
- Risk of high impact loads during service?
- Work index (WI) of incoming material?
- What degree of expansion during work can be accepted (and expected)?
- Type of crusher?
- Type of crushing (coarse/fine)?
- Size of incoming rock material?
- Operational parameters for the crusher?
- Any tests made on other wear materials?
Crushing chambers for Hydrocones
Mantle – Difference between A and B
Mantle – A or B

A-Mantle:
- Used with small setting and small throws.
- Used wrongly means that large enough setting can not be obtained. Piston in bottom position.

B-Mantle:
- Used with large setting and large throws.
- Used wrongly means poor utilization at the end of the A-dimension.

Utilize the Travel length!
Heavy Choke (HC) - Mantle

Advantages:
● Enable smaller settings – More reduction means less circulating load and better shape in small fractions (5-8).
● Larger feed opening – Marginal stones enter.

Disadvantages:
● Lower throughput – Especially with new liners.
Wear problems

- Crushing chamber selection - Concave and mantle
- Feed distribution
Preventive maintenance

- Wrong feed arrangement
  - ✓ Higher power usage = higher load on bearing
  - ✓ Lower capacity
  - ✓ Higher wear in the crushing chamber
  - ✓ Less reduction
  - ✓ Worse shape of final product
  - ✓ Higher cost
Special Liners – 3C

3C includes:
- Crushing Technology – Solution
- After market – Business
- Production – Time

Increased customer value:
- Longer liner life
- More reduction
- Correct setting

Report results to
Crushing Technology Group
Special Liners

Problem:
- Low capacity in the end of liner life.

Action:
- More vertical in the top section by machining

Result:
- No premature liner change – 50% increase in liner life.
- Full capacity all through the liner life.
Special Liners

Problem:
- Wear on support ring when running at large settings

Action:
- Machining in the bottom section to make more space from the support ring

Result
- No wear on support ring
Special Liners

Problem:
- When changing only concave ring the edge creates low capacity

Action:
- Remove the edge by machining - maintaining nip angle

Result:
- No capacity problem
- No need for cutting
Special Liners

Problem:
- High wear and not enough reduction

Action:
- New patterns for both mantle and concave optimizing feed opening and thickness

Result:
- More reduction, %<1/4”
- Liner life increase with 40%
Special Liners

Problem:
- Customer wanted to run at 90mm setting

Action:
- Machine off material to allow larger setting with new liners

Result:
- Crusher sold – Customer satisfied
Special Liners

Problem:
- Ski slope on mantle creating high pressure, large setting and low capacity

Action:
- Optimizing crushing point by machining

Result:
- Full capacity and maintained setting, all through the liner life
- Increase in life up to 100% depending on application
## Jaw Plates for the Jawmaster

### Jaw Plates Specifications

<table>
<thead>
<tr>
<th>Jaw Type</th>
<th>Wide Teeth (WT), Z</th>
<th>Corrugated (C)</th>
<th>Coarse Corrugated (CC)</th>
<th>Sharp Tooth (ST)</th>
<th>Heavy Duty (HD)</th>
<th>Wide Wave (WW)</th>
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Wide Teeth (WT), Z

- General applications
- Abrasive rock
- Less in stock due to that
  the Z-plate can be fitted on both sides
Corrugated (C)

- Laminar material
- High amount of fines
- Small setting
- Cubical product
Coarse Corrugated (CC)

- Laminar material
- Abrasive material
- High amount of fines
- Large setting
Sharp Tooth (ST)

- Increased nip action
- Laminar material
- Abrasive material
- Large amount of fines
Heavy Duty (HD)

- Extremely abrasive material
- Increased liner life
- No demands on particle shape
- Can be combined with CC or ST for improved particle shape
Wide Wave (WW)

- Extremely flaky material
- Less abrasive material
- Muddy material
- Good particle shape
Improvements

- New ST jaw plates for large crushers
- One piece
- Angled teeth to reduce cheek plate wear
Study of Wear Profiles

- Heavy Duty (HD)
- Wide Teeth (WT), Z

Please report to Crushing Technology Group
Manganese steel

History:
- 1880 – Sir Robert Hadfield 12% Mn, 1% C
- Hardening by deformation
- Strömhard increased the Mn- och C-content.

Important parameters when casting manganese:
- High quality scrap – Impurities means lower quality
- Casting temperature – Decides grain size
- Heat treatment – Time enough to get to center of casting
Manganese steel

To choose from Sandvik alloys: M1, M2 and M7
- Soft and abrasive material – M2, M7
- M2 and M7 have less significance in fine crushing
- Try and see – Please report to Crushing Technology Group

Pirates promote 24% manganese steel.
- The manganese content do not show the wear resistance.
- Mn-content expand the austenite zone, enabling higher carbon and chromium content.
- Higher Mn, Cr och C-content increase wear resistance *marginally* but also increase the cracking risk *substantially*. 
Wear Problems - Summary

1. Choose the correct standard crushing chamber – Both mantle and concave

2. Make the feed distribution as good as possible – Here is a lot to gain, rebuild if possible

3. If there still is a problem with the wear profile – Contact the 3C-group

4. To boost liner lifetime even more – Try a different manganese alloy
The capacity is too low?

- Make sure the crusher is choke fed
- Increase the eccentric throw
- Select a coarser crushing chamber
- Reduce the moisture content
The product size is too coarse (or the circulating load is too high)

- Reduce the C.S.S.
- Reduce the throw to enable a finer C.S.S.
- Select a finer crushing chamber
- Increase eccentric speed
The product contains too much fines

- Increase the C.S.S.
- Reduce the throw for a more gentle crushing
- Select a coarser crushing chamber
- Reduce the amount of fines in the feed
The product shape is not acceptable

- Make sure the crusher is choke fed with a minimum of stops for idling
- Select a C.S.S. that is close to the product size with high demands on cubicity
- Reduce the reduction ratio, i.e. reduce the top size of the feed
- Reduce the lower fraction limit of the feed a little in order to add some fines
The crusher is packing

- Reduce the reduction ratio
- Reduce the amount of fines in the feed.
- Avoid dirt or moist in the feed
- Adjust the feeding arrangement for even distribution (and central feeding of Hydrocones)
- Avoid segregated feed
- Inspect the crushing chamber for uneven wear
Excessive wear at the bottom part of the crushing chamber

- Select a finer crushing chamber in order to move the crushing work upwards
Uneven wear around the concave ring

- Adjust the feeding arrangement for even distribution (and central feeding of Hydrocones)
- Avoid segregated feed
- Use a distributor for MF and finer crushing chambers
Too short liner life

- Try the M1+ material for the mantle and concave
- Try the M1+ material only for the mantle
We know what we are talking about!

- Manganese steel???
  - Cold work hardening + toughness
- Manganese content???
  - heat treatment + alloys + solving carbon + cooling & carbides
- Thicker manganese???
  - tramp iron protection + risk of carbides + shape of profile
- Tonnes or hours = money???
- Surface finish???
  - It does matter!
- Machining???
  - It does matter!
- Experience in design, manufacturing & process???
  - >10000 years
- Sandvik quality and development???
  - Tooling and Material Technology
Preventive maintenance

- Warranty policy
  - Design, material or manufacturing
  - Report to Sandvik Rock Processing within warranty time
  - Used according to maintenance manual and in appropriate applications.
  - Service and repair carried out by SRP authorised personnel
  - Use Sandvik Rock Processing genuine parts
Preventive maintenance

- Parts policy
  - Genuine Parts = optimal safety and economy
  - Latest design and quality
  - 10 years supply of parts
Preventive maintenance

● Storage of parts
- Check corrosion protection regularly
- Place wood under heavy components
- Seals and gaskets shall be stored under dark, dust free and dry conditions, preferably at room temperature.
- Bushings should be kept standing
- E.g. dust seal ring should be stored flat
Proactive Elements for Success:

- Availability of Parts
  - Operational cost, process, performance
- Reliability of Parts
  - Effective maintenance, operational cost, uptime
- Maintenance
  - Operational cost, uptime
- Process
  - Desired product, minimise waste, utilise plant, adopt to changes
- Performance
  - Capacity, uptime, quality