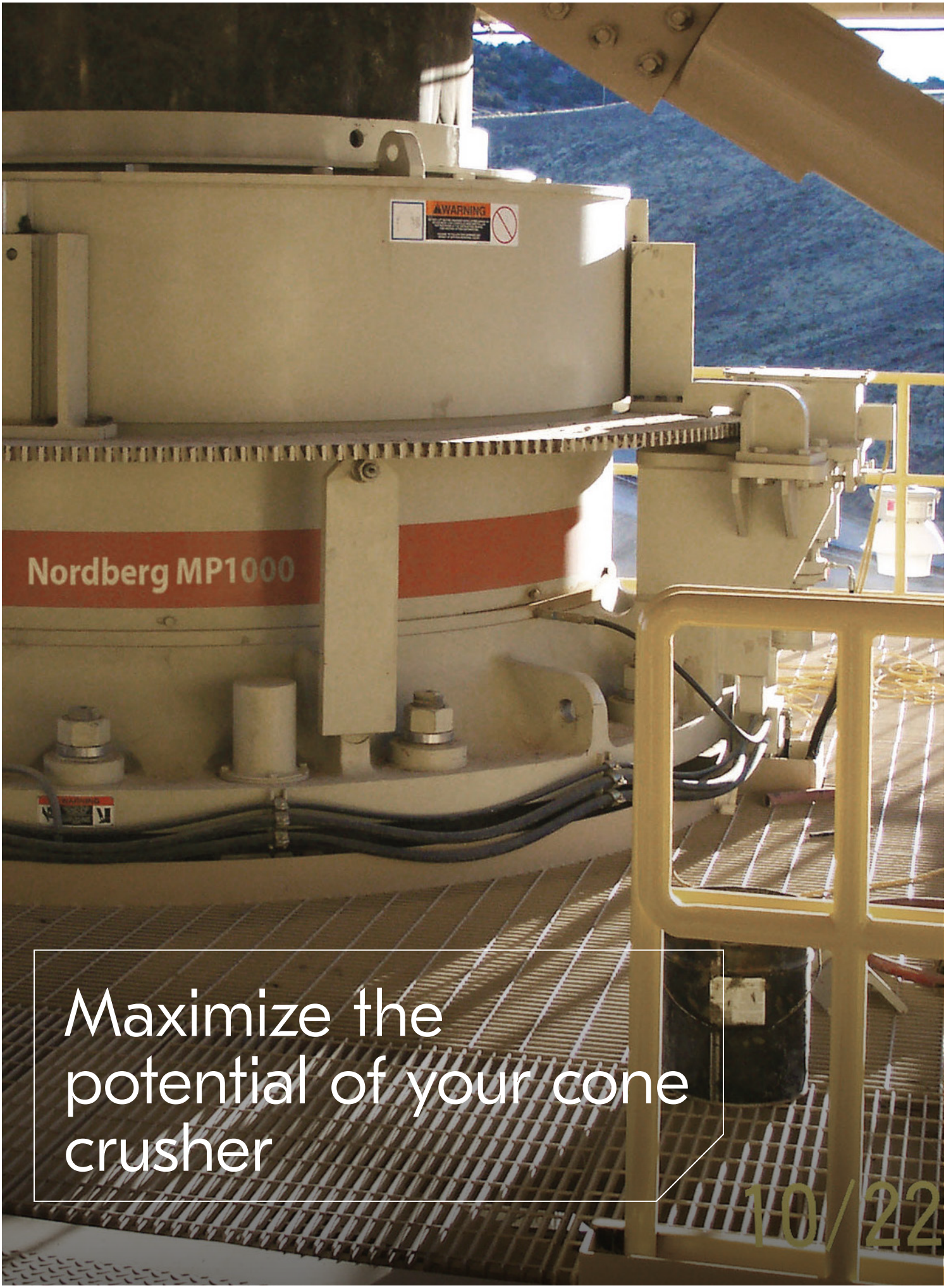
Metso:Outotec

Application guide

Nordberg® MP Series™ cone crusher wear parts



Maximize the potential of your cone crusher

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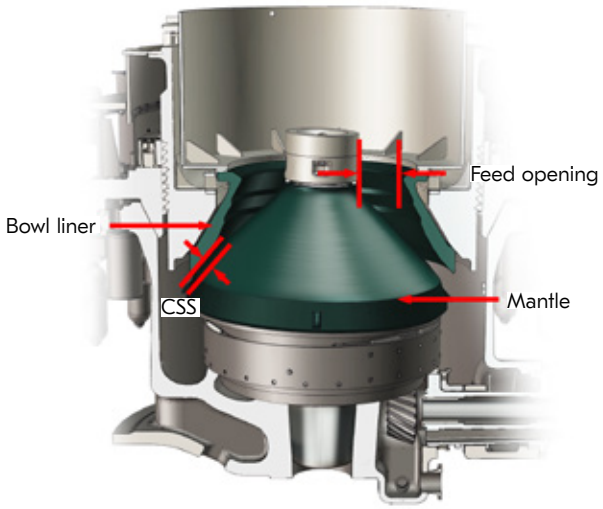
Contents

Nordberg® MP Series™ cone crusher



MP Series™ cone crusher basic concepts

The MP Series™ cone crusher is a compressive crusher that crushes feed material between a fixed bowl liner and a movable mantle. Bigger rock particles are crushed directly between the surfaces of the mantle and bowl liner. This is called single-layer crushing. Smaller rock particles are crushed between other rock particles; this is termed multi-layer crushing or inter-particle comminution. Multi-layer crushing plays a significant role in the MP Series™ cavity. This improves the reduction through the crusher and the end-product shape.

Closed side setting (CSS)

The closed side setting has a significant effect on the product gradation, capacity, and power draw of an MP Series™ cone crusher. The closed side setting is measured from the bottom of the mantle to the bottom of the bowl liner at their closest point during the gyrating cycle.

Feed opening

The feed opening defines the maximum feed size for the crushing cavity. The closed side feed opening is the smallest distance between the top of the mantle and bowl liner as measured when they are at their closest to one another during their gyrating cycle.

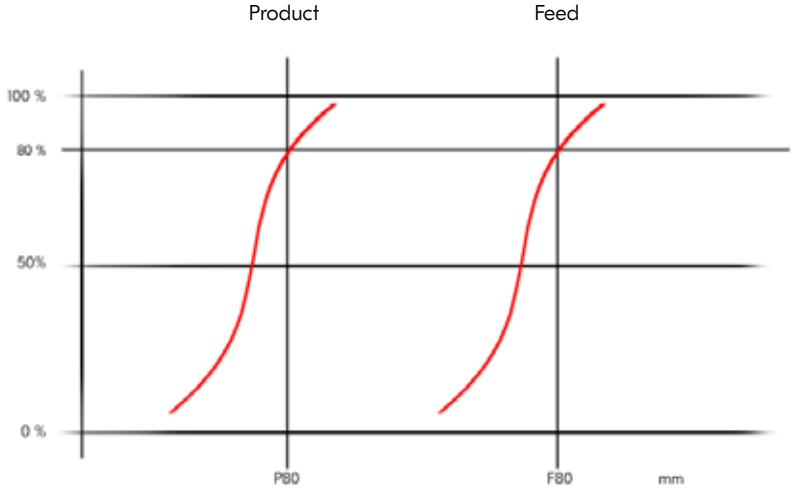
The open side feed opening is the distance between the top of the mantle and bowl liner as measured when they are at their farthest from one another during their gyrating cycle. In MP Series™ cavities, the maximum feed size is equal to the closed side feed opening.

Nip angle

The nip angle is the angle between the mantle and bowl liner. A nip angle that is too large reduces capacity and increases wear, as feed material will tend to move upwards in the cavity rather than crush. This can be observed as a bouncing or boiling of the feed material.

Reduction ratio

The reduction ratio is the ratio between the size of the feed and the size of the outgoing product. It is normally measured at the 80% passing point. A typical reduction ratio in the MP Series™ standard cavity is 4-6 and in the MP Series™ short head cavity it is 3-5.



How to operate an MP Series™ cone crusher

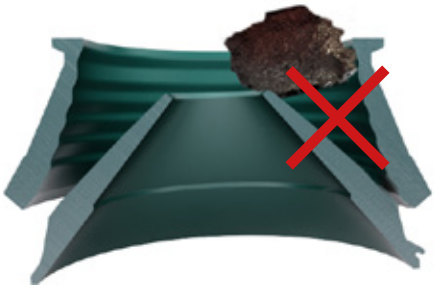
In order to optimize capacity and maximize the lifetime of wear parts, consider the following points:

1. **Check the feed arrangement**
   - The crusher should be choke fed so that the crushing chamber is full all the time. This is important, especially in fine crushing. Choke feeding maximizes the amount of multi-layer crushing, improves the shape of the crushing cavity as it wears and improves the crushing efficiency.
   - The feed must be distributed evenly 360° around the crushing chamber. Uneven feed distribution may cause power and force cycles through each gyration cycle. Evenly distributed feed will result in a more steady power and crushing force.
   - Feed should not be segregated (for example finer material on one side of the cavity and coarser material on the other side of the cavity).
   - The flow of the feed should be stable and continuous.

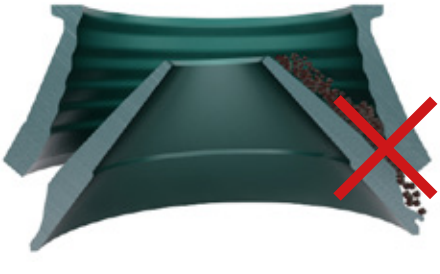
2. **Check the feed size and gradation**
   - Oversized feed material decreases capacity and can cause abnormal wear of the liners.
   - Under sized feed material increases the wear at the bottom part of the liners and may cause a poor utilization rate of the wear parts.
   - Fines should be screened out before the material is fed to the crusher as the fines may cause packing; they can also create high forces in the cavity that may lead to exceedance of the power and/or force limit.
   - Feed should be well graded with no gaps in the size distribution.

3. **Check the power draw**
   The crusher should operate with a steady power draw and as close to full rated power as practical, depending on the circuit design and the ability to control the system.

4. **Check the closed side setting**

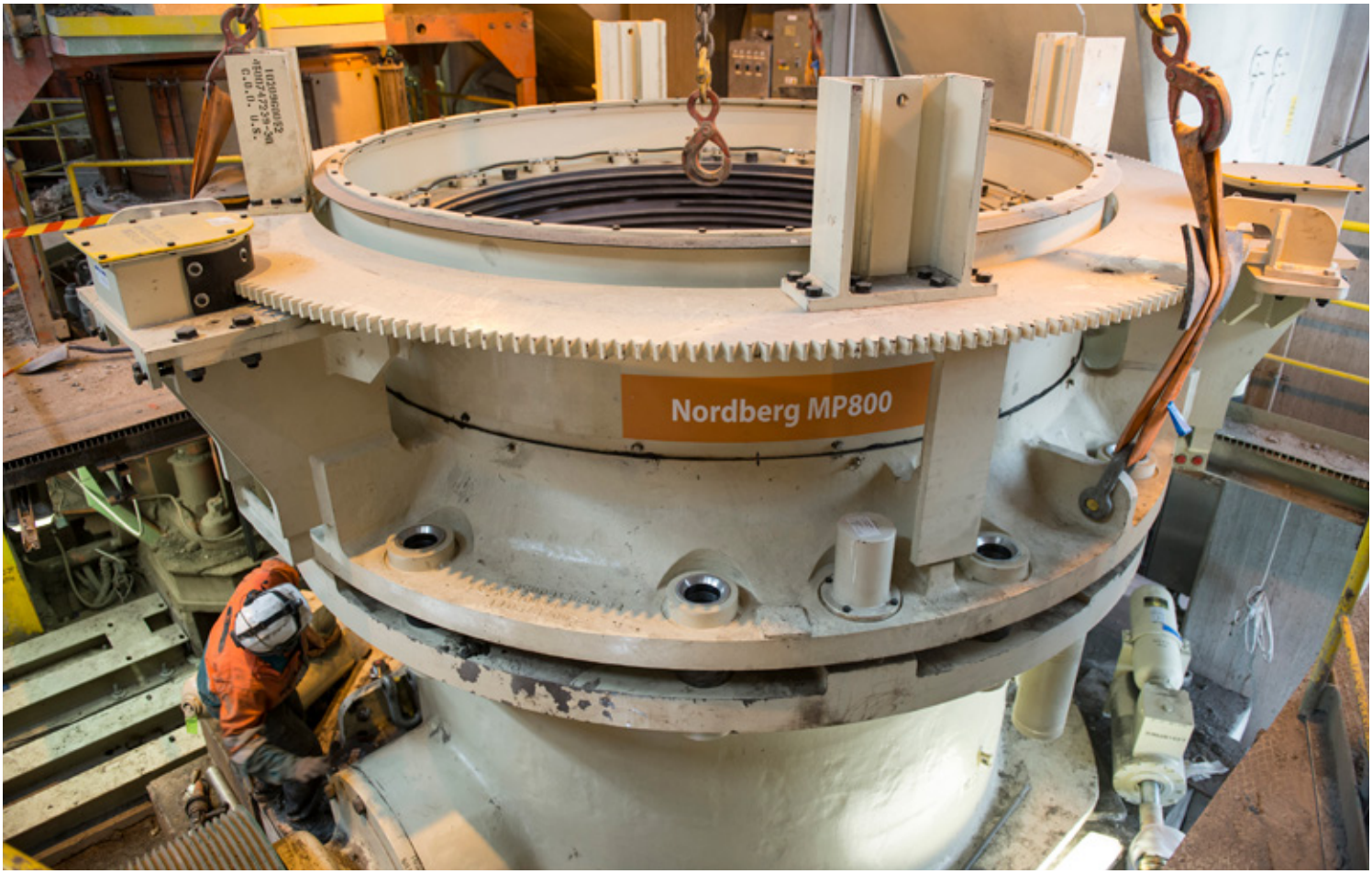


Over sized feed material



Under sized feed material

Note: Feed material characteristics such as gradation, bulk density, moisture, clay content and crushability have a significant impact on crusher capacity and the wear life of the liners



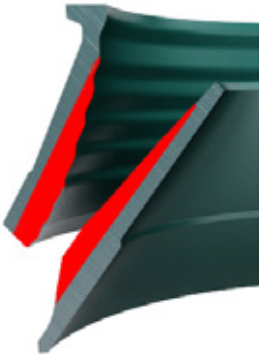
1. The setting should be close to the required product. The setting is too small if the adjustment ring is moving on the main frame (ring bounce).
   Larger setting -> Product size increases
   Larger setting -> Capacity increases
   Larger setting -> Power draw decreases

2. **Check the crusher operating speed**
   Make sure that the operating speed of the crusher matches the application and liner profile used.

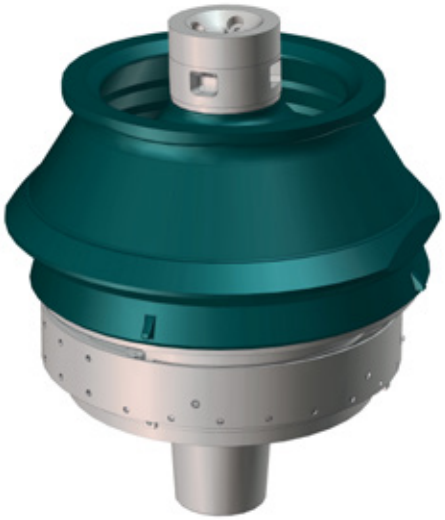
3. **Check the cavity in use**

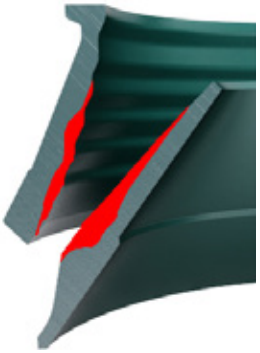
- Based on feed size
- Based on the required end product size which determines the required setting range
- Check the crushing reduction ratio

4. **Check the wear profile of the liners**
   A distorted wear profile may decrease capacity, increase the liner wear rate and increase the crushing force.



Example of normal wear. Obtained with correct feed arrangements, feed gradation and parameters for the cavity.





Example of abnormal wear. Cupping has occurred.

	Difficult and abrasive rock	Difficult and non abrasive rock	Medium and abrasive rock	Medium and non abrasive rock	Easy and abrasive rock	Easy and non abrasive rock
MP800						
XT525/XT520		C (●●●)		C (●●●)		C (●●●)
XT510	●●●	●●	●●●	●●	●●●	●
XT710	C (●●●)		C (●●●)		C (●●●)	
XT750/XT770	C		C		C	
MP1000						
XT525/XT520		C (●●●)		C (●●●)		C (●●●)
XT510	●●●	●●	●●●	●●	●●●	●
XT710	C (●●●)		C (●●●)		C (●●●)	
XT750/XT770	C		C		C	
MP1250						
XT510/XT525		●●●	●	●●●	●	
XT710	C	C	C	C	C	C
XT750/770	C	C	C	C	C	C
MP2500						
XT525		●●●	●	●●●	●	
XT750/770	C	C	C	C	C	C

● Can be used ●● Good choice ●●● Recommended C - Contact Metso representative for more information

MP Series™ cone crusher cavity selection

Each MP Series™ cone crusher has several cavity options with different feed openings and setting ranges. The correct cavity can be selected based on the feed size, setting and application.

Standard liners are typically used in secondary applications. Secondary applications do not necessarily need to be operated in closed circuit, but preferably choke fed.

Short head liners are used in tertiary or quaternary stage applications for fine crushing and may be in closed circuit returning to the crusher.

Liners are manufactured from XT510™, XT520™, XT525™, XT710™, XT750™ or XT770™ material depending on the application and material characteristics.

		Standard		Short head	
Crusher size	**Cavity**	**Minimum setting "A"**	**Feed opening "B"**	**Minimum setting "A"**	**Feed opening "B"**
MP800™	Extra fine Fine Medium Coarse Extra coarse	19 mm (0.75 in) 19 mm (0.75 in) 25 mm (0.98 in) 32 mm (1.26 in)	144 mm (5.67 in) 241 mm (9.49 in) 308 mm (12.13 in) 343 mm (13.50 in)	8 mm (0.31 in) 10 mm (0.39 in) 12 mm (0.47 in)	43 mm (1.69 in) 71 mm (2.80 in) 113 mm (4.45 in)
MP1000™	Extra fine Fine Medium Coarse Extra coarse	22 mm (0.87 in) 25 mm (0.98 in) 32 mm (1.26 in) 38 mm (1.50 in)	241 mm (9.49 in) 242 mm (9.53 in) 343 mm (9.57 in) 360 mm (14.17 in)	8 mm (0.31 in) 10 mm (0.39 in) 12 mm (0.47 in) 19 mm (0.75 in)	63 mm (2.48 in) 90 mm (3.54 in) 140 mm (5.51 in) 235 mm (9.25 in)
MP1250™	Extra fine Fine Medium Coarse Extra coarse	22 mm (0.87 in) 25 mm (0.98 in) 32 mm (1.26 in) 38 mm (1.50 in)	249 mm (9.80 in) 250 mm (9.84 in) 351 mm (13.82 in) 368 mm (14.49 in)	8 mm (0.31 in) 10 mm (0.39 in) 12 mm (0.47 in)	71 mm (2.80 in) 98 mm (3.86 in) 148 mm (5.83 in)

1. The minimum setting is that at which the crusher will operate without causing ring bounce. Depending on the crushing characteristics of the rock, this setting can change.
2. Feed opening "B" is at a minimum setting "A".
3. Maximum feed size varies from 80-100% of "B," depending on the machine size and the cavity profile.

Note: Definitions for different rock types are presented in the wear and materials application guide.

When to change liners

In order to prevent damage to the liner seating surfaces of the crusher head or bowl, wear parts must be replaced before they are worn through. In normal conditions, approximately 50% of the liner weight is consumed when liners are worn out. It is important to keep a record of liner wear in order to assess the degree of liner wear without the need to stop the crusher operation.

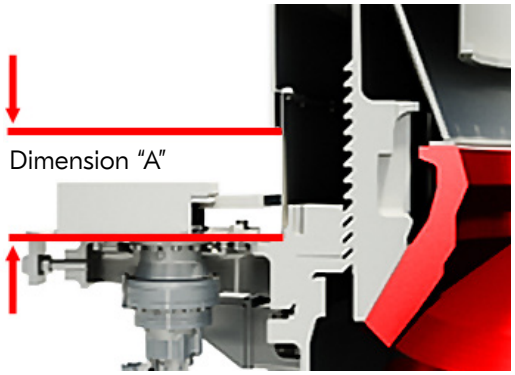
See the following instructions:

1. On the initial set of new liners, place a mark on the adjustment cap driver ring where the pinion tooth makes contact with a driver ring tooth when the target crusher setting has been achieved.
2. Keep an accurate record of the number of teeth used to compensate for liner wear on this set of liners.
3. After the initial set of liners has worn out, but before moving the bowl, record the total number of teeth the driver ring has moved and also paint a horizontal line on the side of the dust shell just below the bottom of the adjustment cap. This will be the baseline for determining how close the next liner sets are to being worn out.
4. When a new liner set has been installed, keep a record of the number of teeth the driver ring has moved and compare this number to the total number from the initial set of liners. This will give an estimation of the liner wear. The horizontal mark painted on the dust shell will also indicate when the liners are approaching the wear limit. The approximate minimum heights of the adjustment cap (the "A" dimension) with worn liners are listed in the attached tables.

When changing liners and determining liner wear, follow the instructions in the related Nordberg MP Series™ cone crusher instruction manual.

Production considerations may sometimes favor the changing of wear parts before they are fully worn. Hourly capacity or product quality may decrease towards the end of the liner wear life, and it may be more economical to change the liner before the end of its lifetime.

Typically, distorted wear profiles can cause a reduction in capacity. Other symptoms of abnormal worn liners are high power draw and ring bounce. Also, the wear life can be reduced because the wear is sometimes concentrated in a small zone rather than spread along the full cavity, and the cavity may have to be replaced before it is fully worn. This results in poor utilization and higher operating wear costs.



Caution: Dimension "A" is given for normal wear. Meaning similar mantle and bowl liner wear, without a distorted wear profile = correct application according to the cavity selected.

Note: See the instruction manual for more detailed information about when and how to change wear parts.

Crusher size	Number of gear teeth required for one complete revolution	Vertical bowl travel per tooth	Setting variation per tooth	Setting for 1/4 revolution of the driver ring	"A" Approximate dimension when the liners are worn out
MP800™	306	0.332 mm (0.013 in)	0.22 mm (0.009 in)	16.83 mm (0.663 in)	STD A = 91 + (1.50 x CSS) SH HD A = 77 + (1.50 x CSS)
MP1000™	120	0.626 mm (0.025 in)	0.41 mm (0.016 in)	12.42 mm (0.489 in)	STD A = 76 + (1.50 x CSS) SH HD A = 105 + (1.50 x CSS)
MP1250™	120	0.626 mm (0.025 in)	0.41 mm (0.016 in)	12.42 mm (0.489 in)	STD A = 123 + (1.50 x CSS) SH HD A = 141 + (1.50 x CSS)

How to change liners

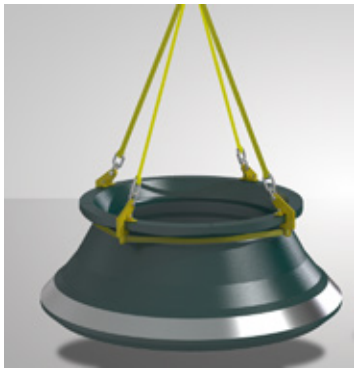
Always follow the safety instructions during all maintenance and lifting work.

Bowl removal

1. Depressurize the clamping circuit
2. Turn out bowl (counter-clockwise rotation)
3. Remove bowl from machine/ worn liner from bowl
   - Inspect/ clean/ regrease threads on bowl and adjustment ring
   - Remove wedges
   - Lift bowl free of worn liner

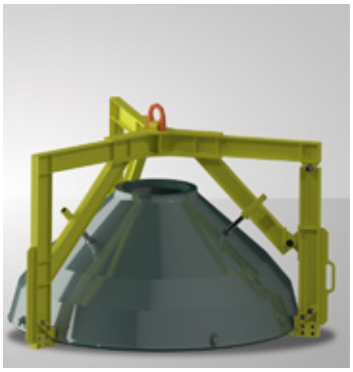
Bowl installation

1. Clean/ inspect bowl
   - Remove any backing stuck to the bowl
   - Grind smooth any ridges on seat
   - Oil inside of bowl to prevent backing from sticking
2. Bowl liner preparation
   - Chalk line above high points of bowl liner helix
   - Clean seating surface of bowl liner
3. Installation of new bowl liner
   - Make sure bowl liner is centered in bowl
   - Replace wedges (shim as needed)
   - Tighten in criss-cross pattern: check seat area with feeler gauge, pour backing if required and place insulation around wedges



Mantle removal

1. Remove feed plate (feed cone)
2. Lift head assembly out of the machine
   - Using head lifting plate (offset)
3. Cut the torch ring
   - Reduces pressure on the locking nut
4. Use sledging wrench to loosen locking nut
5. Weld lift lugs to mantle
   - Follow welding procedure as specified in the instruction manual
   - Do not preheat mantle



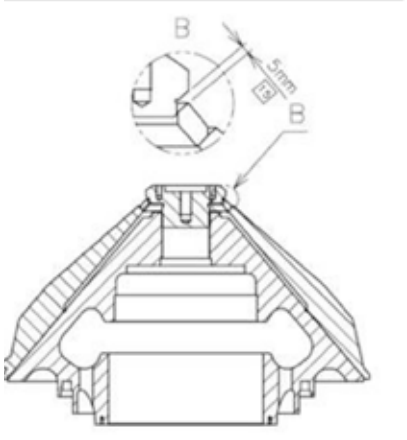
6. Lift worn mantle from head
   - Always stand clear of suspended loads
   - Watch for pieces of backing that may fall out

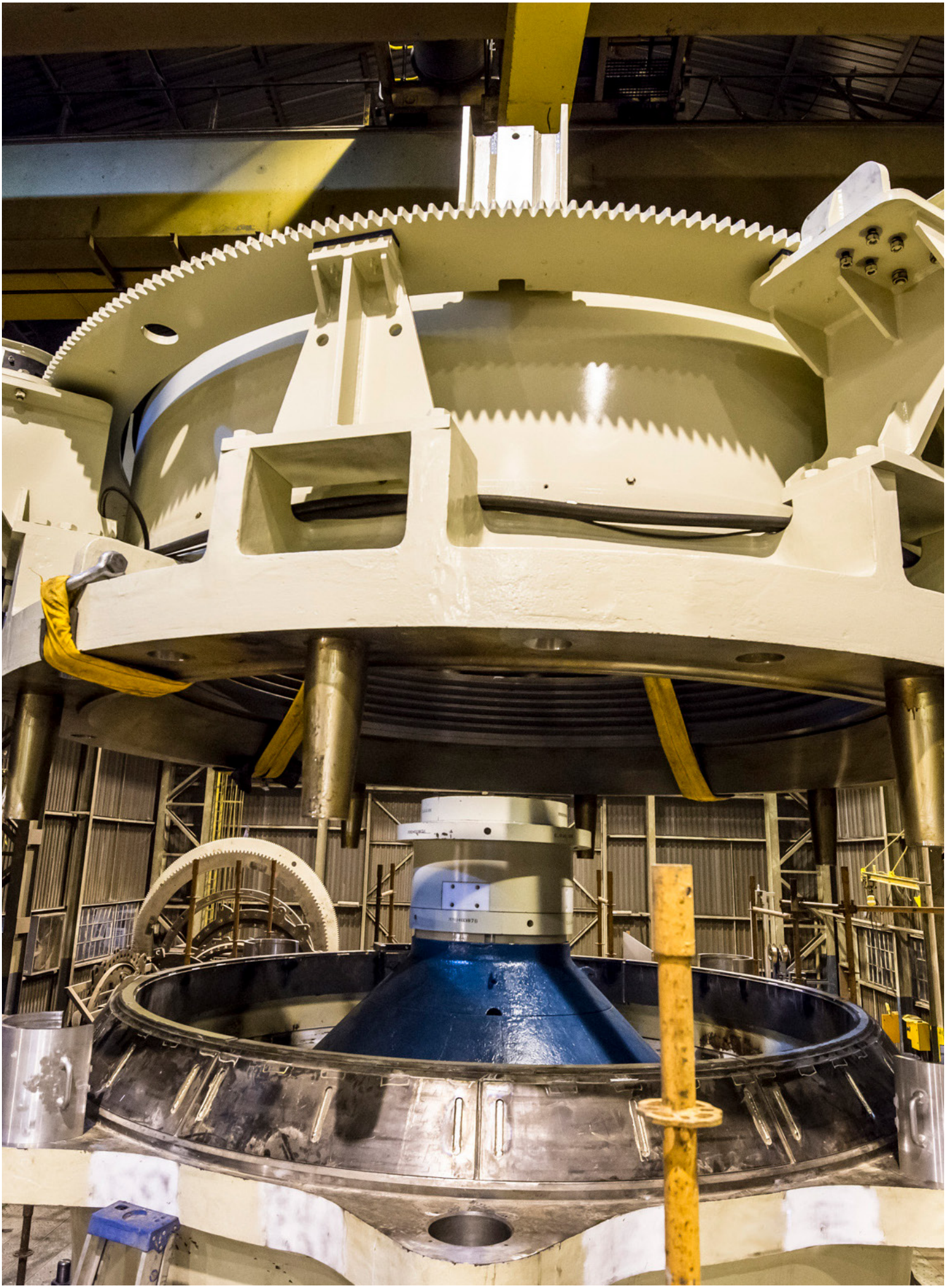
New liner preparation

1. Check head seat surface
2. Check threads on head bolt/ locking nut
3. Clean mantle mating surfaces of mantle and torch rings

New mantle installation

1. Center mantle on head
2. Tighten locking nut
3. Mark vertical line
   - Locking nut – torch ring – mantle
4. Heat seating area of mantle
   - Temperature range given in Instruction manual
5. Tighten locking nut again
6. Pour backing
   - Fill to top of pour hole
7. Weld torch ring to mantle and mantle to locking nut





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