Welcome to the First Edition of the Terex Finlay Crusher Wear Parts Reference Guide. This Guide has been developed to help Dealers personnel to expand their knowledge of Crusher Wear part options & terminology and help relay this information to end users in a clear and logical manner. The Guide is broken down into following sections:

1. Wear Parts Overview
2. Jaw Crusher Wear Parts
3. Cone Crusher Wear Parts
4. Impactor Crusher Wear Parts

Topics within these sections include metallurgy options, liner profiles available, application examples, case studies, wear part codes, etc.

I hope this Guide provides an invaluable source of information that will assist you in selling Terex Finlay crusher wear parts.

Regards

Brendan Mc Anulla
Crusher Wear Parts Product Manager
Manganese Liner Facts:

- Manganese liners are used because of their ability to work harden while crushing, which extends their wear life dramatically.
- Liners work harden by compressive forces and at any given time the work hardened face is only about 2-3mm.
- The speed at which the liner work hardens increases as the percentage manganese content increases; so 12-14% work hardens slowest & 20-24% fastest.
- The work hardened face has a higher Brunel value if the percentage manganese content is lower; so once work hardened the 12-14% will be more wear resistant than the 16-18% etc.

Optimizing Liner Wear Life:

- Reduce the amount of fine and wet material allowed into the crushing chamber, by using correct choice of feeder.
- Run the Chamber at an optimum speed. Running it too fast will hinder the liners ability to ‘bite’ the material and pull it into the chamber and will result in the material rubbing against the liners excessively, promoting premature wear.
- Possibly running the Chamber at a larger CSS for a day or so, initially, as tight settings hinder the liners ability to sufficiently work harden.
- Rotating Jaw liners prematurely would also assist with allowing the crushing faces to work harden more effectively.

Through Hardening

Through hardening is when the core of the manganese loses its ductility. For manganese to work the skin has got to be very hard, and abrasive resistant, but the core needs to be as ductile and as soft as chewing gum.

If manganese is misapplied there is a serious risk of losing this innate ductility that must be at the core.

Work Hardening

Work hardening of a jaw liner, is the strengthening of the liner as it is pounded by the rock forces inside the crushing chamber. This strengthening occurs because of permanent changes within the microstructure of the material on the liner surface. Before work hardening, the molecular structure of the liner is a regular, defect-free pattern. As the liner is pounded by the rock the microstructure dislocates and the structure becomes denser. The denser structure provides more resistance to forces and is observed as strengthening or work hardening.

Highly Abrasive

Rock Types

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>14% Manganese</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>18% Manganese</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>22% Manganese</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
WHAT IS WEAR?
Wear is produced by 2 elements pressing against each other e.g. Between a jaw liner and crushing material. During this process small materials from each element become detached.

Primary factor in wear for Crushing applications is ABRASION. Material fatigue is also a factor as the crusher tools e.g. Jaw liners are subject to numerous pressure and impact stresses.

Several other factors affect the wear lifetime of crusher wear parts as listed in below Diagram.

Wear occurs in all crushers, however wear costs can be controlled by selecting the correct crusher type for the abrasive content of the material to be crushed. The table demonstrates how a relatively small increase in abrasive content can result in wear costs spiraling. Exact wear cost is a function of feed size, reduction ratio, moisture content, capacity friability and grain size.

Same can be said when selecting correct Wear Liner for your application. E.g. If it is highly abrasive application then 22% Manganese would be considered best option over 18%.

The 3 Main Abrasives found in rocks are listed below:

- **SiO₂**: Silica Dioxide
- **Fe₂O₃**: Iron Oxide
- **Al₂O₃**: Aluminium Oxide
**CRUSHABILITY**
How easy is product broken into smaller fragments?

**ABRASIVENESS**
It is very important to know the abrasive qualities of the material you are looking to crush. Materials can be soft but abrasive. The abrasive nature of the material will dictate the estimated wear life of your wear parts and what metallurgy should be utilized. The 3 main abrasives found in rock are listed below:

- **SIO₂**: Silica Dioxide
- **AL₂O₃**: Aluminium Oxide
- **FEO₂**: Iron Oxide

**HARDNESS OF MINERALS**
Some minerals are very soft; others are very hard. The degree of hardness is an aid in identifying the minerals. Diamonds are harder than quartz and will therefore, scratch quartz; quartz will scratch calcite; calcite will scratch gypsum and so on. An easy way of estimating the hardness of a mineral in the field is by trying to scratch it with such common objects as a fingernail, a copper penny, a pocket knife blade, and a piece of window glass. Glass the hardest of the four, will scratch the most minerals, the knife is next in hardness; then in order comes the copper cent, and the fingernail.

**BOND WORK INDEX**
The amount of energy required by plant to crush material

**LOS ANGELES VALUE**
The Los Angeles test is commonly used to evaluate the hardness of aggregates to find the suitability of aggregates for use in road construction. Therefore, the road aggregates should be hard enough to resist abrasion.

**UCS (UNIAXIAL COMPRESSIVE STRENGTH)**
Predicting the strength and brittleness of rocks from a crushability index

**FRENCH ABRASIVENESS TEST**
The Abrasivity Coefficient (ABR) is defined as the ratio of the plates weight loss to the mass of tested material. The index is given in grams per ton and varies between 0 to over 2000, depending on whether the rock is respectively little or highly abrasive.

**Crushability**

<table>
<thead>
<tr>
<th>CLASSIFICATION</th>
<th>CRUSHABILITY (%)</th>
<th>BOND WORK INDEX (KWH/T)</th>
<th>LOS ANGELES VALUE</th>
<th>UCS (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Easy</td>
<td>50+</td>
<td>0 - 7</td>
<td>27+</td>
<td>0 - 90</td>
</tr>
<tr>
<td>Medium</td>
<td>40 - 50</td>
<td>7 - 10</td>
<td>22 - 27</td>
<td>90 - 150</td>
</tr>
<tr>
<td>Difficult</td>
<td>20 - 30</td>
<td>14 - 18</td>
<td>12 - 17</td>
<td>220 - 300</td>
</tr>
<tr>
<td>Very Difficult</td>
<td>10 - 20</td>
<td>18 +</td>
<td>5 - 12</td>
<td>300 +</td>
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</table>

**Abrasiveness**

<table>
<thead>
<tr>
<th>CLASSIFICATION</th>
<th>FRENCH ABRASIVENESS (G/TON)</th>
<th>ABRASION INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Abrasive</td>
<td>0 - 100</td>
<td>0.0 - 0.1</td>
</tr>
<tr>
<td>Slightly Abrasive</td>
<td>100 - 600</td>
<td>0.1 - 0.4</td>
</tr>
<tr>
<td>Medium Abrasive</td>
<td>600 - 1200</td>
<td>0.4 - 0.6</td>
</tr>
<tr>
<td>Abrasive</td>
<td>1200 - 1700</td>
<td>0.6 - 0.8</td>
</tr>
<tr>
<td>Very Abrasive</td>
<td>1700 +</td>
<td>0.8 +</td>
</tr>
</tbody>
</table>

**Material Properties**

<table>
<thead>
<tr>
<th>ROCK NAME</th>
<th>CRUSHABILITY</th>
<th>ABRASIVENESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphibolite</td>
<td>26 - 46</td>
<td>30 - 1600</td>
</tr>
<tr>
<td>Basalt</td>
<td>20 - 44</td>
<td>500 - 2300</td>
</tr>
<tr>
<td>Diabase</td>
<td>18 - 44</td>
<td>450 - 2300</td>
</tr>
<tr>
<td>Diocrite</td>
<td>20 - 36</td>
<td>400 - 1700</td>
</tr>
<tr>
<td>Dolomite</td>
<td>30 - 56</td>
<td>20 - 450</td>
</tr>
<tr>
<td>Gabbro</td>
<td>27 - 34</td>
<td>800 - 1700</td>
</tr>
<tr>
<td>Gneiss</td>
<td>30 - 67</td>
<td>600 - 1600</td>
</tr>
<tr>
<td>Granite</td>
<td>28 - 90</td>
<td>500 - 1900</td>
</tr>
<tr>
<td>Gravel</td>
<td>30 - 55</td>
<td>300 - 2500</td>
</tr>
<tr>
<td>Limestone</td>
<td>30 - 62</td>
<td>0 - 500</td>
</tr>
<tr>
<td>Rhyolite</td>
<td>16 - 56</td>
<td>700 - 1900</td>
</tr>
<tr>
<td>Sandstone</td>
<td>32 - 60</td>
<td>300 - 2200</td>
</tr>
<tr>
<td>Quartzite</td>
<td>22 - 65</td>
<td>1400 - 2400</td>
</tr>
</tbody>
</table>
Igneous formations (granite) and Metamorphic formations (quartzite).

The softer materials are usually the sedimentary formations (limestone).

Because there are always exceptions, testing of the material is desired.

**Compressive Strength**

<table>
<thead>
<tr>
<th>VERY SOFT</th>
<th>SOFT</th>
<th>MEDIUM</th>
<th>HARD</th>
<th>VERY HARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>4400 - 10,000 psi (27 - 69 MPa)</td>
<td>10,000 - 20,000 psi (69 - 138 MPa)</td>
<td>20,000 - 30,000 psi (138 - 207 MPa)</td>
<td>30,000 - 40,000 psi (207 - 276 MPa)</td>
<td>&gt; 40,000 psi (&gt;310 MPa)</td>
</tr>
</tbody>
</table>

| Lime Rock | Asbestos Rock | Limestone | Granite | Iron Ore |
| Caliche | Gypsum Rock | Dolomite | Quartzite | Granite |
| Diatomite | Slate | Sandstone | Iron Ore | Granite Gravel |
| Shale | Talc | Gneiss | Gravel | Trap Rock |
| Coquina | Gneiss | Quartzite | Basalt | Chert |
| Conglomerate | Granite | Gabbro | Basalt | Marble | Serpentinite |

**MOHS Scale Of Hardness**

<table>
<thead>
<tr>
<th>SCALE</th>
<th>MINERAL</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TALC</td>
<td>Baby Powder</td>
</tr>
<tr>
<td>2</td>
<td>GYPSUM</td>
<td>Finger Nail, Gold</td>
</tr>
<tr>
<td>3</td>
<td>CALCITE</td>
<td>Concrete, Limestone</td>
</tr>
<tr>
<td>4</td>
<td>FLOURITE</td>
<td>Marble, Copper Penny</td>
</tr>
<tr>
<td>5</td>
<td>APATITE</td>
<td>Window Glass</td>
</tr>
<tr>
<td>6</td>
<td>FELDSPAR</td>
<td>Steel Blade Knife</td>
</tr>
<tr>
<td>7</td>
<td>QUARTZ</td>
<td>Granite, Sand</td>
</tr>
<tr>
<td>8</td>
<td>TOPAZ</td>
<td>Topaz</td>
</tr>
<tr>
<td>9</td>
<td>CORUNDUM</td>
<td>Ruby, Sapphire</td>
</tr>
<tr>
<td>10</td>
<td>DIAMOND</td>
<td>Diamond</td>
</tr>
</tbody>
</table>

**WEAR PARTS OVERVIEW**

Test Methods & Terminology

The hardness of a material is a major consideration in the selection of the type of crusher to use. Hardness is a factor in the amount of wear and tear crushers and screens experience. In most cases, the hardest materials are:

- Igneous formations (granite) and Metamorphic formations (quartzite).
- The softer materials are usually the sedimentary formations (limestone).
- Because there are always exceptions, testing of the material is desired.

**Side Liner / Cheek Plates**

- Terex provides a full range of Jaw and Impactor side liners.
- Manufactured to 450 Brinell steel hardness.
- Industry standard 400 Brinell or less.

**WEAR LIFE COMPARED TO STEEL HARDNESS**

- Terex Standard - 450 Hardness
- Industry Standard - 400 Hardness

**WEAR PARTS OVERVIEW**
**Terminology**

**OPEN SIDE SETTING**
Maximum distance between jaw plates for a given setting. (This is the distance when the jaw is at rest)

**CLOSE SIDE SETTING**
Minimum distance between jaw plates derived from the OSS and the stroke.

**DRIVE SIDE**
Side of the crusher fitted with a grooved pulley couple to the crusher drive.

**NON DRIVE SIDE**
Opposite side of the crusher form the drive side.

**FLYWHEEL**
Large wheels used as part of the crusher drive and to store inertia.

**NIP ANGLE**
Inclusive angle between jaw plates indicative of the crushers ability to crush and draw rock.

**JAW PLATES**
Replaceable liner plates available with different profiles for certain applications to help achieve the required output grading whilst protecting the jaw stocks from wear.

**FIXED JAW**
Replaceable liner plate attached to the fixed frame.

**SWING JAW**
Replaceable liner plate attached to the jaw stock.

**CHEEK PLATES**
Wear plates used to protect the crusher frame side plates.

**WEDGES**
Some designs of jaw crushers require wedges to ensure that the jaw plates are held firmly in position. There are also a wear part that can be replaced when worn down.

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**Jaw Liner Selection**

There are a few key points that you need to consider when selecting the correct liners for an application:

- Feed Material Type.
- Feed Material Hardness / Abrasiveness.
- Feed Size.
- Required output.
- Potential of uncrushable material in the chamber.
- Required throughput.

**APPLICATIONS**

<table>
<thead>
<tr>
<th>Jaw Plate Profile</th>
<th>Recycling</th>
<th>Soft-Med Rock</th>
<th>Hard Rock</th>
<th>River Gravel</th>
<th>Asphalt</th>
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</thead>
<tbody>
<tr>
<td>Super Tooth</td>
<td></td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Quarry Tooth</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Standard Tooth</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Multi Tooth</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Heavy Duty</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>
**Jaw Plate Profiles**

**Super Tooth**
- Medium to hard rock applications
- Grips material to allow better crushing
- Available in 18% & 22%

**Quarry Tooth**
- Hard rock & high abrasive applications
- Deeper tooth profile allows for extra wear
- Available in 18% & 22%

**Multi Tooth**
- Recycling applications
- Good grip on smooth flat surfaces
- Available in 18%

**Standard Tooth**
- Recycling & soft rock applications
- Available in 18%
- Not available for all models

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**Heavy Duty Fixed Jaw Liner**

**Heavy Duty Fixed Jaw Liner**
- Designed for fixed side only
- Reduces the number of fixed liner changes
- Available in 18% & 22%

**Available for:**
- J-1170
- J-1175
- J-1480

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**Jaw Fitted with Fixed Heavy Duty Liner & Super Tooth Swing Liner**

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**Quarry Tooth Swing & HD Fixed Jaw**  **Super Tooth Swing & HD Fixed Jaw**
IMPROVING JAW LINER WEAR LIFE WITH HEAVY DUTY FIXED JAW

THE CHALLENGE

Subedharji Grit based in India, were looking to improve Uptime on their Terex Static Jaw Plant. Processing extremely abrasive Gritstone the Terex Super tooth 18% Jaws liners where lasting 10,000MT before requiring a change. This was causing unnecessary downtime and lost production of the site.

THE SOLUTION

Heavy Duty Fixed Jaw – 18% & Swing Super tooth

This Heavy Duty Liner has been uniquely designed by Terex engineering to improve the wear life of fixed jaw liners, whilst maintaining throughput of the machine and output grading of the material. This allows the machine to maintain optimal performance whilst reducing the amount of downtime due to fewer number of liner changes.

MATERIAL SPECIFICATION

Extremely Abrasive Grit Stone
Abrasiveness - 2000 g/tn
Crushability - 40%

THE RESULTS

Standard 18% Super tooth liners were lasting 10,000MT. Newly designed fixed Heavy Duty liner with Swing Super tooth and wear life increased to 17,250MT. This is an improvement in wear life of 70% which means a large improvement in machine uptime.
When a jaw is at rest, the setting that will be measured is the **OPEN SIDE SETTING (OSS)**. The Operations manual states the **CLOSED SIDE SETTING (CSS)**. To calculate the **CSS** for the measured **OSS**, the stroke must be deducted.

**THE STROKE OF THE MACHINE IS STATED IN ‘TECHNICAL INFORMATION’ IN THE MANUAL.**

A tight **CSS** will lead to higher wear on jaw plates.

**Maximun Acceptable Wear**

A jaw should not run any longer once the tooth profile has reduced to below 90% of its profile height (if the face is smooth this will result in high loadings) in the crushing zone.

**NB:** The crusher must not be operated at a smaller **CSS** than what is stated in ‘Technical Information’ in the Operation manuals.
Feeding A Jaw Crusher

All crushers work best with a uniform feed gradation and a wide range of material size. Fines do not need to be crushed and so it is normal to use a Vibrating Grizzly Feeder (VGF) so that material smaller than the grizzly aperture bypasses the crushing chamber. This reduces wear on the jaw liners and can improve overall plant performance. However it is good practice not to have grizzly aperture any larger than jaw CSS. This is to ensure there are some smaller materials to help the jaw grip and crush the larger rocks.

Jaw Liner Parts Codes

<table>
<thead>
<tr>
<th>Jaw</th>
<th>Supertooth</th>
<th>Quarry Tooth</th>
<th>Multi Tooth</th>
<th>Standards Tooth</th>
<th>Heavy Duty</th>
</tr>
</thead>
<tbody>
<tr>
<td>J960</td>
<td>Fixed 600/041E</td>
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<td>N.A.</td>
<td>N.A.</td>
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<tr>
<td>Swing</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>Wedges</td>
<td>600/055E</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
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<td>J1160 up to TRX1160JAOMH5652</td>
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</tr>
</tbody>
</table>

JAW CRUSHER

22 23

VGF TO REMOVE FINES

TOO MANY FINES IN FEED
The J1175 jaw pockets at rear of jaw have been re-designed to allow the jaw liners to be more durable in the field.

**OLD POCKET**

**NEW POCKET**

**JAW PLATE NEW PART CODES**

<table>
<thead>
<tr>
<th>Description</th>
<th>Current Part Code</th>
<th>New Part Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Jaw Quarry Tooth (18% Mn)</td>
<td>31.10.0205</td>
<td>CW024-006-MN180</td>
</tr>
<tr>
<td>Swing Jaw Quarry Tooth (18% Mn)</td>
<td>31.10.0210</td>
<td>CW024-007-MN180</td>
</tr>
<tr>
<td>Fixed Jaw Quarry Tooth (22% Mn)</td>
<td>31.10.0207</td>
<td>CW024-006-MN220</td>
</tr>
<tr>
<td>Swing Jaw Quarry Tooth (22% Mn)</td>
<td>31.10.0212</td>
<td>CW024-007-MN220</td>
</tr>
<tr>
<td>Fixed Jaw Multi Tooth (18% Mn)</td>
<td>31.10.1171</td>
<td>CW024-005-MN180</td>
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<tr>
<td>Swing Jaw Multi Tooth (18% Mn)</td>
<td>31.10.1170</td>
<td>CW024-004-MN180</td>
</tr>
<tr>
<td>Fixed Jaw Supertooth (18% Mn)</td>
<td>31.10.1174</td>
<td>CW024-003-MN180</td>
</tr>
<tr>
<td>Swing Jaw Supertooth (18% Mn)</td>
<td>31.10.1173</td>
<td>CW024-002-MN180</td>
</tr>
<tr>
<td>Fixed Jaw Supertooth (22% Mn)</td>
<td>31.10.1181</td>
<td>CW024-009-MN220</td>
</tr>
<tr>
<td>Swing Jaw Supertooth (22%Mn)</td>
<td>31.10.1179</td>
<td>CW024-002-MN220</td>
</tr>
</tbody>
</table>

NB: Old & New Design Jaw liners can be mixed Except for the Quarry Tooth Liners – See Next Page.

On the Quarry tooth jaws the old design there was no half tooth on the outside of the swing jaw plate it was on the fixed jaw. This causes increased wear on the cheek plates due to material being pushed out against the cheek plates during operation. On all other jaw plates in the range the half tooth is on the swing jaw so the decision was made to bring the quarry tooth profile in line with the rest of the jaw range.

NB: THE OLD DESIGN & NEW DESIGNED QUARRY JAWS CANNOT BE MIXED

QUARRY SWING JAW – OLD DESIGN – 7 FULL TEETH

QUARRY SWING JAW – NEW DESIGN – 6 FULL TEETH & 2 HALF TEETH
CONES
MANTLE
Covers the cone head of the crusher to protect it from wear. It is the inner sacrificial wear liner that sits on the cone head.

CONCAVE
Sits in the upper frame of the crusher to protect it from wear. It is the outer sacrificial wear liner that sits inside the upper frame.

BACKING COMPOUND
A resin that is poured behind the manganese liners to fill the void and secure the manganese liners.

OPEN SIDE SETTING (OSS)
The maximum distance between concave and mantle at a given close side setting.

CLOSE SIDE SETTING (CSS)
The minimum distance between concave and mantle to give the required output and grading for a machine.

MANTLE NUT
Used on the top of the mantle to secure the mantle in place on the cone head.

** Metallurgy Options for Cone Liners – See Wear Parts Overview **

There are a few key points that you need to consider when selecting the correct crushing chamber:

1. FEED SIZE
Each chamber configuration has a maximum feed size that it can accept.

2. FEED GRADING
The maximum feed size is important as if there are a lot of fines in the feed or a lot of single size in the feed, it can cause issues with wear and output.
Attention should also be given to recirculating stone for the following reasons:
• It has a tendency to be a lot more abrasive and harder than virgin stone
• Depending on the amount recirculating, it can cause issues with segregated feed

3. OUTPUT REQUIRED
This takes into account output and grading required, which can affect which crushing chamber you should select

<table>
<thead>
<tr>
<th>LINER OPTIONS &amp; MAX FEED SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chamber</td>
</tr>
<tr>
<td>Auto Sand</td>
</tr>
<tr>
<td>Fine</td>
</tr>
<tr>
<td>Medium Coarse</td>
</tr>
<tr>
<td>Coarse</td>
</tr>
<tr>
<td>Extra Coarse</td>
</tr>
<tr>
<td>Heavy Duty</td>
</tr>
</tbody>
</table>

***See next page for Cone Chamber Configurations by Model***
CONE CRUSHER

C-1545

1150 Fine Chamber
1150 Medium Coarse Chamber
1150 Heavy Duty Chamber

C-1550

1300 Auto Sand Chamber
1300 Medium Coarse Chamber
1300 Heavy Duty Chamber

(Medium coarse standard fit from factory)

C-1554

Coarse - Medium
(Bowl Liner - Mantle Liner)

Medium - Medium
(Bowl Liner - Mantle Liner)

Medium Fine - Medium
(Bowl Liner - Mantle Liner)

CONE CRUSHER

Standard configuration is the Coarse-Medium

CSS (mm) | Max Feed Size (mm)
---------|------------------
20       | 255              
38       | 245              
50       | 220              
60       | 175              
130      | 110              

Comment [MG8]: This is only available in PDF I'm afraid

Coarse - Medium
(Bowl Liner - Mantle Liner)

CSS (mm) | Max Feed Size (mm)
---------|------------------
20       | 255              
38       | 245              
50       | 220              
60       | 175              
130      | 110              

Medium - Medium
(Bowl Liner - Mantle Liner)

CSS (mm) | Max Feed Size (mm)
---------|------------------
20       | 255              
38       | 245              
50       | 220              
60       | 175              
130      | 110              

Medium Fine - Medium
(Bowl Liner - Mantle Liner)

CSS (mm) | Max Feed Size (mm)
---------|------------------
20       | 255              
38       | 245              
50       | 220              
60       | 175              
130      | 110              

Fine - Medium
(Bowl Liner - Mantle Liner)

CSS (mm) | Max Feed Size (mm)
---------|------------------
20       | 210              
32       | 185              
50       | 180              
75       | 155              
25       | 140              
13       | 110              
6        | 135              

Medium - Medium
(Bowl Liner - Mantle Liner)

CSS (mm) | Max Feed Size (mm)
---------|------------------
20       | 210              
32       | 185              
50       | 180              
75       | 155              
25       | 140              
13       | 110              
6        | 135              

Extra Fine Liner

CSS (mm) | Max Feed Size (mm)
---------|------------------
20       | 210              
32       | 185              
50       | 180              
75       | 155              
25       | 140              
13       | 110              
6        | 135              

30 31
The latest crusher models have the option to select heavy duty liners on the control panel navigation screen when changing the liners. This way the wear limits can be determined automatically with alarms in the control panel system.

### Pin Centre Measurement

<table>
<thead>
<tr>
<th>Pin Centre Measurement</th>
<th>C-1540</th>
<th>C-1545</th>
<th>C-1550</th>
</tr>
</thead>
<tbody>
<tr>
<td>New</td>
<td>Standard Heavy Duty</td>
<td>Standard Heavy Duty</td>
<td>Standard Heavy Duty</td>
</tr>
<tr>
<td>Vertical Travel</td>
<td>765 mm 788 mm</td>
<td>869 mm 897 mm</td>
<td>907 mm 927 mm</td>
</tr>
<tr>
<td>Wear</td>
<td>680 mm 680 mm</td>
<td>775 mm 775 mm</td>
<td>805 mm 805 mm</td>
</tr>
<tr>
<td>Wear</td>
<td>85 mm 108 mm</td>
<td>94 mm 122 mm</td>
<td>102 mm 122 mm</td>
</tr>
</tbody>
</table>

Increased Wear Available Heavy Duty Liners v Standard Liners

- Cone liners must be changed when the hydraulic rams cannot be fully closed. The pin to pin centre distance is detailed below and worn pin centre measurements are outlined in the table above.

### Chamber Profile and Dump Clearance

The new Heavy Duty cone liners have been designed around the popular medium coarse chamber and as such accepts the same feed size as the medium coarse chamber. Due to the thicker liners there is a REDUCTION IN DUMP CLEARANCE on all the crushing chambers. This clearance will increase proportionally as the Liners wear.

The reduction in dump clearance means that the machines need to have a metal detector working to ensure that no uncrushable material can enter the chamber.
IMPROVING CONE LINER WEAR LIFE WITH HEAVY DUTY LINERS

THE CHALLENGE
A company based in the Midlands in the UK were experiencing wear issues on their Mobile cone crusher. Processing approximately 150tph of very Abrasive River Gravel the Standard 18% Terex Cone liners were lasting only a maximum of a week before requiring a change. This was reducing planned productivity and affecting the financial performance of the site.

THE SOLUTION
Heavy Duty Cone liners – 18%
These are based on the popular Medium Coarse chamber configuration and re-engineered and modelled by specialist engineers within the Terex Chamber Design team to improve wear life. The enhanced liners have been uniquely designed by Terex to deliver optimal performance for abrasive applications in accordance with the design parameters of the cone chamber.

MATERIAL SPECIFICATION
Abrasive Material 96.5% silica
Aggregate Crushing Value (%) - 14
Aggregate Impact Value (%) - 18
SiO2 - 96.52%
Al2O3 - 1.23%
Fe2O3 - 0.46%

THE RESULTS
Standard 18% Manganese liners were lasting on average 42hrs in this application. Newly designed 18% Heavy Duty cone liners and the wear life increased to 62hrs on the same application. This is an improvement of + 45 % over the standard liners which made a massive difference to the Site productivity.

Machine factors that affect Wear Part performance:
• Speed
• Stroke
• Closed Side Setting
• Feed Arrangement (Choke Fed)

CHOKE FED (CORRECT METHOD)
Result = Uniform Liner Wear

TRICKLE FED (INCORRECT METHOD)
Result = Irregular Liner Wear

Note : Feed Grading
• If there are a lot of fines in the feed or a lot of single size product in the feed – this can cause issues with wear and throughput.

WHAT IS CHOKE FED?
Feed material always filled above Mantle Nut
When describing MVP liners, the Bowl Liner is stated first with the Mantle Liner stated second.
IMPACT CRUSHER

IMPACTORS

IMPACT CRUSHER
**Terminology**

**ROTOR**
This is the main part of the HSI crusher. It holds the blow bars and rotates at a high speed, being driven by a pulley connected directly to the engine.

**BLOW BAR / HAMMERS**
Wear parts inserted into the rotor which impact the rock to cause breakage. These can be replaced when they are worn down. There are two different options:
- 4 high blow bars
- 2 high and 2 low blow bars
Some older design crushers had a 3 bar rotor.

**APRONS**
Primary and Secondary aprons are used to reduce rock down to the required product size.

**APRON SETTINGS**
This is the measurement the aprons are set at to achieve the product gradings. There are general rules of what the settings should be.

**APRON LINERS**
Liners that are generally fitted to the end of aprons (which are replaceable wear parts) to ensure the apron settings can be maintained.

**SIDE LINERS**
Sometimes called frame liners, these are used on the inside of the impactor body to protect it from wear.

**Metallurgy Options - Blow Bars**

**MARTENSITIC**
- Good for hardness and impact resistance
- Used in primary and recycling applications
- Can accommodate large feed size
- Can tolerate steel in feed
- Used in primary & recycling applications

**MARTENSITIC CERAMIC**
- Martensitic bar that has a got a ceramic matrix running through the blow bar for extra wear life
- Maintains impact resistance of martensitic bar
- Increases wear life
- Used in primary & recycling applications

**CHROME**
- High Wear resistance
- Feed size needs controlled due to risk of breakages
- Will not tolerate steel in feed
- Available as Medium chrome and High chrome
- Used in secondary, tertiary & asphalt applications (as long as no unbreakable in feed)

**CHROME CERAMIC**
- Chrome bar that has a got a ceramic matrix running through the blow bar for extra wear life
- Feed size needs controlled due to risk of breakages
- Will not tolerate steel in feed
- Used in secondary, tertiary & asphalt applications (as long as no unbreakable in feed)

**NOTE – MEDIUM CHROME**
- Medium Chrome & Medium Chrome Ceramic: will offer better Impact Resistance over High Chrome variants but will have less Wear Resistance for more abrasive applications.
- They will therefore accommodate larger feed sizes than High Chrome.
- They lie between Martensitic variants and high chrome variants as an added option.

**R-1545**
Terminology

**Rotor Configurations**

- 2 Bar is Standard fit from the Factory
- 4 Bar is an option – Only used when feed size small
- Some older Models have 3 bar Rotor

**X2 SHORT X2 LONG BLOW BARS**
- Better penetration
- Higher Tonnage for a given speed.
- Reduced Blow Bar Wear.
- Less Fines Produced.
- Suitable for most Applications.
- Time between Blow Bars is Doubled improving penetration on material.

**X4 LONG BLOW BARS**
- Reduced oversize
- More fines produced
- Good for secondary applications where shape and size outweigh throughput.
- High reduction on softer feed materials
Metallurgy Options - Blow Bars

Ceramic Inserts

Ceramic inserts can be provided for both Martensitic and Chrome Blow bars

EXAMPLES OF CERAMIC INLAYS IN THE BASIC MATERIAL OF MARTENSITIC OR CHROME

ADVANTAGES:
- High wear resistant over standard blow bars
- Increased service life
- Increased uptime

NB: The ceramic inlay will not be visible when the blow bar is new

Impacto Wear Comparison

Guide below shows comparison of wear life between:
- Blow Bars
- Apron Plate Liners
- Side Liners

IMPACTOR WEAR COMPARISON %

IMPACT CRUSHER
Blow bar needs changed or rotated when the wear limit \( Z \) is reached otherwise considerable damage will occur to rotor.

*NEW BLOW BAR, FULL WEAR LIFE*

*HALF WORN, TURN NEEDED*

*FULLY WORN, REPLACEMENT REQUIRED*

*ALWAYS REFER TO A MACHINE OPERATIONAL MANUAL FOR WEAR LIMITS.*

In the case of excessive wear on the blow bars, there can be detrimental effects on the rotor.

- If the bar is not turned before the recommended specified limit, then once changed the bar will not be in a stable position when working.
- This may lead to the bar becoming loose and falling out of the rotor.
- The figure below shows how a blow bar has been worn excessively past its recommended limit.

The result of this negligence has led to the blow bar not being able to be turned.

More severely is the fact that the machine will now need a new rotor.

**FEED MATERIAL IS THE MOST IMPORTANT FACTOR FOR SELECTING THE CORRECT BLOW BAR.**

To increase the life of blow bars the following guidelines should be adhered to:

- Maintain and clean chamber daily.
- Inspect blow bars for premature wear or damage.
- Select correct blow bars depending on application.
- Adjust machine parameters.

**IMPACT CRUSHER**

**Wear Limits**

**Excessive Wear**

- In the case of excessive wear on the blow bars, there can be detrimental effects on the rotor.
- If the bar is not turned before the recommended specified limit, then once changed the bar will not be in a stable position when working.
- This may lead to the bar becoming loose and falling out of the rotor.
- The figure below shows how a blow bar has been worn excessively past its recommended limit.

**Influencing Factors on Blow Bar Wear**

- Feed Material
  - Excessively worn rotor
  - Blow bar worn on one face only, has not been turned
- Rotor Speed
  - Due to excessive wear to the blow bar, the locking wedge has now come in contact with material and dislodged from its seat
- Moisture Content
  - The result of this negligence has led to the blow bar not being able to be turned.
- Fine Content
  - More severely is the fact that the machine will now need a new rotor.

**FEED MATERIAL**

- 45% Feed Material
- 13% Crusher Ratio
- 10% Fine Content
- 12% Moisture Content
- 20% Rotor Speed
OVER PENETRATION

CAUSES & ISSUES

- Excessive penetration on the blow bar.
- The rotor speed is too slow.
- Increases risk of blow bar breakage.
- The blow bar is under-utilized before changing.
- Increased rotor wear.

SOLUTION

- Increase the rotor speed.
- Change to 4 high blow bars.

PROBLEM

- Excessive penetration on the blow bar.

THE RESULT OF ALL THIS?

The blow bar life is optimized.

A gentle radius on the blow bar shows that the feed material is the correct size.
- It shows that the rotor penetration and rotor speed are correct.
- The correct blow bar for the feed material is being used.
- The machine parameter is correctly set up.

Ideal Wear Pattern

Over Penetration

C-1545

Ideal Wear Pattern

Over Penetration

SOLUTION

- Increase the rotor speed.
- Change to 4 high blow bars.

PROBLEM

- Excessive penetration on the blow bar.

THE RESULT OF ALL THIS?

The blow bar life is optimized.

A gentle radius on the blow bar shows that the feed material is the correct size.
- It shows that the rotor penetration and rotor speed are correct.
- The correct blow bar for the feed material is being used.
- The machine parameter is correctly set up.

IMPACT CRUSHER

IMPACT CRUSHER

IMPACT CRUSHER
**Poor Penetration**

**PROBLEM**
- Poor penetration on the blow bar means the top of the blow bar is worn down flat.

**CAUSES & ISSUES**
- The rotor speed is too high.
- Wear rates will be excessive.
- Reduced output.
- Creates lot of fines.

**SOLUTION**
- Reduce the rotor speed.
- Change configuration to 2 high and 2 low blow bars.

**Excessive Wear at Centre of Blow Bar**

**PROBLEM**
- The blow bar is wearing towards the centre.

**CAUSES & ISSUES**
- A trickle feed gives uneven wear.
- Reduces the life of the blow bar.

**SOLUTION**
- Increase feed to crusher. (e.g. A larger excavator is required to feed machine)
- Increase the speed on the feeder.
**PROBLEM**
- Wear on the sides of the blow bar.

**CAUSES & ISSUES**
- High percentage of fines in the feed or overfeed causing fines to be pushed to outside.
- Crusher chamber contaminated with caked material causing friction wear.

**SOLUTION**
- Reduce speed of feeder so wear becomes even across the surface of the blow bar.
- Clean chamber daily after each shift.

**PROBLEM**
- Blow bar wearing excessively to one side.

**CAUSES & ISSUES**
- Machine on uneven ground – material falling to one side.
- Machine isn’t choke fed.
- Feed dropped onto one side of feeder when using recirculating option.

**SOLUTION**
- Ensure the machine is on level ground.
- Continuous loading.
**PROBLEM**
- Blow bar is damaged or broken.

**CAUSES & ISSUES**
- Incorrect blow bar for application. (E.g. Chrome)
- There is steel or rebar in feed.
- Feed size is too large.

**SOLUTION**
- Select correct blow bar.
- Control feed size.
- Remove steel or rebar.

**Increased Wear Available Heavy Duty Liners v Standard Liners**

- Make sure all blow bars are in matched pairs pertaining to weight.
- The weight difference of paired blow bars should not exceed 0.5kg and matched pairs should be installed on opposite sides of the rotor.
- Ensure that all the mounting surfaces of the blow bar are cleaned of any debris and build-up, as well as the rotor backing bar and locating key.
- Check and ensure that any deformities found on the blow bar mounting area are dressed properly to allow the blow bars to sit square in the rotor.
- Ensure that all blow bars are pulled up square in the rotor.
**Blow Bar Selection**

There are a few key points that you need to consider when selecting the correct blow bar for an application:

1. **FEED SIZE**
   - This has a direct link to what blow bars should be selected for each application.

2. **UNCrushable MATERIAL**
   - This is material such as steel or rebar that can cause blow bar breakages.

3. **FEED MATERIAL**
   - The type of feed material can have a large impact due to the different abrasiveness of materials.

<table>
<thead>
<tr>
<th>Blow Bar Type</th>
<th>Recommended For</th>
<th>Recommended For</th>
<th>Risk Of Breakage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Martensitic</td>
<td>• Primary blasted quarry rock</td>
<td>• High Abrasive Material</td>
<td>• Very large feed size</td>
</tr>
<tr>
<td></td>
<td>• Building rubble &amp; Concrete</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Limestone</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Larger feed sizes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chrome</td>
<td>• Secondary Crushing</td>
<td>• Low Abrasive Material</td>
<td>• Large feed size</td>
</tr>
<tr>
<td></td>
<td>• Smaller feed sizes</td>
<td></td>
<td>• Steel content</td>
</tr>
<tr>
<td></td>
<td>• Abrasive Materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Martensitic Ceramic</td>
<td>• Asphalt</td>
<td>• Low Abrasive Material</td>
<td>• Large feed size</td>
</tr>
<tr>
<td></td>
<td>• Natural stone</td>
<td></td>
<td>• Steel content</td>
</tr>
<tr>
<td></td>
<td>• Building rubble &amp; concrete with small to medium iron content</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Medium Abrasive material</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chrome Ceramic</td>
<td>• Secondary crushing with natural stone</td>
<td>• Low Abrasive Material</td>
<td>• Large feed size</td>
</tr>
<tr>
<td></td>
<td>• Asphalt in the case of small feed size without any iron content</td>
<td></td>
<td>• Steel content</td>
</tr>
</tbody>
</table>

**Blow Bar Guide**

**ALWAYS REFER TO OPERATIONS MANUAL FOR MAXIMUM FEED SIZE LIMITATIONS PER CRUSHER MODEL**

**NOTE**
- Martensitic Steels - Good for Impact / Large Feed Size - High Wear in Abrasive Applications
- Chrome Steels - Good for Abrasive Applications - Risk of breakage in Larger feed sizes (over 300mm) & Steel in feed.
- Ceramic Inlays - Available in both Martensitic & Chrome Steels - Provides Longer Wear Life

**KEY FACTORS TO CONSIDER**
- The type of material being crushed.
- The size of the feed.
- Material shape – Cubic or Plate like.
- Abrasiveness.
Examples of Applications for Chrome / Chrome Ceramic

- CERAMICS, Tiles, Basins, Pans etc
- Secondary Quarry, Limestone, Basalt, Granite, Limited Feed Size
- Asphalt

Examples of Applications for Martensitic / Martensitic Ceramic

- Concrete Recycle with Steel
- Primary Limestone
- Light Demolition, Bricks, Blocks etc.
Now available as a retrofit kit, the innovative T-Link telematics system can help you plan, run and manage your fleet. The system can be fitted to older model Terex|Finlay machines and other mixed fleet equipment.

From the fleet management fundamentals of knowing the hours and location of your machine to sending machine specific alerts and tracking machine production, T-link can help you remotely monitor and manage your Terex|Finlay fleet and grow your business.

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