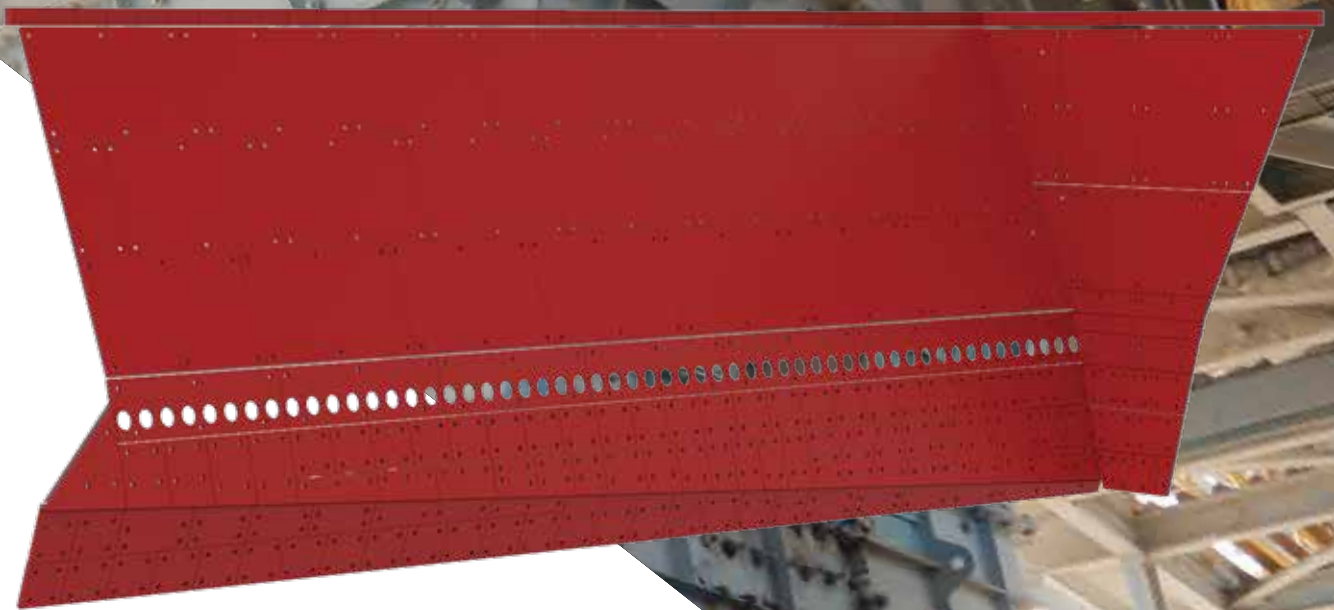


Chute Wear Liner Application Selection Guide



Makuri Addresses your typical problem of:

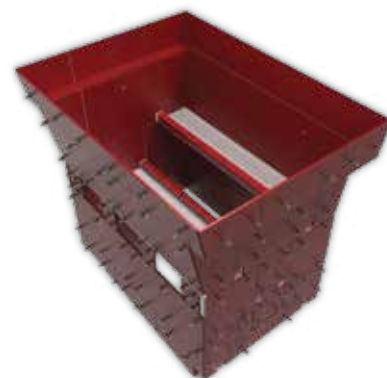
- Localised high wear zones
- Reduced, uneven liner life with wasted liners
- Cracked liners
- Increased unplanned downtime
- Chute blocking from throughput increases, poor design and thicker / additional liners

Makuri means Quality & Innovation



Makuri manufactures chute liners in a range of materials, including our flagship MAK-Hard Bimetallic cast and forged liners, cast white irons, ceramic composites and forged manganese plates.

By adopting an approach that focuses on using the correct material in the correct location with the correct thickness and design, Makuri solutions can reduce not only operating cost per hour or per tonne but the Total Cost of Ownership to a significant level.



Material Selection

Makuri has a selection of material Grades covering varying abrasion and impact ratio applications

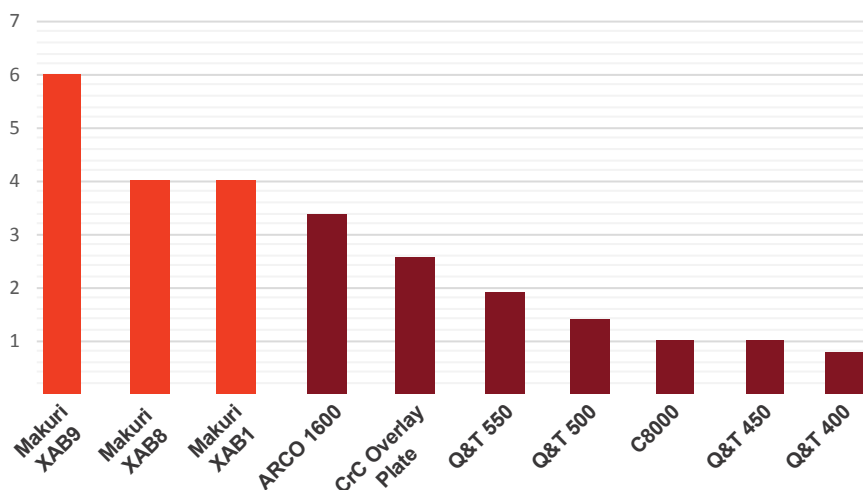
MAK Forged Bimetallic

XAB8 forged bimetallic is for heavy-duty applications, and **XAB9** forged bimetallic is for extreme-duty applications.

MAK Cast Bimetallic

XAB1 cast bimetallic excels where you need a custom-shaped liner to be put in in a uniquely-shaped chute face and corners. Makuri is able to manufacture XAB1 liners to match any required sizes, shapes, and thicknesses.

Grade	Bi-Metallic Wear Plates & Blocks	Applications
XAB1A	High Chrome (HC) bonded plates and blocks	All quarry & mining duty applications
XAB1B	HC bonded plates & blocks with dispersed ceramics	Increased abrasion resistance over 1A
XAB1C	HC bonded plates & blocks with titanium inserts	
XAB8	High Chrome forged bimetallic plate	High abrasion and high impact
XAB9	Complex Alloy forged bimetallic plate	Extreme abrasion and high impact



Wear Life Ratio Under High Impact,
Coarse Particle Abrasion

Independent University testing at TUNRA*, shows they can outperform all AR, Q&T, Chrome Carbide Overlay (CCO) and other well-known propriety brand name wear plates in the market as shown in the chart.

*Source: TUNRA (2022), "Liner Impact Testing, report # 10818" University of Newcastle, New South Wales

Chute Liner Mounting System

Makuri can supply a wide range of mounting options to suit existing site fitment practices and can custom-design additional systems to suit individual requirements. Choosing the correct mounting system that match your chute condition & the flow of the ore will increase



MAK-CS Bolts (Countersunk Bolts)

- Liners can be manufactured to suit any standard CS bolts available on site
- In some applications, use of these can allow the full thickness of wear material to be utilised without damaging the bolt head
- Liners can be flat packed



MAK-Safe System (Back Bolted)

- Allows for the full life of the liner to be obtained
- Allows for flat packing
- Fast, safe and versatile mounting and lifting options
- Can be used with Makuri's 5-step installation system



MAK-HT Studs (High Tensile)

- Provides for simple installation, but requires additional space for packing.
- Weld-free design ensures tensile strength of studs is maintained.
- Allows for studs to be fully tensioned in critical applications.



MAK-FT Bolts (Fishtail Bolts)

- Fishtail bolts are readily available and do not turn inside the hole
- Allows for some degree of misalignment
- Makuri liners can be manufactured to suit any bolt profile
- Allows for flat packing



MAK-PW Slots (Plug Weld)

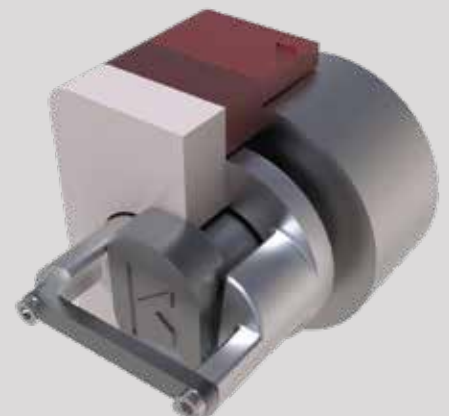
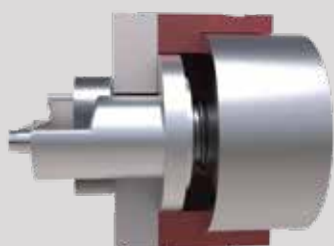
- Can be used where installation conditions do not allow for use of bolts, or where chute conditions are not acceptable for bolting

Makuri MAK-Lok™ - Single-sided Mounting System

Makuri has progressively developed a true one-sided bolting and installation design called the MAK-Lok system. There is much to be gained by changing to and using faster and safer one-sided mounting systems for all chute liners.

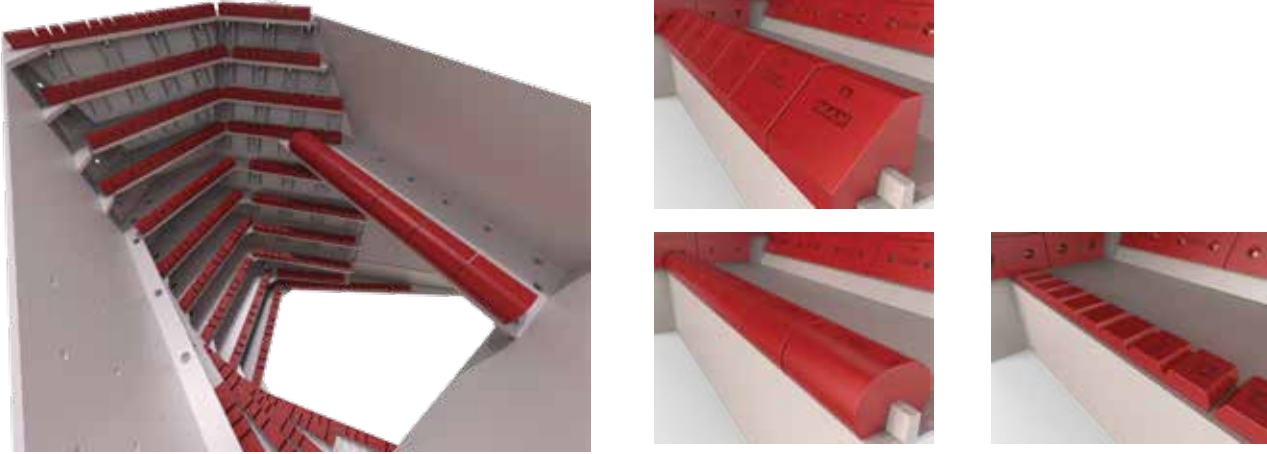
There are 2 types, those that fit directly into and replace the Metso Taper T and those that require bolt on adaptor rails. The adaptor rails bolt onto the original chute liner mounting holes. These original holes are not modified in any way.

- The rail system allows for easier fitment, liner size and spacing with gap minimisation
- The bolt head positively locks and can't vibrate loose
- Endless mounting hole centre variations can be used to suit optimised liner sizing and shape
- The rail system can be removed by unbolting, and the chute can be returned to standard



Rock Box, Bund & Lip Liners

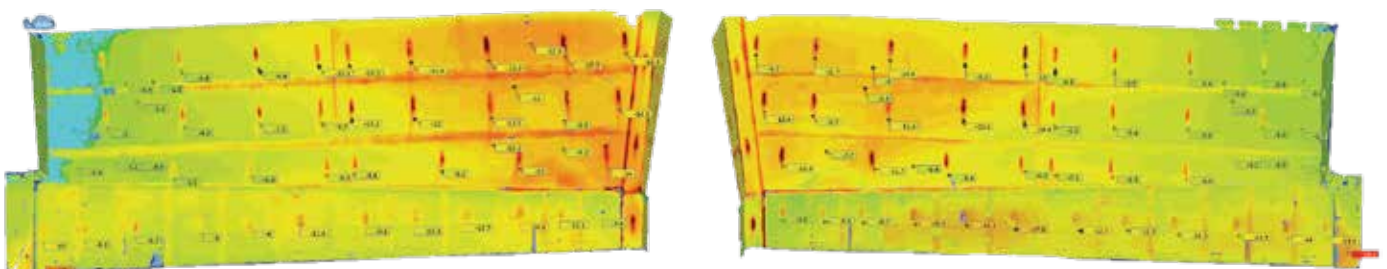
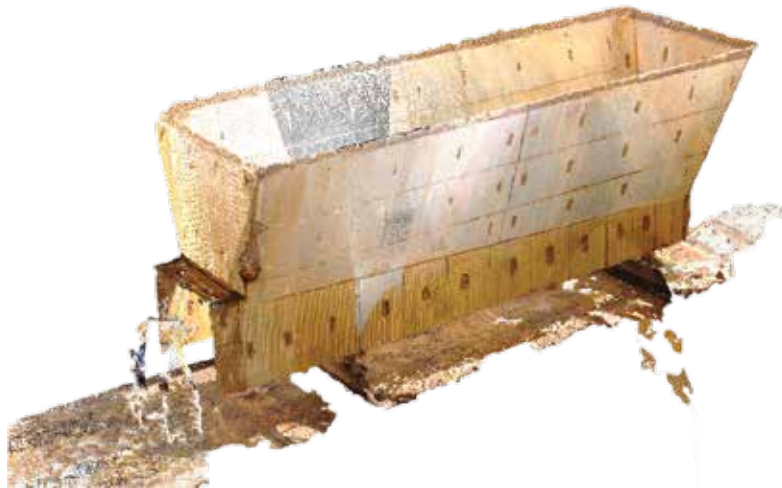
Many chutes upper edges, transition and discharge points require edge protection to do a variety of functions from protecting the edges, forming rock boxes and also ensuring the material is streamed properly.



Identifying different wear rates

Makuri uses in house proprietary technology to capture necessary information needed to be able to analyze and evaluate the best design, materials, and thicknesses in each section of the chute.

Using a comprehensive 3D laser scanning process allows for accurately measure wear pattern based on real life wear results of the chute liner



In search for the combination of the best materials and designs, mapped and adjusted using laser scanning precision, which can offer significant increases in life and reduction in risk to meet fixed tonnage or time targets that can't be reached by others.



Choosing the best liner combination

After the assesment is done, utilizing different material grades and thicknesses to match wear rates in each area of the chute allows for even wear out and replacement of all at the same time, reducing downtime .

