

CASE STUDY

Combating SAG Mill Feed End Wear with White Iron Inserts

The Challenge: Increase the wear life of the Feed End liners in a 32' x 16' SAG

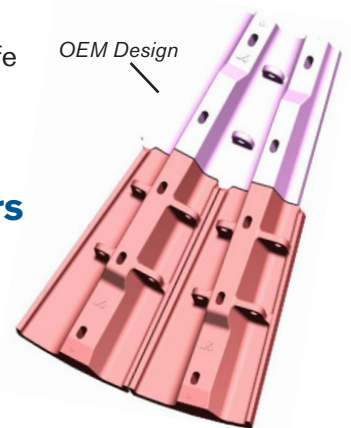
Bradken observed a challenge that a customer was having with their SAG mill Feed End (FE) liners. These FE liners were wearing sooner than the liners in the rest of the mill. The Discharge End (DE) liners and shell liners all have a consistent wear life of six months enabling these liners to be removed and changed during the same mill shutdown.

Due to the higher wear on the FE liners, they had to be replaced after only four months, subsequently necessitating extra mill stoppages beyond that required for the other liners and adding cost and reducing mill availability.

The mill environment is hard rock (12% Cu, 88% Au), with a 28% charge volume (incl. 13% 125mm steel media). The challenge for Bradken was to increase the wear life of the FE liners to match the wear life of liners in the rest of the mill.

Review of Current OEM Design of FE Outer and Middle Liners

At a charge level of 28%, the joint line between the outer and the middle FE liners is aligned with the highest wear area resulting in both these liners needing replacement at the same time.



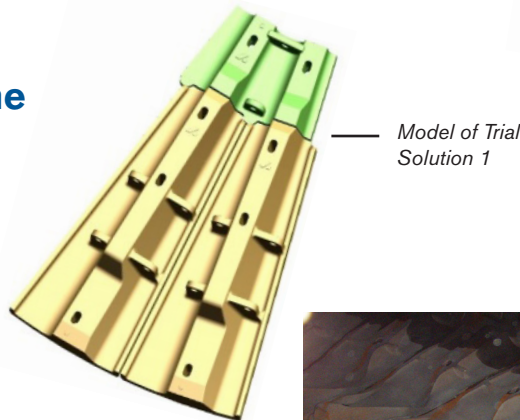
Trial Solution 1 - Move Joint Line

Actions:

- Extend the outer liner so that the joint line is outside the high wear area
- Increase lifter height to add wear life

Outcomes:

- Removed the need to replace middle liners at the same time as the outer liners reducing the number of parts requiring changeout from 48 to 32. Middle liners no longer experience high wear
- Reduced the number of bolts required in the FE
- Restricted the higher wear zone to the outer liner
- Increased the wear life of the outer liner by approximately 10%



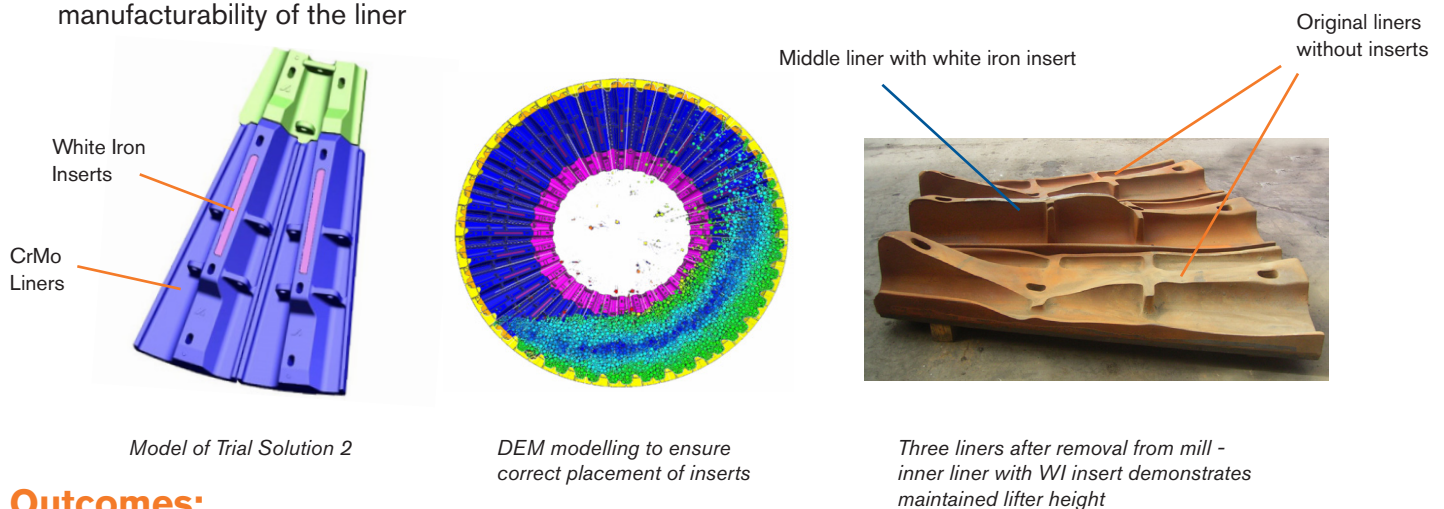
^Caption...

The challenge Remains: Achieve six months wear life from outer FE liners without adding more wear material and increasing liner mass

Trial Solution 2 - Mitigate the High Wear Zone

Actions:

- Any further increases in lifter height are restricted by maximum liner mass within the mill. Therefore other alternatives were considered
- Reviewed alternative wear materials to increase life. The liner material must be able to survive in the hard rock SAG mill environment with 125mm steel balls whilst remaining economical
- Introduced an insert of White Iron into the lifter across the high wear zone. White iron is too brittle in this application to cast an entire FE liner, however by protecting the edge of the insert using the current alloyed steel, significant improvement can be obtained in the abrasive wear life of the liner
- CAD modelling incorporating DEM was undertaken ensuring correct positioning of the insert and manufacturability of the liner

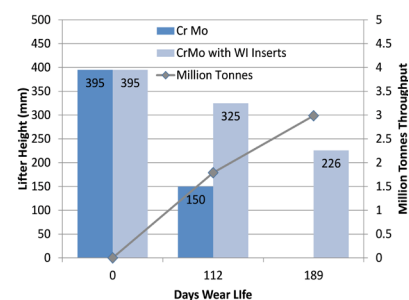


Outcomes:

- The trial demonstrated that the use of white iron inserts into the lifters on the FE liners extended the wear life from 3.8 months to 6.2 months – an increase of 69%

	Liner	Qty per Set	Liner Mass per Set (kgs)	Change-out time per Set (hrs)	Wear Life (months)	Annualised Change out time (hrs)
Original Feed End	Middle Liner	16	24,000	4.53	3.8	14.3
	Outer Liner	32	44,800	9.07	3.8	28.6
			Total Mass: 68,800			Total Hours: 43
Bradken Feed End	Middle Liner	16	10,816	4.53	42.7	1.3
	Outer Liner	32	62,080	9.07	6.2	18.1
			Total Mass: 72,896			Total Hours: 19

- By increasing the wear life of the outer FE liners and matching the shutdown/change out cycle of the remaining liners in the mills, the Bradken solution reduced the annualised change out times by 24 hours thereby reducing mine operating costs



Full Implementation of Inserts in CrMo FE Liners

Overall Outcomes:

- Excessive wear was tackled by the use of high wearing white iron inserts in the CrMo steel FE mill liners
- Consistent Wear on all liners with the FE, shell and DE liners now matching a 6 month shut down cycle
- Savings of one full reline shut per year and extended life of liners