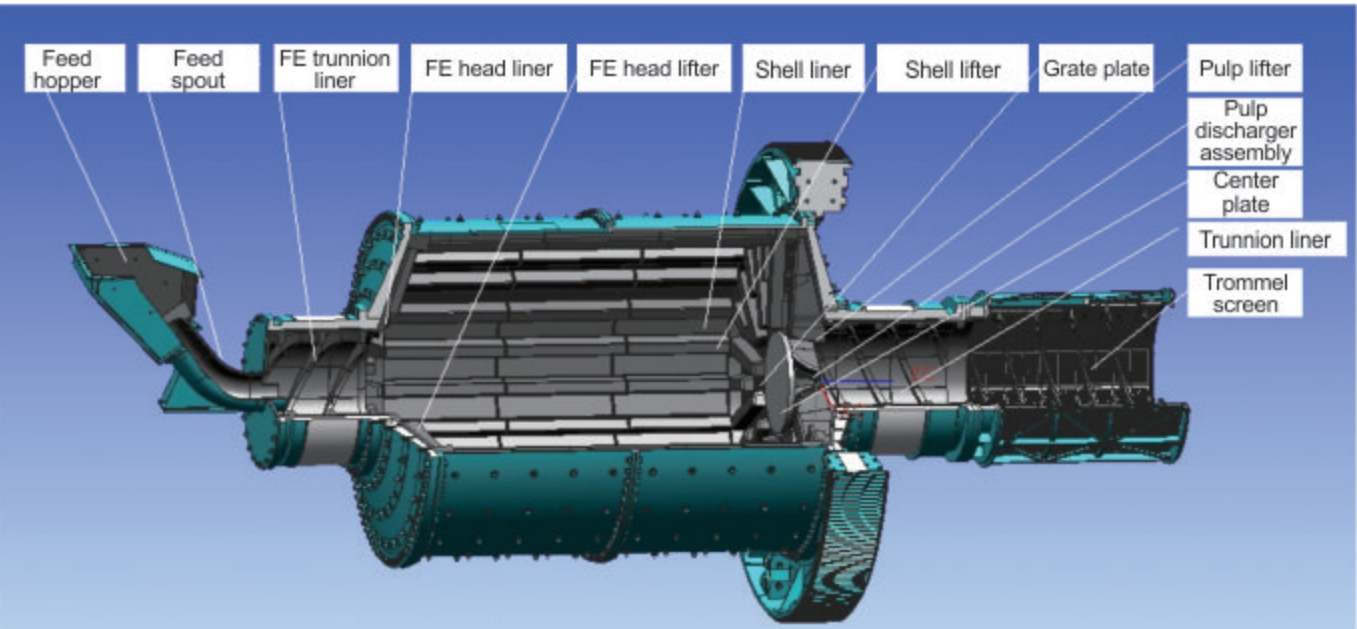


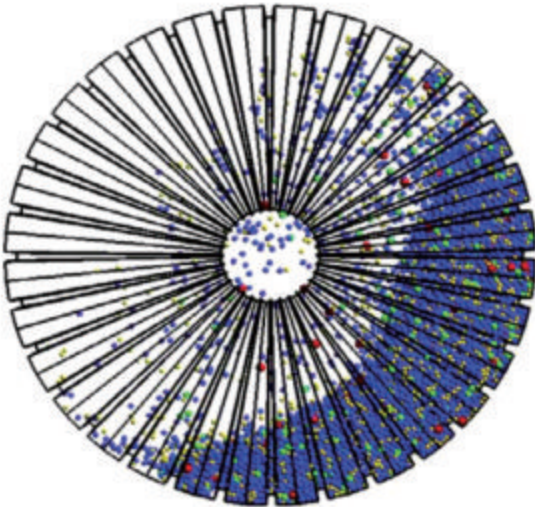
Rubber Liners for Grinders

Jiangxi Napu Company is a manufacturer specializing in mining equipment and spares. Wear resistant rubber liners produced by Naipu Co, as one of the major materials for liners on grinders, gradually substitute the traditional steel liners, widely used in non-ferrous and ferrous metals mining, coal and power plants. Naipu Company, through long term R&D, designs and experiments, has successfully applied rubber liners in ball mills, SAG mills and AG mills, and significant tech breakthroughs and innovations have been achieved.



I. Features of rubber liners for grinders:

1. Rubber density is only 1/6 of metal one, and the lighter weight makes an easier installation and disassembly, saves time (to install rubber liners, it takes one-third of the time span for metal ones), greatly reduces workers' labor intensity and improves the installation safety.
2. The damping, elasticity and absorbing functions of rubber liners reduce noise, and the noise from a rubber-lined grinder is normally lower by 8-10dB than that from one with metal liners.
3. As high wear-resistant rubber is applied, the service life of rubber liners is 1.5 times longer than that of metal ones, leading to the cost-performance ratio of rubber liners is higher than that of metal ones.



Running track of ore and balls on head liners

II. Structural features of rubber liners:

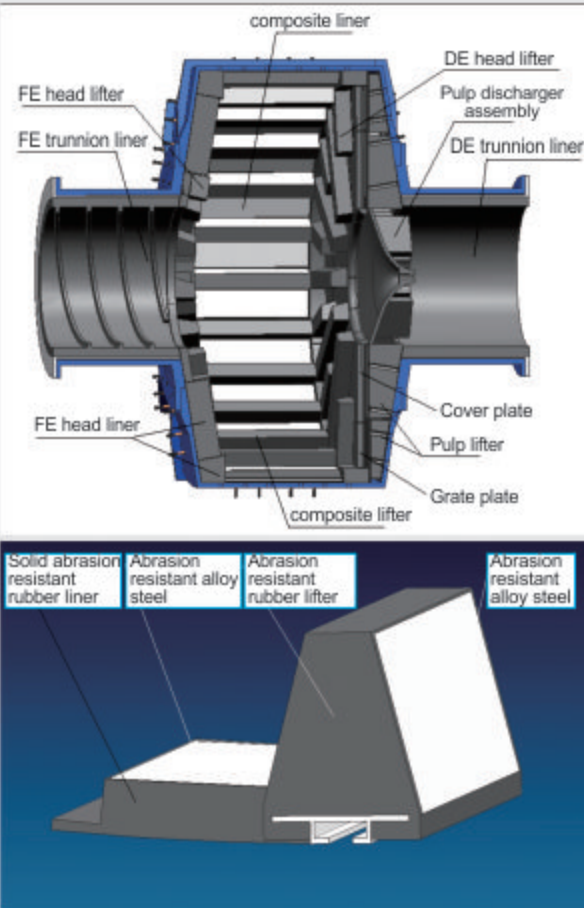
1. Rubber liners for O/F ball mills
 - 1) As rubber friction resistance is higher than that of metal, rubber reverse spirals in the DE trunnion liner yield a high rate of returned materials to the mill.
 - 2) It can effectively improve the throughput of a grinding mill by changing height, spacing and pattern of lifter bars.
2. Structural Features of Grate Mills:



Thanks to the improved evasive property resulting from flexible inserts between apertures of them, the rubber grates solve undesirable phenomena as of aperture blockage or jam experienced on metal liners, improving the screening efficiency.

3. Structural features of rubber liners for SAG Mills:

- (1) Rubber liners for SAG mills are classified into: normal rubber liners and composite rubber liners.
- (2) Normal rubber liners use normal metal as skeleton inserts and abrasion resistant rubber as working surface, and are vulcanization molded in molds, mainly used as FE and DE head liners in small SAG mills.
- (3) Composite liners use normal steel plate, abrasion resistant rubber plus imported abrasion resistant HDS steel plate in combination, and are high pressure vulcanization molded in molds. Alloy steel embedded on the working surface of composite liners has abrasion and impact resistant performance two times better than that of normal manganese steel. Abrasion resistant rubber effectively protects the shell from impact, lowers noise and reduces wear on shell wall.
- (4) Composite liners are of simple structure, light in weight and easy for installation and maintenance.
- (5) Compared with that of normal metal liners, the cost-performance ratio of composite liners is higher.



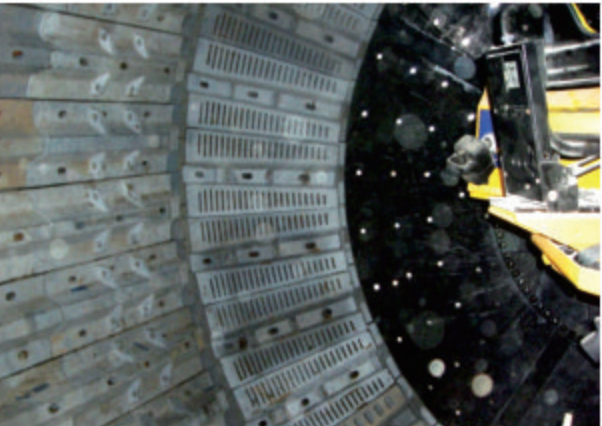
III. A Typical Case:

Results of rubber liners and metal liners applied on Ø8.5x4m SAG mill at Tongling Dongguashan Mine are as follows:

Parts Name	Before Upgrading	After Upgrading (Rubber Parts)	Comparison of Use
1. Outer pulp lifter (#8)			Metal part: over 1 year of service life. Rubber part: 36 months of service life expected (already used for 11 months).
2. Middle pan liner (#9)			Metal part: 12~18 months of service life. Rubber part: 24~32 months of service life expected.
3. Cover plate (#7)		Rubber liner made by Naipu	Metal part: 12 months of service life. Rubber part: 24 months of service life expected.
4. Inner pan liner (#12)		Rubber liner made by Naipu	Rubber part imported: 20 months of service life. Rubber part made by Naipu: 20 months of service life. Equal to imported parts.
5. Center plate (#12)		Rubber liner made by Naipu	Rubber part imported: 20 months of service life. Rubber part made by Naipu: 20 months of service life. Equal to imported parts.



Discharge end head liners on Ø8.5 x 4m SAG mill supplied to Dahongshan Iron Mine, Yunnan



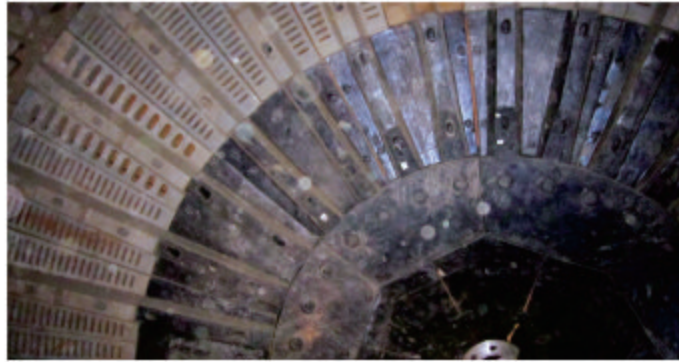
Ø10.37 x 5.19m SAG mill at Dexing Copper with metal liners before modification



Ø10.37 x 5.19m SAG mill at Dexing Copper with rubber liners after modification

IV. A Reference List

1. Dashan Concentrator, Dexing Copper, JCC, China:
F.E. and D.E. rubber liners on $\varnothing 10.37 \times 5.19$ m SAG mill
2. Dongguashan Concentrator, Tongling Copper, China
F.E. and D.E. rubber liners on $\varnothing 8.5 \times 4$ m SAG mill
F.E. and D.E. rubber liners on $\varnothing 5.03 \times 8.3$ m ball mill
3. CITIC Heavy Industrial Machinery Co., Ltd. China
Rubber liners on $\varnothing 12.2 \times 11$ m ball mills (SINO Iron Mine, Australia)
Rubber liners on $\varnothing 5.5 \times 8.8$ m ball mills (CONCEICAO Iron, Vale, Brazil)
Rubber liners on $\varnothing 7.9 \times 13.5$ m ball mill (SINO Iron Mine, Australia)
4. Saindak Cu & Au Mine, MCC, in Pakistan
Rubber liners on $\varnothing 5.03 \times 6.4$ m ball mills
Rubber liners on $\varnothing 2.7 \times 4$ m ball mills
5. Dazhong Mining, Inner Mongolia, China
Rubber liners on $\varnothing 2.7 \times 3.6$ m grate ball mills
6. Xinjiang Jinmai Int'l Logistics Co. (Tajikistan Mining)
F.E. and D.E. rubber liners on $\varnothing 3.6 \times 4.5$ m ball mills
F.E. and D.E. rubber liners on $\varnothing 3.6 \times 5.3$ m ball mills
Complete set of composite liners on $\varnothing 5 \times 2.3$ m SAG mill
7. Fengning Xinyuan Mining, Heibei, China
Rubber liners on $\varnothing 2.7 \times 3.6$ m ball mills
Rubber liners on $\varnothing 3.6 \times 6$ m ball mills
8. Dahongshan Iron Mine, Yunnan, China:
F.E. and D.E. rubber liners on $\varnothing 8.5 \times 4$ m SAG mill



Dashan Concentrator, Dexing Copper, JCC, China:
F.E. and D.E. liners on $\varnothing 10.37 \times 5.19$ m SAG mill (rubber)



Dashan Concentrator,
Dexing Copper, JCC, China:
F.E. liners on $\varnothing 7.32 \times 10.6$ m
Ball mill (rubber)



Dahongshan Iron Mine,
Yunnan, China:
F.E. rubber liners
on $\varnothing 8.5 \times 4$ m SAG mill



Russia: D.E. grates on $\varnothing 3.2 \times 4.5$ m ball mill (rubber)



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Rubber Liners for Grinding Mills



Product Introduction



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