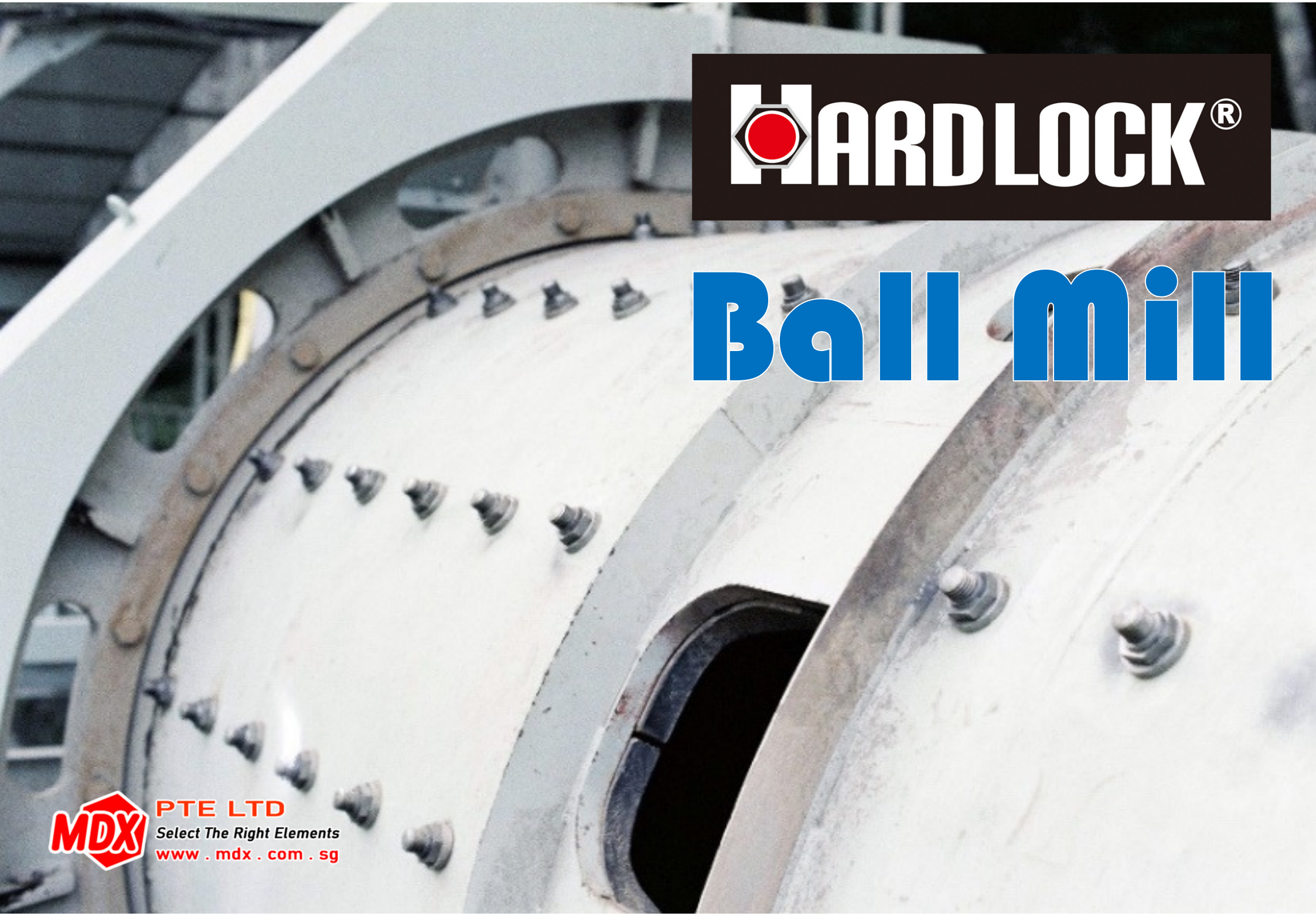

HARDLOCK®

Ball Mill

PTE LTD

Select The Right Elements

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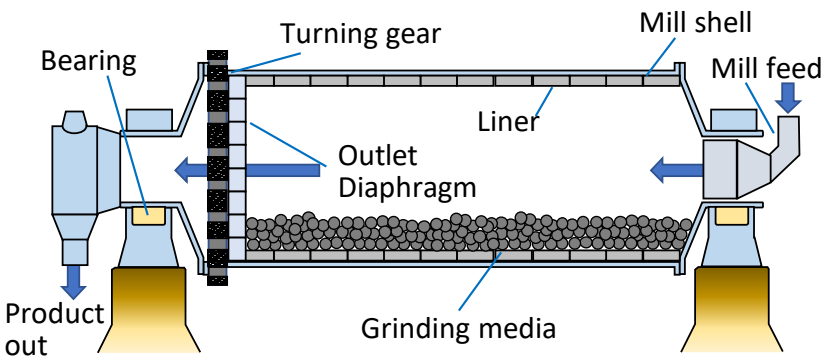
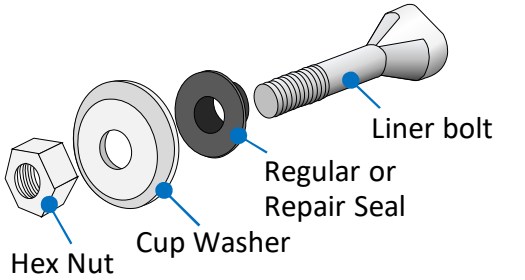
Bolt failure problem in Ball/Rod Mill

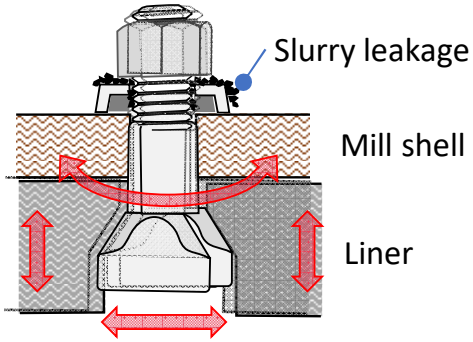
Grinding mill liner bolts are installed by inserting the liner bolts through the liner and then the shell of the mill, this is done from the inside out.

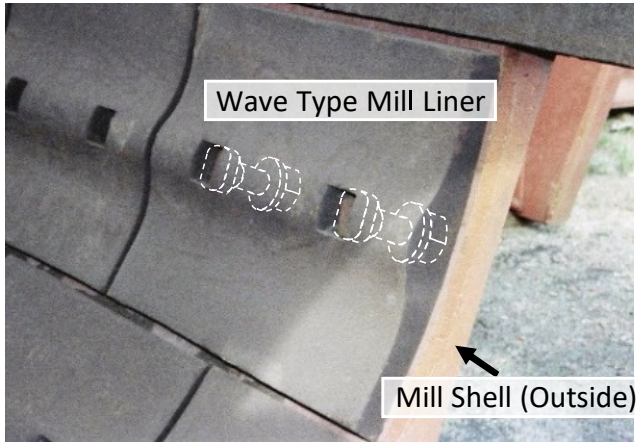
Slurry leakage (Weeping joints) and Bolt failures can occur over time due to drop in clamping force (tensile force). Intermittent drop in clamping force occurs more frequently in discharge liner bolts than feed end liner bolts, this is thought to be influenced by shifting of material and grinding media to one side of the ball mill, leading to heavier impacts to the liners.
Loss of clamp force over time may allow liners to become slack, generating further bending force inducing bolt failures and loose bolts.

Outline of ball mill

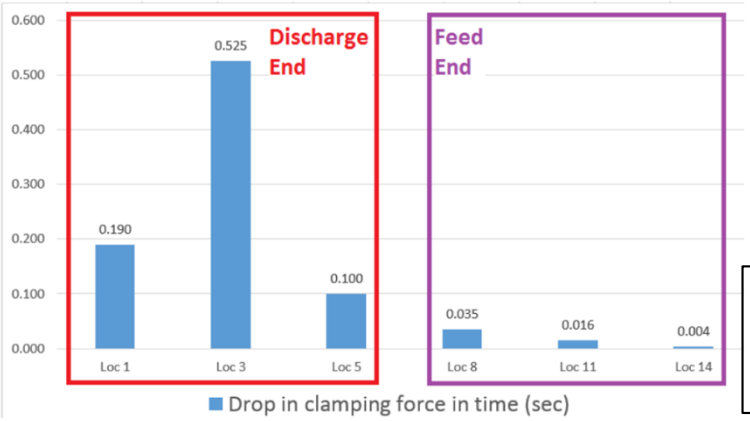








Early failure detection

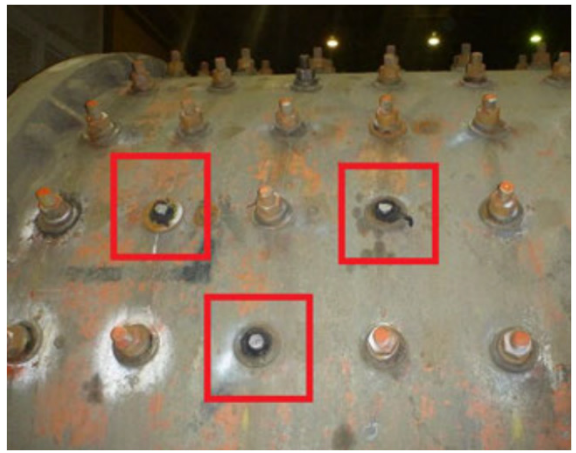


Weeping joints and broken bolts will cause:

- Unexpected interruption to operation
- Metallurgical losses and production downtime
- Multiple bolt failures may lead to liner loss

Minimizing liner movement and reducing bending forces on bolt are key issues to prevent bolt failures and reduce liner wear.

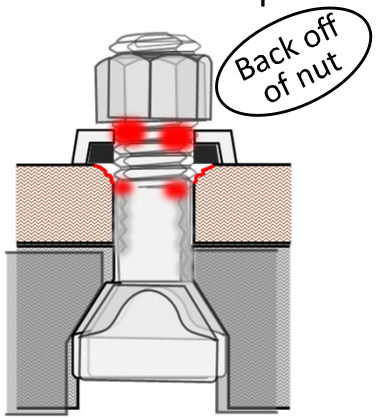
Fatigue failure of bolt

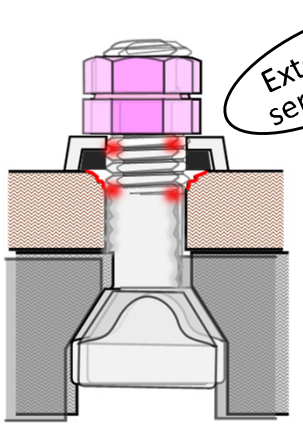


Source:
"Application of Wireless Load Cell to Investigate Rod Mill Liner Bolt breakage" XPS Consulting & Testwork Service, 13 Nov 2015

HARDLOCK Solution for Ball/Rod Mill

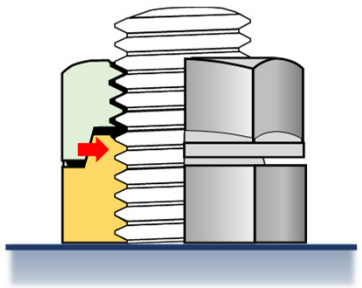
HARDLOCK Nuts are used along with liner bolts to prevent leaking joints and broken bolts. Longer Lifetime of joints leads to increased time until next Retorque.

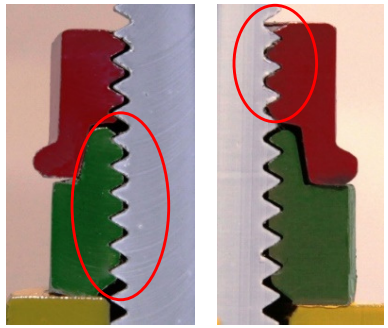




The damages act as a stress raiser applying unwanted force to the bolt shaft, which involves higher possibility of bolt breakage as the nut loosens. The function of HARDLOCK Nut to prevent rotational loosening can aid less bolt breakage.

HARDLOCK Nuts withstand heavy impact to the liners





The picture shows the engagement between the threads of bolt and HLN Convex Nut.
When the nut is fixed to the bolt without play (gap) between the threads, very strong friction is generated in the contact areas, which prevents any external forces or vibrations from making the nut rotate.

HARDLOCK Nuts prevent further loosening even on badly damaged shells

Liner bolts are removed by hammering the end of the bolt pushing the bolt inside the mill, allowing removal of the liner. Hammering is required because big heavy liners apply weight on the bolt increasing the friction as well as dried up slurry filling the hole. Uncontrolled hammering damages the mill shell bolt holes and ruins the clamping surface. Rough clamping surfaces and damaged bolt holes can prevent proper installation of bolt joints. Unequal stress distribution in the bolt shaft extra movement inducing slipping of the nut.

The relaxation generated by flattening of surface roughness leads to the nut moving on loosening. HARDLOCK Nut can not prevent relaxation, but can prevent rotational loosening. Leading to less bolt failure.