MULTOTEC
PROCESS EQUIPMENT

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Report on Siebtechnik Screen Modifications performed at Roy Hill Iron Ore Mine in March 2016.

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Synopsis: This document summarizes the work performed at Roy Hill Iron Ore Mine during the period 18th to 25th of March 2016 in regard to reformatting 3 by 3000mm x 6000mm vibrating Grizzly Screens

Introduction and Back Ground

The period 18th of March to the 25th of March 2016 was spent at Roy Hill Iron Ore mine in the Pilbara region of Western Australia re-formatting three Siebtechnik manufactured vibrating grizzly screens. These machines form part of three sizing and crushing lines supplying Run of Mine (ROM) ore into the main processing plant. Each of these lines are designed to run at a maximum capacity of about 6000 metric tons of ore per hour.

The screens are so positioned as to remove the fines from that part of the ore body passing through the secondary sizer circuit.

These machines were commissioned in October and December 2015, and January 2016 respectively.

During the period they have been in operation several liner failures have occurred in the inlet chute to the secondary sizer, which have been attributed to high horizontal velocities of oversize ore leaving the screen deck.

To reduce this phenomena, the amplitude of vibration of these machines was been reduced by some 30 percent.

This document outlines the methodology adopted in performing these modifications and the results achieved.

It also includes an overview of a series of discussions held with Roy Hill particularly in regards to the maintenance being performed on these machines as well a brief investigation into dislodged ceramic armoring prevalent to the exposed deck support structures of the machine.

Re-orientating the Counter Weights on the Exciter Units

Inorder to reduce the out of balance forces acting on the screen, the position of the adjustable counterweight was moved from key position 0 (both reference and counterweight aligned, or 100% centrifical load) to key position 3, which corresponds to a an applied load of roughly 70% of maximum.

Photos No 14 and 15: Original and re-oriented position of counter weights on actuator.

Methodology Used

Eight counter weights per exciter (4 per gearbox) were removed and repositioned to their new positions. To this end the following methodology was applied to each of the three screens.

- The screen was isolated and locked out in accordance with Samsung and Roy Hill isolation requirements.
- A scaffolding was built along the front of the exciter beam. This scaffolding included an elevated ‘beam’ for purposes of lifting and supporting the counter weights.

Photo No 16: Scaffloding built to provide a work platform along the excitor unit

- The gaurds and covers were removed from the machine

Photo No 17: Gaurds and covers being removed

- The machine was chocked to prevent the out of balance weights from rotating during their re-orientation. This was performed on both gearbox assemblies.

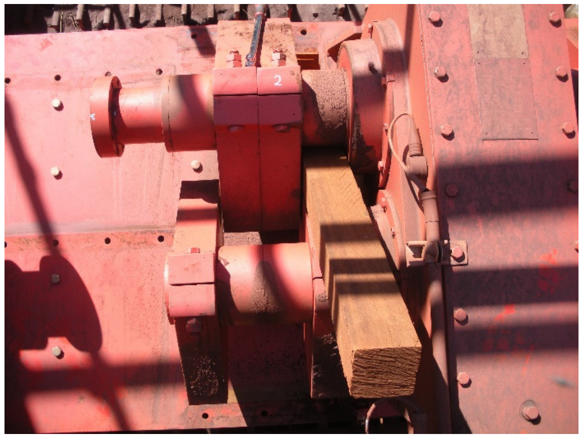
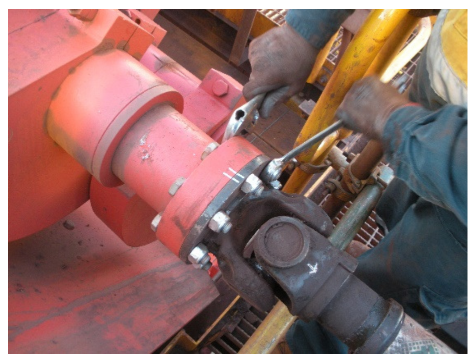


Photo No 18: Counter weights chocked to prevent rotation during work operations

- The inter-gearbox and main drive universal shafts were removed from the drive train.



Photos No 19 and 19A: Universal shafts being removed

- The bolts holding the end locking plates on the outside counter weight shafts were loosened, and the plate removed.

Photo No 20: Outer Counterweight locking plate removed

- The clamping bolt locking the counter weight onto the shaft was loosened and removed, and a lifting eye and rod was fastened through the clamping bolt hole

Photo No 21: Lifting attachment fitted to counterweight

- The weight was supproted by the lifting device, pulled off its key and removed from the shaft

Photo No 22: Outer Counter Weight removed from keyway and shaft

- The spacer piece was removed from the shaft to allow access to the full length of the key.

Photo No 23: Spacer piece removed from shaft

- The key was removed from the keyway position '0', cleaned and dressed as required and repositioned in keyway position '3'

Photos No 24 and 24A: Key repositioned in drive shaft

- After thouroghly cleaning all the componets, and coating with anti sieze (the key and inner bore of all the components), the spacer and counterweight was rotated and re-fitted to its new position. A zink based anti-sieze agent was used on keys and keyways and a high viscosity oil / high impact grease emultion was used on shaft and bore surfaces.

Photos No 25, 25A, 25B: Outer Counterweight being refitted to new position

- The counterweight clamping bolt was refitted, the locking plate replaced and torqued up to 210 Nm in accordance with specifications contained in section 8.13 of the OEM manual.

Photo No 26: Locking plate being torqued

- The Counter Weight clamping bolt was torqued to 415 Nm in accordance with specifications contained in section 8.13 of the OEM manual.

Photo No 27: Clamping bolt on Outer Counterweight being torqued.

- The lock nut was fitted to the clamping bolt and locked

Photo No 28: Counter Weight clamping bolt lock nut being tensioned.

- This procedure was carried out for all 8 counter weights per machine that needed re-orientation. The only diffrenece being that for the counterweights on the upper shafts, the weight was not removed from the shaft.

Photo No 29: Top Excitor Counter Weight being re-orientated

- Once all the outer Counter weights had been re-orientated to keyway position 3. The drive shafts between the two gearboxes were replaced and nipped up

Photo No 30: Inter Gearbox drive shaft being refitted

- The weight assembly was rotated and chocks removed allowing the counterweights to find their balanced or neutral position.

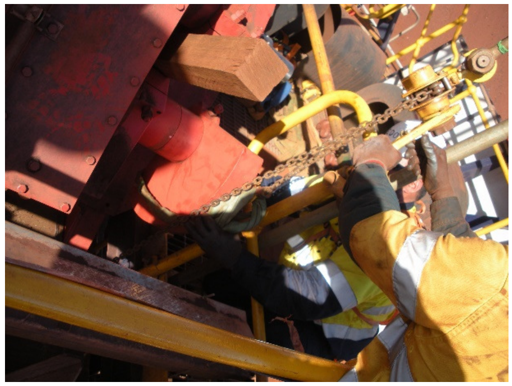


Photo No 31: Counter Weight assemblies being lifted to remove chocks

- The drive shaft bolts were talked to 210 Nm in Nm in accordance with specifications contained in section 8.13 of the OEM manual.

Photo No 32: Inter Gearbox being torqued after weght assemblies in neutral position

- The main drive shaft was aligned and fitted. This was also torqued to 210 Nm in accordance with specifications contained in section 8.13 of the OEM manual.

Photo No 33: Main Drive Shaft being fitted

- The machine was inspected to ensure that all counter weights were correctly positioned and tightened.

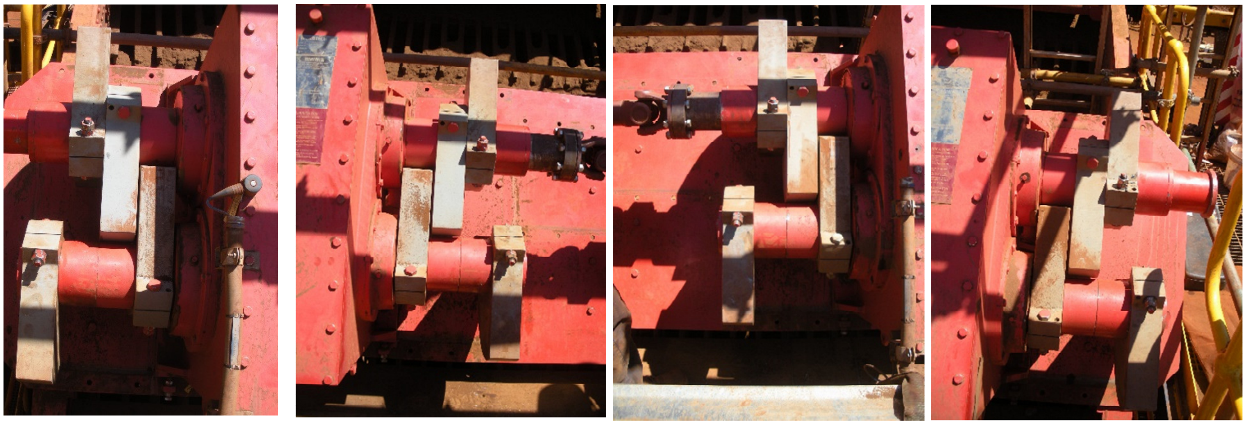


Photo Nos 34, 34A, 34B, 34C: Alignment of Counter Weights after re-orientation

- All guards and covers were re-instated on the machine line and fastened

Photo Nos 35, 35A: Guards and covers re-fitted

- Scaffolding was removed from the screen structure and area

Photo No 36: Scaffolding being broken down

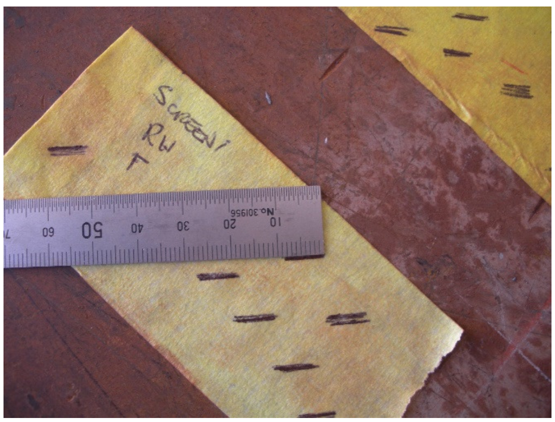
- All isolation locks and documentation was removed and signed off
- Machine was handed back to SamSung for purposes of re-energization bringing back on line.

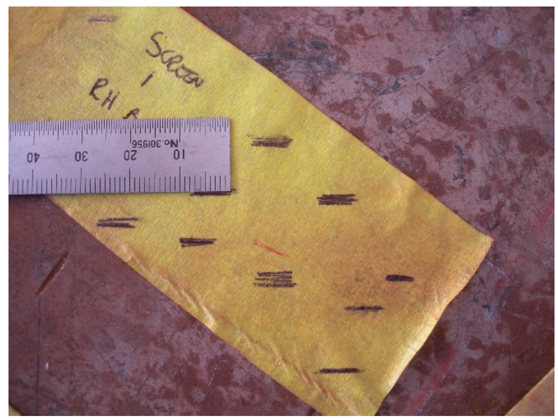
Post Orientation Machine Performance

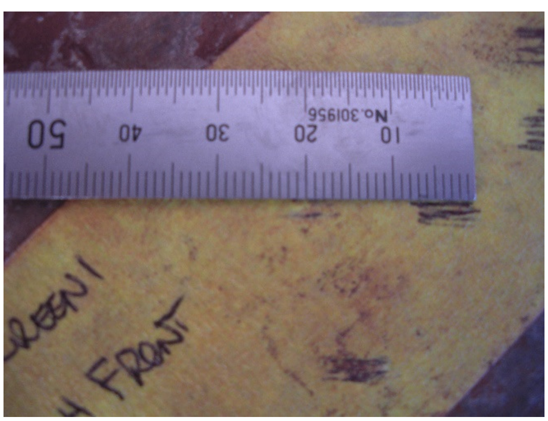
Following the re-orientation of the counter weights on the three machines, they were all re commissioned and brought back on line. During this process the discharge hopper servicing screen 201 became choked and the line had to be stopped.

Both screens 101 and 301 were checked with material passing through them. The materials being fed onto 101 contained substantially more large fraction material than did 301. (301 was cheched as during Takraf perfromance and hand over tests.)

Screen 101 was found to have a reduced stroke of about 8 mm consistently around the machine line, while screen 301 was found to have a stroke of between about 8,0mm and 8,4mm







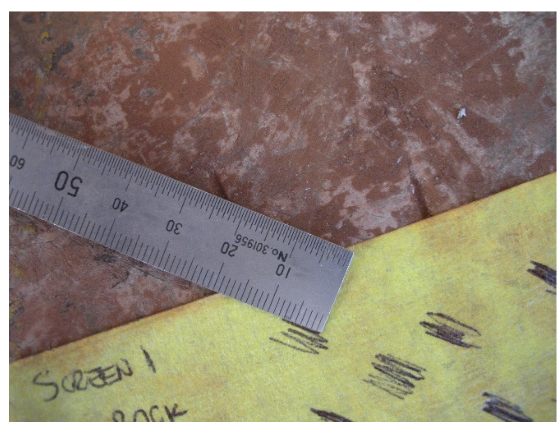


Photo Nos 42,42A,42B,42C: Screen 101 amplitude measuremets recorded at the four corners of the screen.

Photo Nos 43,43A,43B,43C: Screen 301 amplitude measuremets recorded at the four corners of the screen.

Conclusions

Decreasing the amplitude of vibration of the screens appears to have had some impact on the horizontal velocity of materials leaving the discharge end of the screen deck.

A major impact on the surrounding plant has been that the discharge chutes under the screens are now prone to blocking, a phenomona that has not occurred previously. (Appears that the additional energy induced into the structure and associated chute work by the screen was adequate in ensuring that the fine material build up in the chute work was controlled. Having decreased this effect has now resulted in the chutes bridging and blocking up with fines. Samsung are going to try control this effect by controlling the feed rate onto the belt conveyor feeding the screen as a function of the level of product in the screen discharge chute.)

The screens run a lot softer which should give added life to the mechanical wear components associated with the screen mechanism.