Case Study

Anglo American – Kumba Iron Ore Sishen Mine

Client Background

Kumba supplies high-quality iron ore to the global steel industry - the key component in steel and the most widely used of all metals.

Sishen Mine is one of the largest open-pit mines in the world, and it produces around 69% of Kumba's annual iron ore production. The mine is in the Northern Cape province and has been in operation since 1952.

All mined ore is transported to the beneficiation and jig plants where it is crushed, screened and beneficiated.

The intricate conveyor belt system used to transport products is at the core of this operation.

Conveyor belts can be single-line (meaning if the conveyor is not moving, the entire operation comes to a standstill), or modular.

Key Challenges

- 883-1400 is a single-line conveyor belt transporting product from Quaternary Crushing to Quaternary Screening, where the iron ore is further processed before heading to the storage beds and ultimately loadout.
- 1400 conveyor belt started running skew towards the RHS (facing the head pulley). The skew movement was caused by the 1200 and 1300 feed belts' head chutes loading off-centre on the 1400. This resulted in the 1400 conveyor belt carrying more load on one side and shifting to one side, causing a skew movement.
- The constant shifting and running into the head chute structure caused the belt to flip and fold on its central axis, ending up in a circular profile moving over the pulley to the return side, where it got cut by the scraper.
- A breakdown on a conveyor belt system means halted operations at screening, empty beds, and the product not reaching the load-out station, with immense cost and profitability implications.

The belt was replaced, after a 77-hour-long breakdown and put back into operation, and a root cause analysis exercise was conducted.

Value Add

- Immediate replacement of the belt
- New scrapers installed
- Belt tear sensors installed
- Shuttle structure repaired
- Skew limits installed
- Full audit conducted on 1200, 1300 and 1400 conveyors
- Location and direction of chutes on 1200 and 1300 corrected
- All head chutes repaired/refurbished
- Structure of 1400 straightened
- Shuttle structure upgraded
- Planned routine tasks for 1400 conveyor and head chute reviewed
- Compliance with escalation process reiterated and reinforced

Pragma Intervention

- The Pragma reliability engineer conducted the root cause analysis investigation into the breakdown and found several anomalies. The following corrections were identified as being required:
  - Immediate replacement of the belt
  - New scrapers installed
  - Belt tear sensors installed
  - Shuttle structure repaired
  - Skew limits installed
  - Full audit conducted on 1200, 1300 and 1400 conveyors
  - Location and direction of chutes on 1200 and 1300 corrected
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Tools and Technology

- Root Cause Analysis
- Skew limits
- Tear sensors
- Scrapers
- Head chutes
- Shuttle structure
- PRTs