

Introduction

In November 2007 Rail Corp Quarry was approached to trial the BIRN VTP (Ventilated Turbo Pulley) Pulleys at their Bombo Site. The choice of plant to trial the range was on their secondary crushing plant where some of the most extreme conditions were found. The particular plant chosen was a Jaques 4ft Cone Crusher. This crusher was fitted with a 475mm 8spc VTP pulley on the drive, and an 800mm 8spc VTP pulley on the crusher.

History

The purpose of the 4ft crusher is to take 600mm minus Basalt and reduce product to 60mm minus at 600 tonnes per hour. Historically the crusher was driven using grey iron pulleys and SPC belts. The grey iron pulleys had a service life of 6 to 8 months with belts replaced every 10 weeks on average, whilst operating approximately 10 hours a day.

The three main problems that were encountered using the grey iron pulleys were:

- Dust accumulation – Being in the crushing plant the dust was a major issue for two reasons. Firstly the dust would build up on the inner circumference of the pulleys. This would cause the drive to run out of balance if left uncleaned. This out of balance problem would then cause a significant shortening of the bearing life both on the motor shaft and the crusher drive shaft. To overcome the out of balance problem the quarry maintenance staff would need to remove the guarding and clean the pulleys regularly.
- The other problem caused by the dust was the excessive wear in the belt grooves of the pulleys. Even with the pulleys rotating at speed, the dust was trapped in the grooves, causing excessive wear on both belts and pulleys alike.
- Premature belt failure – As with all Vee belts heat is the enemy. With the grey iron pulleys, heat was a contributing factor as to reduced belt life. Being in the crusher house the buildup of dust, as mentioned previously, caused the pulley to run hotter within a dusty environment. During normal operation and especially with a heavy work load (largely due to a percentage of oversize material) the pulley would run extremely hot. As mentioned above, the other problem with early belt failure was the dust in the groove, thus reducing belt life at an accelerated rate.

Aims

The aims of the trial were to ascertain:

- The ability of the VTP pulleys to perform in extreme conditions.
- The life expectancy of the VTP pulleys compared to grey iron pulleys.
- The life expectancy of the belts running a VTP, as opposed to a grey iron equivalent.
- The ability to resist and perform in a high debris environment.
- The ability to take on the shock loads via crushing that are transmitted through the crusher drive shaft.
- Any savings obtained through reduced down time, maintenance and spares during the first 12 months of operation.
- If the dust build-up on the inner circumference was lessened or eliminated.
- OH & S Impacts



In December 2007 the crusher pulleys were changed to the BIRN VTP style. These pulleys are at the time of our audit, (December 08) still in operation and not due for replacement until mid next year.

Result;

The outcome of the trial has been very pleasing for all parties with some unexpected outcomes. The VTP style pulleys have performed so well in this application, that other items of plant that incorporate a Vee belt drive system are currently being re-evaluated, with the view towards standardising all drives with the VTP. We plan to change current grey iron drives to VTP once such drives are due for renewal.



The trial proved the VTP style pulleys were able to work within the extreme conditions without failing.

To date, the VTP Pulleys have outlasted the grey iron equivalent on a ratio of 2:1 with the expectation that by the time the pulleys are changed, the ratio will be approximately 3:1 or better.

The belt life has also been extended by five times (so far) running the VTP pulleys with the only failure being caused by a piece of steel jamming the crusher.

The dust build up on the inner circumference was all but eliminated with cleaning not required so far. Also the wear in the grooves caused by the dust build up was lowered as proven in the length of service life.

Significant savings were achieved over the 12 month period in maintenance and belt replacement.



Occupational Health and Safety (OH&S)

This should be a subject all on its own. As anyone connected with industry will know OH&S is a very real issue for business to deal with. Using the VTP had some significant advantages. As you can see from the photographs in the document, access to the crusher pulley is somewhat difficult. As the VTP pulleys are much lighter (50% to 60%) than grey iron pulleys, the installation of the VTP was much safer and easier. The 800 8spc VTP – 8 groove pulleys at 77.5 kg is safely lifted by two men, grey iron for this size range is app 168kg.

While not completely eliminating manual handling issues it does lessen them. Also moving the pulleys around on the catwalk and setting the pulley onto the taper lock whilst positioning the pulley in line with the drive also proved to be easier. The ease of manual handling in this particular installation made the whole job easier and safer for the maintenance staff.

Savings / Costs

Due to commercial confidentiality, we can not release a detailed breakdown into this report but rather give an overview of the cost verses savings.

The initial cost of the trial i.e. the price difference between the grey iron pulley and the VTP pulley was approximately 38% more.

The balance of savings for the trial was approximately \$10,500.00

Key Advantages in using the VTP pulleys

- Weight – The VTP style allows for ease of handling
- Installation cost savings – For pulleys up to 800mm PCD, logistics costs through handling have been considerably reduced.
- Ease of installation and alignment via the VTP's reduction in weight.
- Increased service life of the pulleys.
- Increased belt life
- Reduced maintenance costs
- Reduced inventory costs

NB. The guarding for the pulleys has been removed for the photographs in this document.

For any further information regarding this trial please contact Keith Robinson from Wearco NSW on +61 2 4272 6400.