THE KELSEY CENTRIFUGAL JIG - A NEW ERA IN IRON ORE BENEFICIATION

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Abstract - Gravity concentration methods have for a long time been an integral part of iron ore beneficiation due to their operational simplicity and higher capacities to that of other methods. With the introduction of refining routes such as direct reduced iron (DRI) and increasing energy costs associated with blast furnace operations it has become necessary for higher grade concentrates to be generated.

However, in most cases, the traditional gravity concentrators (jigs, spirals and dense medium hydrocyclones) lose efficiency when the mean particle size is lower than 150µm when high grade targets are met.

Geo Logics Pty Ltd has recognised the need to economically separate at high grade minus 150µm iron oxides from gangue. This has led to the development and manufacturing of a purpose built Model J1800 Kelsey Iron Ore Centrifugal Jig.

This paper presents the operation of the Model J1800 Kelsey Centrifugal Jig in on-site testing.

Introduction

The Kelsey Centrifugal Jig is in plant operations all over the world separating various minerals at high efficiencies down to very fine sizes with specific gravity differences as close as one. Past tonnage limitations have limited its application to higher valued concentrates.

The vast increase in production unit size has seen throughput increase to 100mtph from 30mtph.

Model J1800 Kelsey Centrifugal Jig Description

The Kelsey Model J1800 unit is substantially larger than the existing units. The size change is deliberate to handle a vast increase in tonnage and yet maintain the high metallurgical performance in which the Kelsey Jig is renowned for.

This model has a bowl capacity over twice that on the smaller units, the internal screen area is over double that of the smaller J1300 unit.

Picture of a J1800

Slight changes have been implemented to the working components of the device to ensure minimal downtime is maintained and that operator involvement is at the absolute lowest.

The changes included the automatic screen cleaner which improves availability and gives consistent cleaning which optimises metallurgical performance.

Other changes include inclining the device to minimise the footprint, heavier launders to minimise the operating harmonics inherent in plant construction.

Case Study

The Kelsey Model J1800 was first tested at IOC in Canada in 1998. IOC installed the unit on a stream which was reporting to final tailings after being subjected to two stages of gravity separation and one stage of magnetic separation.

The stream still contained liberated iron but with a large amount of unliberated iron and silica particles which were predominantly coarser than the liberated value minerals.

The aim of the testing was to observe the ability of this new model to recover the fine valuable minerals at a consistent final grade with minimal operator involvement.

Discussion of Results

The results were consistent and precisely that predicted before the trial began. The final grade concentrate generated by the jig was above initial expectations and for over 900 hrs was maintained at higher than 68%Fe.

The feed rate was kept at around 55mtph and 40% solids, unfortunately the feed pump being used was unable to exceed this tonnage and thus no higher feed rate tests could be conducted.

Table 1 - Size Distribution from a Kelsey Jig Operating in Iron Ore

Size	***Feed***		***Concentrate***		***Tail***		***Recovery***	***Reject.***
mm	Wt%	Fe%	Fe%	Si%	Fe%	Si%	Fe%	Si%
300	4.63	13.2			13.2	76.83		
212	19.71	8.39			8.4	86.89		
150	24.93	6.06	42.7	32.86	5.9	92.34	3.06	99.85
106	21.78	5.92	57.9	15.1	5.1	92.69	15.17	99.74
75	11.76	11.11	65.1	5.81	5.8	90.82	52.46	99.38
53	5.63	21.03	67.2	2.51	7.7	84.95	71.58	99.15
45	4.55	45.15	68	1.78	10.6	71.6	90.65	96.38
-45	7	44.33	66	3.8	21.8	57.64	75.9	93.58
Total	**100**	**12.71**	**65.87**	**4**	**7.39**	**88.19**	**47.14**	**99.5**

It can be seen clearly from table 1 the ability for the Kelsey Centrifugal Jig to produce final grade iron ore from a very low and partially liberated stream. This is particularly evident in the finer size fractions. This typical recovery resulted on 5.5mtph of final grade concentrate being generated by the Kelsey Model J1800 jig.

Mechanical reliability was as expected, excellent. The advancements made by the Geo Logics engineering staff have ensured a low operator involvement machine.

Acknowledgements

Geo Logics would like to thank all the mining companies involved in aiding the comprehensive testing of the Model J1800 and aiding in its acceptance into the mining industry.

Conclusions

The comprehensive test program concluded as Geo Logics had indicated that the metallurgical performance was not compromised by the higher tonnages.

This meant the production of the Kelsey Jig per hour was 5.5mtph of fine final grade hematite.

IOC are obviously considering the installation of a Kelsey Jig Beneficiation Plant in the future.

References

1. Tucker, P. (1994) Modelling the Kelsey Centrifugal Jig
2. Wyslouzil, H.E. (1990) Evaluation of the Kelsey Centrifugal Jig at Rio Kemptville Tin.
3. Silva, E.C. (1999) Centrifugal Concentrators - A New Era in Gravity Concentration - The Experience of CVRD Research Center