TR16_309_311

R.635. Concentration and sizing of hydraulic cyclone products from Industrial Sands Pty Ltd.

Industrial Sands Pty Ltd submitted hydraulic cyclone products from their plant for sizing analysis and heavy mineral concentration. Previous results from Reg. No. 691016 had indicated the presence of rutile, cassiterite, zircon and chromiferous ilmenite in their beach sand.

SAMPLE

Three samples were received and were designated as follows:

Reg. No.	*Description*
712551	Hydraulic cyclone underflow.
712552	Hydraulic cyclone overflow.
712553	Hydraulic cyclone underflow partially concentrated.

TEST WORK

The samples were separately dried, mixed, and then riffled to provide samples for sizing analysis and heavy mineral concentration.

Sizing Analysis. Samples were wet screened on 200#, then dry screened.

Heavy Mineral Concentration. 10 kg of each sample was gravity concentrated on a Deister laboratory table, the subsequent table concentrates were magnetically separated on a Rapid laboratory dry magnetic separator.

TEST RESULTS

Sizing Analysis

Particle Size		*712551*		*712552*		*712553*	
		C U/F		*C O/F*		*C U/F*	
µm	#	*% Wt*	*Cum. Wt %*	*% Wt*	*Cum. Wt %*	*% Wt*	*Cum. Wt %*
+250	+60	0.7	0.7	0.5	0.5	0.5	0.5
+210	+72	0.9	1.6	0.4	0.9	0.6	1.1
+180	+85	15.3	16.9	8.2	9.1	7.3	8.4
+150	+100	61.4	78.3	66.6	75.7	66.7	75.1
+125	+120	9.8	88.1	7.5	83.2	8.4	83.5
+105	+150	8.5	96.6	11.9	95.1	9.3	92.8
+75	+200	3.1	99.7	4.2	99.3	5.8	98.6
-75	-200	0.3	100.0	0.7	100.0	1.4	100.0
Composite		100.0	-	100.0	-	100.0	-

The sizing analysis indicates that the hydraulic cyclone is performing very little classification.

Heavy Mineral Concentration

712551. C U/F

Fraction	*% Wt*	*% TiO_2*	*% Ti*	*% ZrO_2*	*P*	*Cr*	*Sn*
M/S M/Al	0.15		30.9			0.07	
M/S M/A2	0.09		9.0		0.06		
M/S N	0.23	41.3		17.4			0.05
T.C.	0.47						
T.T.	99.53						
Head	100.00	950*	550*	400*	0.5*	1*	1.2*

*parts per million.

The cyclone underflow contains:

950 ppm rutile
1.5 ppm cassiterite
1500 ppm chromiferous ilmenite
600 ppm zircon
4.4 ppm monazite

712552. C O/F

Fraction	*% Wt*	*% TiO_2*	*% Ti*	*% ZrO_2*	*P*	*Cr*	*Sn*
M/S M/Al	0.12		30.4			0.48	
M/S M/A2	0.05		7.8		0.04		
M/S N	0.17	39.5		16.0			0.05
T.C.	0.34						
T.T.	99.66						
Head	100.00	670*	400*	270*	0.2*	5*	0.9*

*parts per million.

The cyclone overflow contains:

670 ppm rutile
1.1 ppm cassiterite
1100 ppm chromiferous ilmenite
410 ppm zircon
1.6 ppm monazite

712553. C U/F, partially concentrated

Fraction	*% Wt*	*% TiO_2*	*% Ti*	*% ZrO_2*	*P*	*Cr*	*Sn*
M/S M/Al	1.57		30.9			0.31	
M/S M/A2	0.40		8.2		0.06		
M/S N	1.58	47.3		23.5			Nil
T.C.	3.55						
T.T.	96.45						
Head	100.00	7500*	5200*	3700*	2.4*	49*	Nil

*parts per million.

The partially concentrated cyclone underflow contains:

7500 ppm rutile	15,000 ppm chromiferous ilmenite
Nil ppm cassiterite	5500 ppm zircon
	19 ppm monazite

CONCLUSIONS

(1) The hydraulic cyclone is performing inefficiently as the products size and assay similarly.

(2) The heavy mineral content of the cyclone feed is approximately 0.4% of which more than half is composed of chromiferous ilmenite which is not worth recovering. Of the economic minerals, rutile and zircon make up the bulk of the remainder of the heavy mineral in the cyclone feed with cassiterite and monazite occurring in only very minor quantities. Electrostatic separation would be required to separate rutile and zircon.

(3) The heavy minerals were about eight times more abundant in the partially concentrated cyclone underflow sample.