

IRON ORE RECOVERY FROM WASTE DUMP FINES IN SAIL MINES

V Dayal, S K Pan, S K Mukherjee, M P Srivastava, S K Sinha

Research & Development Center for Iron and Steel,
SAIL, Ranchi

DUMP FINES

✓ DALLI MINES

DUMP FINES TO THE TUNE OF 12 MILLION TONNES ARE ACCUMULATED DURING MANUAL MINING OVER A LONG PERIOD OF TIME AND IS DUMPED THERE FOR THE LAST 20 YEARS.

NOW THERE IS NO FURTHER GENERATION OF FINES AS THE OPERATION IS FULLY THROUGH WET CIRCUIT.

✓ GUA MINES

DUMP FINES OF ABOUT 40 MILLION TONNES ARE ALREADY ACCUMULATED. MORE FINES ARE BEING ADDED TO THE DUMP TO THE TUNE OF 1.5 MILLION TONNES ANNUALLY AS THE MINES HAS DRY CIRCUIT OPERATION WITH 3 MILLION TONNES THROUGHPUT CAPACITY.

DALLI DUMP FINES



- **QUANTITY: 12 MILLION TONNES**
- **QUALITY: 56.0% Fe,
13.0% silica and alumina combined.**
- **REQUIRED QUALITY : 62% Fe, for sinter making.
7.0%(max.) silica and alumina
combined.**

Size-wise Chemical Analysis (Dalli Mines)

Size fraction, mm	Wt. %	Chemical Composition		
		Fe, %	SiO ₂ , %	Al ₂ O ₃ , %
+10	8.30	61.22	2.97	2.18
-10+8	5.30	62.79	2.85	1.72
-8+6	3.60	62.36	2.88	1.78
-6+3	12.30	62.58	3.11	2.24
-3+1	21.20	58.63	4.35	2.56
-1+0.5	9.00	56.08	5.82	5.32
-0.5+0.25	8.60	56.07	5.9	6.3
-0.25	32.00	52.07	11.20	11.98
Total	100.00	57.10	6.28	6.01

LEGEND

Wt.	Fe,%	SiO ₂ ,%	Al ₂ O ₃ ,%
-----	------	---------------------	-----------------------------------

FEED

100 .0	56.6	8.63	9.5
--------	------	------	-----

Screen, 3mm

29.5	62.28	3.12	2.14
------	-------	------	------

70.5	54.27	10.94	12.57
------	-------	-------	-------

+3mm

Fines Product - 1

-3mm

Spiral Classifier

O/F

Sand

30.0	48.39	15.44	22.28
------	-------	-------	-------

40.5	58.62	7.61	5.4
------	-------	------	-----

Jig

Hydrocyclone

O/F

U/F

Tails-1

Tails-2

19.4	53.15	10.79	10.8
------	-------	-------	------

Conc.

WHIMS

26% of 19.4 = 5.0

74% of 19.4 = 14.4

34.1	60.9	4.95	3.37
------	------	------	------

Tails-3

14.4	63.05	2.86	2.31
------	-------	------	------

Fines Product - 2

Fines Product - 3

Proposed flow sheet for Dalli dump iron ore fines

COMPREHENSIVE TEST RESULT OF LOW GRADE IRON ORE (Dalli Mines)



Particulars	Wt, %	Fe,%	SiO ₂ ,%	Al ₂ O ₃ ,%
Feed	100	57.1	6.28	6.01
Product – 1 (wet Screen)	29.5	62.28	3.12	2.14
Product – 2 (Jig conc.)	34.1	60.90	4.95	3.37
Product – 3 (Magnetic conc.)	14.4	63.05	2.86	2.36
Final Product	78.0	61.82	3.87	2.72
Tails – 1(Jig reject)	6.4	46.66	21.16	9.71
Tails – 2 (Hrodro-cyclone overflow)	10.6	37.92	12.39	23.40
Tails –3 (WHIMS non-magnetic)	5.0	46.10	13.74	15.03
Final tails	22.0	42.30	15.25	17.52

GUA DUMP FINES



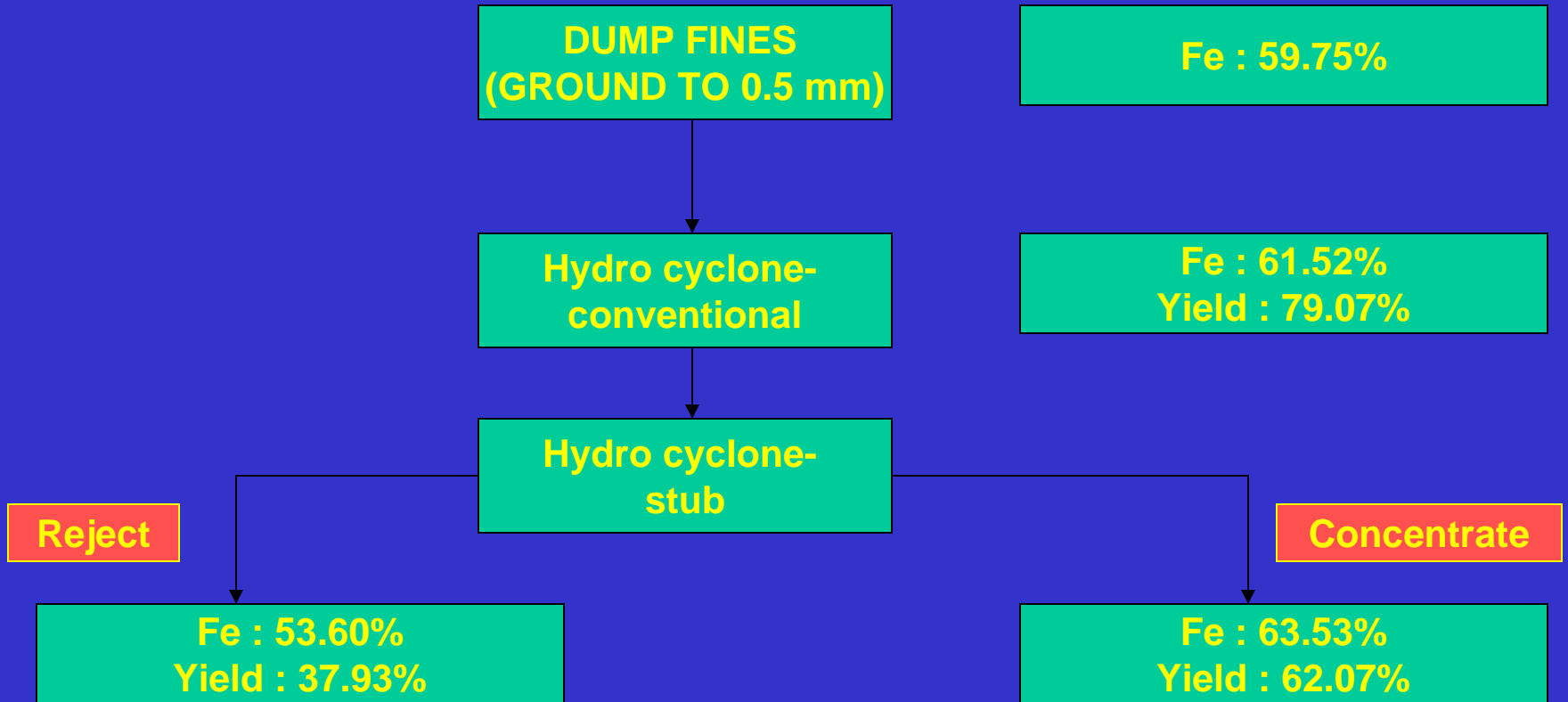
- **QUANTITY: 40 MILLION TONNES**
- **QUALITY: 58-60% Fe**
7.0% silica and alumina combined.
- **REQUIRED QUALITY : 63-64% Fe, for sinter making,**
4.0%(max.) silica and alumina combined.

Size-wise Chemical Analysis (Gua Mines)



Size fraction, mm	Wt. %	Chemical Composition		
		Fe, %	SiO ₂ , %	Al ₂ O ₃ , %
+10	3.60	59.4	2.4	4.1
-10+8	6.1	60	2.3	3.1
-8+3	25.9	60.6	2.7	3.4
-3+1	16.4	60.7	2.45	3.5
-1+0.75	3.6	59.8	2.7	3.5
-0.75+0.38	9.1	59.2	2.8	3.8
-0.38+0.2	9.5	59.1	2.9	4.2
-0.2+0.16	2.65	58.8	2.9	4.9
-0.16+0.15	3.65	58.8	3.2	5.2
-0.15	19.5	58.7	3.1	5.5
Total	100.00	59.75	2.75	4.05

GUA DUMP FINES



Flow sheet for Gua dump iron ore fines

COMPREHENSIVE TEST RESULT OF LOW GRADE IRON ORE FOR SINTER MAKING (Gua Mines)



Particulars	Wt, %	Fe,%	SiO ₂ ,%	Al ₂ O ₃ ,%
Feed	100	59.75	2.65	4.08
Hydro cyclone U/F stage-1 (conventional)	79.07	61.52	2.22	3.40
Hydro cyclone U/F stage-2 (stub)	78.51	63.53	2.05	1.90
Final concentrate	62.07	63.53	2.05	1.90
Hydro cyclone O/F stage-1 (conventional)	20.93	53.01	4.27	6.65
Hydro cyclone O/F stage-2 (stub)	21.49	54.19	2.84	8.90
Final Reject O/F	37.93	53.60	3.55	7.79

TOTAL RECOVERABLE ORE FROM WASTE DUMP FINES OF DALLI AND GUA MINES

MINES	DUMP QUANTITY (Mte)	RECOVERY (%)	RECOVERY (Mte)
DALLI MINES	12	78	9.5
GUA MINES	40	62	25
TOTAL	52	66	34.5



Thank You



RDCIS