Pre - Feasibility Report on Chalk

Process Technology Developed

by

iNDEXTb

in association with
INDIAN BUREAU OF MINES
Government of India

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REORT OF INVESTIGATION
NO. IBM/AJM/RI 280

PRE-FEASIBILITY REPORT ON CHALK SAMPLE FROM GUJARAT

(For Industrial Extension Bureau, Gujarat)

By

M.S.RAO, A.T.SUTAONE, S.C.TALUJA, P.N.DEO & K.S.RAJU

INTRODUCTION

Indian Bureau of Mines (IBM), Govt. of India, Ministry of Steel & Mines and Industrial Extension Bureau (INDEXTb), a Government of Gujarat organisation, had signed the Memorandum of Undertaking (MOU) for conducting the laboratory scale and Pilot scale beneficiation studies on chalk, clay and silica sand samples. After completion of laboratory scale and pilot scale studies, the techno economical feasibility report was also to be prepared on these three minerals separately.

IBM had conducted the laboratory scale investigation on two chalk samples (IBM RI No. 1240 and 1250) from Adityana Mines, Porbandar dist., Gujarat and one pilot scale beneficiation studies on chalk sample No. II (IBM RI No. 1250) vide IBM RI No. 1316. The pilot scale beneficaition studies were conducted with the following three routes and each route comprises of the following unit operations:

Route No. I :

Circuit : Scrubbing, classification and multi-stage Hydrocyclone.

Route No. II :

Circuit : Scrubbing, classification and flotation with two cleanings.

Route No. III :

Circuit : Scrubbing, classification and Wet High Intensity Magnetic Separation (WHIMS).

The salient results of these three routes are as follows:

SCRUBBING FOLLOWED BY CLASSIFICATION

PRODUCT	Wt%	ASSAY %				
		CaO	SiO2	Fe203	Al203	LOI
+12 mm (Trommel oversize)	2.7	46.26	9.50	3.23	2.55	36.56
CL U/F	19.3	43.61	14.43	3.68	1.95	35.46
CL O/F	78.0	47.34	9.73	1.82	2.76	37.78
Head (Calc)	**100.0**	**46.59**	**10.63**	**2.21**	**2.60**	**37.30**
ROUTE No. I : Feed Classifier Overflow with three sage Hydrocycloning						
Product	**Wt %**	**Overall Wt %**	**ASSAY %**			
			CaO	**Sio2**	**Fe203**	**Al203**	**LOI**
Cy. O/F	50.0	39.0	49.62	6.63	1.08	2.14	40.02
Cy. U/F	50.0	39.0	45.06	13.18	2.78	3.11	35.60
Head (Calc)	**100.0**	**78.0**	**47.34**	**9.90**	**1.93**	**2.62**	**37.81**
ROUTE No. II : WHIMS							
Mag	9.9	7.7	45.84	9.65	3.20	2.53	37.93
Non-Mag	90.1	70.3	47.68	9.76	1.70	2.62	37.85
Head (Calc)	**100.0**	**78.0**	**47.50**	**9.74**	**1.85**	**2.61**	**37.85**
ROUTE No. III : FLOTATION WITH TWO CLEANINGS							
1. IInd Cl. Conc.	43.1	33.6	52.55	2.62	0.74	1.29	41.65
2. IInd Cl. Tail.	8.6	6.7	46.98	8.69	1.71	4.20	37.06
3. 1st Cl. Tail	14.1	11.0	43.85	13.82	2.09	4.55	35.49
4. Rougher Tail	34.2	26.7	41.78	17.48	2.95	3.86	33.49
Head (Calc)	**100.0**	**78.0**	**47.16**	**9.80**	**1.70**	**2.87**	**37.59**
Composite (1+2) 1st Cl. Conc.	**51.7**	**40.3**	**51.63**	**3.63**	**0.90**	**1.77**	**40.87**

PLANT DESIGN CRITERIA:

Plant Capacity	-	100 TPD
Working shifts	-	2
Working hours	-	8
Plant Availability	-	75%
Actual No. of working hours	-	15 x 0.75 = 12

Design – TPH = $\frac{100}{12}$ = 8.33 say 9.0

Process = No comminuation is involved.

PROCESS ROUTE AND UNIT OPERATIONS:

1.0 Scrubbing → Classification → Hydrocycloning (3 stage) → Thickening → Filtration → Drying.

2.0 Scrubbing → Classification → Flotation with two cleanings → Thickening → Filtration → Drying.

Scrubber : Locally made, fitted with trommel 1550 mm ϕ x 3000 mm L

Trommel : 900 mm ϕ x 1200 mm L

Weigh Feeder & Conveyor Belt

Spiral Classifier :

P.D.	-	20% solids
Mesh of separation	-	325 mesh
Slope	-	3"
Feed TPD	-	100

1.57 TPD overflow/sq.ft. pool area (Table)

Total area required = $\frac{100}{1.57}$ = 64 sq.ft.

60" classifier at 20% solids with 3" slope having sand racking capacity of 140 tonnes

Hydrocyclone – KREB

Feed	-	7.01 TPH
Water	-	30.83 M^3/hr
Pulp	-	37.84
% Solids	-	18.5
Pulp Vol.	=	$30.83 + \frac{7.01}{2}$
	=	34.34 M^3/hr
Sp. Gr. of pulp	=	$\frac{Wt}{V} = \frac{37.84}{34.34}$
	=	1.1
% Solids by Wt.	=	$\frac{\%\ solids \times Sp.\ Gr.\ of\ pulp}{Sp.\ Gr.\ of\ Solids}$
	=	$\frac{18.5 \times 11}{2.0}$

Cyclone overflow required 100% -325 mesh with minimum SiO_2

Thickner

Unit area	=	0.166 M^2/tons/24^2 of dry solids
	=	39
Area required	=	39 x 0.166
	=	6.47 M^2
Thickner Area	=	$\pi r^2 = 6.47$
3.14 R^2	=	6.47
R^2	=	$\frac{6.47}{3.14}$
R	=	1.44
D	=	2.88 say 2.9
Ht	=	1.5 x 2.9 = 4.35
Thickner size	=	2.9 ϕ x 4.35 M
Thickner U/F	=	40% solids

1. **Rougher Flotation**:

Lab flotation time	=	5'
In plant retention time	=	12.5'
Cu ft/min per ton of solids at Sp. Gr. of 2.7	=	3.02 (17% solids)
Total Cu ft/min to be handled	=	2.82 x 7.01
	=	19.77 cu ft/min
Retention time	=	12.5'
Total volume	=	19.77 x 12.5
	=	247.12 Cu ft
Effective volume	=	$\frac{247.12}{0.85}$
	=	290.72 cu ft
Denver DR 50 cells required	=	$\frac{290.72}{50}$
	=	5.81 or say 6 cells
H.P.	=	0.12 X 50 = 6

2. **1st Cleaner Flotation**:

Lab flotation time	=	5'
In plant retention time	=	12.5'
Cu ft/min per ton of solids at Sp. Gr. of 2.7	=	3.02 (16% solids)
Total Cu ft/min to be handled	=	3.02 x 4.61
	=	13.92
Total volume	=	13.92 x 12.5
	=	174 Cu ft
Effective volume	=	$\frac{174}{0.8}$ = 217.5 Cu ft
Denver DR 50 Cells required	=	$\frac{217.5}{50}$ = 4.35 or say 5 Cells required
HP	=	0.12 X 50 = 6

3. **IInd Cleaner Flotation:**

Lab flotation time	=	2'
In plant retention time	=	5'
Cu ft/min per ton of solids	=	3.24
Total Cu ft/min to be handled	=	3.24 x 3.62
	=	11.73 cu ft/min
Total volume	=	11.73 x 5
	=	58.65 Cu ft
Effective volume	=	$\frac{58.65}{0.8}$ = 73.31 Cu ft
Denver DR 15 Cells required	=	$\frac{73.31}{15}$ = 4.88 or say 5 Cells required
Rougher flotation volume	=	$32.83 + \frac{7.01}{2.7}$
	=	32.83 + 2.6
	=	35.43 M^3
	=	0.59 M^3/Min
	=	20.81 Cu ft/min
	=	$\frac{260.12}{0.85}$
	=	306.02

CONDITIONERS:

1. **Rougher flotation:**

Cu ft/min of pulp = 19.77

Conditioning time = 5'

Volume (cu ft) = 19.77 x 5
= 98.85 cu ft

Effective volume = $\frac{98.85}{0.85}$

= 116.29 cu ft

= $\frac{116.29}{35.28}$

= 3.3 Cu M

Volume = $\frac{\pi D^2}{4} H = \frac{\pi D^2}{4} (1.5\ D)$

H = 2.1 M

Volume = $\frac{1.5\ D^3\pi}{4}$

3.3 = $1.177\ D^3$

$D^3 = \frac{3.3}{1.177} = 2.80$

D = 1.4 Meters

= 1.4 M x 2.1 M

Or 116.29 x 28.32 = 3,293.33 or say 4,000 litres

2. **1st Cleaner flotation:**

Cu ft/min of pulp	=	13.92
Conditioning time	=	5'
Volume (cu ft)	=	13.92 x 5
	=	69.6 cu ft
	=	$\frac{69.6}{0.85}$
	=	81.88 cu ft
	=	$\frac{81.88}{35.28}$
	=	2.32 Cu M
$1.177\ D^3$	=	2.32
D^3	=	$\frac{2.32}{1.177} = 1.97$
or D	=	1.2 M
H	=	1.87 M

Volume 81.88 x 28.32 = 2,318.84 or say 2,400 litres

3. **11nd Cleaner flotation:**

Cu ft/min of pulp	=	11.73
Conditioning time	=	5'
Total Volume (cu ft)	=	11.73 x 5'
	=	58.69 cu ft
Effective volume	=	$\frac{58.69}{0.85}$

= 69 cu ft

$$= \frac{69}{35.28}$$

= 1.95 Cu M

1.95 = $1.177\ D^3$

D^3 = 1.66

D = 1.2 M
H = 1.8 M

Or Volume = 69 x 28.32
= 1954.08 or say 2,000 litres

SAND PUMPS (DENVER VERTICAL CENTRIFUGAL)

Pump No. 1

Rougher float = 4.61 x 3.02
= 13.92 cu ft/min

To convert to gal/min = $\frac{13.92 \times 28.32}{3.85}$ gal/min

= 102.39 gal/min
50 mm pump, 1520 rpm, 7.5 HP (50' head)

Pump No. 2

Rougher Tails = 2.4 x 2.22
= 5.33 cu ft

To convert to gal/min = $\frac{5.33 \times 28.32}{3.85}$ gal/min

= 39.2 gal/min
40 mm pump, 1570 rpm, 5.0 HP (50' head)

Sand Pump 3

First Cl. Float

= 3.62 x 3.24
= 11.73 cu ft/min

$$= \frac{11.73 \times 28.32}{3.85} \text{ gal/min}$$

= 86.28 gal/min
50 mm pump, 1520 rpm, 7.5 HP (50' head)

Sand Pump 4

First Cl. Tails

= 0.99 x 2.22
= 2.19 cu ft/min

$$= \frac{2.19 \times 28.32}{3.85} \text{ gal/min}$$

= 16.11 gal/min
25 mm pump, 1624 rpm, 2.0 HP (40' head)

Sand Pump 5

Second Cleaner Conc.

= 3.02 x 3.5
= 10.57 cu ft/min

$$= \frac{10.57 \times 28.32}{3.85} \text{ gal/min}$$

= 177.75 gal/min
50 mm pump, 1520 rpm, 7.5 HP (40' head)

Sand Pump 6

Second Cleaner Tails

= 0.61 x 2.0
= 1.22 cu ft/min

$$= \frac{1.22 \times 28.32}{3.85} \text{ gal/min}$$

= 8.97 gal/min
25 mm pump, 1620 rpm, 2.0 HP (40' head)

Sand Pump 7

Tailing pump = 4 x 2.1
= 8.4 cu ft/min

$$= \frac{8.4 \times 28.32}{3.85} \text{ gal/min}$$

= 61.78 gal/min
40 mm pump, 1570 rpm, 5.0 HP (50' head)

LIST OF EQUIPMENT FOR 100 TPD CHALK PROCESSING PLANT

Route No. I : Scrubbing, Classification and Hydrocycloning:

Sl. No.	Equipment	Qty.	Make	Size	H.P.	Approx. price (Rs. in lakhs)
1.	Ore Bin	1	Local	50 M^3	--	2.0
2.	Conveyor Belt	1	Local	--	5	6.0
3.	Weigh Feeder	1	Local	--	2	1.0
4.	Scrubber	1	Local	1500 x 3000 mm	5	12.0
5.	Classifier	1	Local	60" Simplex	5	10.0
6.	Hydrocyclone	3	Kreb/Mozley	1500 mm	15	15.0
7.	Slurry pumps	5	Local	-	25	5.0
8.	Thickner	1	Local	2.9ϕ x 4.35 x 15.0	15	4.0
9.	Filters	-	Local	-	15	15.0
10.	Dryer	-	Local	-	5	20.0
11.	Misc.	-	Local	-	-	10.0
	TOTAL				**92**	**100.0**

ROUTE NO. II : SCRUBBING, CLASSSIFICATION & FLOTATION

Sl. No.	Equipment	Qty.	Make	Size	H.P.	Approx. price (Rs. in lakhs)
1.	Ore Bin	1	Local	50 M^3	--	2.0
2.	Conveyor Belt	1	Local	--	5	6.0
3.	Weigh Feeder	1	Local	--	2	1.0
4.	Scrubber	1	Local	1500 x 3000 mm	5	12.0
5.	Classifier	1	Local	1500 mm Simplex	5	10.0
6.	Sand Pump	6	Local	50, 40 & 25 mm	30	6.0
7.	Rougher Flotation Cell	6	Triveni	DR 50	36	6.0
8.	1st Cleaner Cell	5	Triveni	DR 50	30	5.0
9.	2nd Cleaner Cell	5	Triveni	DR 15	15	3.0
10.	Conditioners	3	Triveni	4000 lit 3000 lit 2500 lit	15 15 15	2.0 2.0 2.0
11.	Thickner	1	Local	2.9 x 4.35 x 15.0	15	4.0
12.	Filter	1	Local		15	15.0
13.	Dryer	1	Local		5	20.0
14.	Misc.	-	-	-	-	10.0
TOTAL					**208**	**106.00**

CRITERIA FOR CALCULATION OF OPERATING COST:

		ROUTE NO. I	ROUTE NO. II
a)	Electric Power kwh/t requirement 0.85 = Efficiency Factor 9.00 = TPH	$\frac{92 \times 0.746}{0.85 \times 9}$ = 8.97 or 9.00 Say 10.0 kwh/t ROM	$\frac{208 \times 0.746}{0.85 \times 9}$ = 20.28 say 21 kwh/t ROM
b)	Water M^3 50% water recirculation	5.0 M^3 2.5 M^3 say 3.0 M^3	8.0 M^3 4.0 M^3 5.0 M^3

FIXED OPERATING COST:

1. Total Labour Cost:

PLANT MANAGER

						STANDBY	
PA to Manager	1	Shift Incharge	1	Shift Incharge	1	Shift Incharge	1
Clerk	2	Supervisor	1	Supervisor	1	Mechanic	1
Driver	1	Mechanic	1	Mechanic	1	Electrician	1
Peon	2	Electrician	1	Electrician	1	Helper	1
		Helper	2	Helper	2	Operator	1
		Operator	2	Operator	2		

SALARY PER MONTH:

Plant Manager	1 x 12,000	:	12,000/-	
Shift Incharge	3 x 8,000	:	24,000/-	
Supervisor	2 x 6,000	:	12,000/-	Salary per annum = 1.5 x 12 = 18.0 lakhs:
Operator	5 x 5,000	:	25,000/-	
Helper	5 x 3,000	:	15,000/-	
Mechanic	3 x 4,000	:	12,000/-	
Electrician	3 x 4,000	:	12,000/-	Labour Cost Per tonne = $\frac{18,00,000}{100 \times 300}$
P.A.	1 x 4,500	:	4,500/-	
Clerk	2 x 3,500	:	7,000/-	
Driver	1 x 3,000	:	3,000/-	= 60/-
Peon	2 x 2,500	:	5,000/-	Say Rs. 75/-
			1,31,500/-	
	Say Rs.	:	1.5 Lakh	

ESTIMATION OF CAPITAL COST (ROUTE No. I) :

		Rs. in Lakhs
1. Total Capital cost		100.00
2. Installation cost including electrical, piping, engine etc. (0.5 x 100)		50.00
3. Plant building cost (0.2 x 100)		20.00
4. Contingencies (0.15 x 100)		15.00
5. Tailing Ponds (0.1 x 100)		10.00
TOTAL		**195.00**
	Say	**200.00**

Capital Investments

	Rs. in Lakhs
1. Total Capital cost	180.00
2. Working Capital	
a) Stores & Spares	10.00
b) Cash in hand	10.00
TOTAL	**200.00**

A. Direct Operating Cost

Sl. No.	HEAD	UNIT	RATE (Rs./Unit)	Qty.	COST Rs./t of ROM
1.	Water	M3	5.0	3.0	15.0
2.	Power	Kwh	3.0	10.0	30.0
3.	Concentrate handling		5.0	1.0	5.0
4.	Royalty etc.		5.0	1.0	5.0
TOTAL					**55.0**

B. **Fixed Operating Cost : Per Tonne of ROM:**

1.	Total labour cost		-	Rs. 75.0
2.	Maintenance and spares :	2%	15% of	
3.	Depreciation	: 10%	capital	
4.	Insurance etc.	: 1%	cost -	Rs. 27.00
5.	Extra (Misc.)	: 2%		---
				Rs. 102.00

Processing Cost Per Tonne of ROM:

A + B = Rs. 55 + Rs. 102
= Rs. 157 say Rs. 160

Production cost per tonne of conc. = $\frac{160}{0.75}$
(75% weight percent yield)

= Rs. 213 say Rs. 215

ESTIMATION OF CAPITAL COST (ROUTE No. II)

		Rs. in Lakhs
1.	Total Capital cost	106.00
2.	Installation cost including electrical, piping, engine etc. (0.5 x 106)	53.00
3.	Plant building cost (0.2 x 106)	21.00
4.	Contingencies (0.15 x 106)	16.00
5.	Tailing Ponds (0.1 x 106)	11.00
	TOTAL	**207.00**
	Say	**210.00**

Capital Investments

	Rs. in Lakhs
1. Total Capital cost	210.00
2. Working Capital	
c) Stores & Spares (5%)	10.50
d) Cash in hand (7.5%)	15.75
TOTAL	236.25
	say 240.00

A. Direct Operating Cost

Sl. No.	HEAD	UNIT	RATE (Rs./Unit)	Qty.	COST Rs./t of ROM
1.	Water	M3	5.0	5	25.0
2.	Power	Kwh	3.0	21	63.0
3.	Concentrate handling	--	5.0	1.0	5.0
4.	Royalty etc.		5.0	1.0	5.0
	TOTAL				98.0

B. Fixed Operating Cost : Per Tonne of ROM:

1.	Total labour cost		-	Rs. 75.0
2.	Maintenance and spares : 2%	15% of		
3.	Depreciation : 10%	capital		
4.	Insurance etc. : 1%	cost	-	Rs. 30.00
5.	Extra (Misc.) : 2%			
				Rs. 105.00

Processing Cost Per Tonne of ROM:

A + B = Rs. 98 + Rs. 105
= Rs. 203 say Rs. 200/-

Production cost per tonne of conc. (75% weight percent yield) = $\frac{200}{0.52}$

= Rs. 384 say Rs. 390

WATER BALANCE:

ROUTE NO. I

a) **Water in :**

1.	Feed to Scrubber	-	13.5 M^3
2.	Discharge end of Scrubber (Trommel)	-	4.7 M^3
3.	Classifier feed	-	16.9 M^3
4.	Cyclone feed (Ist)	-	2.0 M^3
5.	Cyclone feed (IInd)	-	18.5 M^3
6.	Cyclone feed (IIIrd)	-	16.0 M^3
	Total	-	71.6 M^3

b) **Water in :**

1.	Screen O/S	-	0.36 M^3
2.	Screen U/S	-	3.91 M^3
3.	Cyclone O/F (Ist)	-	23.66 M^3
4.	Cyclone O/F (IInd)	-	20.19 M^3
5.	Cyclone O/F (IIIrd)	-	16.44 M^3
5.	Cyclone U/F	-	7.04 M^3
	Total	-	71.6 M^3

Conveyor Belt:

400 mm Belt Width at 100 fpm belt speed has a capacity of about 42 TPH with 20 idlers. HP required = 5.0.

Rotary Drier:

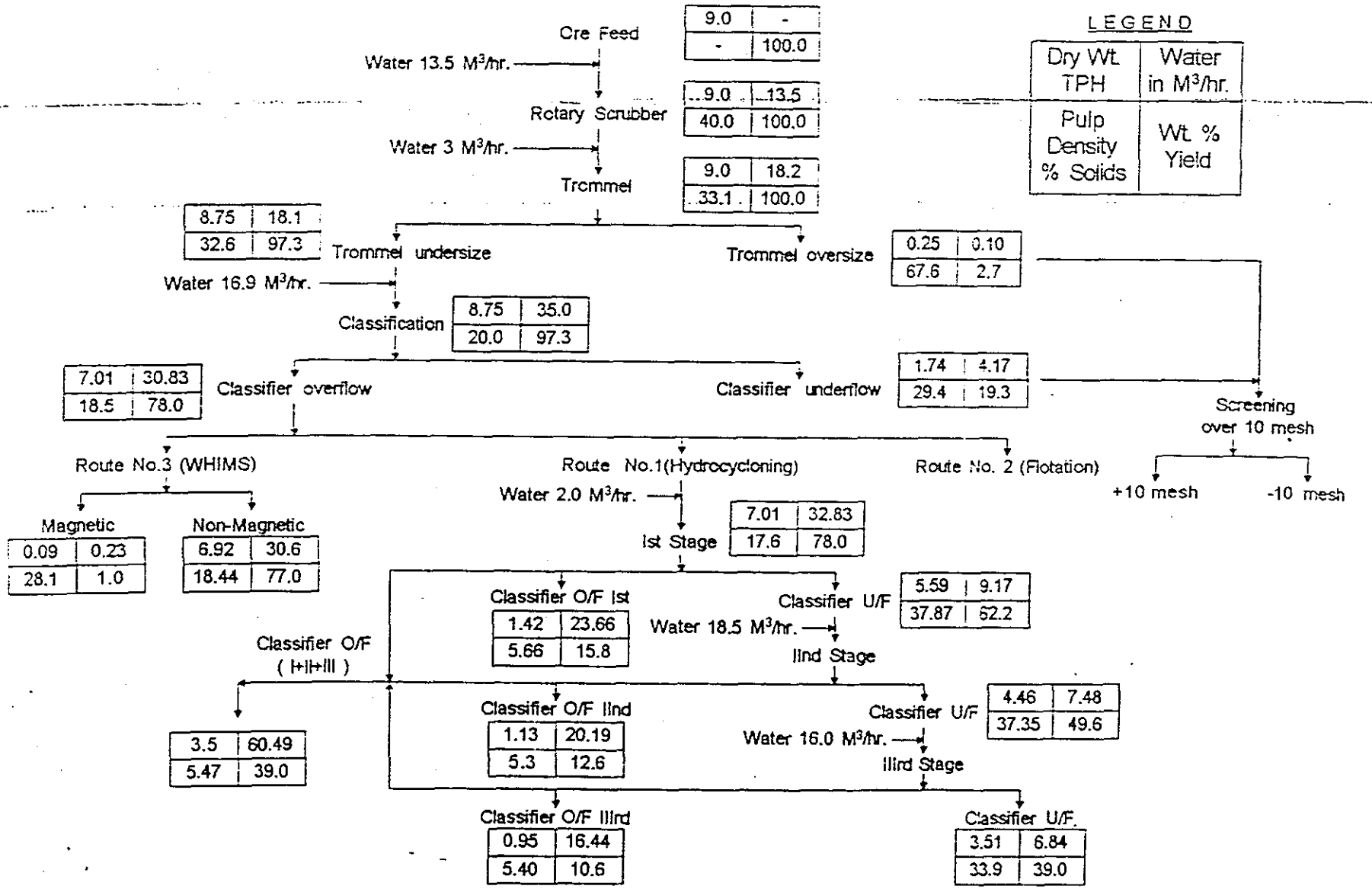
1.61 M X 13 M. L/D = 8.

4 TPH of solids containing 25% moisture.

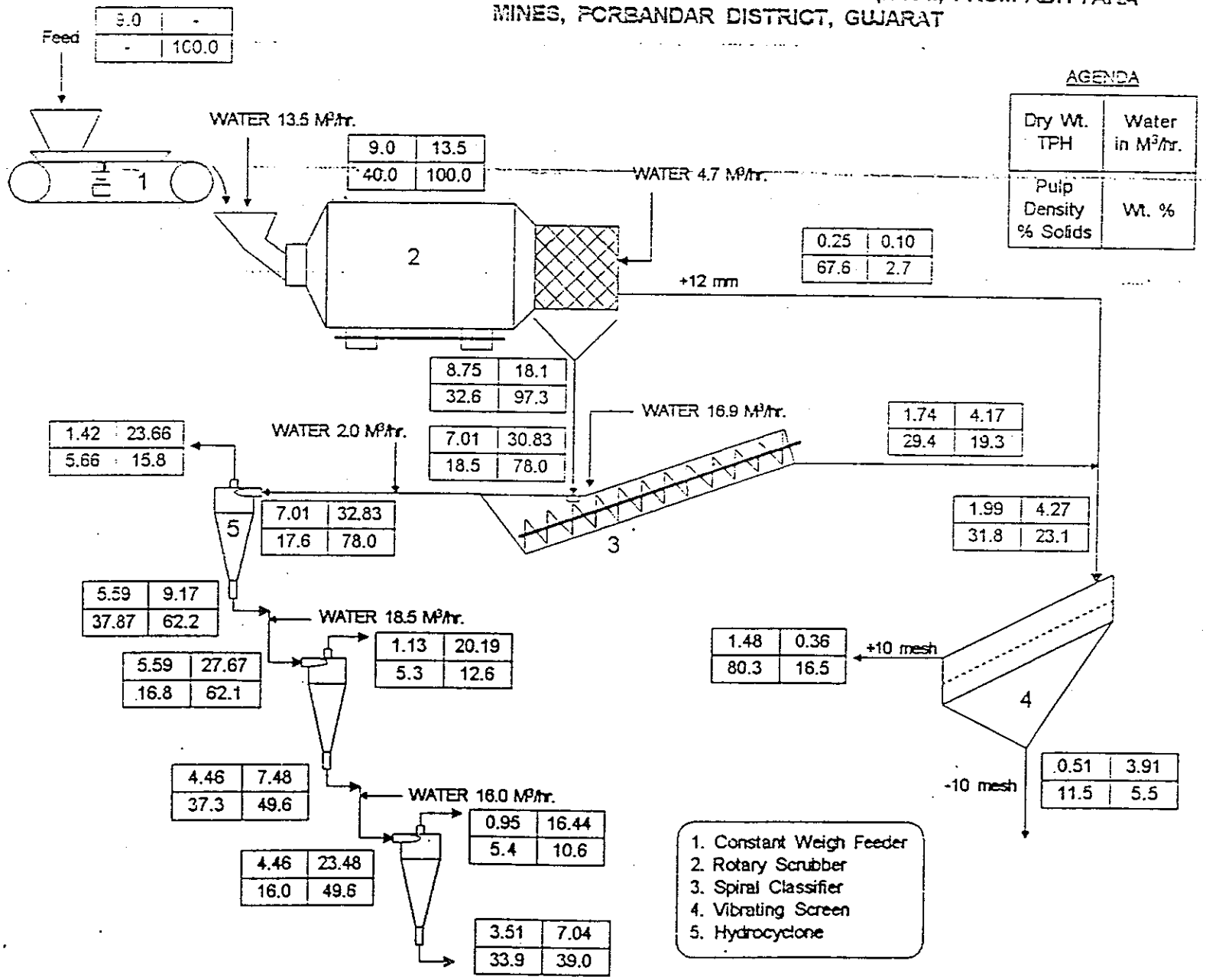
100 TPD CHALK PROCESSING PLANT
(Material Balance)

Sl. No.	Products	Dry Wt. TPH	Water M^3/hr	Pulp	P.D.	Wt %
1.	Feed to scrubber	9.00	-	-	-	100.00
2.	Water to scrubber + Trommel	9.00	18.20	27.20	33.10	100.00
3.	Trommel over size	0.25	0.10	0.37	67.60	2.70
4.	Trommel under size	8.75	18.10	26.85	32.60	97.30
5.	Feed to classifier	8.75	18.10	26.85	32.60	97.30
6.	Water to classsifier	8.75	16.90	43.75	20.00	97.30
7.	Classifier underflow	1.74	4.17	5.91	29.20	19.30
8.	Classifier overflow	7.01	30.83	37.84	18.50	78.00
(A) MAGNETIC SEPARATION (WHIMS)						
1.	Feed to WHIMS	7.01	30.83	37.84	18.50	78.00
2.	Magnetic	0.09	0.23	0.32	28.10	1.00
3.	Non-magnetic	6.92	30.60	37.52	18.44	77.00
(B) **HYDROCYCLONING**						
1.	**First Stage Cyclone**					
	Feed to Cyclone	7.01	30.83	37.84	18.50	78.00
	Water to Cyclone	7.01	2.00	39.84	17.60	78.00
	Cyclone underflow	5.59	9.17	14.76	37.87	62.20
	Cyclone overflow	1.42	23.66	25.08	5.66	15.80
2.	**Second Stage Cyclone**					
	Feed to cyclone	5.59	9.17	14.76	37.87	62.20
	Water to cyclone	5.59	18.50	33.26	16.80	62.20
	Cyclone underflow	1.13	20.19	21.32	5.30	12.60
	Cyclone overflow	4.46	7.48	11.94	37.35	49.60
3.	**Third Stage Cyclone**					
	Feed to cyclone	4.46	7.48	11.94	37.35	49.60
	Water to cyclone	4.46	16.00	27.94	15.96	49.60
	Cyclone underflow	0.95	16.64	17.59	5.40	10.60
	Cyclone overflow	3.51	6.84	10.35	33.90	39.00
C.	**FLOTATION**					
	Feed, Classifier Overflow	7.01	30.83	37.84	18.50	78.00
	Water to flotation cell	7.01	2.00	39.84	17.60	78.00
	Rougher Flotation					
	Rougher float	4.61	24.20	28.81	16.00	51.30
	Rougher tail	2.40	8.63	11.03	21.70	26.70
	First Cleaning					
	Feed→ Rougher float	4.61	24.20	28.81	16.00	51.30
	First Cl. Float	3.62	20.51	24.13	15.00	40.30
	First Cl. Tail	0.99	3.69	4.68	21.10	11.00
	Second Cleaning					
	Feed→ First Cl. Float	3.62	20.51	24.13	15.00	40.30
	Second Cl. Float	3.02	18.55	21.57	14.00	33.60
	Second Cl. Tail	0.60	1.96	2.56	23.70	6.70

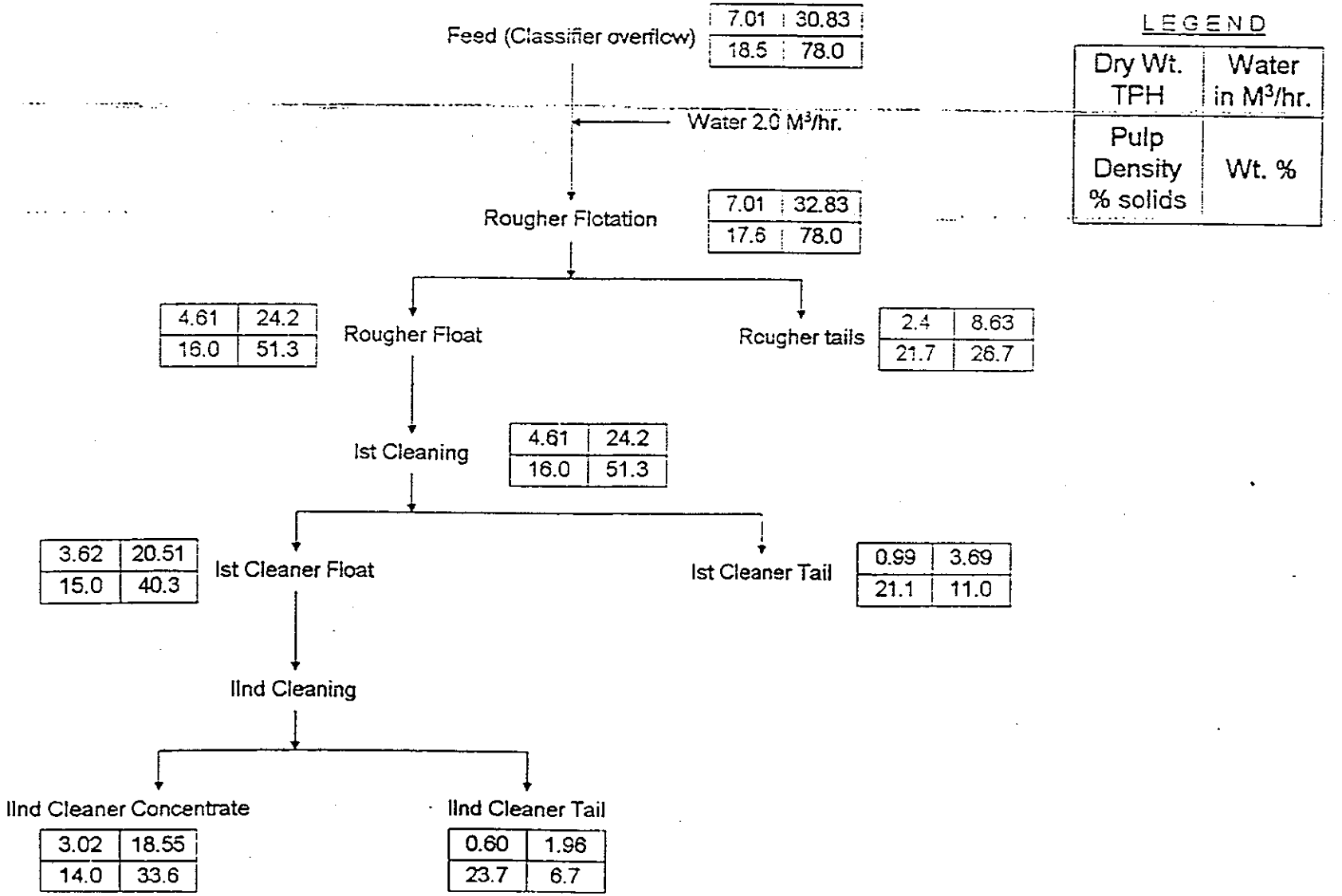
FLOWSHEET & MATERIAL BALANCE FOR PREFEASIBILITY REPORT FOR 100 TPD CHALK PROCESSING PLANT IN GUJARAT (FOR INDUSTRIAL EXTENSION BUREAU, GUJARAT)



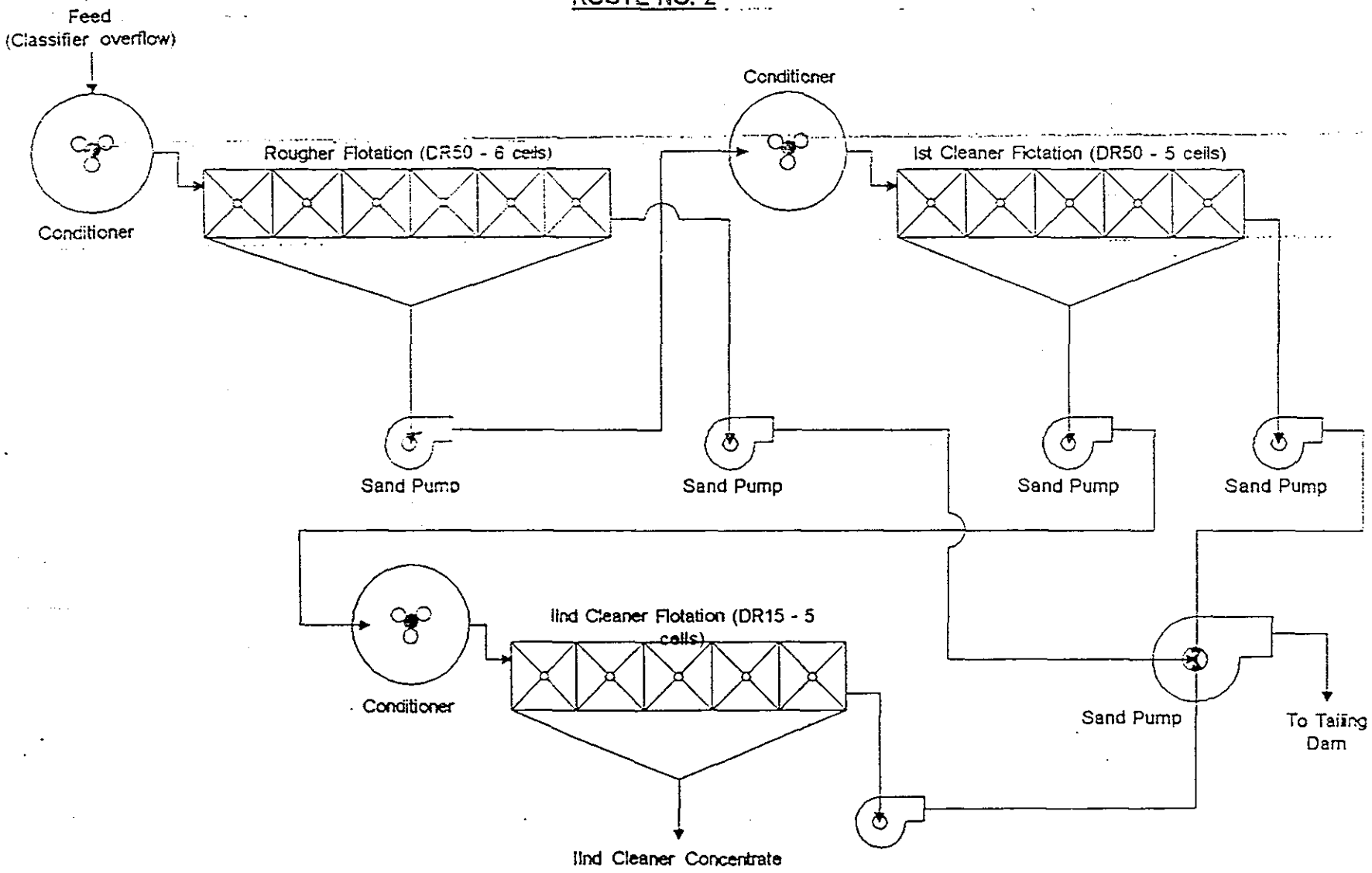
100 TPD BENEFICIATION PLANT OF CHALK SAMPLE (NO. II) FROM ADITYANA MINES, PORBANDAR DISTRICT, GUJARAT



RCUTE NO. 2


Feed (Classifier overflow)
7.01 | 30.83
18.5 | 78.0
Water 2.0 M³/hr.
Rougher Flotation
7.01 | 32.83
17.6 | 78.0
4.61 | 24.2
16.0 | 51.3
Rougher Float
Rougher tails
2.4 | 8.63
21.7 | 26.7
Ist Cleaning
4.61 | 24.2
16.0 | 51.3
3.62 | 20.51
15.0 | 40.3
Ist Cleaner Float
Ist Cleaner Tail
0.99 | 3.69
21.1 | 11.0
IInd Cleaning
IInd Cleaner Concentrate
3.02 | 18.55
14.0 | 33.6
IInd Cleaner Tail
0.60 | 1.96
23.7 | 6.7
LEGEND
Dry Wt. TPH | Water in M³/hr.
Pulp Density % solids | Wt. %

ROUTE NO. 2


Feed
(Classifier overflow)
Conditioner
Rougher Flotation (DR50 - 6 cells)
Conditioner
1st Cleaner Flotation (DR50 - 5 cells)
Sand Pump
Sand Pump
Sand Pump
Sand Pump
Conditioner
IInd Cleaner Flotation (DR15 - 5 cells)
Sand Pump
To Tailing Dam
IInd Cleaner Concentrate