اصول طراحی کارخانه های کانه آرایی

جلسه شانزدهم

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۱۳۹۵

فلوتاسیون

Total flotation cell volume required can be calculated from the formula:

$$Vf = \frac{Q \times Tr \times S}{60 \times Ca}$$

Vf = Total flotation volume required (m^3)

Q = Feed flow rate m^3/hr

Tr = Flotation retention time (minutes).

S = Scale up factor dependent upon source of flotation retention time date (above)

Tr specified by customer S = 1.0

Tr taken from typical industrial data S = 1.0

Tr taken from continuous Pilot Plant test S = 1.0

Tr taken from laboratory scale test work S = 1.6 – 2.6

Ca = Aeration factor to account for air in pulp. 0,85 unless otherwise specified.

فلوتاسیون (ترکیب معمول رافر)

Mineral	% solids in feed	Retention time min (normal)	No. of cells/bank
Barite	30 – 40	8 – 10	6 – 8
Copper	32 – 42	13 – 16	8 – 12
Fluorspar	25 – 32	8 – 10	6 – 8
Feldspar	25 – 35	8 – 10	6 – 8
Lead	25 – 35	6 – 8	6 – 8
Molybdenum	35 – 45	14 – 20	10 – 14
Nickel	28 – 32	10 – 14	8 – 14
Phosphate	30 – 35	4 – 6	4 – 5
Potash	25 – 35	4 – 6	4 – 6
Tungsten	25 – 32	8 – 12	7 – 10
Zinc	25 – 32	8 – 12	6 – 8
Silica (iron ore)	40 – 50	8 – 10	8 – 10
Silica (phosphate)	30 – 35	4 – 6	4 – 6
Sand (impurity)	30 – 40	7 – 9	6 – 8
Coal	4 – 12	4 – 6	4 – 5
Effluents	as received	6 – 12	4 – 6

فلوتاسیون (ترکیب معمول کلینر)

Model	Volume (m^3)	Maximum bank feed rate (m^3/h)	Maximum cells per section (1)
RCS 0,8	0,8	25	4
RCS 3	3,0	240	4/5
RCS 5	5,0	320	4/5
RCS 10	10,0	540	4
RCS 15	15,0	730	4
RCS 20	20,0	870	4
RCS 30	30,0	1120	3
RCS 40	40,0	1360	3
RCS 50	50,0	1650	3
RCS 70	70,0	2040	2
RCS 100	100,0	2550	2
RCS 130	130,0	3050	2
RCS 160	160,0	3450	1
RCS 200	200,0	3990	1
RCS 300	300,0	6500	1

فلوتاسیون

Single rougher bank. Copper flotation.

Feed pulp flow rate 1400 m^3/h (6160 USGPM).

Retention time 16 minutes, determined by continuous pilot plant test.

1. Determination of total flotation cell volume

$$Vf = \frac{Q \times Tr \times S}{60 \times Ca} = \frac{1400 \times 16 \times 1}{60 \times 0.85} = 439\ m^3 \text{ total bank volume}$$

2. Select the number of cells in bank

Minimum cell size to handle 1400 m^3/hr is RCS 50 (Maximum 1650 m^3/hr).

439 / 50 = 8.78 cells. Normal range for copper is 8 - 12 cells, so this is a valid selection. If this was not the case choose the next cell size up or down as appropriate.

9 x RCS 50 cells required. Total volume 9 x 50 = 450 m^3.

3. Select the bank arrangement

For RCS 50 the maximum amount of cells in one section is 3. So to have 9 cells choose bank arrangement.

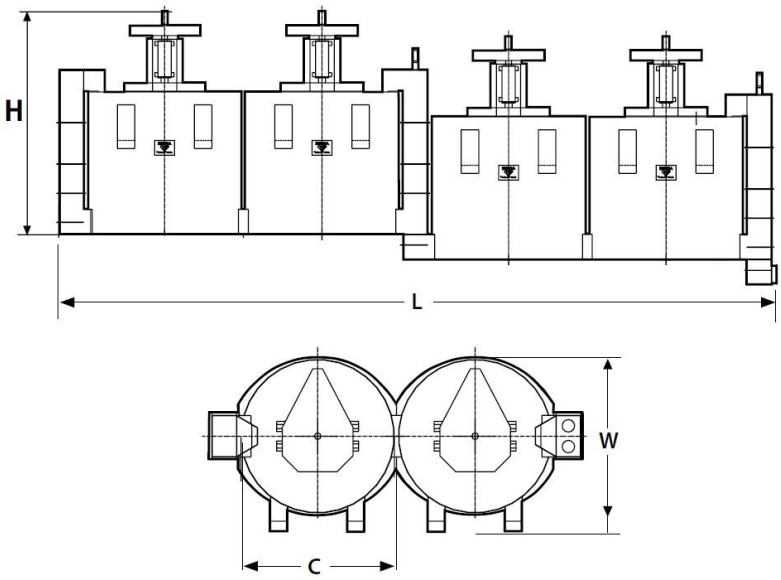
RCS 50 F-3-I-3-I-3-D

فلوتاسیون

RCS specifications

Model	Standard Drive (1)	Cell volume (2) m^3	Cell volume (2) ft^3	Connected motor (3) kW	Connected motor (3) HP	Air requirements (4) Am^3/min	Air requirements (4) kPag	Air requirements (4) Acfm	Air requirements (4) psig
RCS 0,8	*For specifications please contact your local Metso sales office*								
RCS 3	VB	3	105	11	15	2	17	70	2,5
RCS 5	VB	5	175	15	20	3	19	110	2,8
RCS 10	VB	10	355	22	30	4	22	140	3,2
RCS 15	VB	15	530	30	40	6	25	210	3,6
RCS 20	VB	20	705	37	50	7	27	250	3,9
RCS 30	VB	30	1060	45	60	9	31	320	4,5
RCS 40	VB	40	1410	55	75	10	34	350	4,9
RCS 50	VB	50	1765	75	100	12	38	420	5,5
RCS 70	VB	70	2470	90	125	15	41	530	5,9
RCS 100	VB/GB	100	3530	110	150	19	47	670	6,8
RCS 130	VB/GB	130	4590	132	200	23	51	810	7,4
RCS 160	GB	160	5650	160	200/250	25	55	880	8,0
RCS 200	GB	200	7060	200	250	30	59	1060	8,6
RCS 300	*For specifications please contact your local Metso sales office*								

فلوتاسیون



فلوتاسیون

Model	H (1) mm (inch)	L (2) mm (inch)	W mm (inch)	C mm (inch)	Bank weight (2) tonnes (s tons)
RCS 0,8	1 790 (70)	5 550 (219)	1 320 (52)	1 100 (43)	2,73 (3,01)
RCS 3	2 790 (110)	8 250 (325)	1 900 (75)	1 700 (67)	8,4 (9,26)
RCS 5	3020 (119)	9850 (388)	2230 (88)	2000 (79)	10.53 (11.58)
RCS 10	3610 (142)	12250 (482)	2850 (112)	2600 (102)	17.38 (19.12)
RCS 15	3990 (157)	14250 (561)	3320 (131)	3000 (118)	22.97 (25.27)
RCS 20	4610 (181)	15250 (600)	3680 (145)	3250 (128)	26.25 (28.88)
RCS 30	5375 (212)	17350 (683)	4150 (163)	3700 (146)	36.50 (40.15)
RCS 40	5780 (226)	19200 (756)	4410 (174)	4100 (161)	51.04 (56.14)
RCS 50	6100 (240)	20900 (823)	4870 (192)	4500 (177)	56.95 (62.65)
RCS 70	6690 (263)	23600 (929)	5450 (215)	5000 (197)	71.00 (78.10)
RCS 100	6510 (256)	26400 (1039)	6100 (240)	5600 (220)	92.28 (101.51)
RCS 130	6875 (271)	29050 (1144)	6650 (262)	6100 (240)	123.82 (136.2)
RCS 160	7495 (295)	30650 (1207)	7100 (280)	6500 (256)	145.49 (160.00)
RCS 200	8050 (317)	33050 (1301)	7600 (299)	7000 (276)	174.10 (191.40)
RCS 300	*For specifications please contact your local Metso sales office*				

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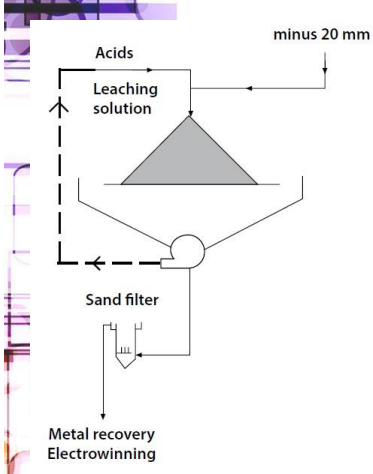

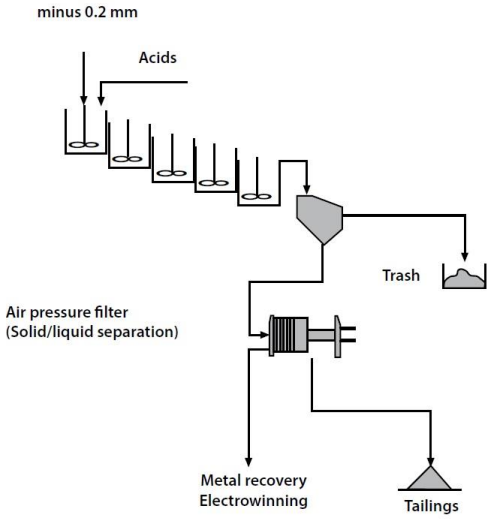

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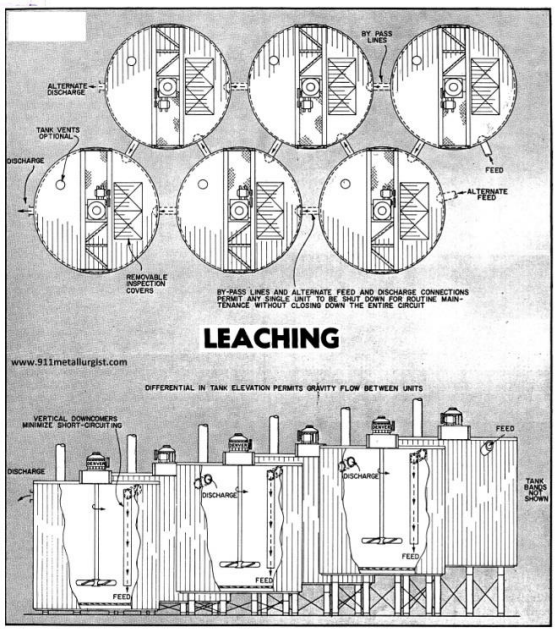

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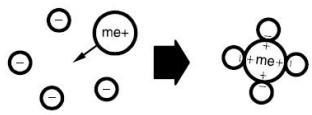
سیستم بازیابی آب

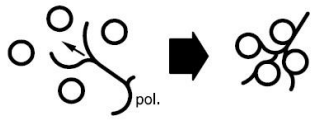
Coagulation: Surface charges are neutralized by addition of chemicals of opposite charge.

Ex: Fe^{+++} *(iron sulphate)*
Al^{+++} *(aluminium sulphate)*
Ca^{++} *(lime)*



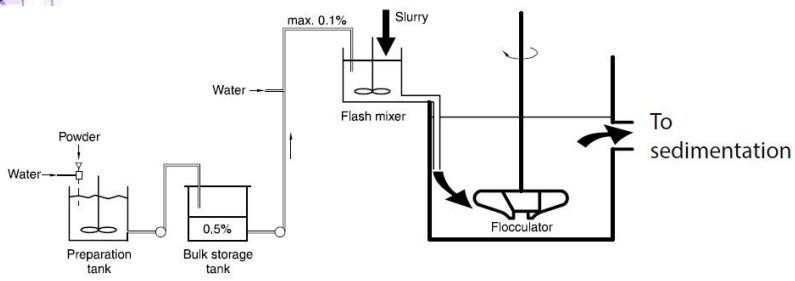
A coagulated aggregate will reform after breaking (e.g. pumping).

Flocculation: Polymers with molecule chains which physically link the particles together (mechanical bridging).



A flocculated aggregate will not reform after breaking.

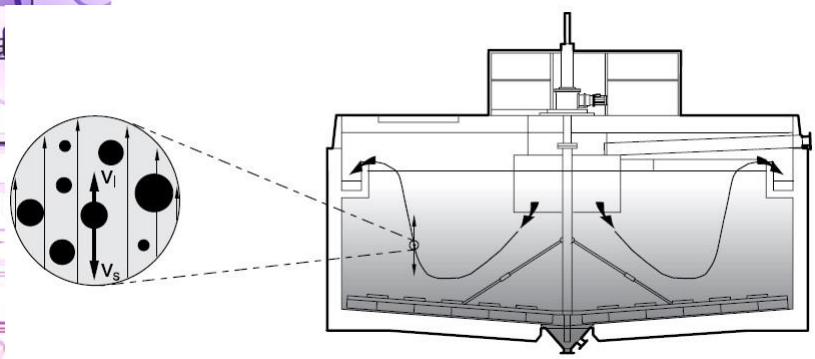
سیستم بازیابی آب



Flocculation - addition and mixing time

Application	Flocculant charge	Mixing time min	Addition rate g/m³
Sand wash water	an- or non-ionic	0.5 – 1	0.5 – 5
Scrubber water (gas cleaning)	an-ionic	0.5 – 2	0.5 – 2
Coal tailings	non- and cat.ionic	0.5 – 1	2.0 – 10
Mineral tailings	an-ionic	0.5 – 1	1.0 – 5 (40-80 g/t)

سیستم بازیابی آب



سیستم بازیابی آب

Surface load material	Feed %	Surface load m^3/m^2, h	Surface load ft^3/ft^2, min	
Brine purification	0.1 – 5	0.5 – 1.7	0.03 – 0.07	
Coal refuse	0.5 – 6	0.7 – 1.7	0.04 – 0.09	
Clean coal fines	1.0 – 5	1.0 – 1.9	0.06 – 0.10	(with flocculation)
Heavy media magnetite	20 – 30	6 – 7.5	0.32 – 0.41	
Gas cleaning	0.2 – 2	1.5 – 3.7	0.08 – 0.20	(with flocculation)
Gypsum desulphurization	1 – 3	1 – 2	0.06 – 0.12	
Sand wash water	1 – 5	0.3 – 1	0.02 – 0.06	(without flocculation)
	1 – 5	1 – 4	0.06 – 0.22	(with flocculation)
Ore flotation tailings	10 – 20	0.1 – 0.3	0.005 – 0.02	(without flocculation)
	10 – 20	0.5 – 1.5	0.03 – 0.08	(with flocculation)

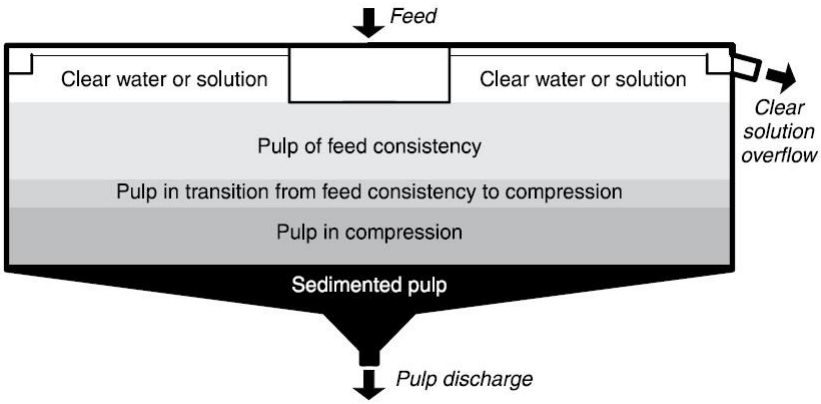
سیستم بازیابی آب

A wash water (100 m^3/h) coming from a sand operation needs to be clarified. Surface load is 0.5 $m^3/h/m^2$. Select clarifier diameter.

Required area is: $100/0.5 = 200\ m^2 = \frac{\pi d^2}{4} = 200$ where d is required diameter $= 15.9$.

Select a 16 m clarification tank!

سیستم بازیابی آب



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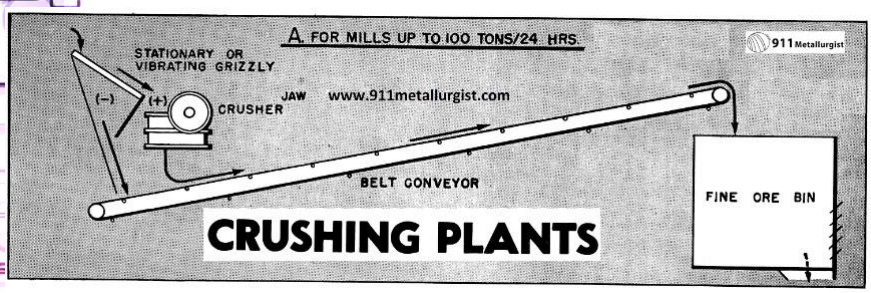

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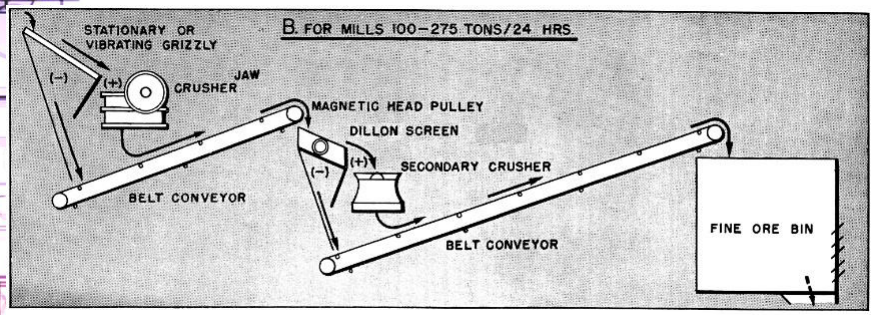

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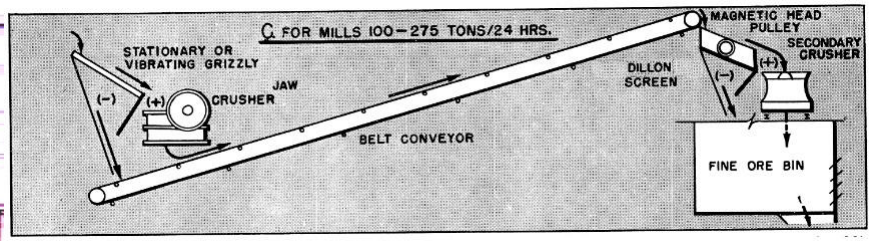

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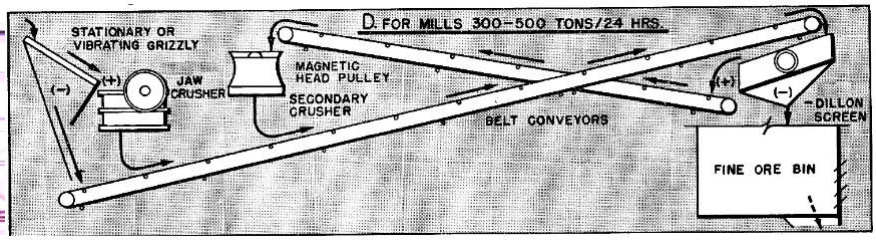

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