

Bloque 3. CASOS PRÁCTICOS

3.1 Circuitos de trituración

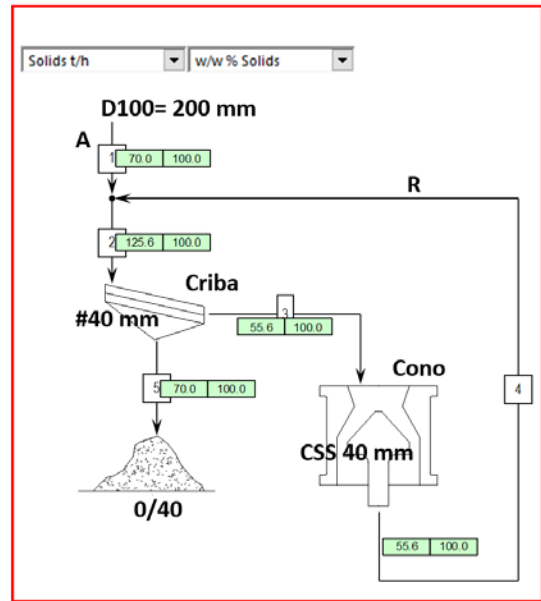
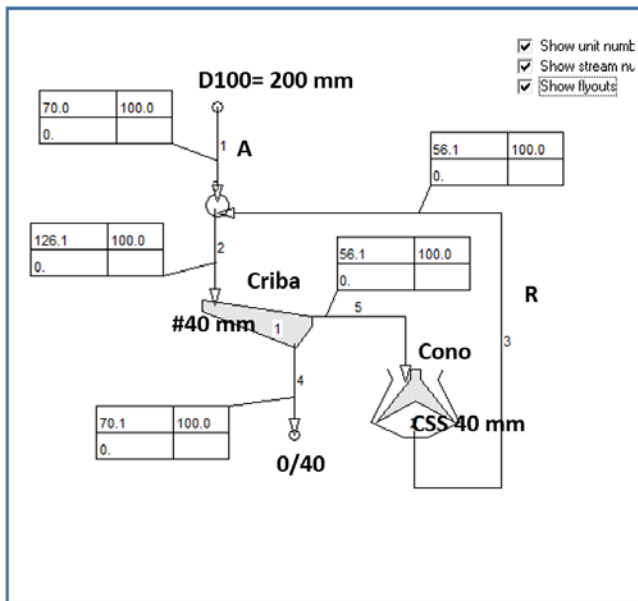


Diagrama de flujo (flowsheet) PRECRIBADO software MODSIM y LIMN

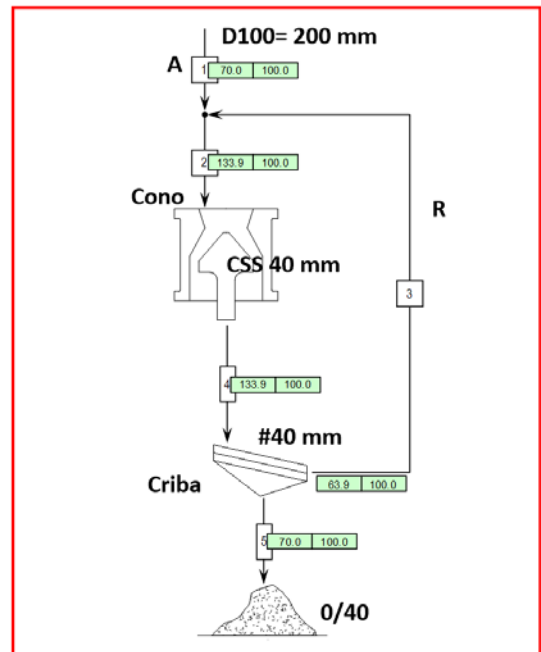
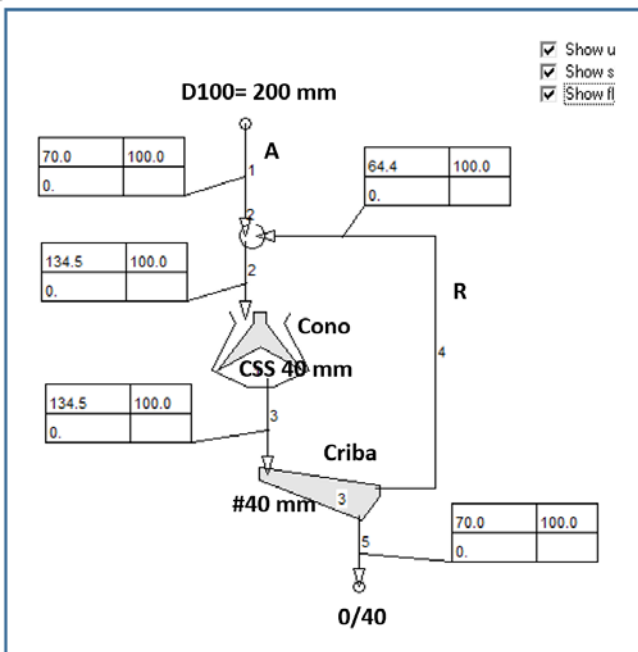
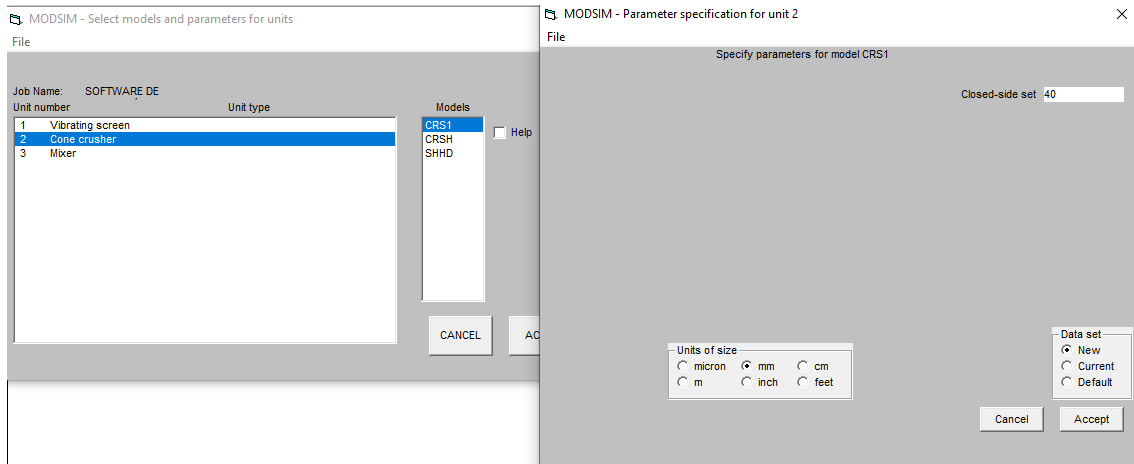


Diagrama de flujo (flowsheet) POSCRIBADO software MODSIM y LIMN

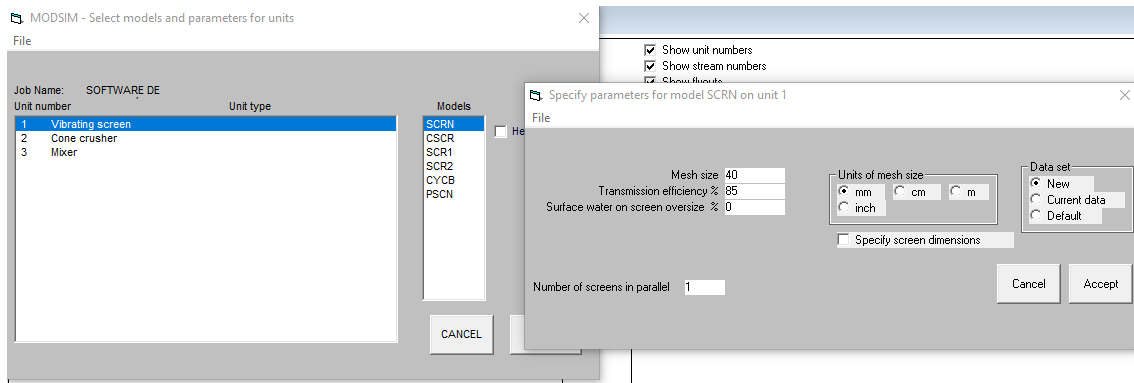
Listado de equipos/unidades de simulación

MODSIM:

- Triturador de Cono (Cone Crusher): CRS1
 - CSS (Closed Side Setting) 40 mm



- Criba (Vibrating Screen): SCRN
 - Mesh size: 40 mm
 - Rendimiento al paso: 85% (Transmission efficiency)



LIMN:

- Curva granulométrica alimentación planta:
 - 70 t/h (sólido seco)
 - Contenido rangos granulométricos (%)

Configuration Data Created with Wizard: ID_Communion Located at: C:\LIMN_V31\Wizards
Version: 20 Oct 2020 - Limn.V3.4.11 Wizard_2_ID_Communion.alsm

Property Definition

Name		Size
Size Ranges		
Lower	Upper	Mean
150.00	200.00	173.205
100.00	150.00	122.474
50.00	100.00	70.711
30.00	50.00	38.73
10.00	30.00	17.321
0.00	10.00	7.071

Additional Definitions

Name	SG
Liquid	Water 1.00
Solid	Solids 2.65

Percent Passing	80.00
Passing Size	40.00

Default Data Heading Layout for Streams and Units

Solids t/h	
Water t/h	
w/w % Solids	
Pulp SG	
Volume m3/h	
P80	
% -40	

Size	Mean
+150	173.21
+100	122.47
+50	70.71
+30	38.73
+10	17.32
-10	7.07

Stream Summary - % in each Size interval

		_stream 1035
Water t/h		0.00
Solids t/h		70.00
w/w % Solids		100.00
Pulp SG		2.65
Volume m3/h		26.415
P80		1.00
% -40		100.00

Size	Mean	
+150	173.21	4.00
+100	122.47	7.00
+50	70.71	20.00
+30	38.73	19.00
+10	17.32	31.00
-10	7.07	19.00

Mass in each Size interval

		_stream 1035
Water t/h		0.00
Solids t/h		70.00
w/w % Solids		100.00
Pulp SG		2.65
Volume m3/h		26.415
P80		1.00
% -40		100.00

Size	Mean	
+150	173.21	2.80
+100	122.47	4.90
+50	70.71	14.00
+30	38.73	13.30
+10	17.32	21.70
-10	7.07	13.30

- Cono:
 - Cone Crusher (hard Ore)
 - CSS (Closed Side Setting) 40 mm

- Criba:
 - Rendimiento al paso: 85% (0,15 bypass)
 - d50c cut size 40 mm

Model for Unit: Crusher

Model Summary			
	Feed	Product 1	Audit Check
Solids t/h	55.605	55.605	OK
Water t/h	0.00	0.00	OK
w/w % Solids	100.00	100.00	-
Pulp SG	2.65	2.65	-
Volume m3/h	20.983	20.983	OK
P80	1.00	1.00	-
% -40	100.00	100.00	-

Crusher Models available	
Hammer Mill	<input type="radio"/>
Jaw Crusher (Hard Ore)	<input type="radio"/>
Jaw Crusher (Average Ore)	<input type="radio"/>
Cone Crusher (Hard Ore)	<input type="radio"/>
Cone Crusher (Average Ore)	<input type="radio"/>
Gyratory Crusher	<input type="radio"/>
Coal Double Rolls Crusher	<input type="radio"/>
Crusher Closed Side Setting (mm)	40.00

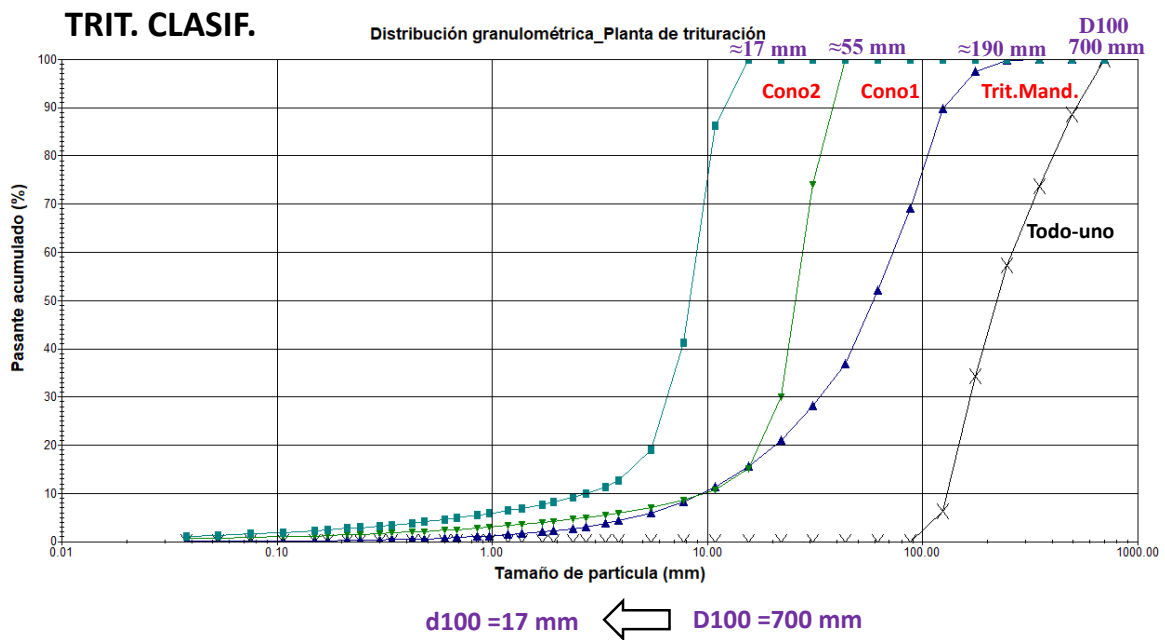
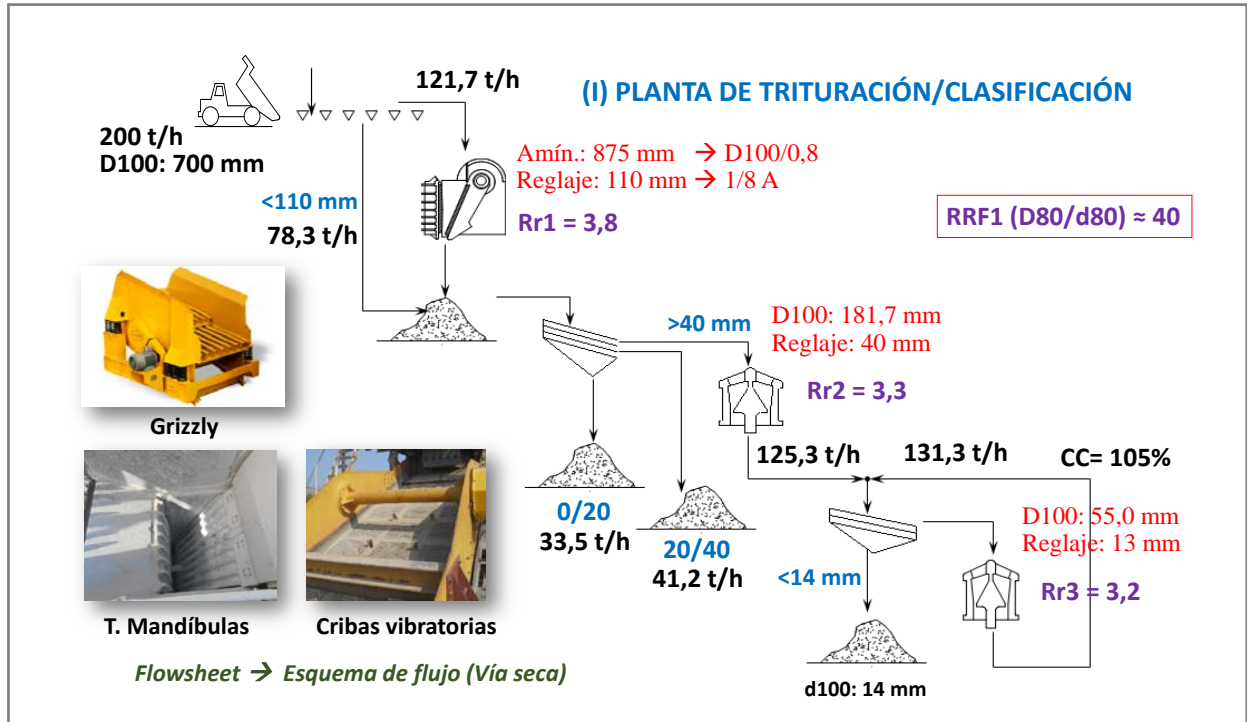
NB: This model produces a product size distribution based on curves fitted to data obtained from various manufacturer's literature.
The distributions are obviously indicative only, but should provide a useful starting point where no other information exists.

Model for Unit: Screen

Model Summary				
	Feed	Product 1	Product 2	Audit Check
Solids t/h	125.605	55.605	70.00	OK
Water t/h	0.00	0.00	0.00	OK
w/w % Solids	100.00	100.00	100.00	-
Pulp SG	2.65	2.65	2.65	-
Volume m3/h	47.398	20.983	26.415	OK
P80	1.00	1.00	1.00	-
% -40	100.00	100.00	100.00	-

Model Parameters	
Nominal d50c -cut size	40.00
Rf - bypass fraction	0.15
Alpha - sharpness of cut	4.00
Beta - "fish hook"	0.00

Water Split		
Water split to Product 1		
Size	Mean	
+150	173.21	1.000
+100	122.47	1.000
+50	70.71	0.963
+30	38.73	0.548
+10	17.32	0.218
-10	7.07	0.166



Esquema de procesamiento y curvas granulométricas de las corrientes de flujo. (I)

Planta de trituración clasificación

3.2 Circuitos de molienda

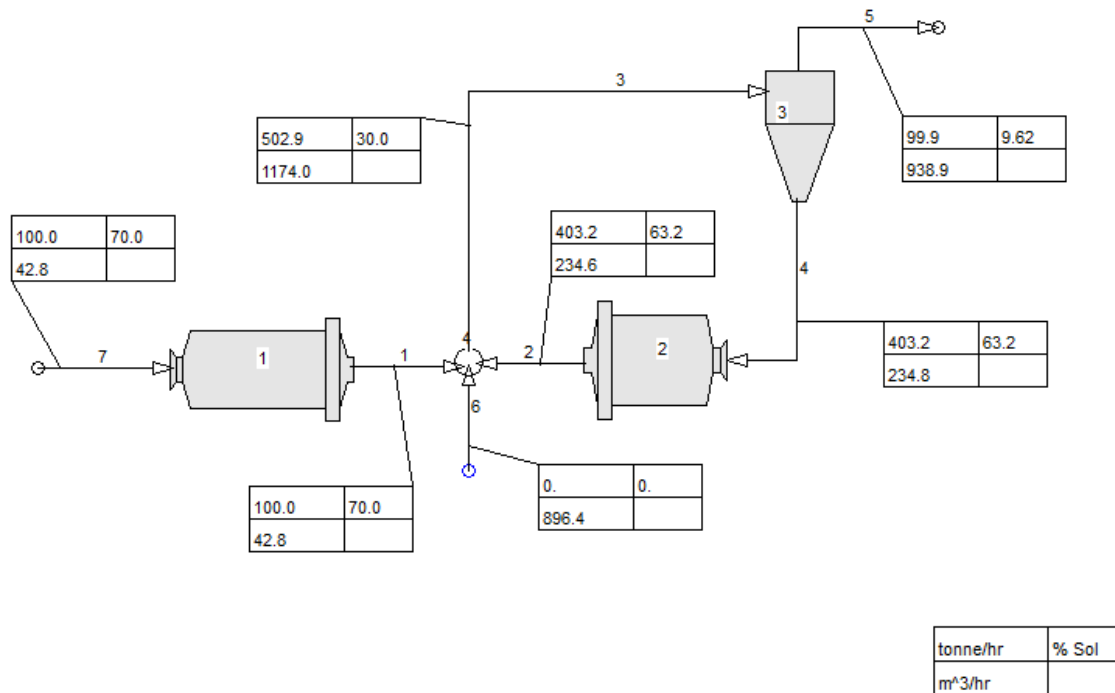
Circuito abierto de molienda en barras seguido de un circuito cerrado de molienda en bolas con hidrociclón (HC). Datos de simulación:

Caudal de alimentación: 100 t/h (70% de sólidos en peso)

Densidad real del sólido: 2,65 t/m³

D100: 50 mm → d100: 74 μm

Bomba de alimentación al hidrociclón: 30% de sólidos en peso

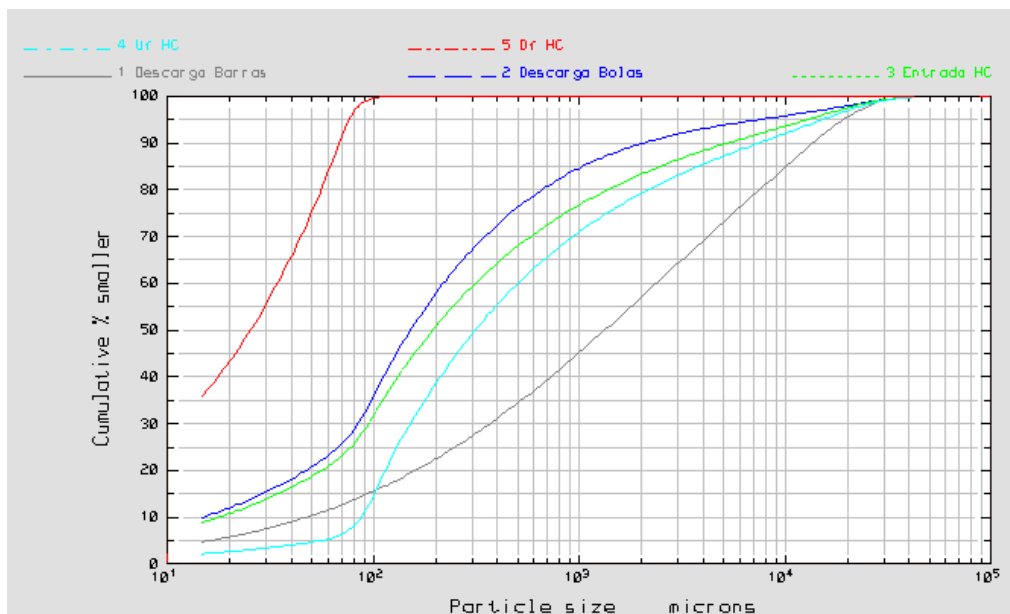


Agua requerida por el circuito en la modelización:

- Alimentación al molino de barras:
42,8 m³/h
- Alimentación a la entrada al HC:
896,4 m³/h

Carga Circulante (Cc):

403,2 %

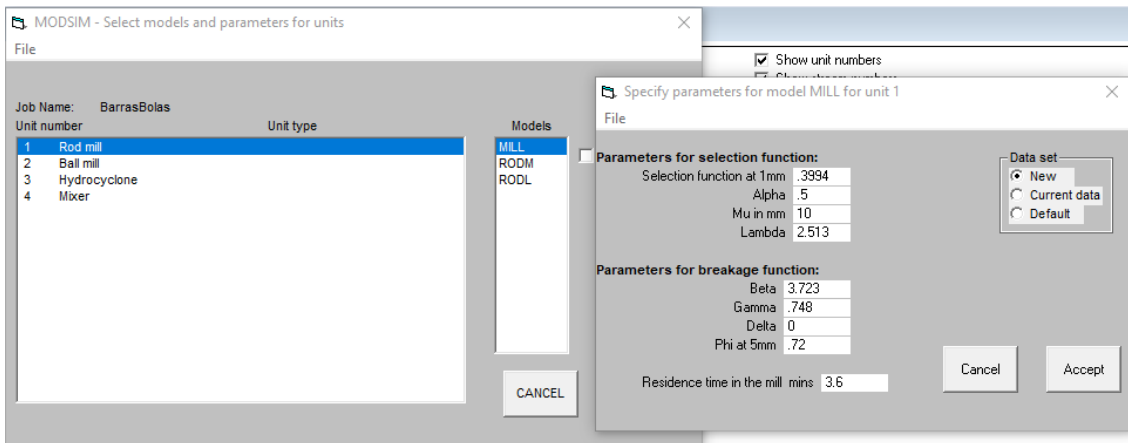


Circuito abierto de molienda en barras y cerrado en bolas con clasificador (HC).

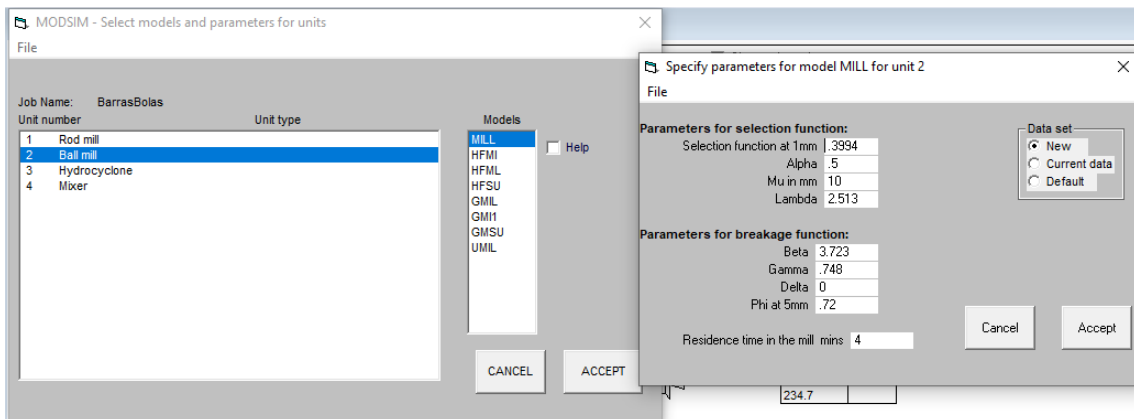
Representación de las líneas de flujo mediante MODSIM

Listado de equipos/unidades de simulación:

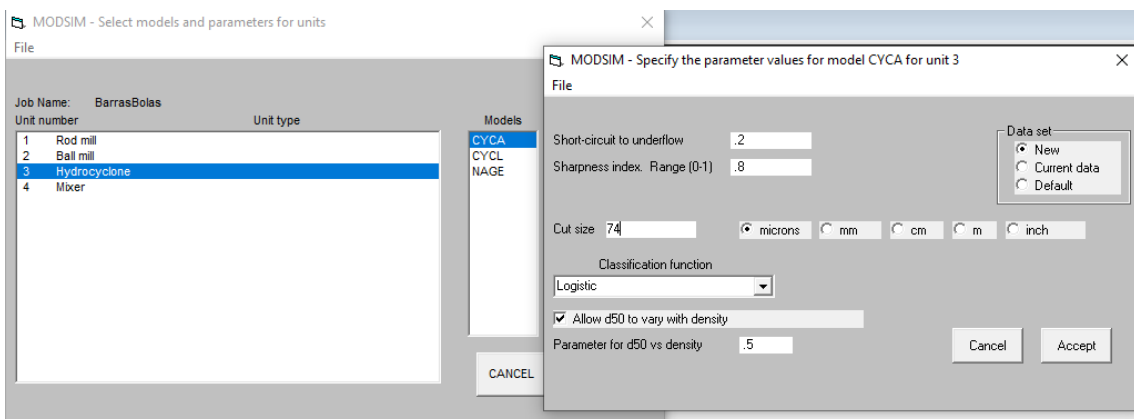
- Molino de Barras:
 - Tiempo de residencia 3,6 min

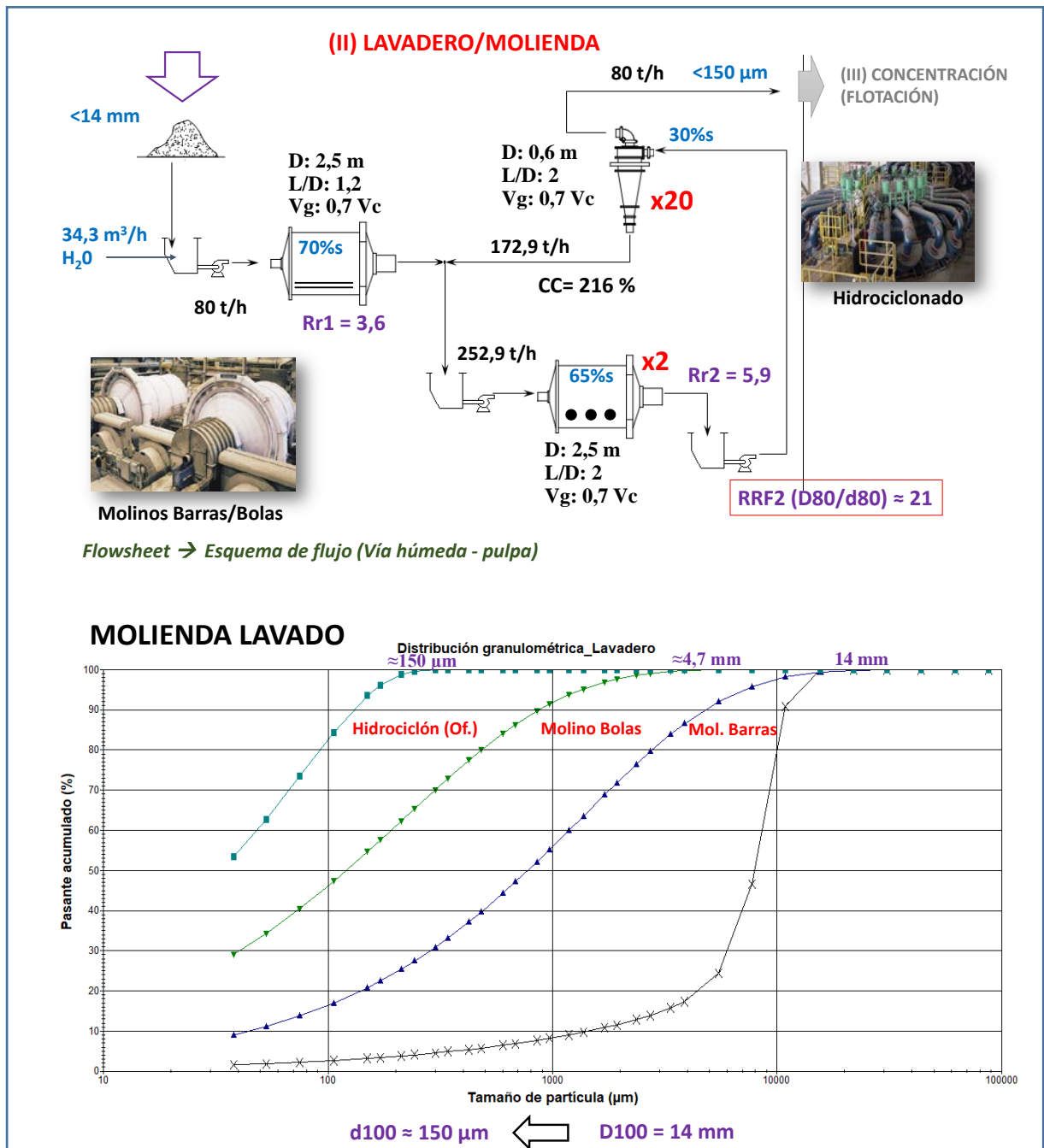


- Molino de Bolas:
 - Tiempo de residencia 4 min



- Hidrociclón:
 - d50: 74 μm (X50 tamaño de corte)
 - Cortocircuito de finos a fracción gruesa: 20%

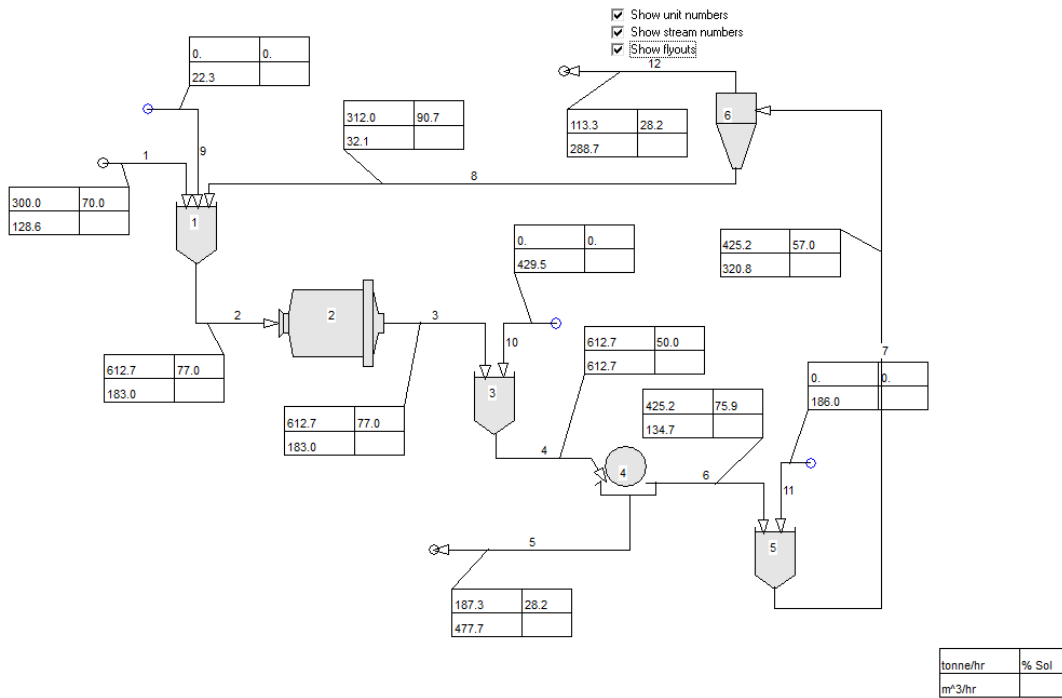




Esquema de procesamiento y curvas granulométricas de las corrientes de flujo.

(II) Planta de lavado y molienda

3.3 Circuitos de concentración y flotación



MODSIM - Specify ore characteristics and stream data for job Conc Mag

File

ORE CHARACTERISTICS

Select type of mineral to be processed

Conventional minerals

Coal processing plant

Number of minerals: 2

Mineral names: Pizarra, Magn

Mineral specific gravities: 2.76, 5.38

Specify sp.gr by: Mineral, Particle type

Number of size classes: 25

Number of grade classes: 12

Largest particle size: 1.00E-2 m

Number of S-classes: 1

Set up grade classes

Set up S-classes

Feed streams

1 Alimentación

Water addition streams

9 W1MB, 10 W2SM, 11 W3HC

Internal and product streams

2 AlmMB, 3 DescargaMB, 4 AlmSM, 7, 8, 5 EstSM, 6 ConcSM

Set convergence properties

Cancel Accept

Particle-size distribution and feed rate in feed streams

File

Mesh size	% Passing
Infinity	100.00
4.998E-3	99.00
3.534E-3	95.21
2.499E-3	86.53
1.767E-3	73.35
1.250E-3	58.21
8.836E-4	43.76
6.248E-4	31.60
4.418E-4	22.16
3.124E-4	15.24
2.209E-4	10.33
1.562E-4	6.94
1.104E-4	4.64
7.810E-5	3.08
5.522E-5	2.05
3.905E-5	1.35
2.761E-5	.90
1.952E-5	.59
1.381E-5	.39
9.762E-6	.26

Stream number: 1

Stream name: Alimentación

Number of mesh sizes in your data: 20

Units of size: micron, mm, cm, m, inch

Use Rosin-Rammler distribution

D63.2: 1.768E-3, Lambda: 1.2

Solids feed rate: 300, Percent solids: 70.00

Units of feed rate: kg/s, Short tons/hr, tonnes/hr, Long tons/hr

Export size distribution

Import size distribution

Specify grade distributions

Specify distribution over S-classes

Cancel Accept

Set up grade classes

File

Class	Composition	Sp. gr. of class
1	1.0000 0.0000	2.760
2	0.9500 0.0500	2.829
3	0.8500 0.1500	2.978
4	0.7500 0.2500	3.143
5	0.6500 0.3500	3.327
6	0.5500 0.4500	3.535
7	0.4500 0.5500	3.770
8	0.3500 0.6500	4.038
9	0.2500 0.7500	4.348
10	0.1500 0.8500	4.709
11	0.0500 0.9500	5.136
12	0.0000 1.0000	5.380

Specify composition by: Mass, Volume

Physical properties: Mag. susceptibility, Other

Specify liberation model data

Cancel Accept

Specify distribution of particle grades

File

Class	Mass fraction	Stream: 1 Alimentación
1	0.004100	
2	0.108600	
3	0.059800	
4	0.088300	
5	0.092800	
6	0.122200	
7	0.053300	
8	0.052800	
9	0.094900	
10	0.259500	
11	0.061900	
12	0.000000	

Size range: 0 - .000038

Size range: .000038 - .000045

Size range: .000045 - .000053

Size range: .000053 - .000075

Size range: .000075 - .000106

Size range: .000106 - .00018

Size range: .00018 - .00025

Size range: .00025 - .000355

Size range: .000355 - .0005

Size range: .0005 - .00071

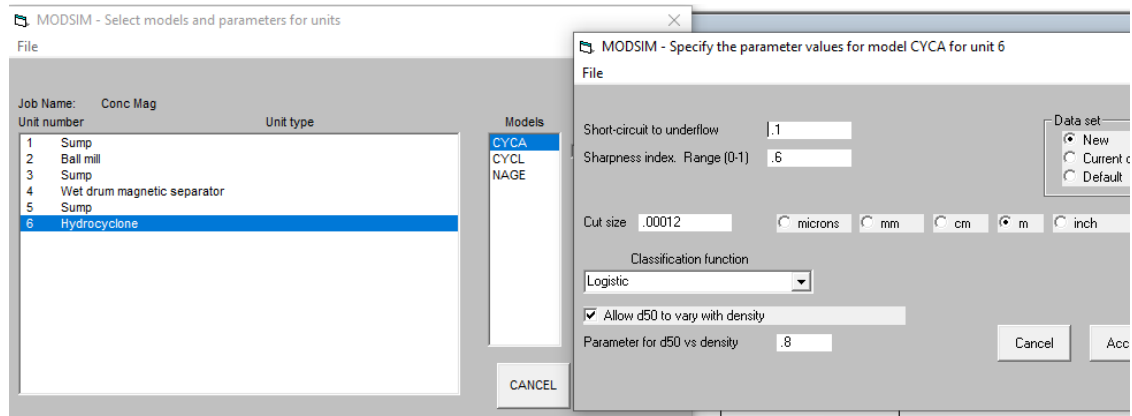
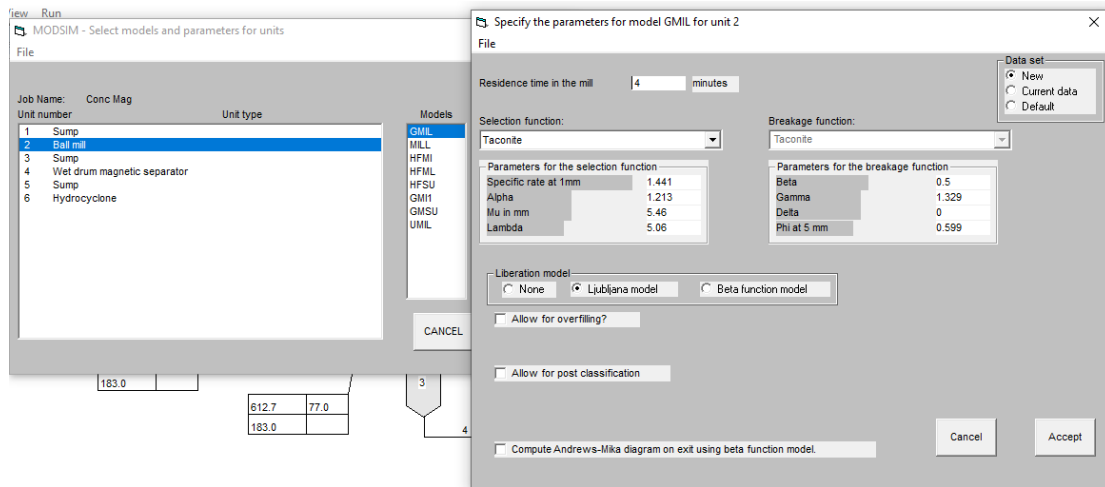
Size range: .00071 - .01

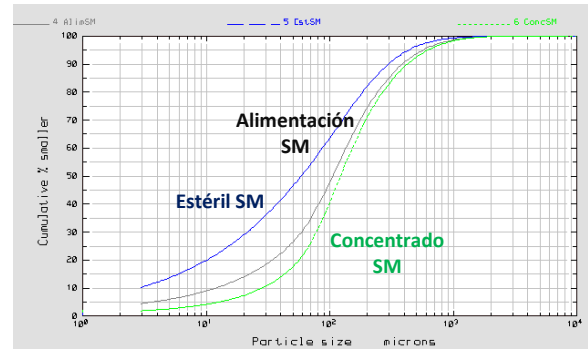
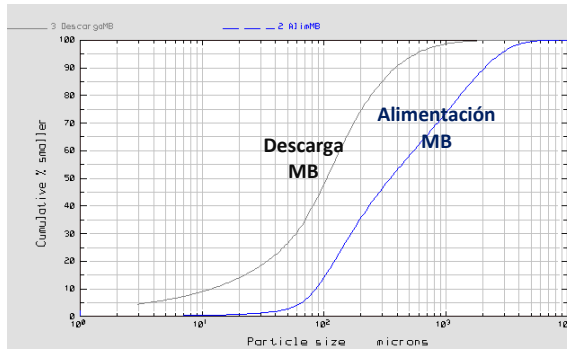
Import data from file

Cancel Accept

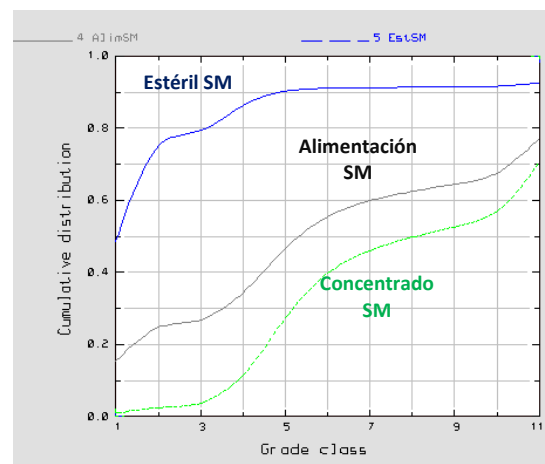
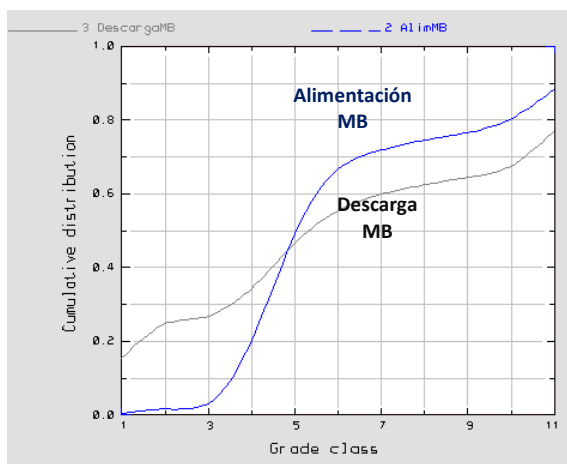
Listado de equipos/unidades/parámetros de simulación

MODSIM:





Curvas granulométricas en el molino de bolas MB (izda.) y separador magnético SM (dcha.)



Curvas liberación en el molino de bolas MB (izda.) y separador magnético SM (dcha.)

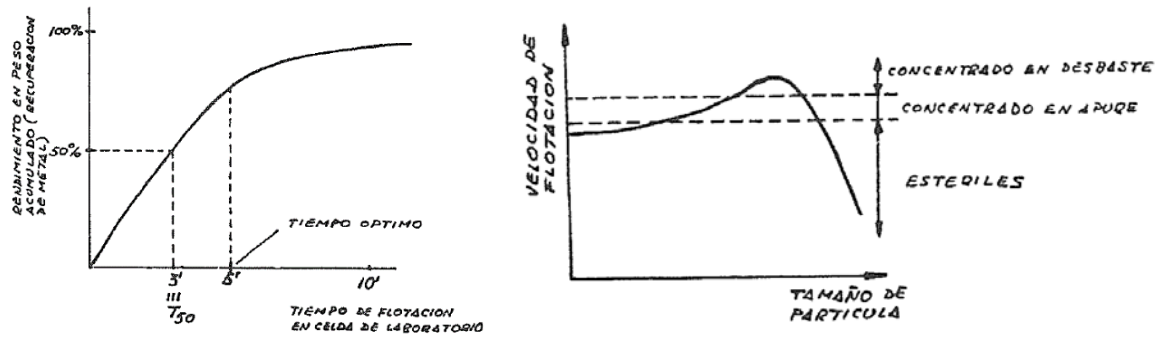
Parámetros de modelización del concentrador magnético

Wet Drum Magnetic Separator

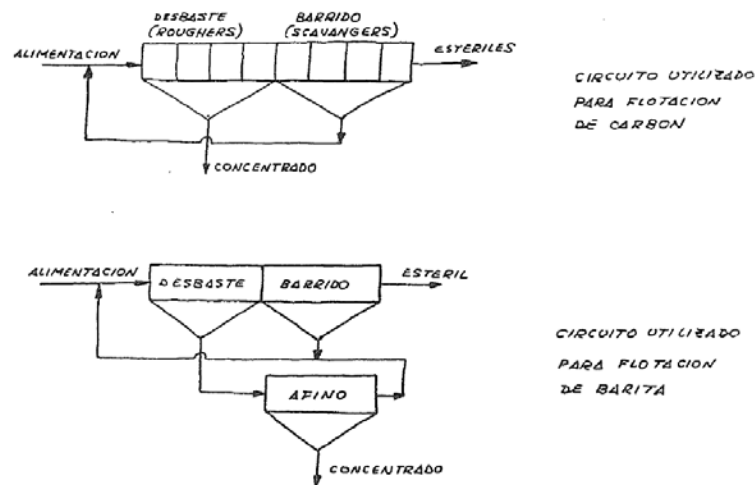
```

Stream number:          6
Job name: Conc Mag
Solid flowrate:        425.16 tonne/hr
Water flowrate:       134.75 m^3/hr
Slurry flowrate:      155.53 kg/s
Slurry volumetric flowrate: 0.6617E-01 m^3/s
Percent solids by mass: 75.93 %
Percent solids by volume: 43.43 %
Yield of solids:      141.73 %
Recovery of mineral Piza 74.16 %
Grade of mineral Piza 32.59 %
Recovery of mineral Magn 253.28 %
Grade of mineral Magn 67.43 %
  
```

En la concentración mediante flotación por espumas, el ensayo de laboratorio determina la cinética de la flotación en la etapa de desbaste, obteniéndose para los sulfuros una curva similar a la siguiente. La curva de velocidad de flotación es función del tamaño de la partícula.

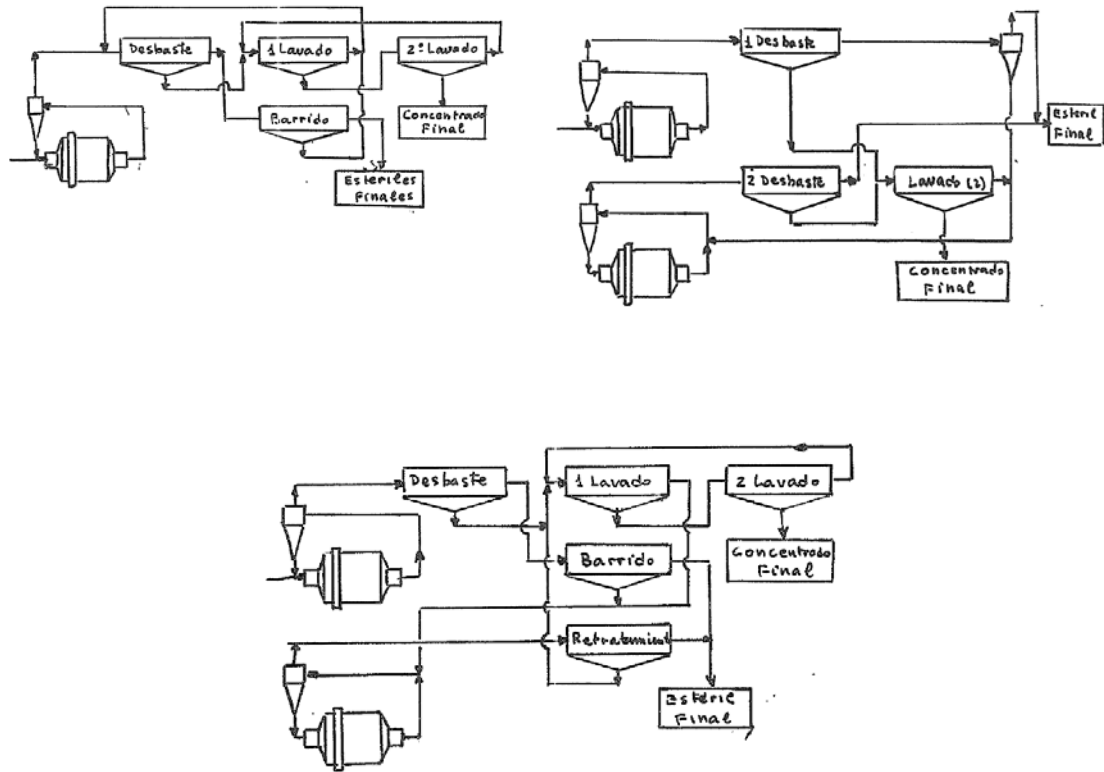


Circuitos de flotación de carbón y barita

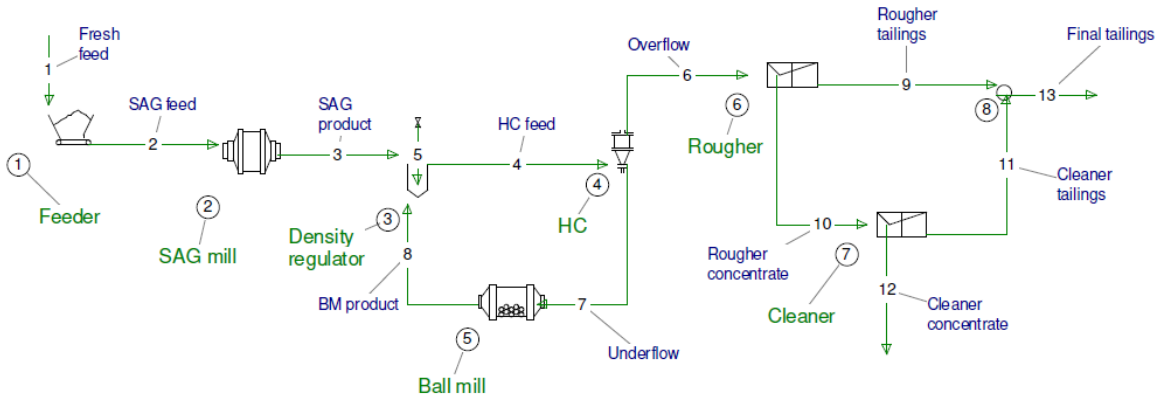
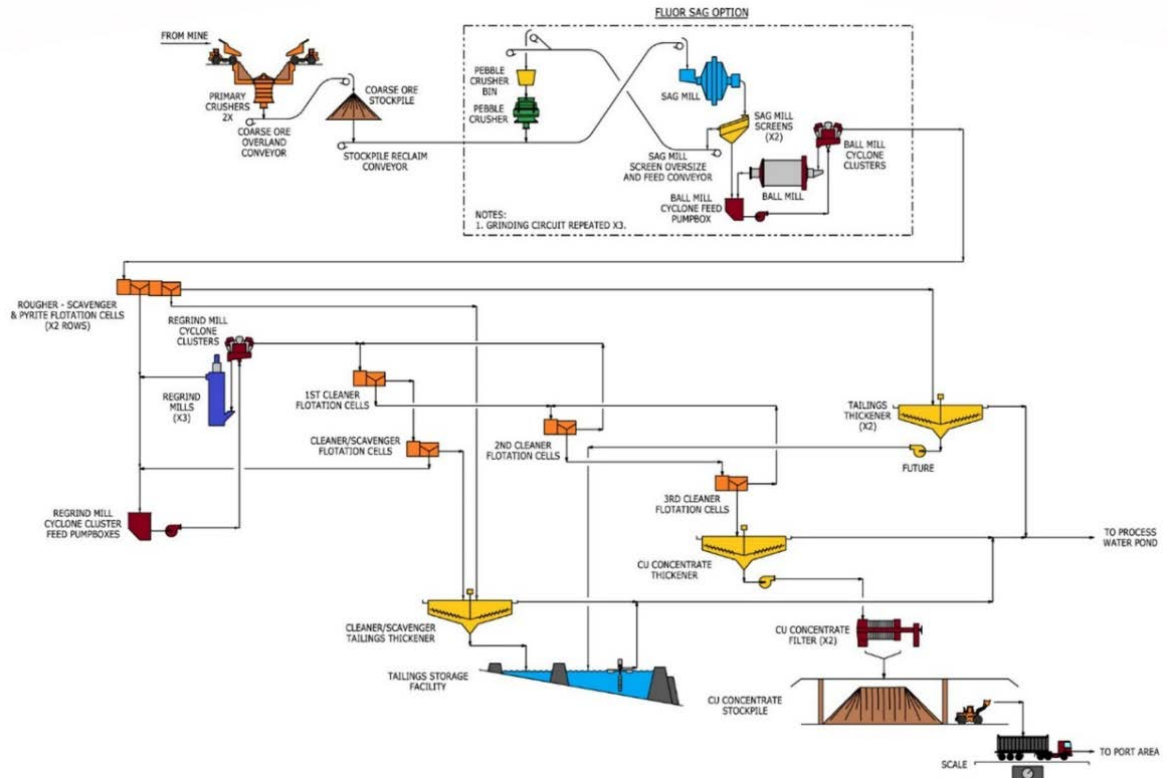


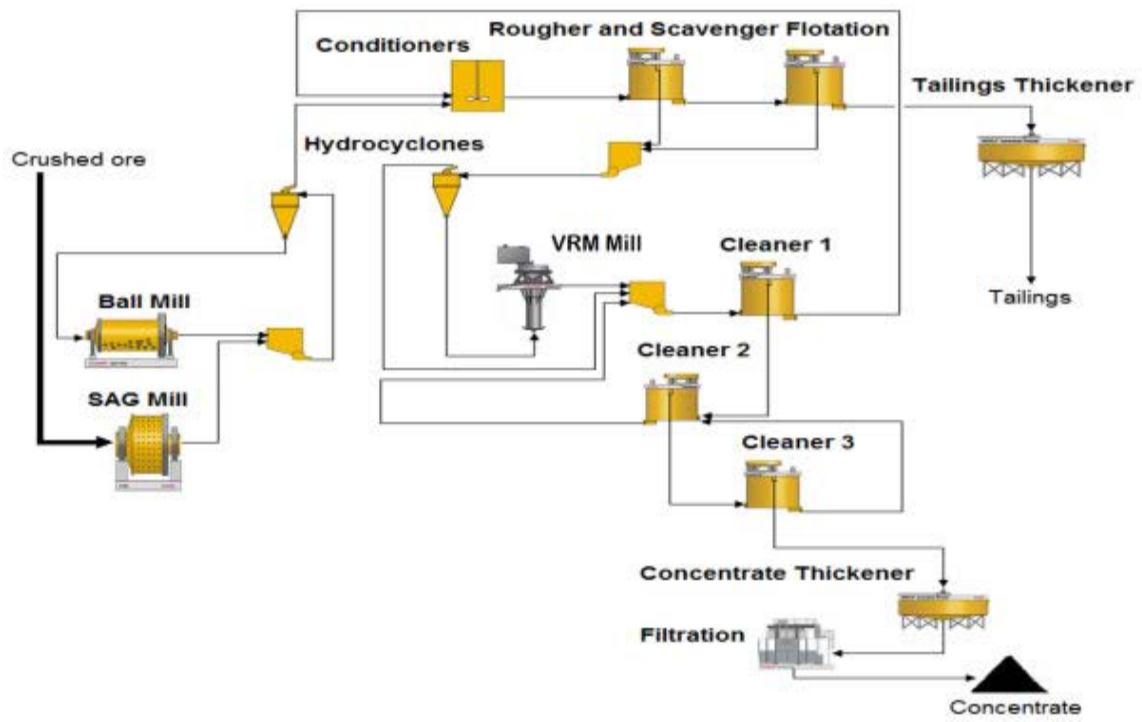
Esquemas típicos de circuitos de flotación de carbón y barita

Circuitos de flotación de sulfuros



Circuitos de flotación de sulfuros. Etapas de Desbaste (Rougher), Barrido-Apure (Scavenger) y Afino-Lavado (Cleaner)





Esquemas de circuitos de flotación