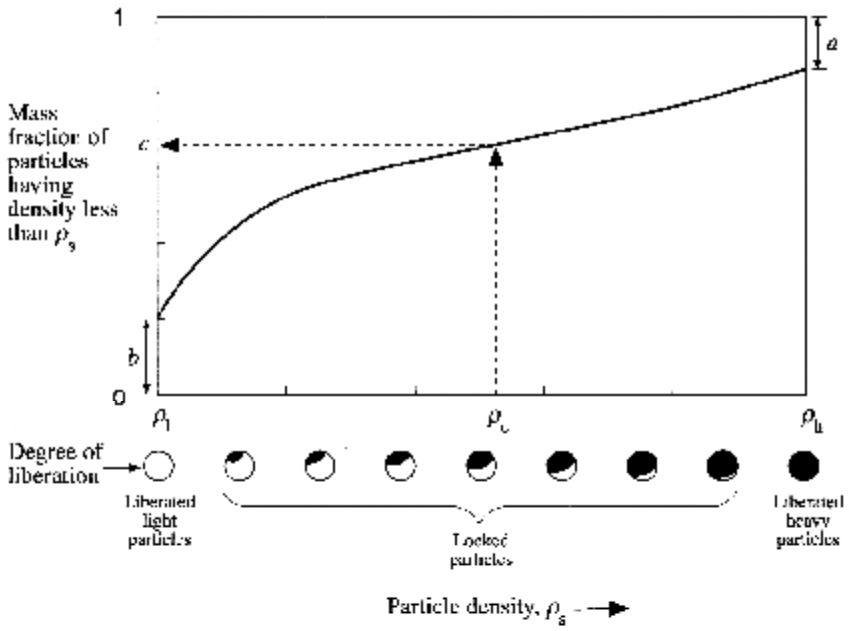
PNEUMATIC JIGGING OF FERRO ALLOYS - like the barbers cat?

PD Scott - Mintek 75

PHYSICAL SEPARATION – PRINCIPLES

PROPERTIES OF MATERIAL

- PARTICLES NOT MINERALS
- LIBERATION
- PARAMETER
  - **Density**
  - **Size**



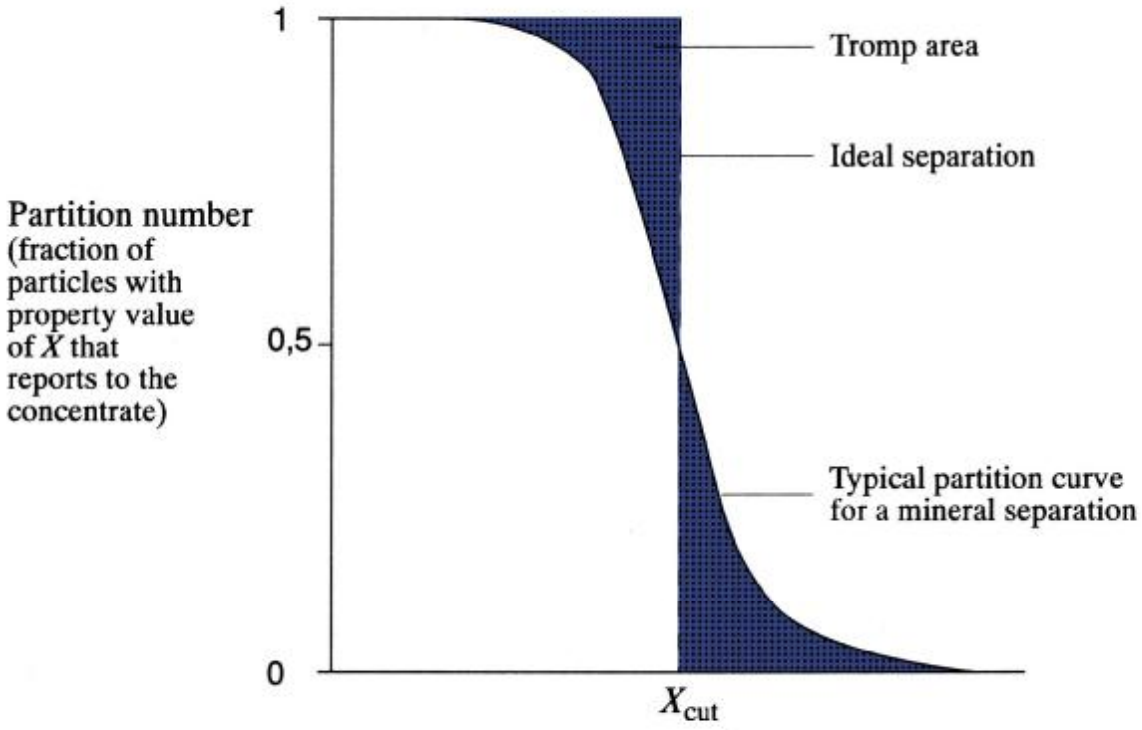
ρ_l = Density of light mineral
ρ_h = Density of heavy mineral

Densiometric curve showing the effect of incomplete liberation

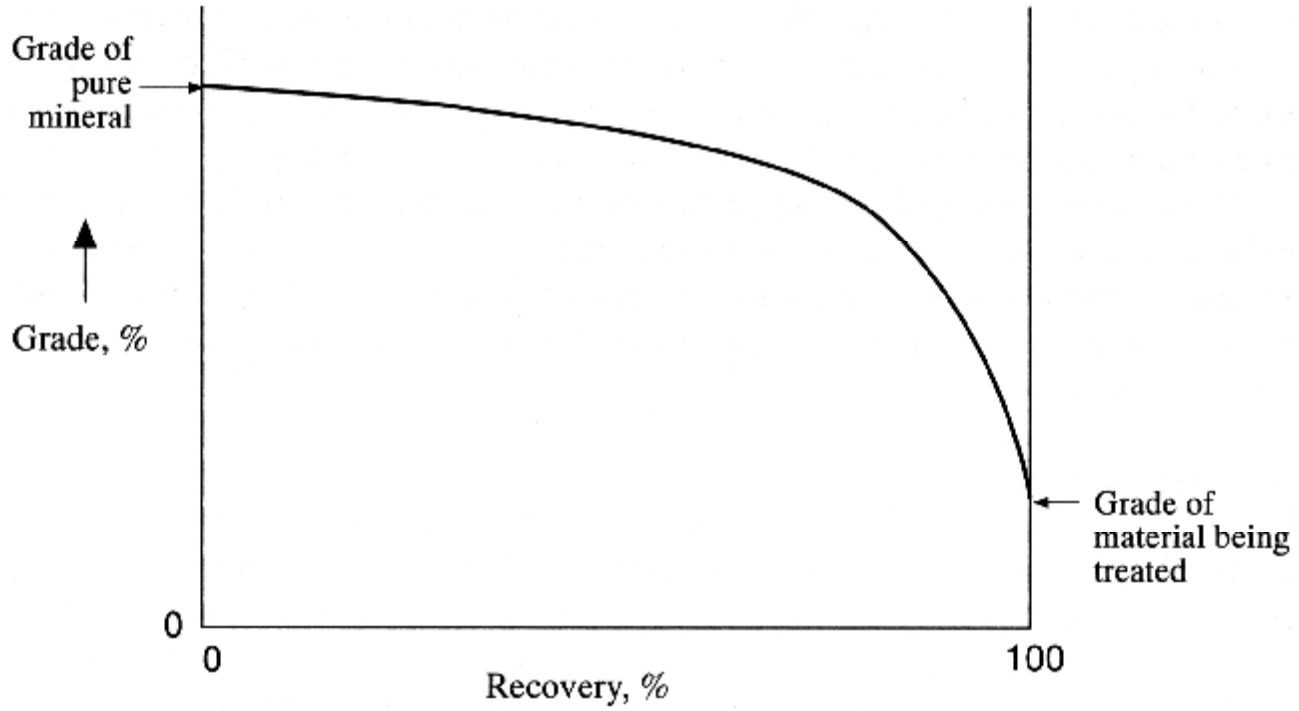
CHARACTERISTICS OF SEPARATOR

- TURBULENT REMIXING
- RESIDENCE TIME
- ENTRAINMENT

Partition curve for a mineral separation



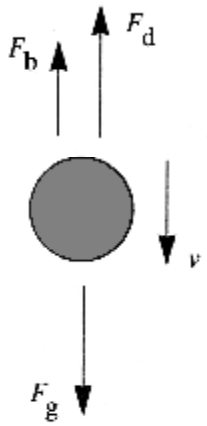
GRADE VS RECOVERY



Typical grade–recovery curve

GRAVITY SEPARATION PRINCIPLES

Forces acting on a particle as it settles through a fluid



Particle settles through the fluid at a velocity v

F_g = Gravitational force
= $Mg = Vg\rho_s$

F_b = Buoyancy force
= $V\rho_f g$

F_d = Hydrodynamic drag force on the particle as it moves through the fluid.
If the particle is spherical,

(a) under conditions of laminar flow,
$F_d = 3d\pi\eta v;$

(b) under conditions of fully developed turbulent flow,
$F_d = {}^1/_8 f_d \rho_f \pi d^2 v^2$

where M, V, ρ_s, d are respectively the mass, volume, density, and size (diameter) of the particle,
ρ_f, η are respectively the density and viscosity of the fluid,
f_d is the experimentally determined drag coefficient, and
g is the gravitational constant.

TABLE

Capacities of gravity concentrators

Type of concentrator	Typical maximum capacity, t/h
Dense-medium separator	
Tank or drum vessel	500*
Dyna Whirlpool	100
Stratification separator	
Jig	200*
Pinched sluice	4
Reichert cone	90
Spiral	5
Thin-film concentrator	
Shaking table	2,5
Bartles–Mozley table	2,5

* The capacities of these devices are highly variable and depend very strongly on the size and nature of the material treated, and on the geometry and operating conditions of the separator

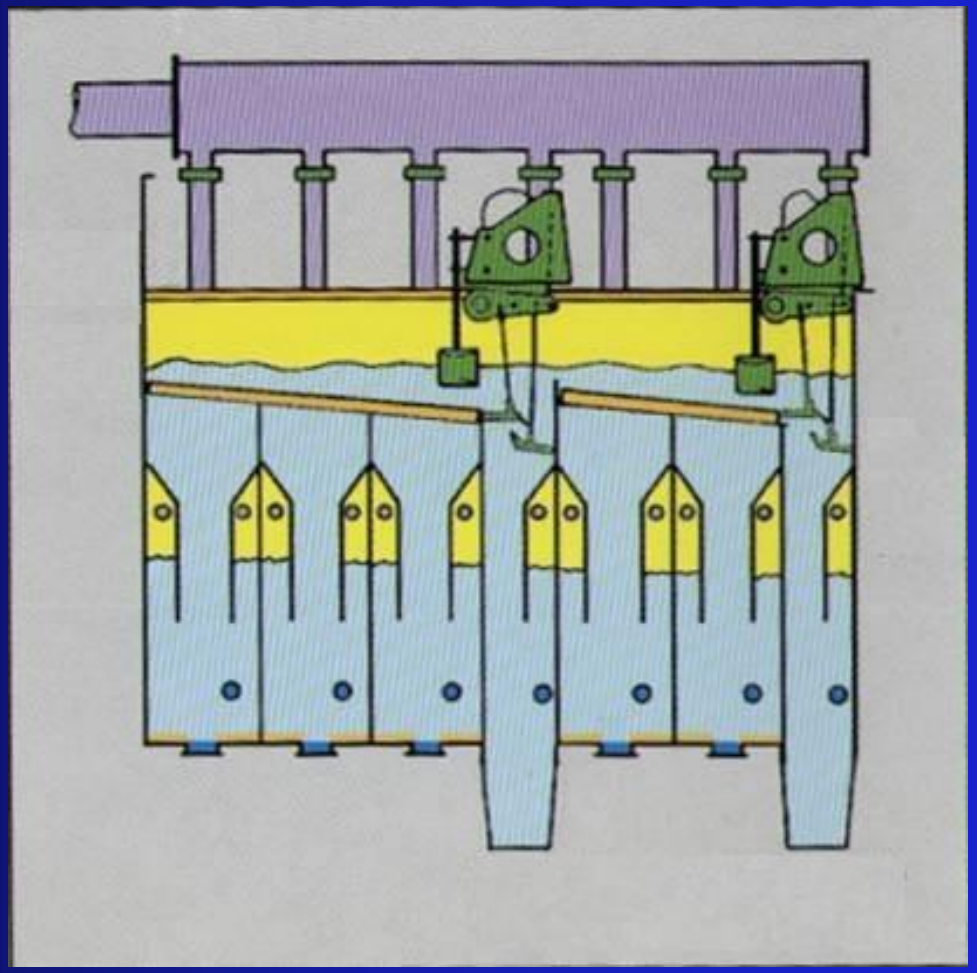
SETTLING RATES

- LARGE > SMALL PARTICLES
- DENSITY –
- SHAPE
- SOLIDS CONCENTRATION/MEDIA DENSITY
- HETEROGENEITY – DIFFERENT CUT SIZE

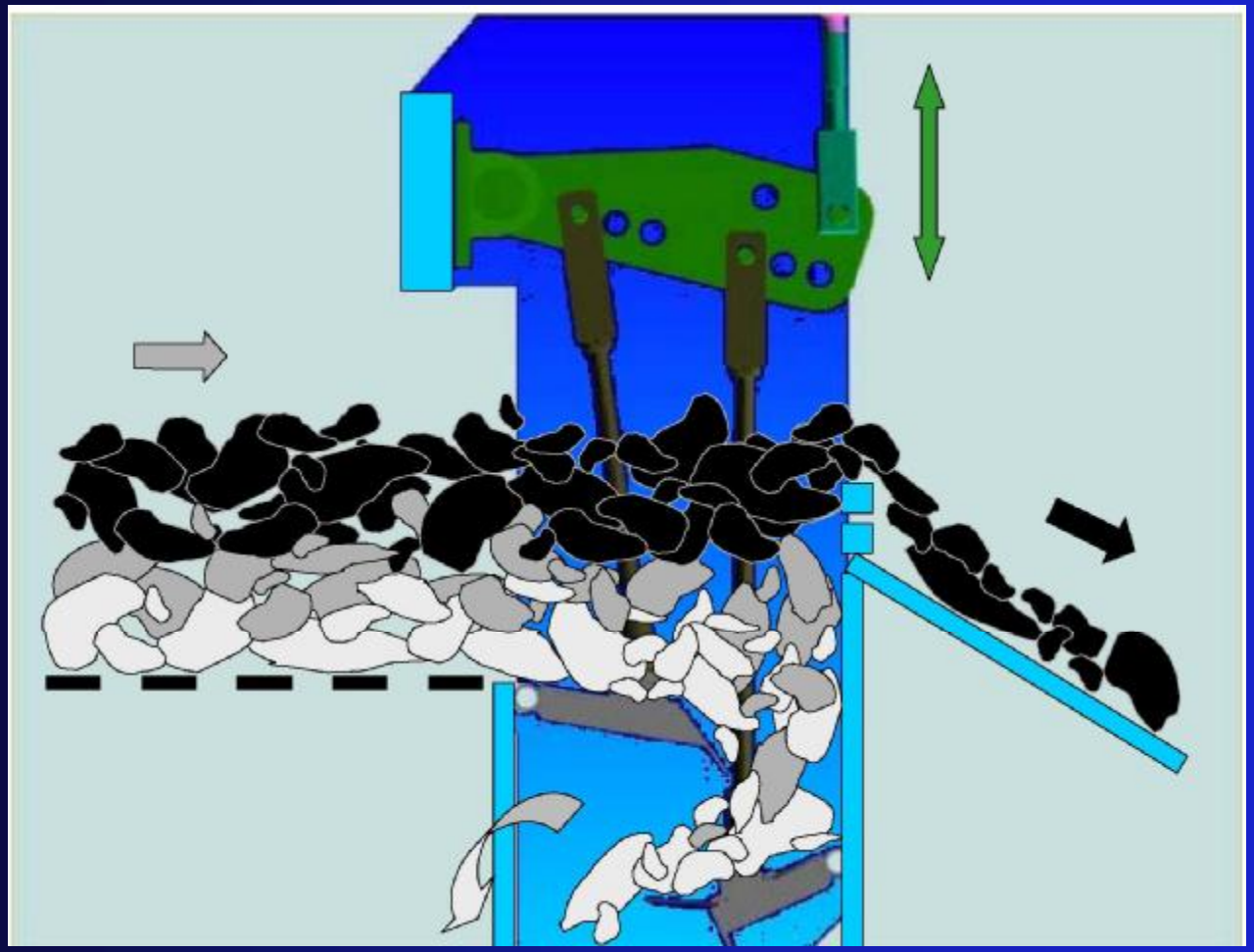
$$v_\infty = k_2\left[\, d(\rho_s - \rho_f\,)\right]^{0,5}$$

JIG SCHEMATIC

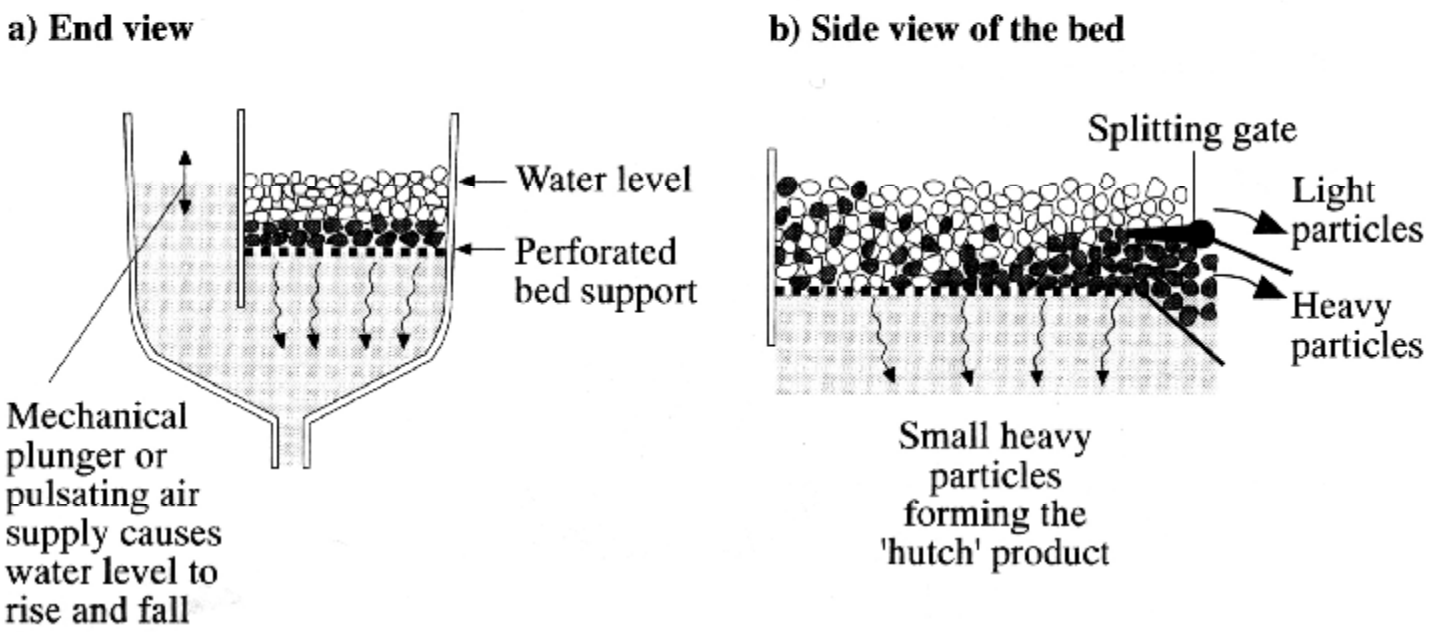
- Float
- Gate
- Air Intake
- Water level
- Media Density



MINERAL JIGS

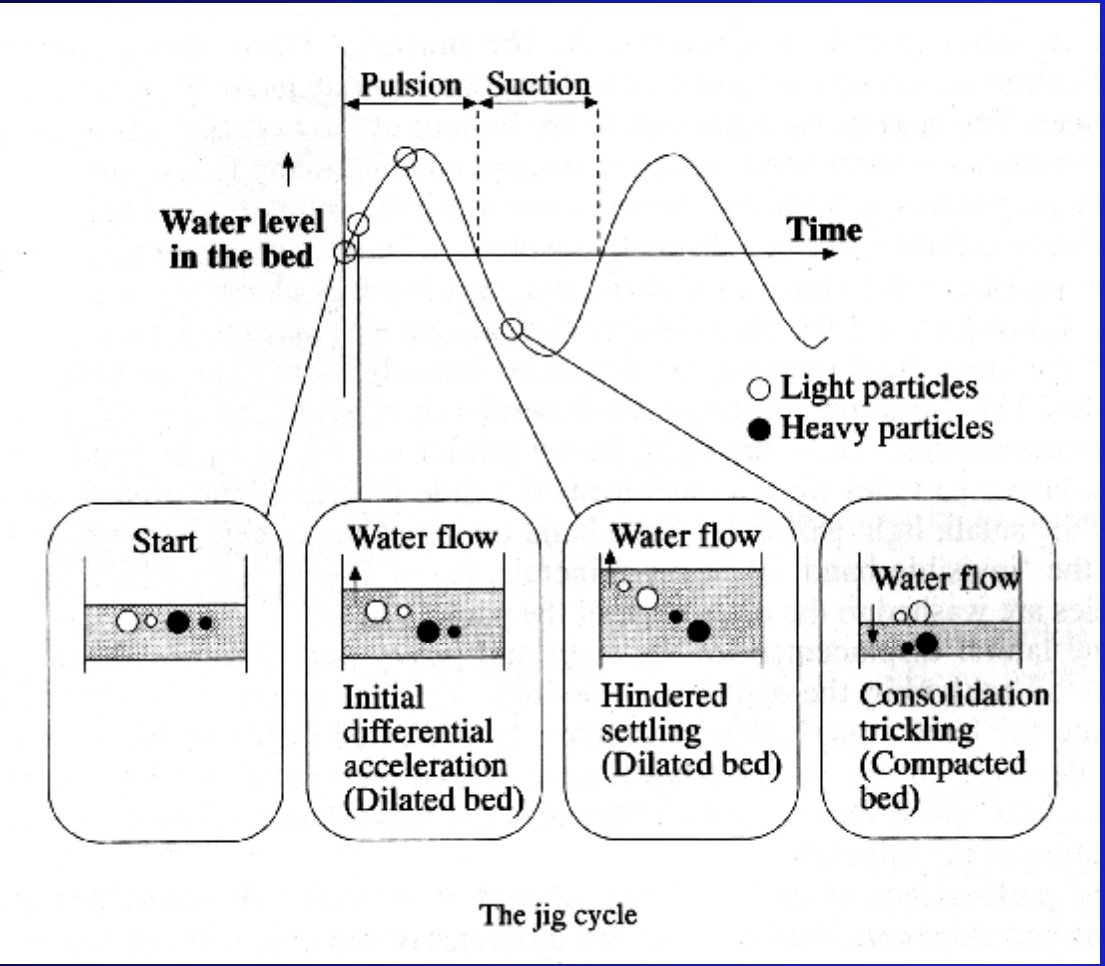


MINERAL JIGS



The mineral jig

MINERAL JIGS



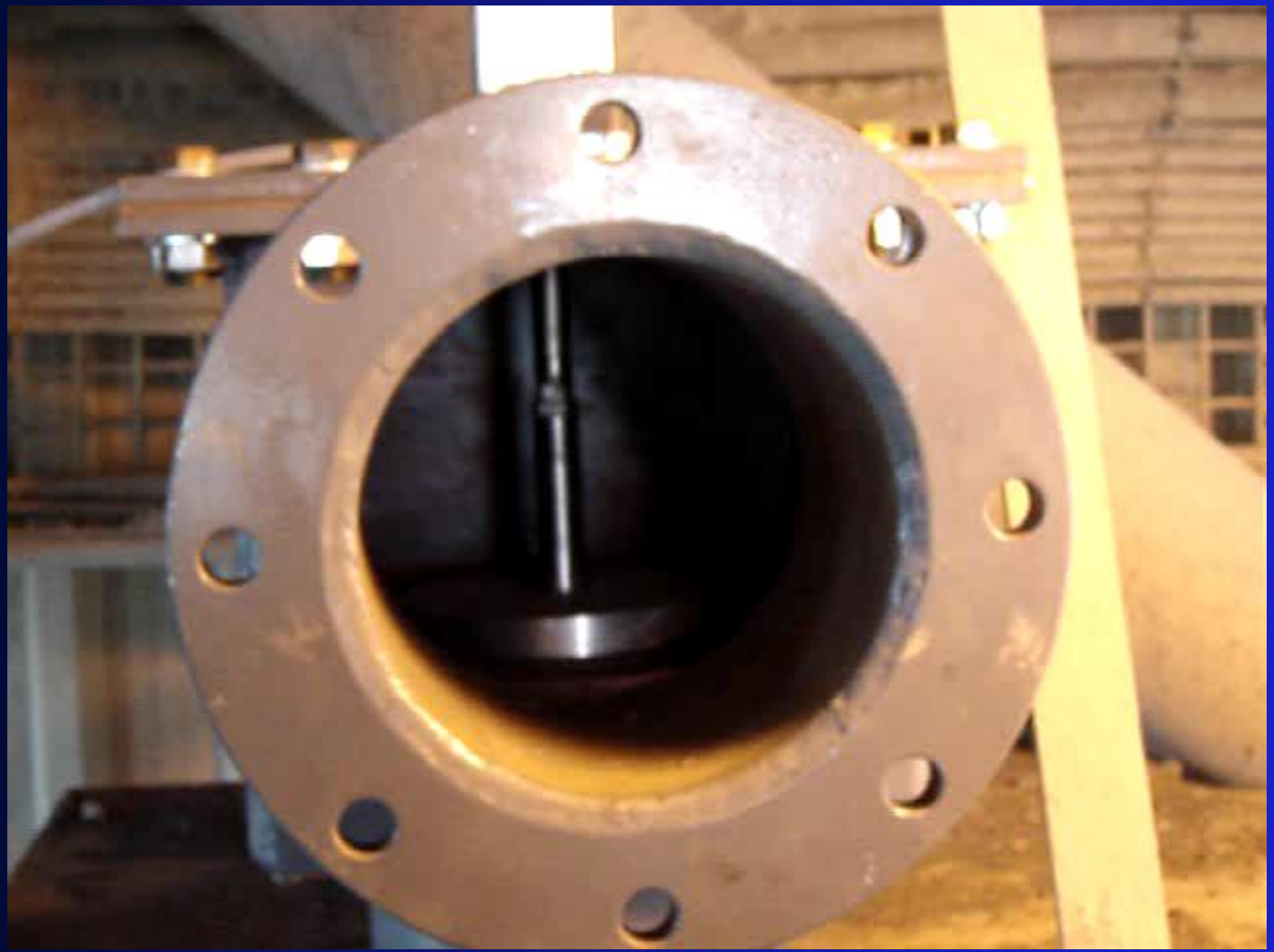
The jig cycle

JIG SIZE

- CAPACITY – WIDTH 60t/h = 1m
- LENGTH – RESIDENCE TIME

JIG PICTURE

VALVE ANIMATION



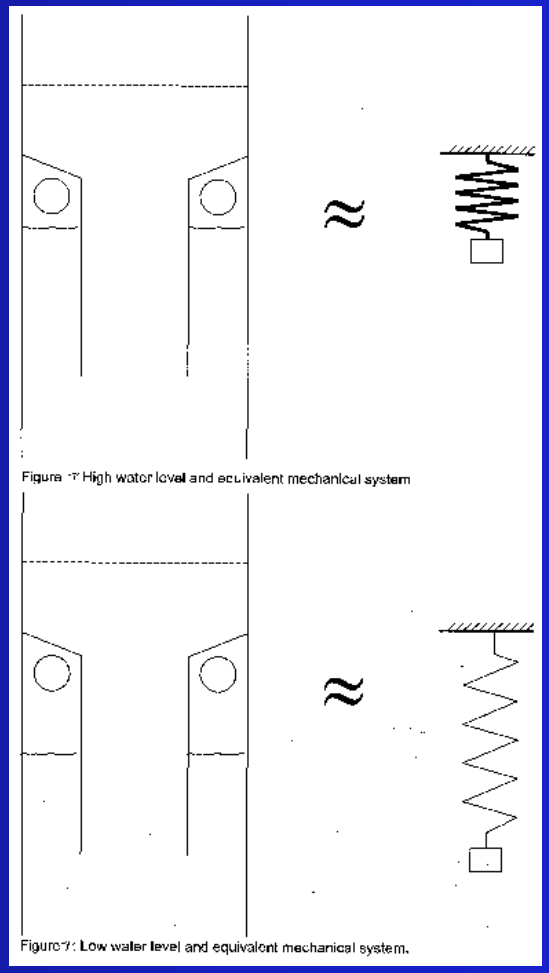
BELLOWS VALVE

SCREEN GATE

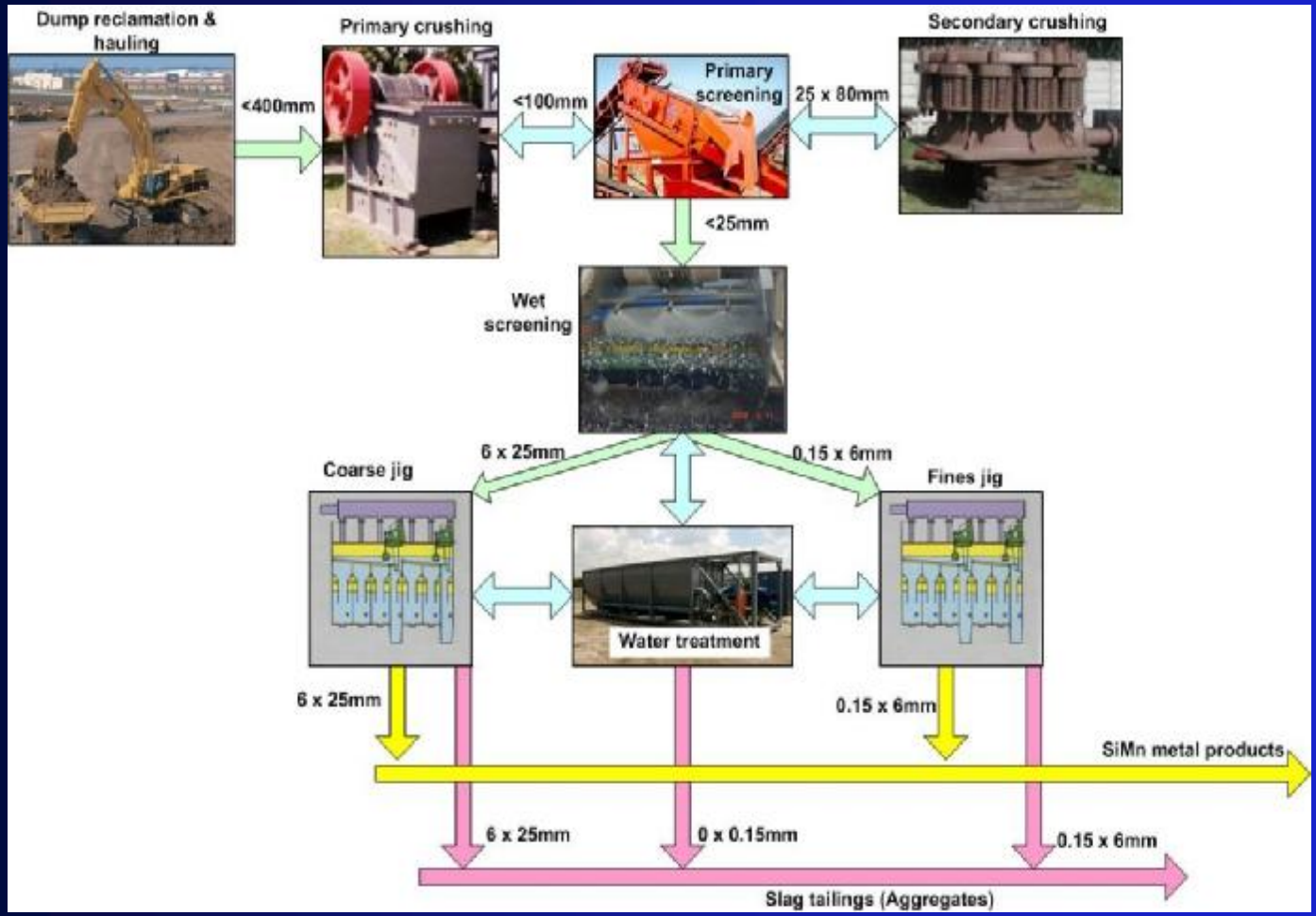
BATCH JIG

JIGSCAN

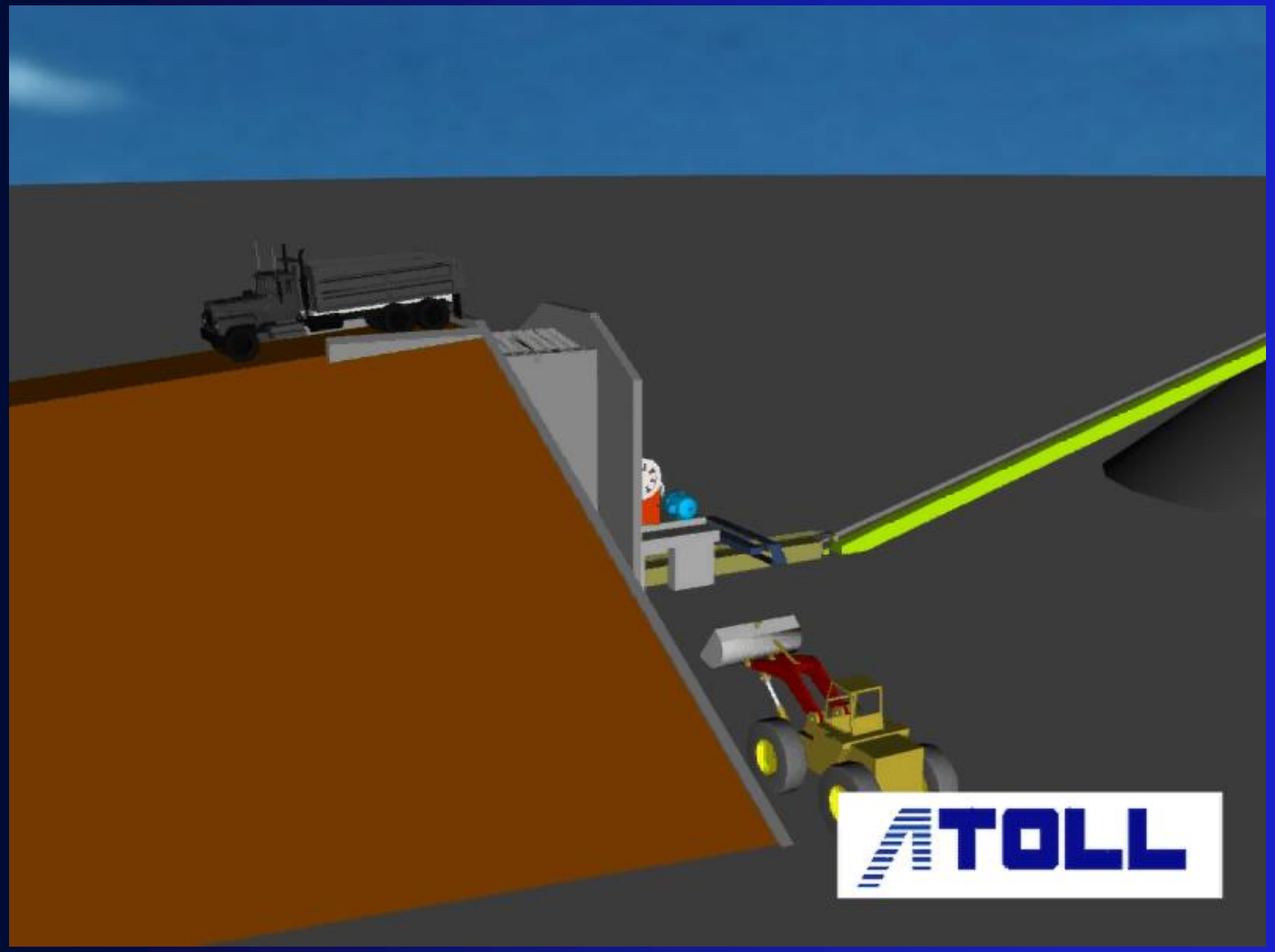
- WATER LEVEL
- PULSE VELOCITY
- BED DENSITY – NUCLEONIC
- MODEL BASED GATE CONTROL



BLOCK FLOW DIAGRAM



PLANT ANIMATION



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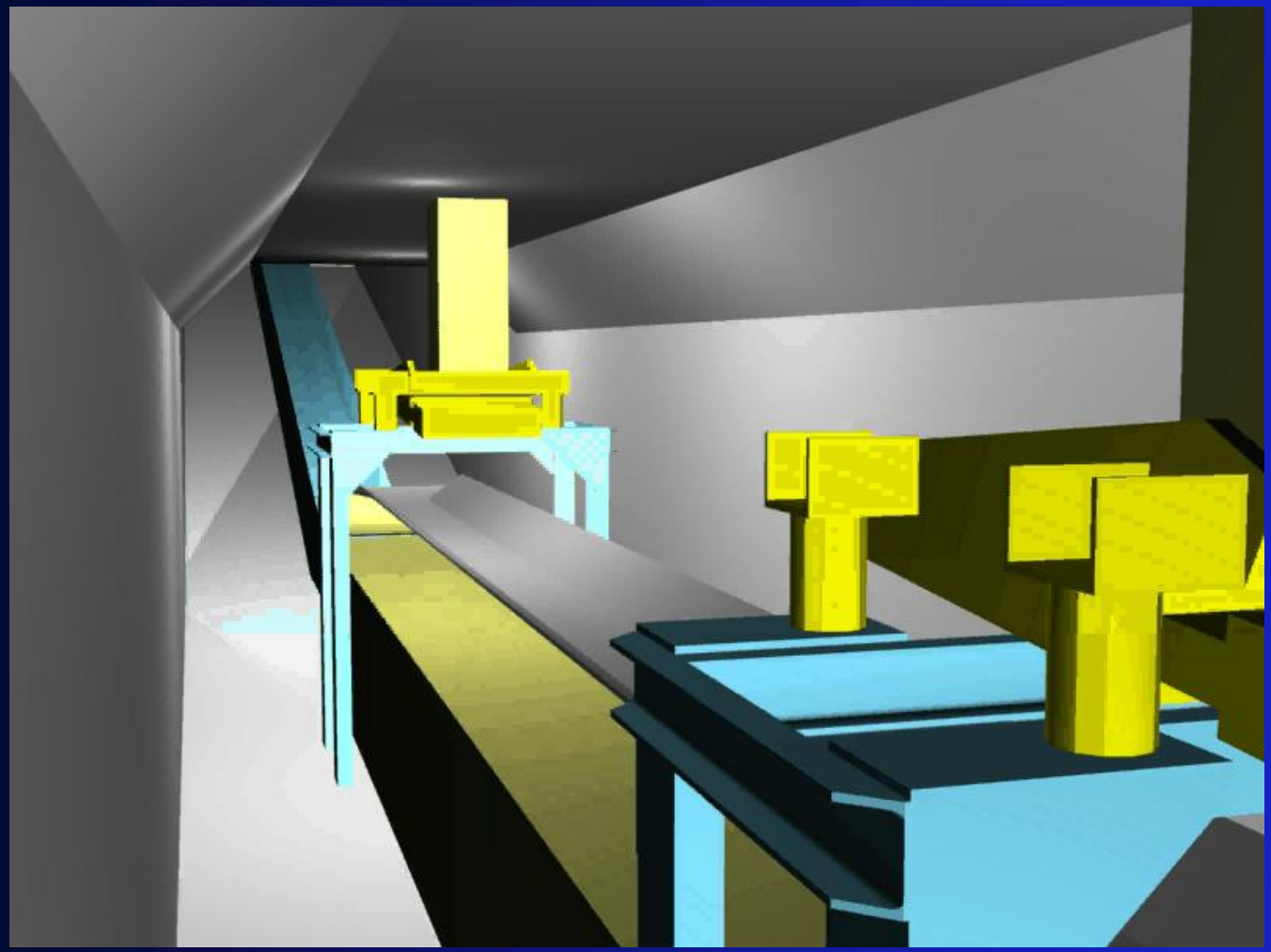

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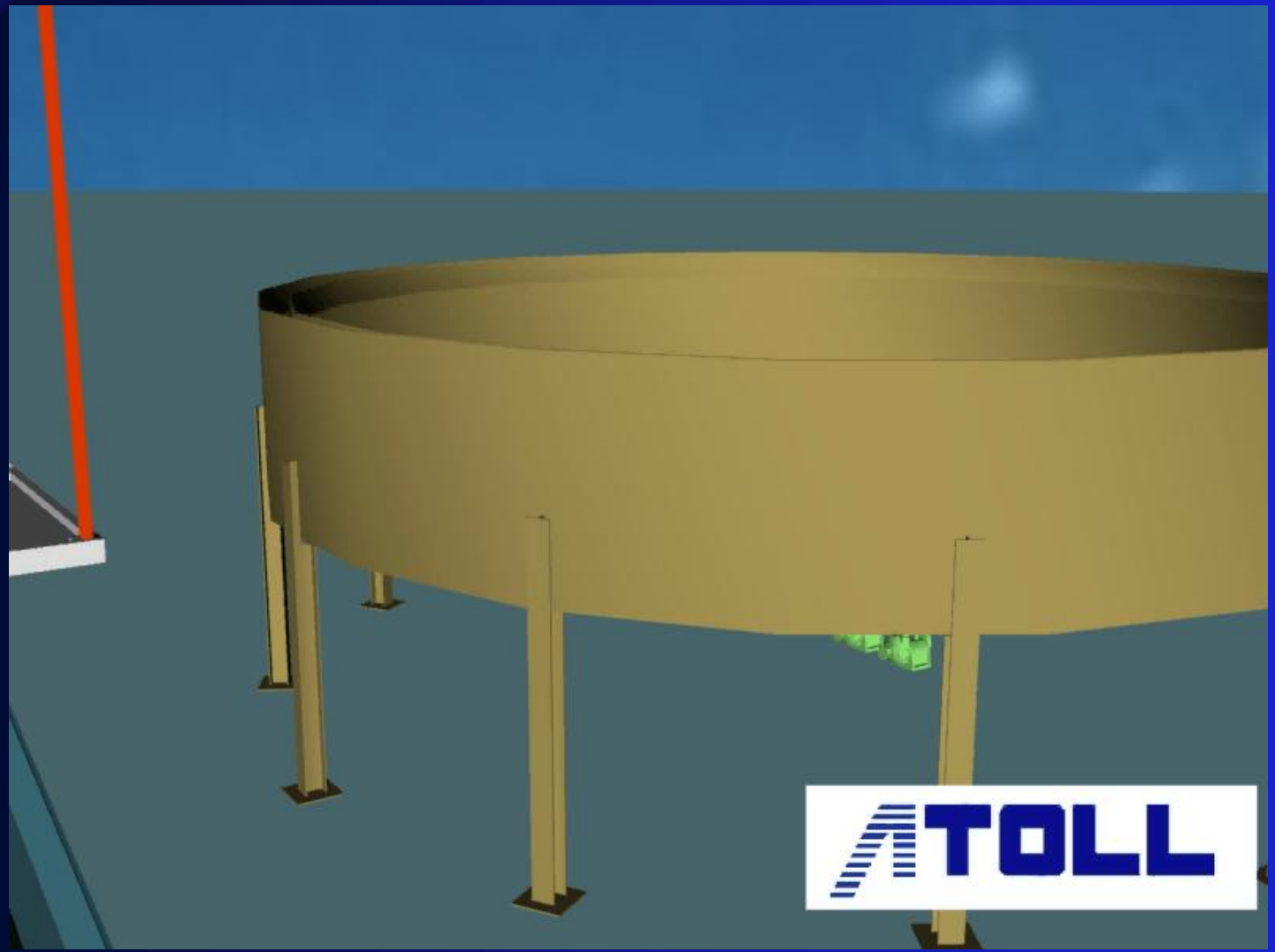
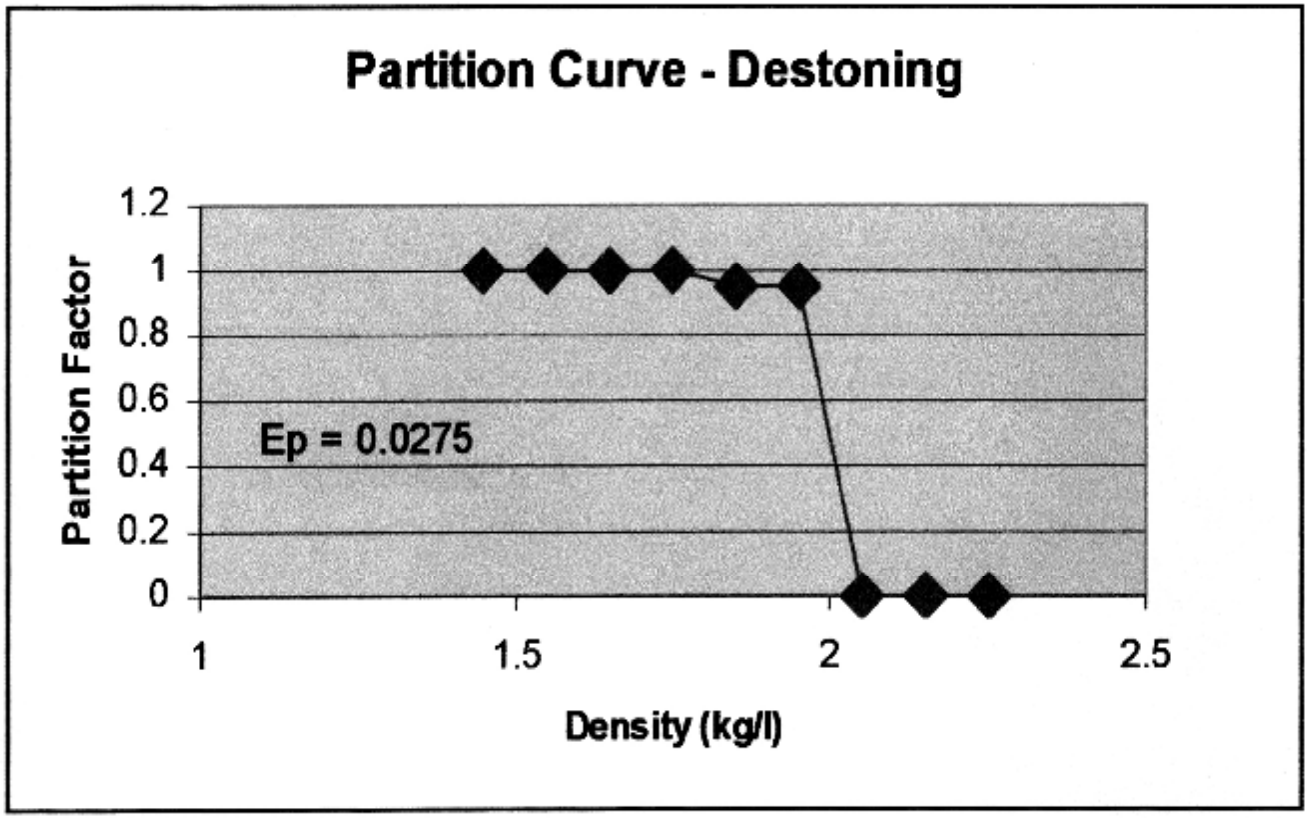


METALLOYS

ZESTAFONI

PARTITION CURVE



COAL PERFORMANCE

Table 1: Coarse coal measured performance

	FEED		CLEAN COAL				
COARSE	Ash%	t/h/m	Ash%	dp	Ep	Imp.	O.E.
FCB Washery:							
13-75mm Aus. *(TC)*	40-48	130	25	1,75	0,07	0,09	
0,5-75mm "		*110*		*1,7*	*0,08*	*0,12*	
APIC Pilot:							
6-40mm India *(27 N&M)*	47,1	20	25,5	1,55	0,043	0,08	92%
6-40mm Rsa *(Am on A1)*	38,5		18,2	1,9	0,07	0,08	99,4%
6-40mm Rsa *(Am on A1)*	38,8		16,7	1,67	0,08	0,12	92,3%
1-40mm Rsa *(Sa on A8)*	29,1	27	19,4	2,0	0,03	0,03	99,8%

Table 2: Fine coal measured performance

FINES	Ash%	t/h/m	Ash%	dp	Ep	Imp.	O.E.
FCB Washeries:							
2-13mm Aus *(TC)*	40	80	25	1,95	0,09	0,09	
0,5-2mm "		-		*2,15*	*0,19*	*0,17*	
0,3-8mm USA *(CL)*	(13)	75	(7)	1,7	0,08	0,114	
0,5-16mm Ger. *(SBW)*	30,6	63	6,8	1,6	0,07	0,117	

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- The APIC Jig and JIGSCAN Controller take the guesswork out of Jigging, Grant Loveday, Andrew Jonkers
- Atoll, Private Communications