

Ore Washing

Why and How?

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To Wash

“to remove matter by or as by the action of water”(dictionary.com)

Wash in Mining Sense

- Remove material from surface of ore.
- Assumes readily liberated particles of ore with loosely agglomerated gangue
- Distinction from separation; Screens, trommels, classifiers, cyclones, spirals
- No size reduction

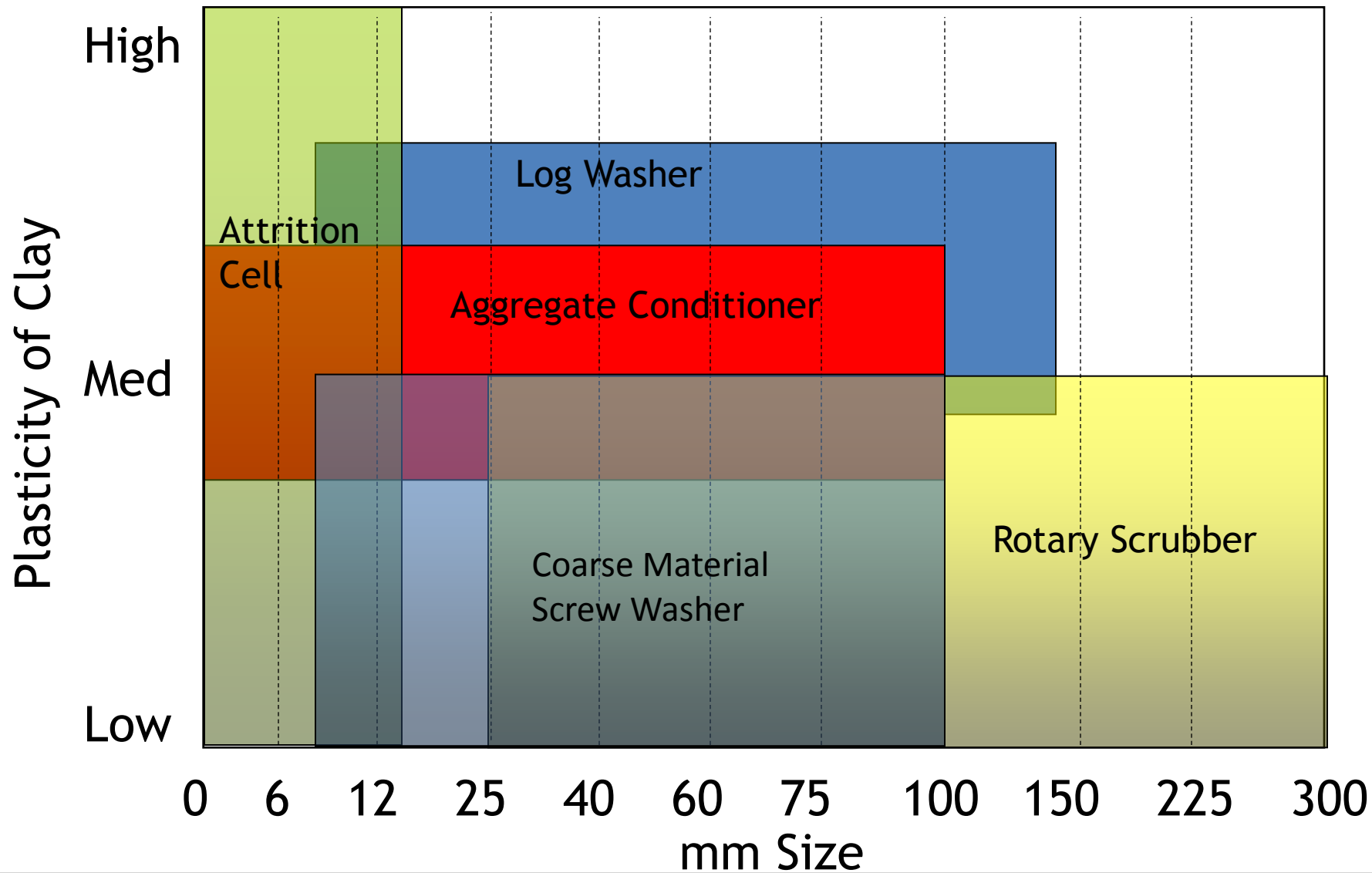
Why Wash Ore

1. Reduced gangue to process
2. Better quality
3. Higher throughput
4. Easier to dewater product

Key Questions

1. How much energy ?
2. What throughput ?
3. What PSD ?
4. How much time ?

Feed Matrix



Testing



Drum Scrubber

[video](#)

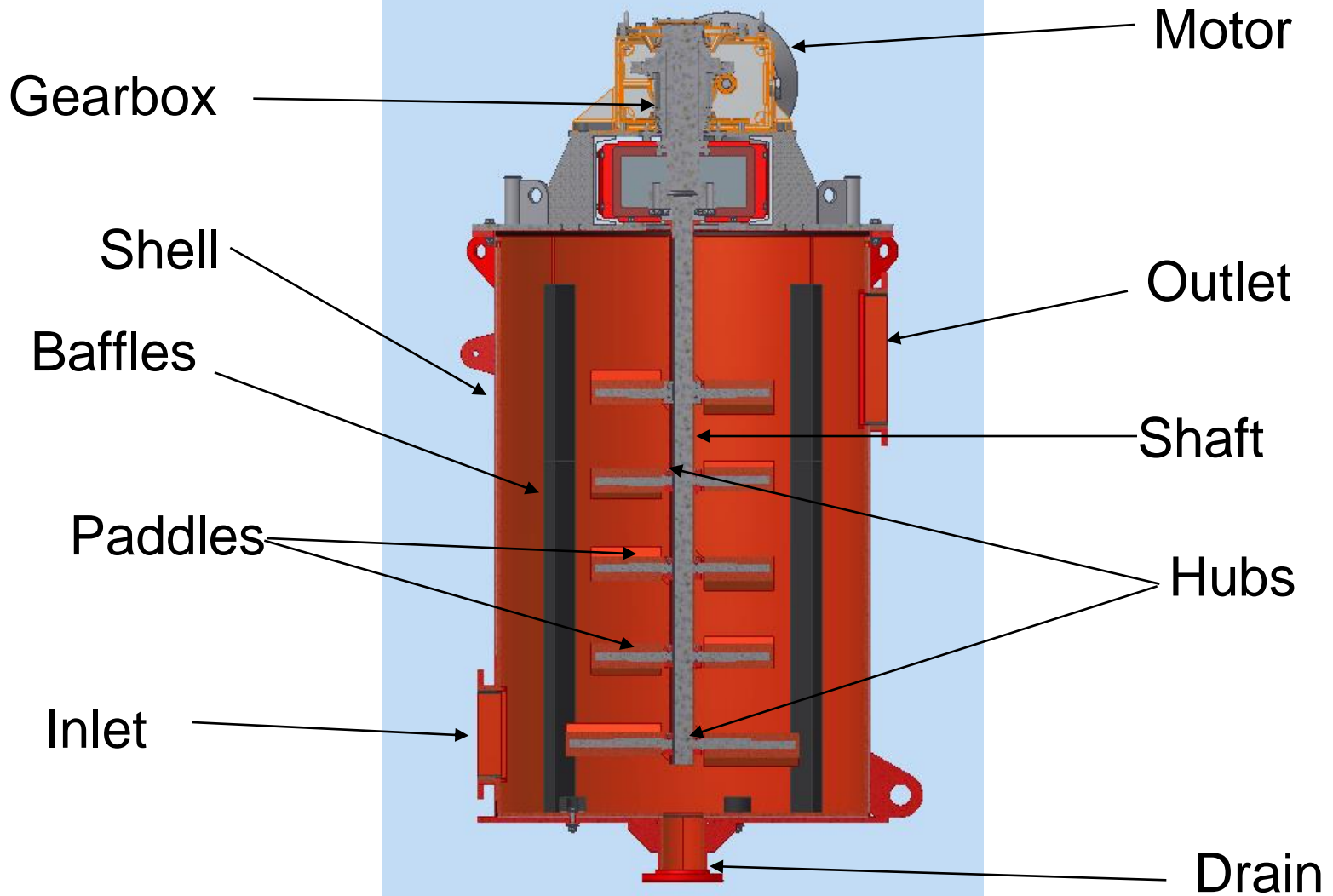


Logwasher



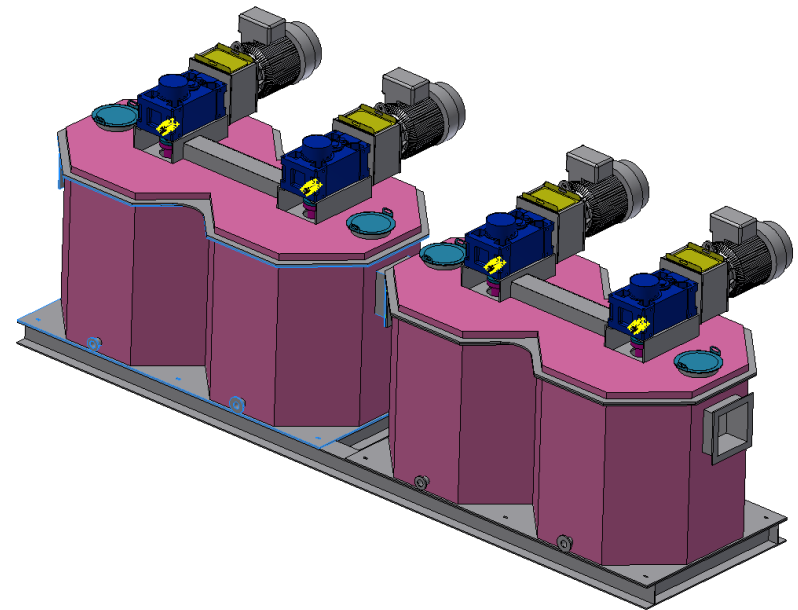
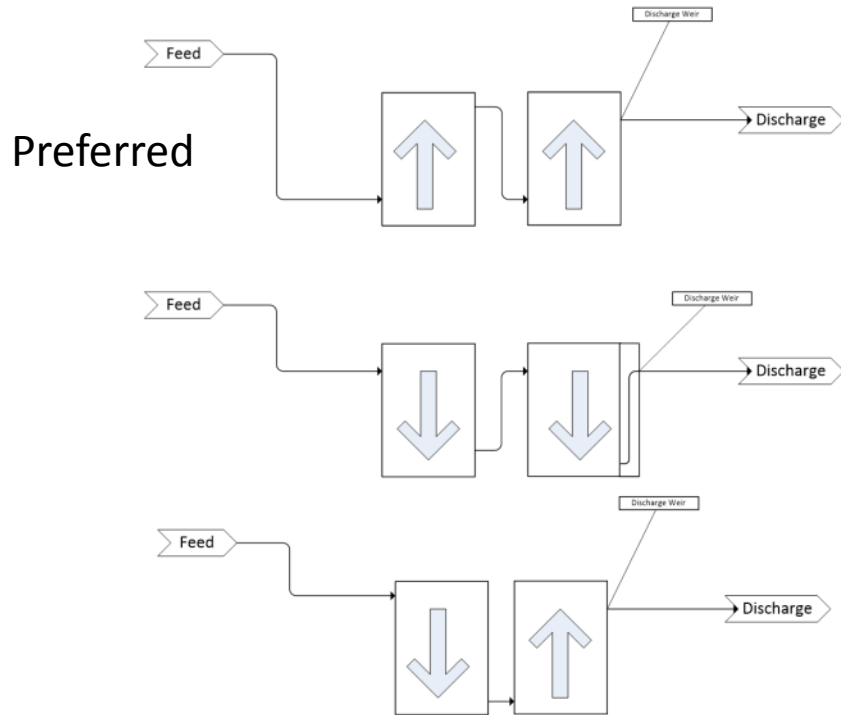
Attrition cell

Attrition Cells



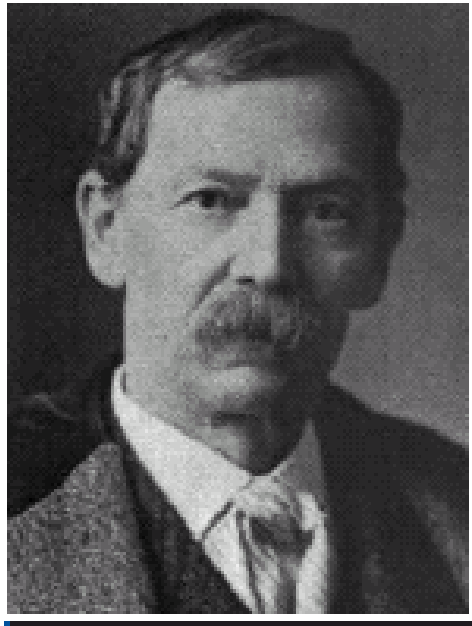
Arrangement

- To minimise short circuiting arrange in series

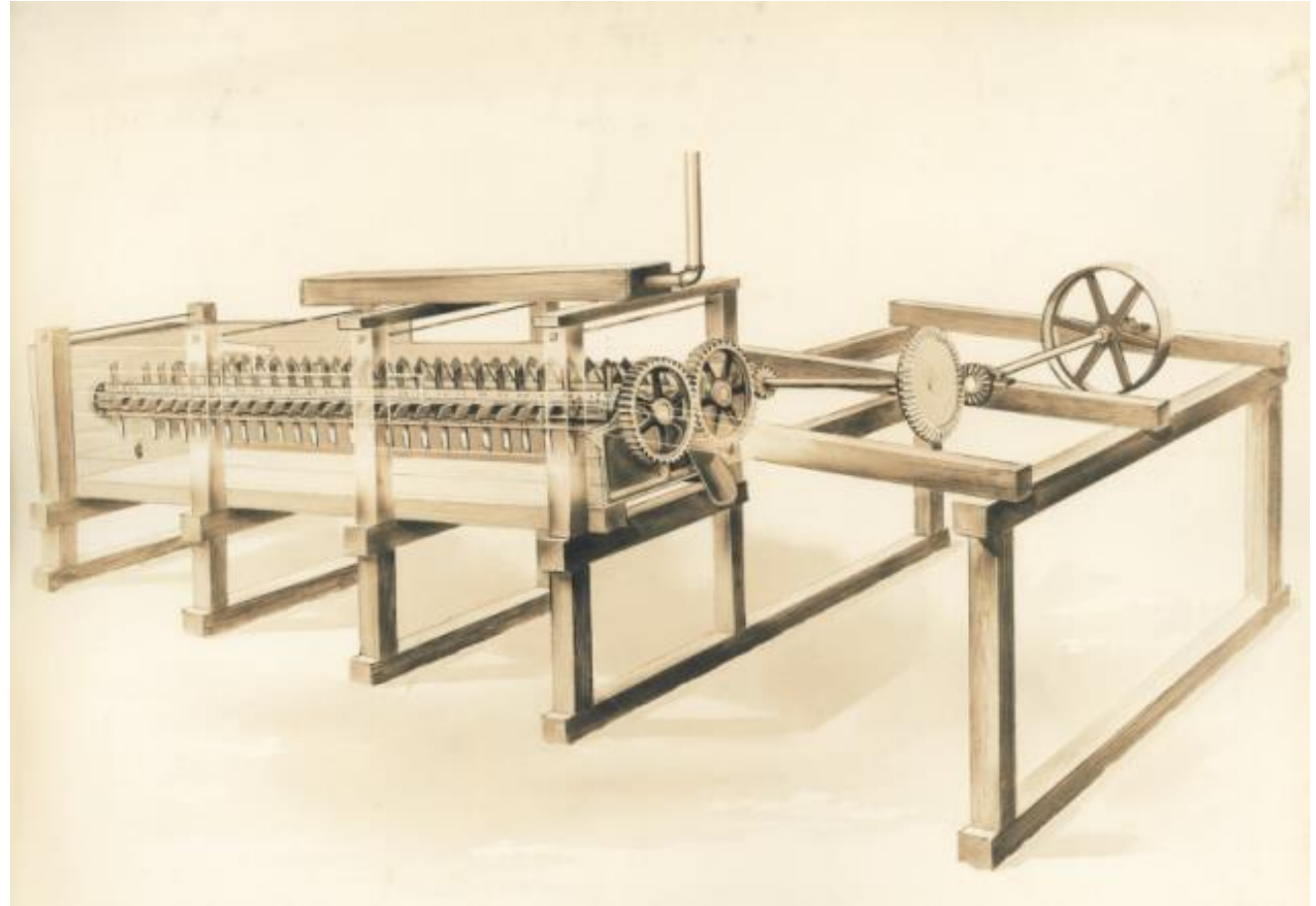




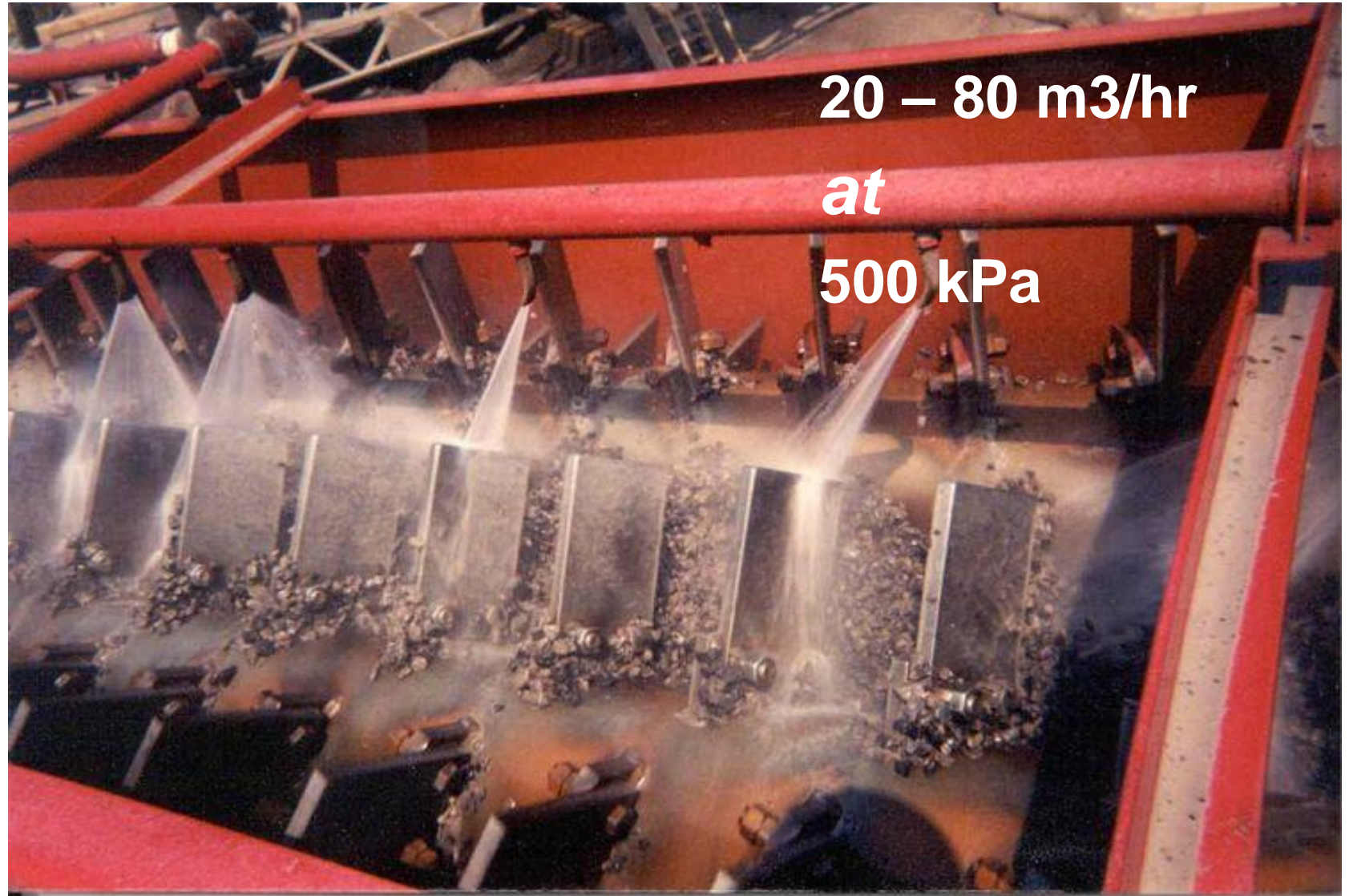
LOG WASHERS



Samuel Calvin McLanahan patented the Log Washer on January 27, 1891.



Spray Water



20 – 80 m³/hr

at

500 kPa

Aggregate Conditioner aka “Blade Mill”



COARSE MATERIAL SCREW WASHERS



Coarse Screw Washer Process

- Feed and water are introduced in the feed end of the unit
- Paddles and screw flights provide a moderate scrubbing and agitation
- This scrubbing along with rising current water breaks down and washes off light coatings and light clays
- Organics removal (i.e. wood, leaves, etc.)
- The “cleaned” product is then conveyed to the discharge end of the box
- A rinse screen typically follows the Coarse Material Screw Washer

Rotary Drum Scrubber



Scrubbers and Scrubber Screens combined



Drive Options

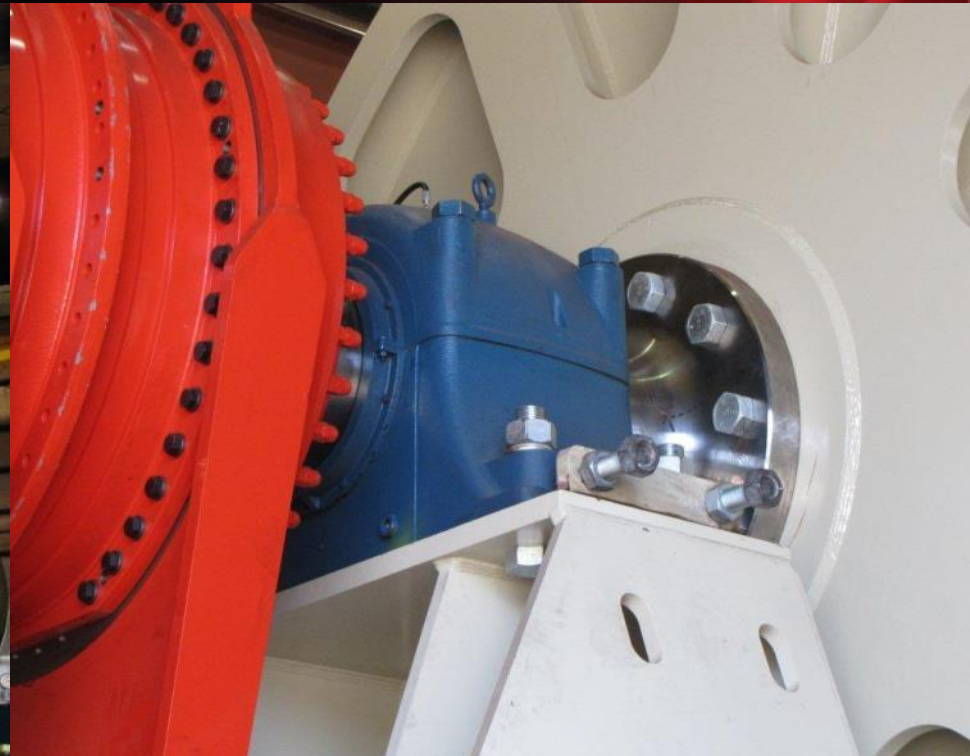
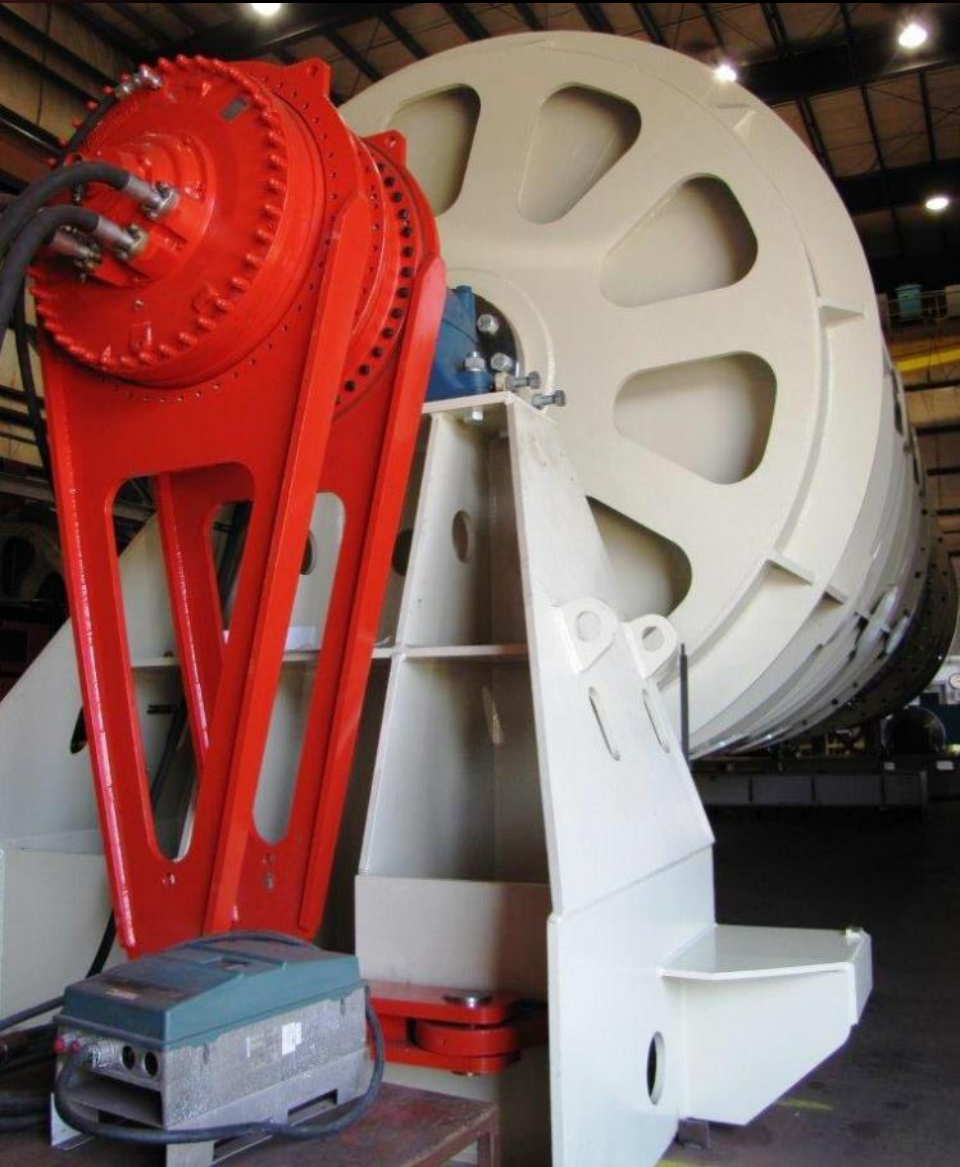
- Friction Drive
 - Competitive cost
 - Limited to ~100kW
- Chain Drive
 - Competitive cost
 - Limited to ~400kW
- Hydraulic 3-point suspension
 - Infinitely variable speed
 - Good to ~1500kW
 - Close spacing (end mounted)
 - Low dynamic loads
- Gear and pinion
 - Precise gear pinion alignment
 - VFD can be costly
 - Good access to discharge end for maintenance

Support mechanism

- Trunnion mounted end bearing with hydrostatic pads (girth gear drive)
 - Extensive oil cooling and filtering
- Trunnion mounted end bearing with centre mounted planetary drive
 - Limited to ~900 kW
- Roller support
 - 3 or 4 point options
 - Simple/robust



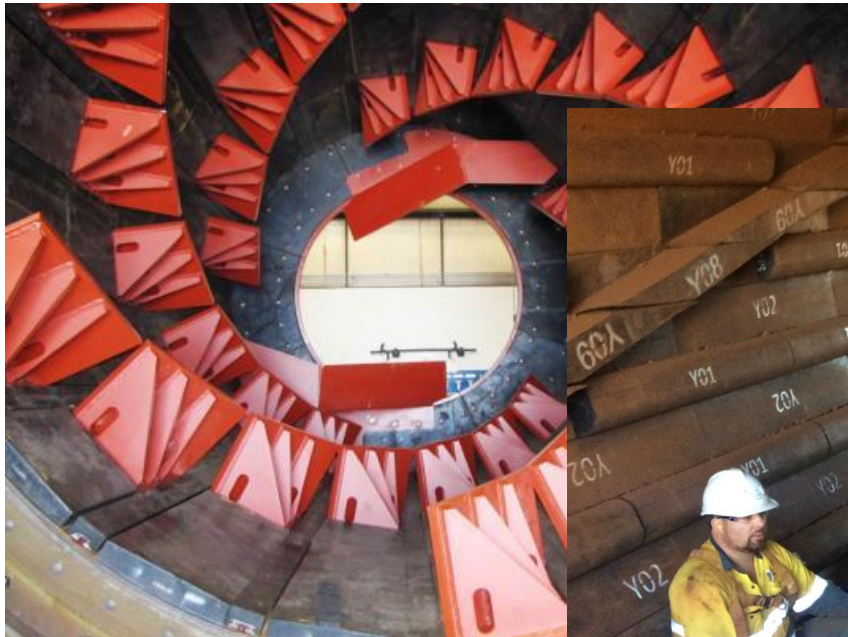
Three Point Support System



Stub shaft & double row spherical roller bearing at drive end.

Liners, Lifters & Weirs

- Retard or advance
- Lift and rotate
- Adjustable



Size and Capacity

- Power 0.3 – 1.5 kWhr/t
- L/D ratio 1.8 – 3.0
- Up to 5m dia / 15m L
- Custom designed

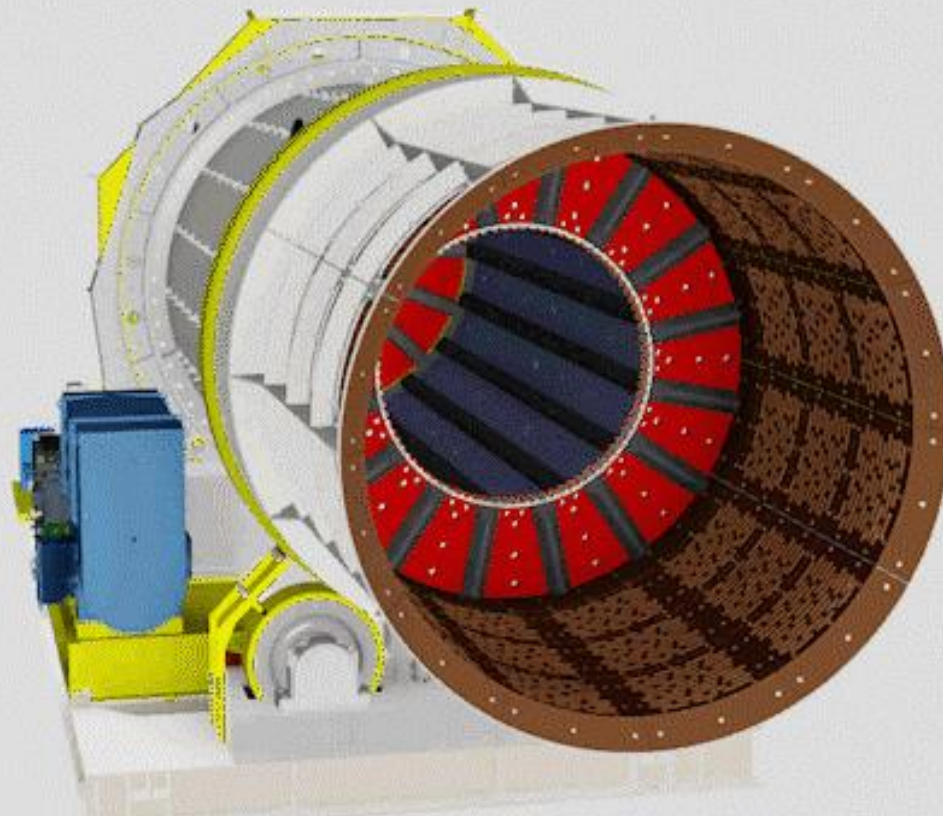
Scrubber Screen

- Combines two functions
- Simplifies layout – less structure



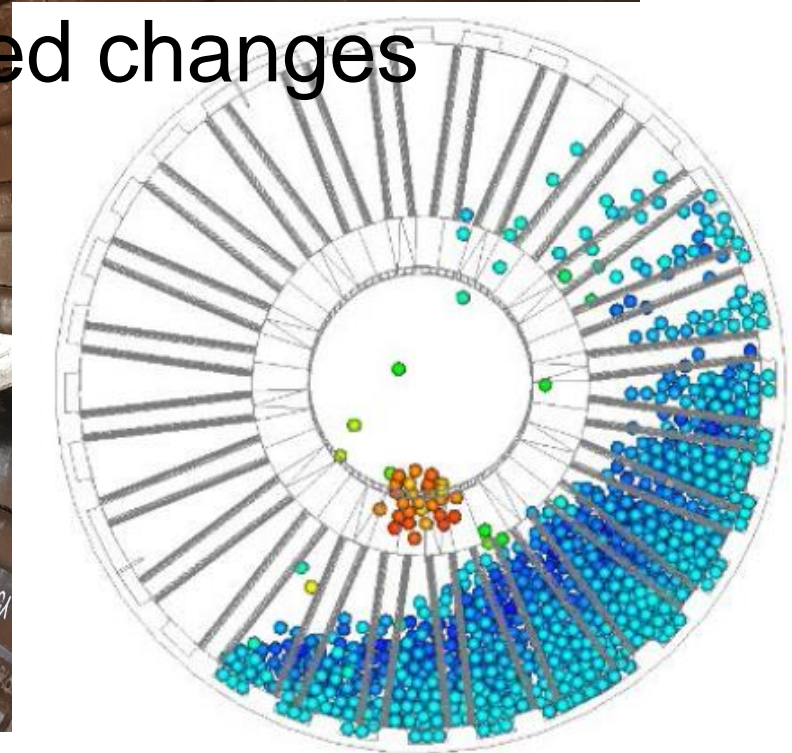
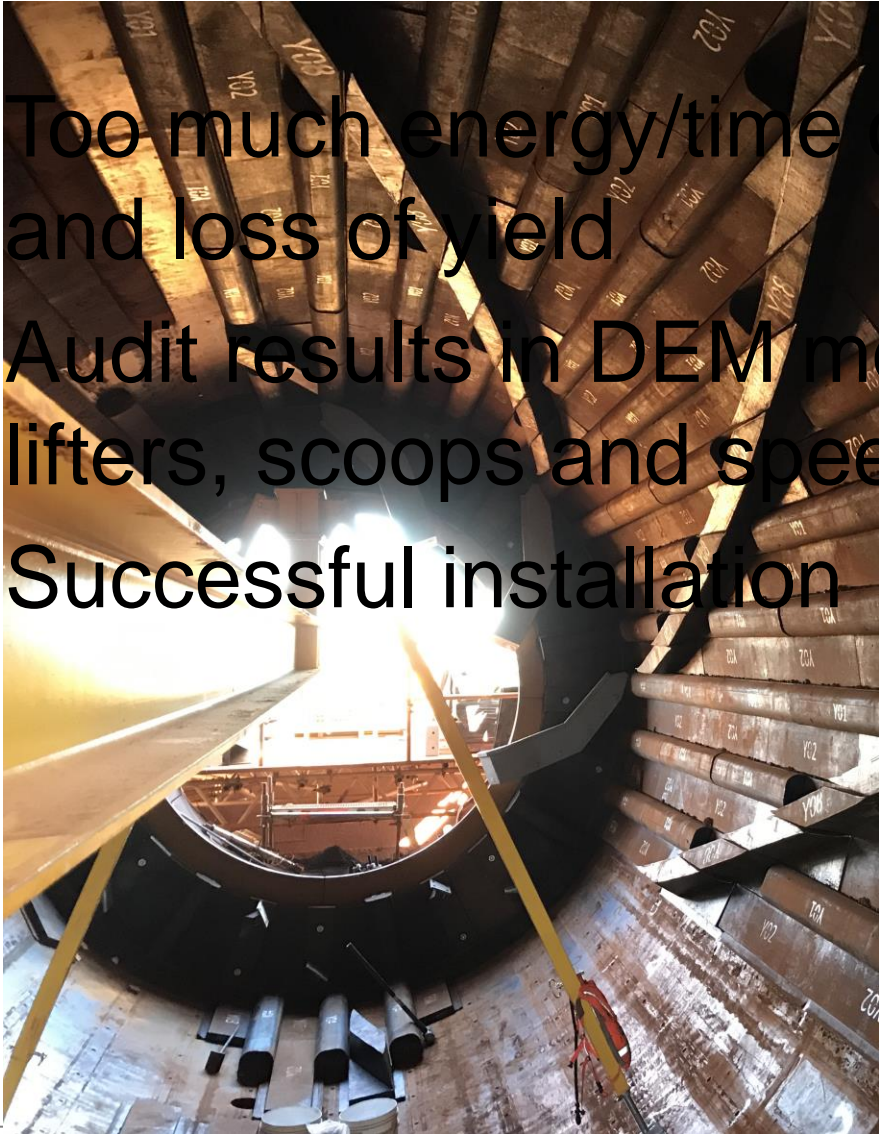
Example 1 – Gold Ore

- Ore mixed with clay-rich overburden
- Trommel for separation
- Downstream mill/flot (coarse) / leaching (fines)



Example 2 – Iron Ore

- Too much energy/time causing attrition and loss of yield
- Audit results in DEM modelling for adv lifters, scoops and speed changes
- Successful installation



Example 3 - Log Washer for U

- Smaller throughput 500 t/hr
- More intensive energy requirement
- Modular design
- Logistic advantage

- Attrition cells – smaller high intensity scrubbing (5 – 10 kWh/t)
- Log Washers/aggregate conditioners – mid sized, mid level intensity (2 – 5 kWh/t)
- Rotary drum scrubber – large , lower intensity (0.3 – 2 kWh/t)

World Wide Scrubber Installations



Hydraulic scrubber AFRICA

- Questions?