

Project Overview

- **System Type:** Copper Ore Slurry Screening and Pumping
 - **Location:** Not specified (assumed mining plant environment)
 - **Material:** Copper ore slurry (wet, abrasive)
 - **Flow Rate:** 5,000 GPM slurry
 - **Dry Solids Throughput:** 800 TPH
 - **Estimated Slurry Specific Gravity:** 1.349
 - **Estimated Moisture Content (by weight):** 52.6%
 - **Estimated Solids Content (by weight):** 47.4%
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System Flow Description

Inlet Stage:

- **Feed:** Copper ore slurry @ 5,000 GPM
- **Dry Solids Feed:** 800 TPH
- **Initial Screen:** ½-inch **sieve bend**, removes coarse trash
- **Remaining Flow (~95% of solids):** 760 TPH to vibrating screen

Primary Screening Unit:

- **Equipment:** Double-deck vibrating screen
- **Top Deck Opening:** ¼-inch
- **Bottom Deck Opening:** ¼-inch
- **Top Deck Oversize Discharge:**

- To belt conveyor with mounted particle size analyzer
 - Discharge chute equipped with plug chute switches
 - **Bottom Deck Undersize Discharge:**
 - To pump box with operating + standby pumps
 - Pump box level controlled at 70% full
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System Calculations & Equipment Estimates

1. Slurry Properties

- **Dry Solids Mass Flow:** 800 TPH = 26,667 lb/min
- **Solids Volumetric Flow:** 1,453 GPM (SG: 2.2)
- **Water Volumetric Flow:** 3,547 GPM (SG: 1.0)
- **Total Slurry Density:** 11.25 lb/gal
- **Total Slurry TPH:** ~1,687 TPH

2. Vibrating Screen Motor Sizing

- **Material Load:** 760 TPH (wet solids)
- **Vibrating Screen Type:** Double-deck, ¼" decks
- **Material Characteristics:** High abrasion, moderate to high viscosity
- **Estimated Motor Horsepower: 100 – 150 HP**
(Based on throughput, deck area, vibratory action type)

3. Belt Conveyor Load (Top Deck Oversize Discharge)

- **Assumed Top Deck Retention:** 20% of incoming solids

- **Dry Solids to Conveyor:** 152 TPH
- **Moisture Assumed Constant:** ~53%
- **Total Slurry on Belt (if wet):** ~325 TPH
- **Conveyor Safety:** Equipped with size analyzer & chute plug switches

4. Slurry Pump Sizing (Undersize Pump Box)

- **Flow to Pump Box:** ~4,724 GPM
 - Incoming Slurry: 5,000 GPM
 - Minus Belt Discharge: ~276 GPM
- **Total Dynamic Head (TDH):** 200 ft (assumed)
- **Slurry SG:** 1.349
- **Pump Efficiency:** 60%, Motor Efficiency: 90%

Hydraulic HP:

$$HP_{\text{hydraulic}} = \frac{4724 \times 200 \times 1.349}{3960} \approx 321.8 \text{ HP}$$

Required Motor HP:

$$HP_{\text{motor}} = \frac{321.8}{0.60 \times 0.90} \approx 596 \text{ HP}$$

- **Pump Motor Selection: 600–700 HP**
(Standard industrial slurry pump motor range with margin)

Installation and Infrastructure Requirements

Component	Estimate / Note
Sieve Bend	½" opening; static curved screen

Vibrating Screen	Double-deck; ¼" decks; steel construction
Screen Motor	100–150 HP
Conveyor to Oversize Belt	Includes particle size analyzer
Pump Box	Level controlled, ~4,700 GPM capacity
Slurry Pumps	Dual setup (1 operating, 1 standby), 600–700 HP each
Controls	Plug chute switches, PLC, MCC integration

Preliminary Total Installed Cost Estimate

(Assuming industrial-scale installation in mining environment)

Cost Item	Estimated Cost (\$)
Vibrating Screen & Structure	\$400,000
Screen Motor (150 HP)	\$35,000
Belt Conveyor (Top Deck Oversize)	\$150,000
Particle Size Analyzer	\$45,000
Slurry Pumps (2 x 600 HP)	\$400,000
Pump Box Structure & Piping	\$80,000
Controls & Instrumentation	\$100,000
Installation, Wiring, Foundations	\$150,000
Contingency (15%)	\$202,500
Total Installed Cost (TIC)	~\$1,562,500

Conclusion & Recommendations

- The vibrating screen and slurry pump must be robustly engineered for abrasive, high-throughput conditions.

- Recommended equipment includes a **double-deck vibrating screen with 150 HP motor, belt conveyor with safety instrumentation**, and **dual slurry pumps rated for ~600–700 HP** each.
- Final design should include:
 - Particle size distribution (PSD) study
 - Screen manufacturer input for selection
 - Pump curves and actual TDH confirmation
 - Material flow and slurry handling simulations