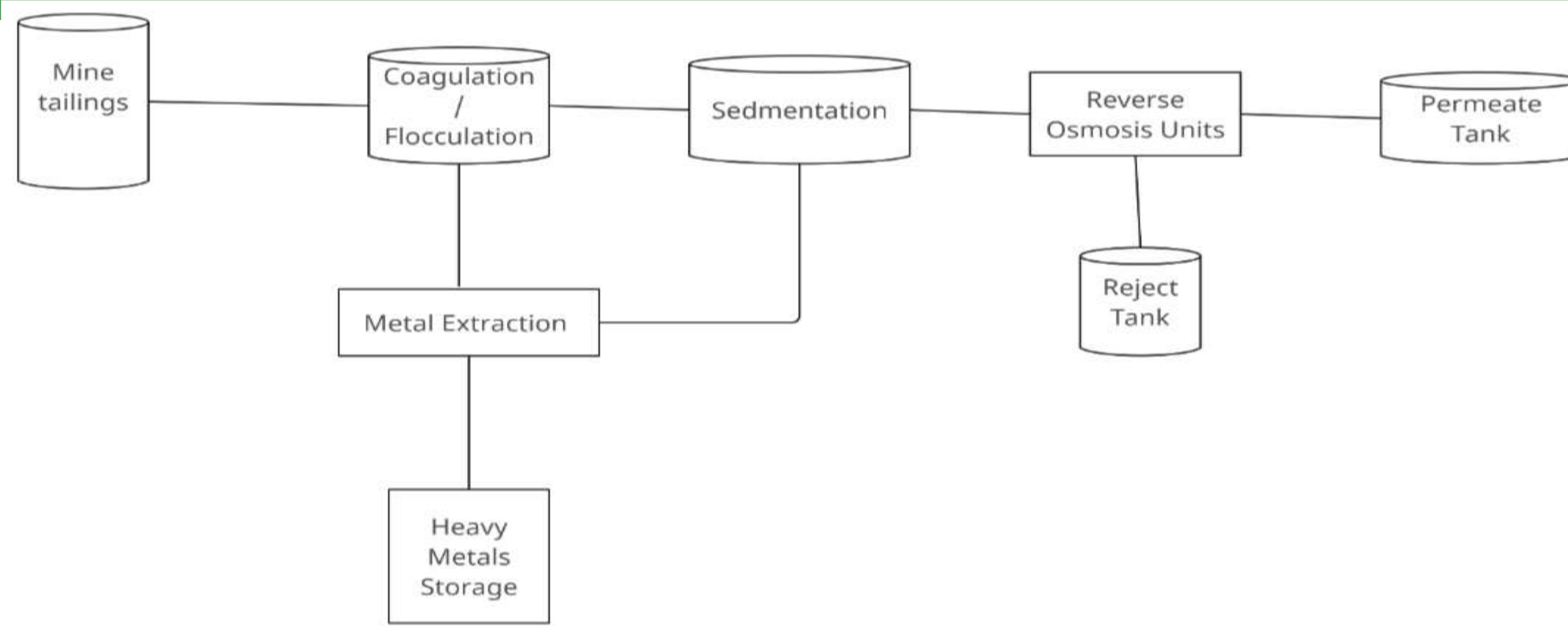


Problem statement

Wastewater treatment and the extraction of heavy metals (As, Fe, Cu) from the mine tailings and the integration of safety for the mining operation.

Block Flow Diagram



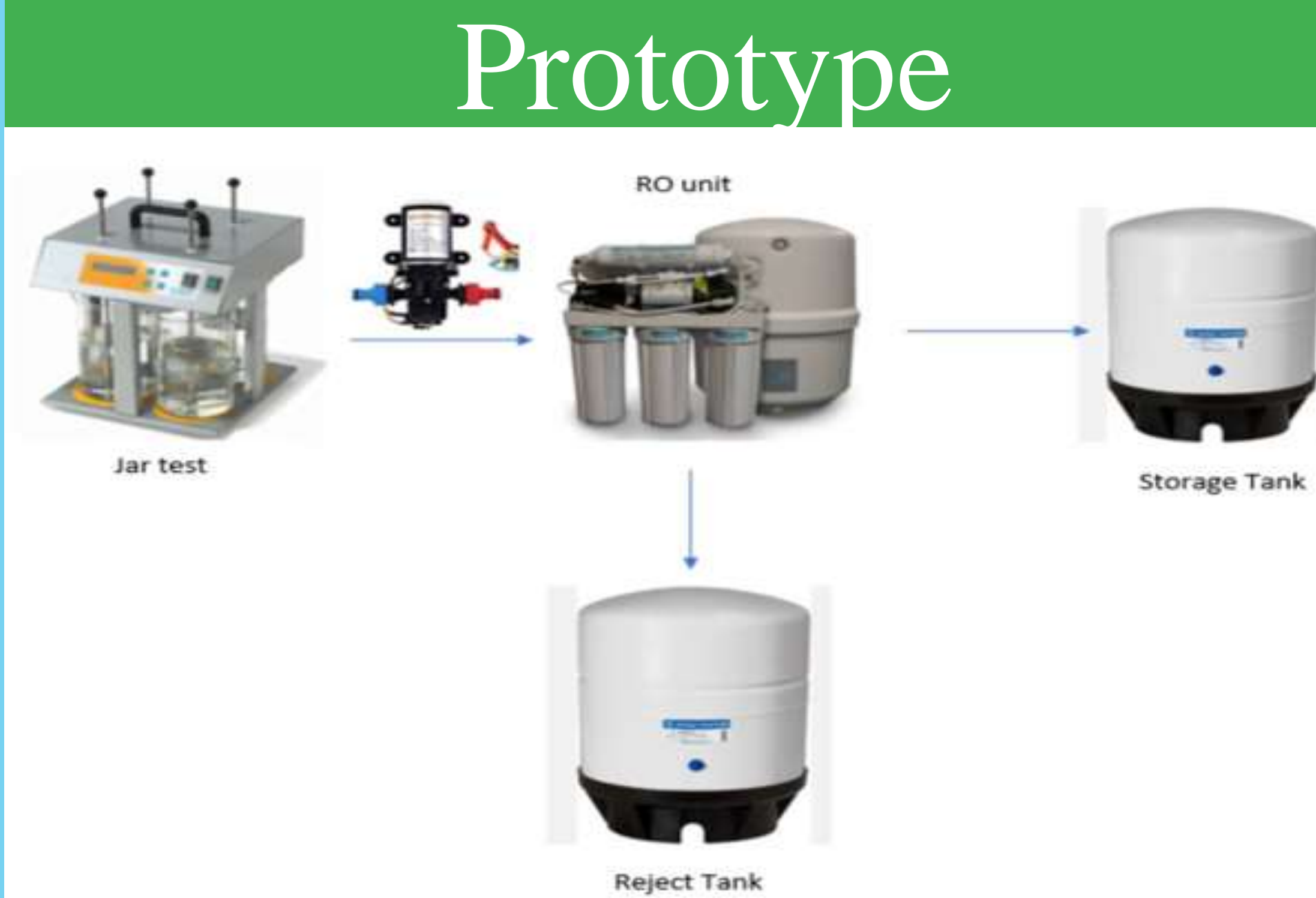
Equations

M.B	$F=R+D$
Osmotic Pressure	$\sum C \cdot RT$
Component M.B	$F_{X_i} = R_{X_i} + D_{X_i}$
Volume of Tank	$\pi r^2 h$
Recovery efficiency	$\eta_r = \frac{C_{L0} - C_L}{C_{L0}} \times 100$
Reliability	$R_{Sys} (Series) = R_1 \cdot R_2 \cdot R_3 \dots R_N$

Specifications & constrains

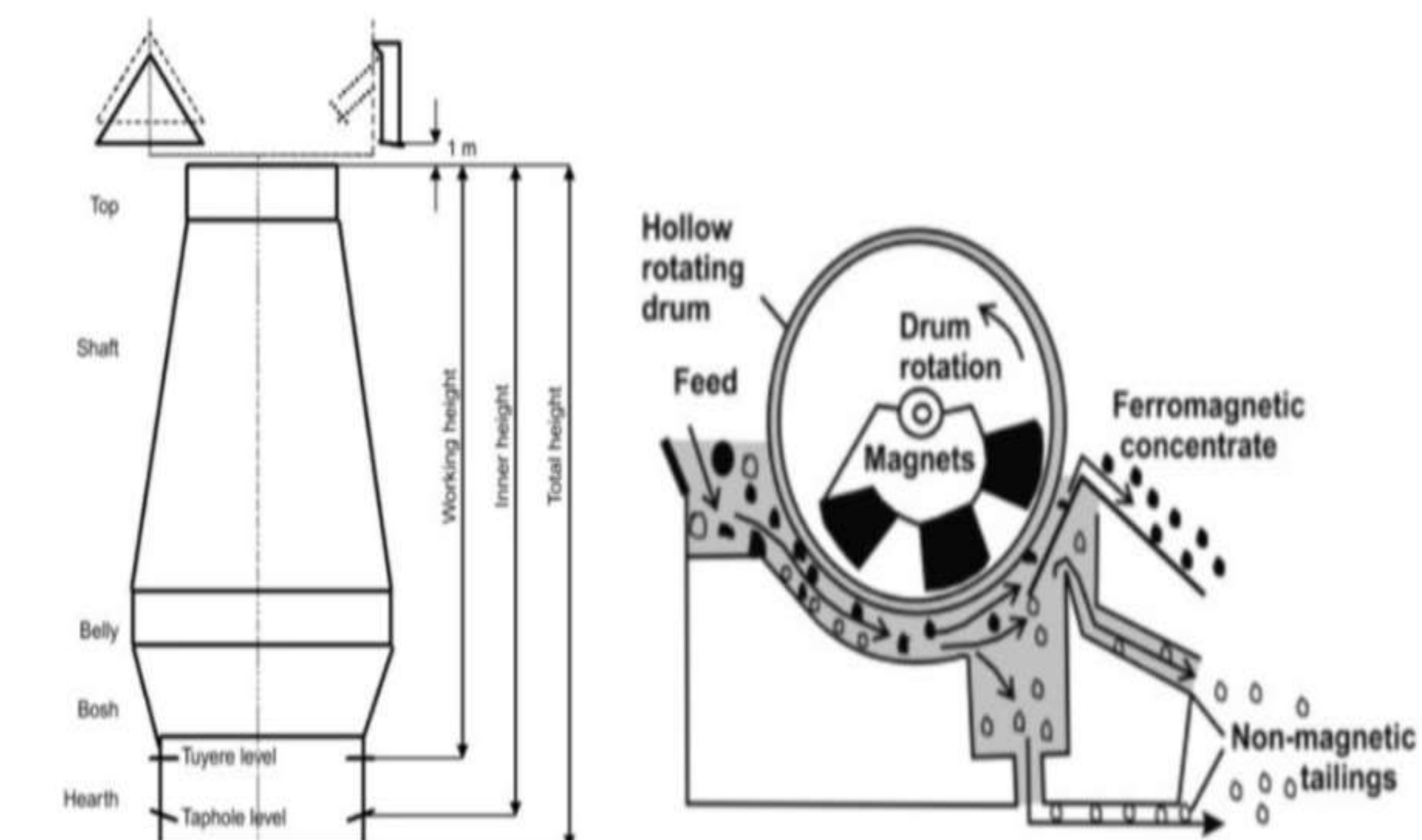
- Specifications:**
- Production rate of RO is 74.2 m³/day
 - Volume of Tanks used for treatment are 2250 m³, 471m³, and 512m³
 - pH level (7-8)
- Constraints:**
- Total dissolved solids
 - Impurities
 - Treatment time (40-45 minutes)

Testing & Validation



Equipment	No. of subsystems	R(t)* at 50 hrs.	PM** at 80% R(t) (hrs.)
Hydraulic shovel	10	1.0	94
Dump truck	6	0.7	34
Conveyor	7	1.0	20.9
Crusher	5	0.991	30.4

*R(t) = Reliability, **PM = Preventive maintenance
Overall reliability at 50 hrs. = 0.6937



Feed Preparation



Conclusion

In conclusion, the treatment of stored mine tailings proved to be successful. Production of 74.2 m³/day of treated water was obtained. Furthermore, treatment time took approximately 45 minutes. Finally, the overall reliability of the equipment was found to be 0.69.