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TECHNICAL GUIDES

Sand Washing Plant Water Balance: Calculate Your Optimal Recycling System Size

Size your sand washing plant water system correctly. Water balance calculations, pump sizing, and thickener selection for 50-300 TPH operations.

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Water balance calculation determines sand washing plant sustainability—matching water supply to process demands while maximizing recirculation. Plants that achieve 85-90% water recirculation consume 0.3-0.5 m³ fresh water per tonne processed versus 2-3 m³ for once-through systems. This guide provides calculation methods for designing and operating water-efficient sand washing operations.

Water Balance Components

Water Inputs

SOURCE	TYPICAL RATE	NOTES
Fresh water makeup	0.3-2.0 m³/t	Depends on recirculation rate
Moisture in feed	0.02-0.10 m³/t	2-10% feed moisture

SOURCE	TYPICAL RATE	NOTES
Recirculated water	1.5-3.0 m³/t	From thickener overflow

Water Outputs

DESTINATION	TYPICAL RATE	CONTROL METHOD
Product moisture	0.10-0.15 m³/t	Dewatering screen efficiency
Waste slurry	0.05-0.15 m³/t	Thickener underflow density
Evaporation	0.02-0.08 m³/t	Climate dependent
System losses	0.01-0.05 m³/t	Leaks, spillage

Water Balance Calculation

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System Balance:
Fresh Water = Product Moisture + Waste Moisture + Evaporation + Losses - Feed
Moisture

Example (200 TPH plant):
Product moisture: 0.12 m³/t × 200 t/hr = 24 m³/hr
Waste moisture: 0.10 m³/t × 200 t/hr = 20 m³/hr
Evaporation: 0.03 m³/t × 200 t/hr = 6 m³/hr
Losses: 0.02 m³/t × 200 t/hr = 4 m³/hr
Feed moisture: 0.05 m³/t × 200 t/hr = 10 m³/hr

Fresh water required: 24 + 20 + 6 + 4 - 10 = 44 m³/hr
Per tonne: 0.22 m³/t
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Recirculation System Design

Key Components

COMPONENT	FUNCTION	SIZING PARAMETER
Settling pond/thickener	Solids removal	Retention time: 2-4 hours

COMPONENT	FUNCTION	SIZING PARAMETER
Clarified water tank	Buffer storage	15-30 min process demand
Return pump	Recirculation	1.2× peak demand
Flocculant system	Settling enhancement	20-80 g/t solids

Thickener Sizing

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Required Area = (Feed Rate × Solids Content) / Unit Area Rate

For fine sand washing:
- Unit area rate: 0.3-0.5 t/m²/hr
- Feed solids: 5-15%

Example:
200 TPH × 10% solids = 20 t/hr solids
Area = 20 / 0.4 = 50 m² minimum
Diameter = √(50 × 4/π) = 8m thickener
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Optimization Strategies

Reduce Fresh Water Consumption

STRATEGY	FRESH WATER REDUCTION	IMPLEMENTATION
Improve thickener efficiency	10-20%	Optimize flocculant, bed management
Better dewatering	5-10%	Upgrade dewatering screen
Reduce spillage	2-5%	Maintenance, containment
Covered tanks	3-8%	Reduce evaporation

Monitoring Parameters

PARAMETER	TARGET	MEASUREMENT	FREQUENCY
Fresh water rate	<0.5 m³/t	Flow meter	Continuous
Recirculation rate	>85%	Calculated	Daily
Thickener overflow clarity	<500 ppm TSS	Sample test	Hourly
Product moisture	<12%	Moisture meter	Per load

Conclusion

Water balance analysis transforms water management from guesswork to engineering. Track inputs and outputs systematically, size recirculation components appropriately, and monitor key parameters continuously. Well-designed systems achieve 85-90% recirculation, reducing fresh water consumption to 0.2-0.4 m³/tonne while meeting environmental requirements and reducing operating costs.

Topics: #Plant Design #Water Management #sand washing

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