

## **MASTER CTS**

Construction Technology Systems  
A Division of ASATEEN GROUP

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# **DF-01 Technical Data Sheet**

## **MASTER REPHOS**

Cold chemical stabilization system for phosphogypsum neutralization, conditioning, and controlled reuse.

Edition

**Public Technical Issue**

Document Family

**DF-01**

Classification

Phosphogypsum neutralization and stabilization system

## Product Identity and Technical Overview

Item	Value
Product Name	MASTER REPHOS
Document Type	DF-01 Technical Data Sheet
Classification	Phosphogypsum neutralization and stabilization system
Manufacturer / Developer	MASTER CTS, a division of ASATEEN GROUP
Primary Function	Neutralization, conditioning, and stabilization of acidic phosphogypsum
Feedstock Basis	Phosphogypsum generated from wet-process phosphoric acid production
Output Basis	Stabilized calcium sulfate dihydrate material for controlled downstream use
Byproduct Generation Basis	4.5–5.0 tonnes phosphogypsum per tonne of phosphoric acid

### System Description

MASTER REPHOS is a high-concentration chemical treatment system for cold stabilization of phosphogypsum. The process is configured as an ambient-temperature route with low dosage requirements and no thermal calcination. The treatment sequence combines acidity correction, impurity immobilization, moisture-controlled mixing, rapid clarification, and conditioned gypsum output for downstream qualification.

### Feedstock and Neutralization Basis

Raw phosphogypsum enters the process in an acidic state and is calibrated against localized chemistry before dose setting. Process control is centered on feed acidity, moisture condition, and neutralization target. Treatment is carried to a target pH of 7.0 within the defined operating window.

### Document Scope

This technical data sheet presents the product identity, process basis, operating parameters, industrial deployment basis, output streams, application pathways, comparative process positioning, and pilot qualification sequence for MASTER REPHOS.

## Operating Parameters and Process Basis

Parameter	Value	Unit / Basis	Technical Note
Reagent dosage	0.5–7.0	g/kg PG	Dose window linked to localized feed condition
Feed moisture	20–40	%	Operational moisture range
Feed acidity	3.5–5.0	pH	Acidic phosphogypsum input window
Target neutral state	7.0	pH	Neutralization target
Clarification time	≤ 5	minutes	Rapid clarification window
Process temperature	Ambient	room temperature	No thermal calcination required
Additional thermal input	None	—	Cold process route
Additional process water	None	—	Operates without added process water
Primary equipment set	High-shear mixers + silos + conveyors	system basis	Industrial mixing and handling line

### Process sequence

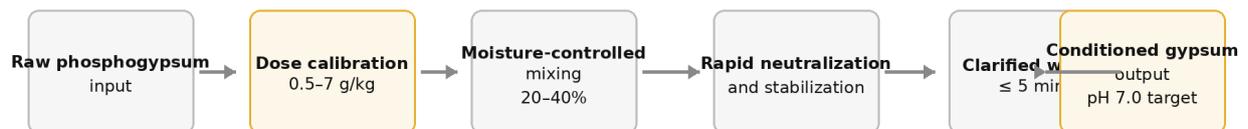


Figure 1. Process sequence for neutralization, clarification, and conditioned output generation.

## Industrial Context and Deployment Basis

Parameter	Value	Unit / Basis	Deployment Note
Global annual phosphogypsum generation	245,000,000	tonnes/year	Approximate worldwide generation basis
Accumulated global phosphogypsum stockpile	> 7,000,000,000	tonnes	Historical stockpile basis
Localized industrial stockpile basis	> 12,000,000	tonnes	Al Qaim industrial complex basis
Indicative additional Iraqi annual generation	4–5 million	tonnes/year	Expansion-linked production basis
Treatment line annual capacity	100,000–500,000	tonnes/year	Industrial line basis
Initial modular line	100,000	tonnes/year	Skid-mounted installation basis
Pilot program duration	90	days	Structured qualification program

### Radiological Screening Basis

Indicative Iraqi phosphogypsum basis: average radium-226 activity 38 Bq/kg against an agricultural reference threshold of 370 Bq/kg.

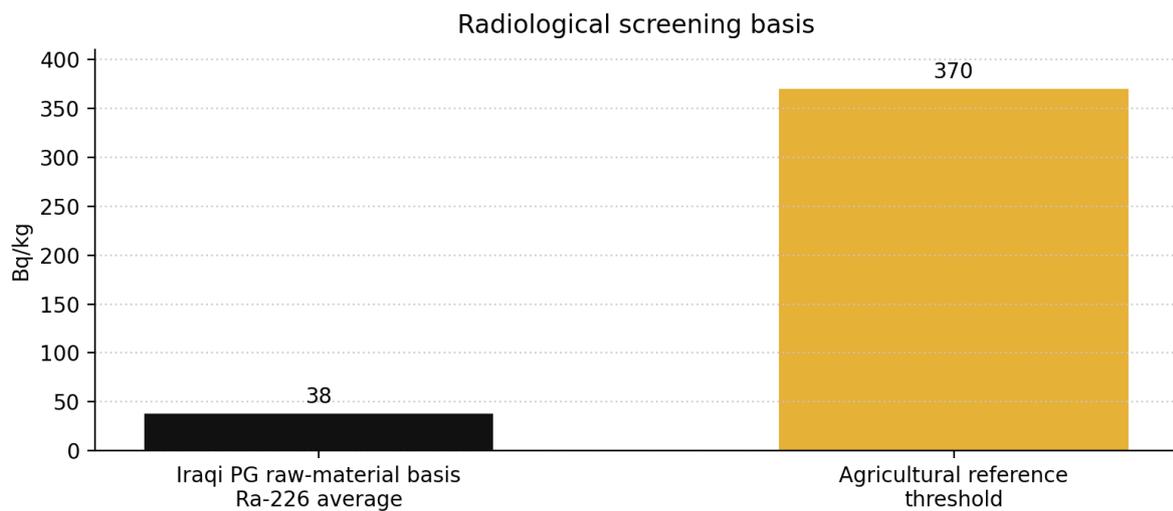


Figure 2. Indicative radiological screening basis.

## Output Streams and Application Pathways

Output stream	Technical basis	Downstream pathway
Conditioned gypsum output	Stabilized calcium sulfate dihydrate material	Cement and mineral binders; gypsum-based products; agricultural soil amendment after qualification
Clarified water stream	Recovered process-water stream after clarification	Process-side handling within the treatment loop

### Application Pathways

Application Path	Technical Function	Application Basis
Cement and mineral binders	Set regulation / gypsum substitution basis	Use in Portland cement grinding and related gypsum-containing products
Gypsum-based building products	Calcium sulfate input basis	Use in wallboard and gypsum product chains after qualification
Agricultural soil amendment	Calcium and sulfur source; sodium displacement basis	Use for saline and sodic soil rehabilitation
Downstream hydrometallurgical route	Conditioned feedstock basis	Applicable with separate downstream leaching and recovery design

### Process Positioning

MASTER REPHOS is positioned as an ambient-temperature stabilization route with low reagent dosage, no thermal calcination, and a compact industrial line configuration.

## Comparative Process Positioning and Capital Basis

Route	Heat Input	Added Water	Indicative CAPEX Basis	Core Process Note
MASTER REPHOS	None	None	USD 2–5 million	Ambient chemical stabilization
Thermal calcination	Required	Not stated	> USD 200 million	High-temperature conversion route
Washing / bio-leaching	Not thermal-led	High	RO / wastewater treatment required	Generates acidic wash water
Carbonation / Merseburg	Commodity-linked	Process-dependent	Conversion cost reported > USD 300/t in cited case	Ammonia- and CO <sub>2</sub> -linked route

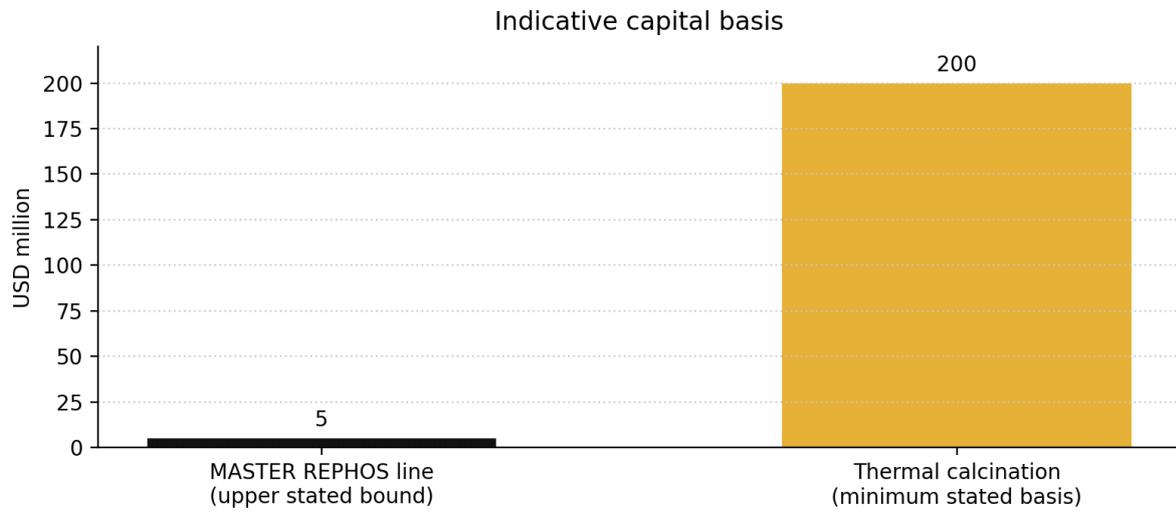


Figure 3. Indicative capital basis using the upper stated MASTER REPHOS line range and the minimum stated thermal-calcination threshold.

# Validation and Qualification Program

Public deployment is structured around representative sampling, dose calibration, on-site pilot treatment, and end-use qualification for downstream application pathways.

## Pilot validation timeline



Figure 4. Pilot validation timeline.

## Pilot Timeline

Time Window	Program Scope
Weeks 1–4	Sampling and laboratory calibration
Weeks 5–8	On-site validation plot deployment
Weeks 9–12	Monitoring and final verification before scaling

## Pilot Milestones

Milestone	Program Scope
Phase 1	Setup of test plot and initial chemical treatment
Phase 2	Stabilization and moisture balancing (+24 hours)
Phase 3	Initial biomass density verification (+45 days)
Phase 4	Full-scale green mass results (+75 days)
Phase 5	Pilot conclusion and scalability assessment (+90 days)

## Biological Validation Indicators

Sample Type	Green Mass Yield	Dry Matter Yield	Unit
Control (untreated)	76.1	15.2	g/pot
Treated (Dose 2)	127.6	22.6	g/pot
Yield increase factor	1.3–1.7	—	vs. untreated

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## **MASTER CTS**

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