

METALLURGICAL CASE STUDY & ECONOMICS

The Resin-Savings Arbitrage: How High-Purity Silica Sand Cuts Chemical Binder Costs by ₹5.3+ Lakhs/Month

An in-depth technical analysis of Acid Demand Value (ADV), micro-fines surface area, and binder polymerization kinetics in No-Bake Furan & Phenolic casting foundries.

< 2.20

ACID DEMAND VALUE (ADV)

1.1% – 1.2%

OPTIMAL RESIN DOSAGE

> 99.20%

PURE SiO_2 QUARTZ MATRIX

₹5,33,250

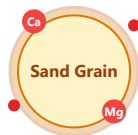
MONTHLY CHEMICAL SAVINGS

1. THE CHEMICAL REALITY: WHY BAD SAND CONSUMES 40% MORE LIQUID RESIN

In chemically bonded sand systems (No-Bake Furan, Alkaline Phenolic, and Shell Moulding), silica sand serves as the inert aggregate while resin serves as the polymer glue. When sand contains alkaline carbonates or unwashed microscopic dust, two severe chemical penalties occur:

A. Conventional / River Sand (High ADV > 8.0)

Resin Wasted: 1.8% - 2.0%



Neutralization

PTSA Acid + CaCO_3

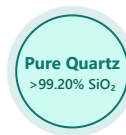
STALLED CURING

- Catalyst neutralized by alkalis
- Micro-dust absorbs free resin
- Forced to dose 1.8% binder

Mechanism: Alkaline lime (calcium & magnesium carbonates, CaCO_3 / MgCO_3) consumes acid catalyst before it can polymerize the furfuryl alcohol. Operators are forced to overdrive resin dosage by 40% to achieve minimal tensile strength.

B. Gujarat Minerals Kiln-Dried (ADV < 2.2)

Optimal Resin: 1.1% - 1.2%



Full Polymerization

Zero Acid Loss

PERFECT CROSSLINKING

- 100% catalyst active efficiency
- Zero fines soaking liquid resin
- High 24h tensile at only 1.2%

Mechanism: Chemically inert, sub-angular quartz grains with zero active basic ions. Every droplet of catalyst triggers instant, complete cross-linking, maximizing polymer film tensile strength.

2. TECHNICAL SPECIFICATIONS: SIDE-BY-SIDE FOUNDRY COMPARISON

QUALITY PARAMETER	MARKET / RIVER UNWASHED SAND	GUJARAT MINERALS WASHED & KILN-DRIED	DIRECT FOUNDRY FLOOR IMPACT
Silicon Dioxide (SiO_2)	94.50% – 97.20%	99.20% – 99.45%	Refractoriness > 1710°C; prevents burn-on defect
Acid Demand Value (ADV)	7.5 – 14.0 (High)	1.8 – 2.2 (Ultra Low)	Zero acid catalyst neutralization
Micro-Fines (< 75 Micron)	1.50% – 3.20%	< 0.30% (Desilted)	Drastically reduces surface area resin thirst
Moisture Content	1.20% – 4.50% (Damp)	< 0.10% (Rotary Kiln)	Eliminates hydrogen gas blowholes & porosity
Loss on Ignition (LOI)	0.80% – 1.60%	< 0.25%	Zero organic breakdown gas defects
Typical Resin Dosage	1.7% – 2.0% BOS	1.1% – 1.3% BOS	Saves 5 to 7 kg of liquid resin per ton of sand

THE FOUNDRY GOLDEN RULE

"Foundries spend 8x to 12x more annually on chemical resins and catalysts than they do on silica sand. Saving ₹200 on cheap sand while consuming ₹800 more in resin is a net loss of ₹600 per ton. True lowest cost is achieved by purchasing the lowest-ADV sand."

3. RUPEE-FOR-RUPEE COST AUDIT: 500 MT MONTHLY OFFTAKE

Benchmarked against live Indian chemical market rates (Furan resin: ₹135/kg, PTSA Catalyst: ₹95/kg at 35% of resin weight):

Cost Item (500 MT Sand / Month)	Conventional Sand (1.8% Binder)	Gujarat Minerals (1.2% Binder)	Net Monthly Savings
Liquid Furan Resin Consumed	9,000 kg (9.0 MT)	6,000 kg (6.0 MT)	- 3,000 kg Saved
Monthly Resin Expense (@ ₹135/kg)	₹12,15,000	₹8,10,000	₹4,05,000 / month
PTSA Catalyst Consumed (@ ₹95/kg)	3,150 kg (₹2,99,250)	1,800 kg (₹1,71,000)	₹1,28,250 / month
Total Monthly Chemical Outflow	₹15,14,250 / month	—	—
Optimized Monthly Chemical Outflow	—	₹9,81,000 / month	—
TOTAL DIRECT CASH SAVINGS	—	—	₹5,33,250 / MONTH

4. THE LOGISTICS ARBITRAGE: "OUR SAND PAYS FOR ITS OWN FREIGHT"

Foundries in South India (Coimbatore, Belgaum, Ranipet, Chennai) often hesitate to source from Gujarat due to perceived transit freight. Here is how coastal shipping container economics make this completely freight-neutral:

Coastal Vessel Container Corridor

Gujarat Minerals loads 20ft marine containers (28 MT payload) directly at **Kandla / Mundra Port**, sailing directly to **Tuticorin Port or Chennai Port**.

Average Coastal Freight: ₹1,000 to ₹1,150 per MT

Total Freight Bill on 500 MT: ~₹5,50,000

The Net Financial Equation

- Chemical Savings: + ₹5,33,250
- Container Freight: - ₹5,50,000
- Net Freight Premium: ~₹16,750 (virtually ₹33/ton)

Conclusion: You obtain export-grade, rotary kiln-dried 99.20% pure silica sand in South India for the exact same net cost as raw local riverbed sand!

5. THE ZERO-RISK 10-TONNE INDUSTRIAL TRIAL PROTOCOL

We do not ask foundries to switch suppliers blindly. We operate on empirical floor validation:

STEP 1

Free Lab Calibration

Courier 5 kg pilot sample with full XRF chemical analysis and sieve grading curve for internal QA validation.

STEP 2

10 MT Plant Floor Trial

Dispatch 10 MT trial batch (or 28 MT container) at promotional subsidized rate for active mixer calibration.

STEP 3

Performance Guarantee

If resin reduction of at least 15% and casting surface finish improvement are not verified, we credit the price variance.