CESTOIL CHEMICAL INC

Expanding Possibilities

Petrochemical Process Solutions > Antipolymerants (Styrene)

Northshore™ GCD2673

Synergistic Inhibition Cuts Retarder Dosage by a Third and Saves RMB 250,000 a Month in Styrene Distillation

Key results

−36%
retarder concentration in column bottoms (1,400 → 900 ppm) at equal inhibition

−35%
gum in column bottoms within days of start-up (367 → 240 mg/100 ml)

RMB 250,000
net chemical-cost saving per month, as reported by the plant

Benefits

- **Synergistic inhibition** — 150 ppm of GCD2673 lets the retarder run at 900 ppm instead of 1,400 ppm
- **Less fouling** — bottoms gum down 35% within days, and below the retarder-alone level for the whole trial
- **Product quality untouched** — styrene purity and product polymer (<4 mg/kg) unchanged; every batch on spec
- **No process change** — existing injection points; column temperatures and pressures unchanged
- **Healthier tar stream** — styrene in tar 3.66% against a 7% limit, no plugging, tar make slightly lower
- **Immediate payback** — RMB 250,000 net monthly saving on chemicals, no capital spend

Challenge

An Asian petrochemical complex runs a four-column styrene distillation train fed with ~15.5 m³/h of dehydrogenation liquid. Styrene polymerises readily at distillation temperatures, so the plant relied on a commercial retarder alone to keep polymer and gum in check. Safety demanded a high residual — about **1,400 ppm in the primary-column bottoms** — and the bill followed: in 2018 the unit consumed **878 t of retarder at a cost of RMB 16.6 million**, which the plant's technical department flagged as a serious burden on production cost. It wanted a lower chemical spend without giving up protection against fouling or runaway polymerisation, and without touching product quality.

Analysis

Retarders slow polymerisation but do not stop it, which is why they must be held at high concentration. A true inhibitor terminates growing radical chains outright, but on its own offers little protection time in an upset. Cestoil proposed the two in synergy: a low dose of the true inhibitor **GCD2673** to take over the day-to-day termination of polymer chains, with the incumbent retarder kept as the safety reserve at a much lower set-point. After technical reviews with Cestoil and with the retarder supplier, the plant's research department and olefins unit designed a one-month trial in which the retarder residual would be stepped down while bottoms gum and polymer, column conditions, tar and product quality were monitored daily.

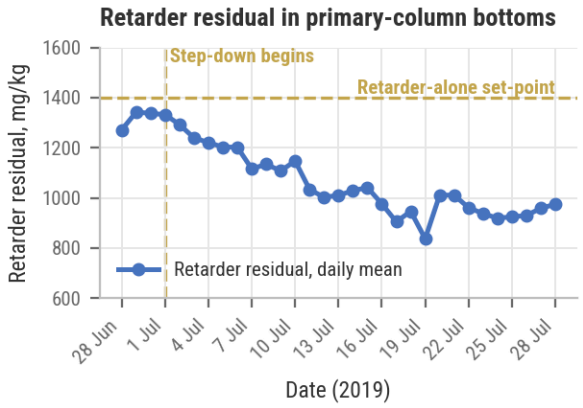

Figure 1: Daily-mean retarder residual in the primary-column bottoms. GCD2673 injection started 28 June; from 1 July the retarder set-point was stepped down to 900 ppm while column conditions and product quality stayed unchanged. Plant laboratory data.

Source: Customer trial report (olefins department, technical section), styrene distillation unit of an Asian petrochemical complex, 28 June – 28 July 2019. All figures as reported by the customer. · CS-STY-GCD2673-2026A · v1.0 · 2026-09

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Solution

GCD2673 was injected into the primary-column feed line through the existing closed sampling loop; the retarder stayed at its usual point near the column top. From **28 June 2019** GCD2673 ran at ~200 ppm for three days with the retarder unchanged, then was held at **~150 ppm (35 ml/min, ≈ 2.1 kg/h)** for the rest of the trial while the retarder set-point was stepped down — **1,300 → 1,100 → 1,000 → 950 → 900 ppm** between 1 and 19 July — each step held two to four days and confirmed by daily analysis of the bottoms. Over the 31-day trial the unit used ~1.7 t of GCD2673 and 60.7 t of retarder.

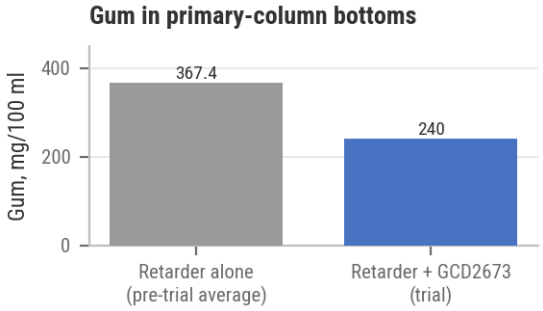

Figure 2: Gum in the primary-column bottoms — the plant's pre-trial average versus the level reached within days of starting GCD2673 (retarder still unchanged) and held through the trial. Plant laboratory data.

Result*

- **Retarder cut by a third, inhibition unchanged.** Retarder residual in the primary-column bottoms stepped from ~1,340 ppm to ~900 ppm (minimum 792 ppm on 19 July) with column temperatures and pressures unchanged (bottoms 112–115 °C, overhead 36.5 kPa(a)). The plant judged inhibition at GCD2673 150 ppm + retarder 800–1,000 ppm equivalent to retarder alone at 1,400 ppm (Figure 1).
- **Fouling precursors down 35%.** Bottoms gum fell from ~367 to ~240 mg/100 ml within days of starting GCD2673 — before any retarder reduction — and stayed below the retarder-only level for the whole trial, even at 900 ppm (Figure 2).
- **Product quality untouched.** Styrene purity held between 99.90 and 99.95% and polymer in the product tanks stayed below 4 mg/kg, both at pre-trial levels; no off-spec batch.
- **Tar stream healthier.** Styrene in tar averaged 3.66% against a 7% limit; tar make was slightly lower and tar transfer never plugged. Bottoms residuals of 30–70 mg/kg GCD2673 show 60–70% of the dose was consumed terminating polymer chains.

Value delivered

Retarder residual in primary-column bottoms	1,400 ppm → 900 ppm (−36%) at equal inhibition
Retarder budget before the trial (2018, plant data)	878 t · RMB 16.6 million
Trial-month retarder use vs. 2018 monthly average	60.7 t vs. 73.2 t (−17%, ramp-down period included)
Net chemical-cost saving (plant estimate, after GCD2673 cost)	RMB 250,000 / month
Annualised (12 × monthly, Cestoil)	≈ RMB 3.0 million / yr (≈ USD 0.43 M at 2019 rates)

About Northshore™ GCD2673

Northshore™ GCD2673 is a true polymerisation inhibitor for styrene monomer distillation. It terminates growing polymer chains at low dosage and provides extra protection time under abnormal conditions, and contains no nitrogen and no DNBP. It is designed to run alongside a retarder — Cestoil's Northshore GCD2676 or an existing retarder program — so the retarder can be held at a fraction of its stand-alone concentration.

Together, the inhibitor/retarder pair lowers polymer and tar formation, cuts total chemical spend and keeps the safety margin against runaway polymerisation during upsets. Cestoil's technical team supports dosing design, residual analysis and step-down planning throughout the trial.

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Discuss a similar application

Send us your current retarder program and bottoms residual, gum and polymer records — we will propose a dosing plan and a step-down trial.

About Cestoil Chemical

Cestoil Chemical is a global provider of specialty chemicals — fuel additives, process additives and advanced materials — headquartered in Ontario, Canada, with operations in North America and Asia. For over 20 years we have combined disruptive technology with hands-on technical service to deliver bottom-line results for refiners, petrochemical producers and pipeline operators.