UptimeAI

CASE STUDY

CUSTOMER PROFILE

Industry:
Chemical Manufacturing (Methanol)

Annual Production
910 kTpa

Deployment Scope
650 tags

Total Program Value
$9M across all catches

CHEMICAL MANUFACTURER SAVES $100K ANNUALLY AFTER UPTIMEAI TRACES UNEXPLAINED STEAM CONSUMPTION TO COMPRESSOR INTERCOOLER FOULING

The turbine was consuming 4.2 tonnes of extra steam every hour. Differential pressure was climbing. Discharge pressure was stable. No alarm fired.

Every Tonne of Excess Steam Is Natural Gas You Didn't Need to Burn

The recycle gas compressor circulates unreacted synthesis gas back through the methanol reactor—maintaining the pressure and flow conditions that sustain conversion rates. It's driven by a steam turbine drawing extraction steam from the process. When the compressor works harder than it should, the turbine burns more natural gas to compensate—raising fuel costs, increasing emissions, and eroding the operating margin that determines whether a 910 kTpa facility runs profitably under commodity price pressure. In methanol production, where margins are already thin against global natural gas pricing, excess steam consumption is one of the most common and least visible sources of economic leakage.

Gradual Fouling Doesn't Cross Thresholds—It Erodes Margins

Compressor fouling develops over months, not days. Differential pressure creeps up a fraction of a percent per week. Steam consumption inches higher. The turbine compensates automatically by increasing speed, masking the degradation from operators watching individual parameters. No single reading crosses an alarm threshold, so the problem never feels urgent enough to investigate—even as the economic impact accumulates.

The existing monitoring could see each parameter in isolation—compressor DP, steam flow, turbine speed—but couldn't correlate them to answer the diagnostic question: is this fouling, a process change, or a control system response? In the past, answering that question required assembling process and reliability engineers to compare trends manually. But with experienced specialists stretched thin, that cross-functional investigation was happening too infrequently and too late.

Intercooler Fouling, Not a Process Upset or Control Response

The facility partnered with UptimeAI to deploy AI reasoning agents across the Ammonia and Methanol units—650 tags covering compressors, turbines, and process parameters. The Recycle Gas Compressor was modeled as a connected system across 69 tags, correlating differential pressure, discharge pressure, suction conditions, steam flow, turbine speed, and recirculation loop behavior in a single comprehensive view.

UptimeAI correlated a 15% differential pressure increase with rising steam consumption while discharge pressure held stable—and traced the restriction to the compressor intercooler.

CASE STUDY

UptimeAI's analysis across pressure, temperature, and flow parameters pinpointed the intercooler as the fouling location. Cleaning the intercooler required a turnaround shutdown, so the immediate response was to optimize steam flow to the turbine, reducing excess consumption while the compressor continued operating within acceptable limits. A thorough cleaning was scheduled for the next planned turnaround.

Without this reasoning, the result would have been a slowly rising DP trend and gradually increasing steam cost—neither crossing an alarm, both quietly adding 4.2 T/hr of unnecessary fuel burn that only surfaced in quarterly energy reviews, long after the losses have accumulated.

From Single Catch to $9M Program Value

The intercooler fouling diagnosis was one of multiple catches across the site deployment. The same system-level reasoning that traced unexplained steam consumption on the methanol compressor identified a $5.2M bearing failure risk on the ammonia SynGas compressor, amongst numerous other catches that summed to $9M in total program value within the first year.

The Expert Recommendations Delivered Lasting Impact

$9M Value Delivered Across the Full Deployment

Quantifiable Gains

- $100K annual steam savings from optimized turbine operation
- 4.2 T/hr excess steam identified and mitigated before turnaround
- 15% DP increase diagnosed months before any alarm threshold
- $9M total program value across the full deployment

Transformational Results

- System-level compressor-turbine analysis replacing isolated parameter monitoring
- Surge risk failure mode surfacing restrictions before compressor trip
- Interim steam optimization adopted as a managed degradation strategy
- Cross-unit learning compounding insights across Ammonia and Methanol

What's Next?

With $9M in total program value and the Ammonia and Methanol units now under continuous monitoring, the facility is extending UptimeAI's reasoning agents into energy optimization and emissions reduction.Applying the same system-level analysis to identify where steam, fuel, and process efficiency can be improved across the plant.

About UptimeAI

UptimeAI provides AI reasoning agents that help industrial operations teams make goal-oriented, real-time optimal decisions. Our solutions achieve 90%+ pilot-to-production success rates and are trusted by leading companies in cement, oil & gas, power generation, chemicals, and metals industries. Backed by industry leaders including ABB, Yokogawa, and Mitsubishi.

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