

CUSTOMER PROFILE

Industry
Chemical Manufacturing (Ammonia)

Annual Production
80 kTpa

Deployment Scope
8 Ammonia + 2 Methanol
compressors, >150 tags

Value Delivered
\$5.2M in avoided compressor failure

CHEMICAL MANUFACTURER AVERTS \$5.2M SYNGAS COMPRESSOR FAILURE AFTER UPTIMEAI TRACES BEARING TEMPERATURE SPIKE TO VARNISH DEPOSITS

Turbine bearing temperature jumped 21°C overnight. Lube oil looked normal. Vibration was below threshold. The system was heading toward bearing damage—and the standard checks couldn't explain why.

An Unplanned SynGas Compressor Shutdown Halts Production

The steam turbine-driven SynGas compressor maintains synthesis gas circulation through the ammonia reactor—the single most critical rotating asset in the production train. A bearing failure forces a full train shutdown, stopping ammonia production entirely and triggering a ripple effect across downstream operations. At 80 kTpa, every day offline represents significant lost output and supply chain risk.

Breaking the Diagnostic Dead End

In one overnight period, turbine journal bearing temperature rose abruptly from 96°C to a sustained 117°C. The operations team ran their standard diagnostics: lube oil flow, pressure, and quality parameters all appeared normal. Ambient conditions hadn't changed. Vibration showed a minor uptick but remained below threshold—not enough for the team to flag as a significant anomaly. By conventional logic, the bearing should have been fine.

That's the diagnostic gap. When the obvious causes check out clean, the investigation stalls. Without a system that correlates bearing temperature against vibration, axial displacement, discharge flow, and load conditions simultaneously, the only path forward is manual trend comparison across disconnected screens—and the urgency fades because no single parameter is in alarm. Meanwhile, the bearing continues to degrade.

The Catch: Varnish on Bearing Metal, A System-Level Issue

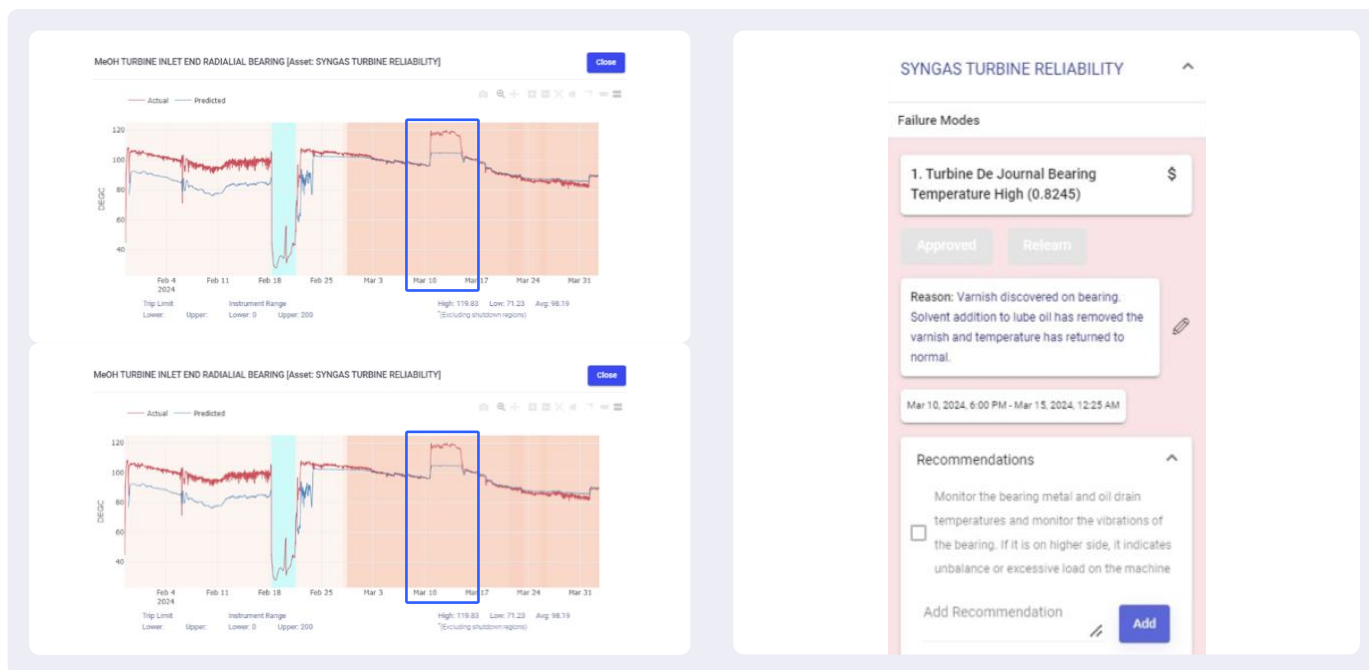
The facility deployed UptimeAI's AI reasoning agents across the full Ammonia and Methanol compressor fleet—152 tags on this unit alone, covering turbine, compressor, lube oil, and process parameters in a single connected model.

UptimeAI correlated the temperature spike with axial displacement and vibration behavior to rule out mechanical causes—and pointed the investigation toward the bearing surface itself.

Axial displacement was trending high alongside the temperature, indicating the bearing was under abnormal friction loading. UptimeAI's recommendation directed the team to inspect bearing metal and monitor oil drain temperatures.

Operations inspected the bearing and discovered varnish deposits—a thin, hard coating formed from oil degradation byproducts that restricts heat transfer and increases friction. The fix was targeted: solvent was added to the lube oil, dissolving the varnish. Bearing temperature returned to normal operating range.

A chemical intervention instead of a \$5.2M forced outage. Without this reasoning, the investigation had already stalled at “lube oil looks fine, vibration is below threshold”—while varnish continued to build, friction increased, and the bearing progressed toward catastrophic failure.



From Single Catch to Fleet-Wide Reasoning

The varnish diagnosis demonstrated that UptimeAI identify failure mechanisms that standard diagnostics missed entirely. Across the same deployment, the system also traced \$100K in annual excess steam consumption on the methanol recycle gas compressor to intercooler fouling—kicking off a series of catches that compounded to \$9M in total program value across both units within the first year.

The Expert Recommendations Delivered Lasting Impact

\$9M Value Delivered Across the Full Deployment

Quantifiable Gains

- \$5.2M avoided compressor failure and unplanned shutdown
- 21°C bearing excursion resolved without equipment teardown
- Online chemical fix replaced extended forced outage
- \$9M total program value across the full deployment

Operational Shift

- System-level models surfaced root causes and recommendations that traditional diagnostics missed
- Failure mode hypothesis ranking focused the investigation on the highest probability cause
- Cross-unit learning compounding insights across Ammonia and Methanol

What's Next?

With \$5.2M in avoided failure on the SynGas compressor alone, the facility is applying UptimeAI's reasoning agents across all 10 compressors in the Ammonia and Methanol units—extending the same diagnostic depth to every critical rotating asset in 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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