

CASE STUDY — INDUSTRIAL EQUIPMENT FAILURE & MAINTENANCE ADEQUACY

Was the Failure Predictable From Data the Operator Already Had?

Matter type	Insurer subrogation and breach of contract following catastrophic failure of major rotating equipment at a generating facility
Retained by	Counsel for the property carrier
Issue	Whether the failure was detectable in advance from existing condition monitoring data, and whether the service contractor's maintenance program was adequate to the risk
Role	Testifying expert — degradation modeling, prognostics and reliability analysis

Background

Major rotating equipment failed catastrophically, forcing an extended outage and a substantial business interruption claim. The service contractor maintained that the failure was sudden and unforeseeable and that its maintenance program conformed to the manufacturer's published intervals. The facility had been collecting continuous condition monitoring data for years prior to the failure.

Scope of work

- Recovery and cleaning of several years of continuous condition monitoring, process and operating data, including periods the contractor had not analyzed.
- Degradation modeling of the failed components, reconstructing the progression of damage against the operating history.
- Remaining useful life analysis performed retrospectively, using only data available at successive points before the failure, to establish what a competent analysis would have shown and when.
- Reliability and failure-rate analysis of the component class, including the effect of the facility's actual duty cycle relative to the design basis.
- Comparison of the contractor's maintenance and surveillance program against the risk the program was managing, and against the prognostic capability the installed instrumentation already provided.
- Review of alarm and exception history to identify indications raised and not acted upon.

Findings

Degradation modeling established that the damage progression began well before the failure and was reflected in the monitoring data throughout that period. The retrospective remaining-useful-life analysis — deliberately constrained at each step to data available at that time — produced a failure prediction with a usable warning interval, demonstrating that the outcome was not merely explicable after the fact but predictable before it. The facility's duty cycle differed materially from the design basis underlying the manufacturer's published intervals, so conformance to those intervals did not establish adequacy for this installation. Instrumentation sufficient to support prognostic monitoring was installed and functioning; the data it produced was archived but not analyzed.

Deliverables and use in the case

- Retrospective remaining-useful-life analysis quantifying the warning interval that existed, with explicit statement of assumptions and uncertainty.
- Degradation model and supporting data analysis, delivered in reproducible form so that opposing experts could run it.
- Assessment of maintenance program adequacy against the risk profile of the installation rather than against published intervals alone.
- Report and deposition testimony; the analysis established the predictability of the loss as a factual matter rather than an inference.

WORKING WITH FORWARD THINKING

How We Support Counsel

Early case assessment	A candid technical read before you commit to a theory. If the engineering does not support the claim or defense, we say so early, while that information is still useful and inexpensive.
Data preservation	Log files, condition monitoring archives and control system records overwrite on a schedule and are frequently lost before anyone asks for them. We identify what must be preserved, and how, in the first days of a matter.
Defensible methodology	Our methods are published and peer-reviewed rather than developed for the case. Models are delivered in reproducible form, with assumptions and uncertainty stated — the standard Rule 702 actually asks about.
Clear communication	Quantitative results are translated into terms a judge and jury can follow, without losing the precision that has to survive cross-examination. Uncertainty is stated plainly rather than hidden in a point estimate.
Rebuttal work	We are frequently retained solely to evaluate an opposing expert's risk, reliability or causation analysis, and to identify where the conclusions outrun what the model and the data actually support.
Conflict checking	Prompt conflict clearance and a written engagement scope before substantive work begins.

Practice areas

Energy, power and utility infrastructure · Industrial equipment failure and maintenance adequacy · Marine, offshore and autonomous systems · Cyber incidents and business interruption · Root cause and complex system accident analysis

Discuss a matter

Initial consultations to determine whether a matter is within our expertise are without charge. Contact us with the case posture, the technical question at issue and your key deadlines.

Tara Parhizkar, Ph.D., P.E. · 310.408.6750 · expertwitness@forwardthinkingsolution.com · www.forwardthinkingsolution.com

This case study is an illustrative composite prepared for informational purposes. Party names, locations, dates and identifying details have been omitted or altered. Nothing herein constitutes an opinion on any pending matter, creates an expert–client relationship, or discloses confidential information from any engagement.