



From Breakdown to Claims: Turbine Failures and the Making of Arbitration Claims

By Shweta Srivastava



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Introduction

Modern power projects depend on turbines that run with precision and consistency. When they fail, the issue rarely stays technical. What begins as a mechanical fault can grow into a dispute involving engineers, lawyers, insurers, and project owners. By the time the matter reaches arbitration, the focus has shifted from repair to responsibility, causation, and financial loss.

This book explains how turbine failures can lead to arbitration claims. It brings together engineering realities and legal strategy in a clear, practical way. The aim is simple. To show how failures occur, how they are investigated, and how they are argued before a tribunal.

Chapter 1: Understanding Turbine Failures

1.1 Gas Turbines

Gas turbines are widely used in modern power plants. Their design is often standardized, yet their operation takes place under extreme conditions. High temperatures and rotational speeds make them vulnerable to specific types of failure.

The most common issue is blade or vane liberation. A small component breaks off, but the consequences are far from small. The loose fragment moves through the turbine, damaging multiple stages. Repair costs can rise into millions, and downtime may extend for months.

These failures usually trace back to:

- Design issues, such as resonance or vibration
- Overload conditions
- Foreign object damage, though less common
- Lubrication failures, often linked to operational events like blackouts
- Combustion chamber damage, where internal parts break and cause cascading harm

A single defect can destroy large sections of the machine. That is what makes gas turbine failures so serious in disputes.

1.2 Steam Turbines

Steam turbines differ in one important way. They are often bespoke. Each unit is designed for a specific project, which introduces variability.

Common failures include:

- Blade cracking and liberation
- Corrosion linked to poor water treatment
- Material defects
- Vibration and resonance
- Erosion due to operational wear
- Lubrication system failures

Unlike gas turbines, many steam turbine issues are tied to operational conditions. Yet design and material selection still play a role. In recent cases, material defects have appeared more frequently than expected.

1.3 The Nature of Damage

Across both turbine types, one fact remains constant. The initial failure is rarely the main cost. The real damage lies in what follows. Secondary destruction spreads through the machine, turning a minor defect into a major event.



Chapter 2: Classifying Defects

In arbitration, technical failures must be translated into legal categories. This often leads to three main classifications:

1. Design defects
2. Manufacturing or installation defects
3. Operational defects

This classification is not just academic. It determines liability.

In gas turbines, many failures are linked to design. Despite claims of operational error, a deeper investigation often reveals inherent design limitations.

Manufacturing and installation defects may also arise, but in many cases, the same entity is responsible for design, supply, and maintenance. This blurs the lines and strengthens claims against a single party.

Operational defects are frequently alleged, especially by manufacturers. Yet they must be proven with clear evidence. Without that, such claims do not hold.

Chapter 3: Fitness for Purpose

One of the most contested issues in turbine disputes is whether the equipment was fit for purpose.

When a turbine is purchased, the expectation is straightforward. It should perform as promised. It should not require years of adjustment or repeated breakdowns before reaching stable operation.

In practice, disputes arise when manufacturers argue that the technology is still evolving. They may claim that performance improves over time. From a legal standpoint, this argument carries little weight if the contract requires immediate and reliable performance.

In several cases, turbines eventually reached acceptable output levels, but only after extended delays. By then, the project had already suffered losses. Arbitration focuses on that gap between promise and delivery.

Chapter 4: Root Cause Analysis (RCA)

Root cause analysis sits at the center of any technical dispute. It answers a single question. What actually caused the failure?

4.1 The Ideal Approach

The strongest investigations begin early. Experts attend site inspections as soon as the turbine is opened. They examine:

- Damage patterns
- Failed components
- Surrounding material conditions

The goal is to identify the first point of failure, not the resulting damage.

4.2 Securing Evidence

Physical evidence is critical. Components must be preserved and protected from corrosion or loss. In many cases, manufacturers attempt to retain control over failed parts. This can complicate the process.

A structured protocol helps. All parties agree on how samples will be handled, tested, and documented.

4.3 Laboratory Analysis and Modelling

Once samples are secured, testing begins. This may include:

- Metallurgical analysis
- Microscopic examination
- Stress and fatigue testing

If direct evidence does not provide answers, experts turn to modelling. For example, vibration simulations may reveal resonance issues that are not visible through inspection alone.

In one case, a manufacturer claimed foreign object damage. Laboratory analysis disproved this. Further modelling showed that blade resonance caused the failure. The conclusion shifted liability from operator to designer.

4.4 Challenges in Practice

RCA is rarely straightforward. Data may be incomplete. Years may pass before arbitration begins. Experts must work with limited records and conflicting narratives. This is why methodology matters. A clear, logical process stands up better under scrutiny.

Chapter 5: Framing Arbitration Claims

By the time a turbine dispute reaches arbitration, the issue is no longer a single failure. It is a chain of consequences.

5.1 Key Claim Categories

Claims generally fall into four groups:

- Defect and non-compliance claims
- Design-related claims
- Performance shortfalls
- Reliability and maintenance issues

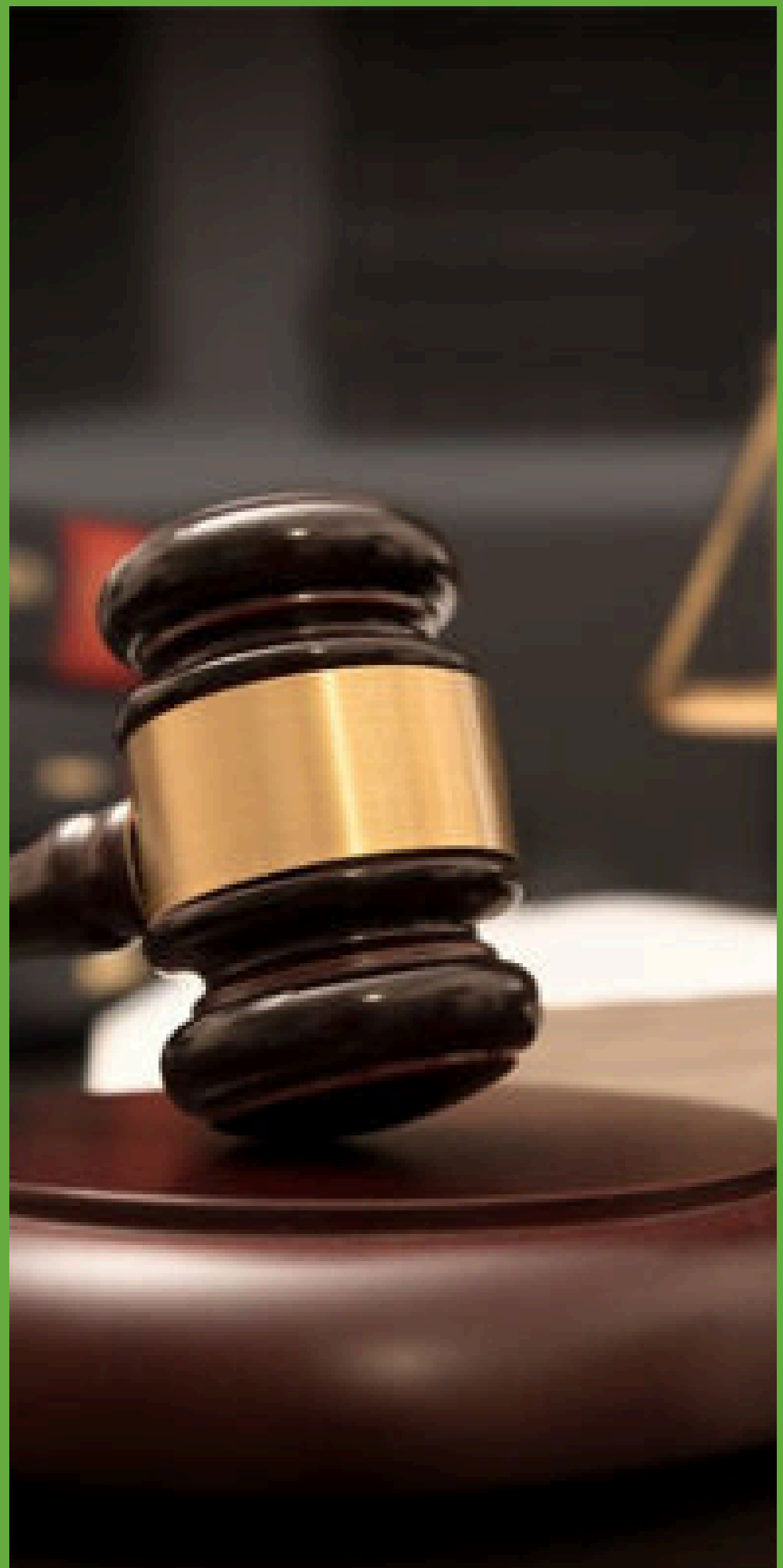
Each category reflects a different aspect of the failure. Yet presenting them separately can weaken the case.

5.1 Building a Narrative

Tribunals respond better to a unified story. The claim should answer three linked questions:

- What went wrong?
- How did it affect the project?
- What loss resulted?

This structure aligns with how decisions are made. Liability comes first. Causation follows. Quantum is assessed last. A fragmented approach, where each issue is treated in isolation, often fails to persuade.



Chapter 6: Quantifying Loss

Financial loss in turbine disputes extends beyond repair costs.



6.1 Types of Damages

- Repair and replacement costs
- Outage-related losses, including lost revenue and penalties
- Performance degradation losses, such as reduced efficiency
- Delay-related losses, including extended project timelines

Each category must be linked back to the technical failure.

6.2 The Importance of Causation

A list of losses is not enough. The claim must show how each loss flows from the defect. This requires coordination between technical and quantum experts.

Tribunals expect a clear chain of cause and effect. Without it, even valid losses may be rejected.



Chapter 7: Evidence in Technical Arbitration

Strong evidence forms the backbone of any claim.

7.1 Essential Documents

- Operation and maintenance manuals
- Design and layout drawings
- Performance data
- Inspection reports

These documents help explain how the turbine works and what went wrong.

7.2 The Value of Objective Data

The most reliable evidence is:

- Contemporaneous
- Independent
- Technically sound

Operational data, third-party inspections, and laboratory reports carry more weight than internal communications.

Chapter 8: Contractual Framework

Turbine disputes are governed by contract terms. Here are some of the clauses:

- Defective work provisions
- Repair and replacement obligations
- Performance warranties
- Root cause analysis requirements
- Force majeure clauses, where the cause is uncertain

Understanding these provisions is essential. They define the legal consequences of technical findings.

Chapter 9: The Role of Experts

Experts play a central role in turbine arbitration. Their findings often determine the outcome.

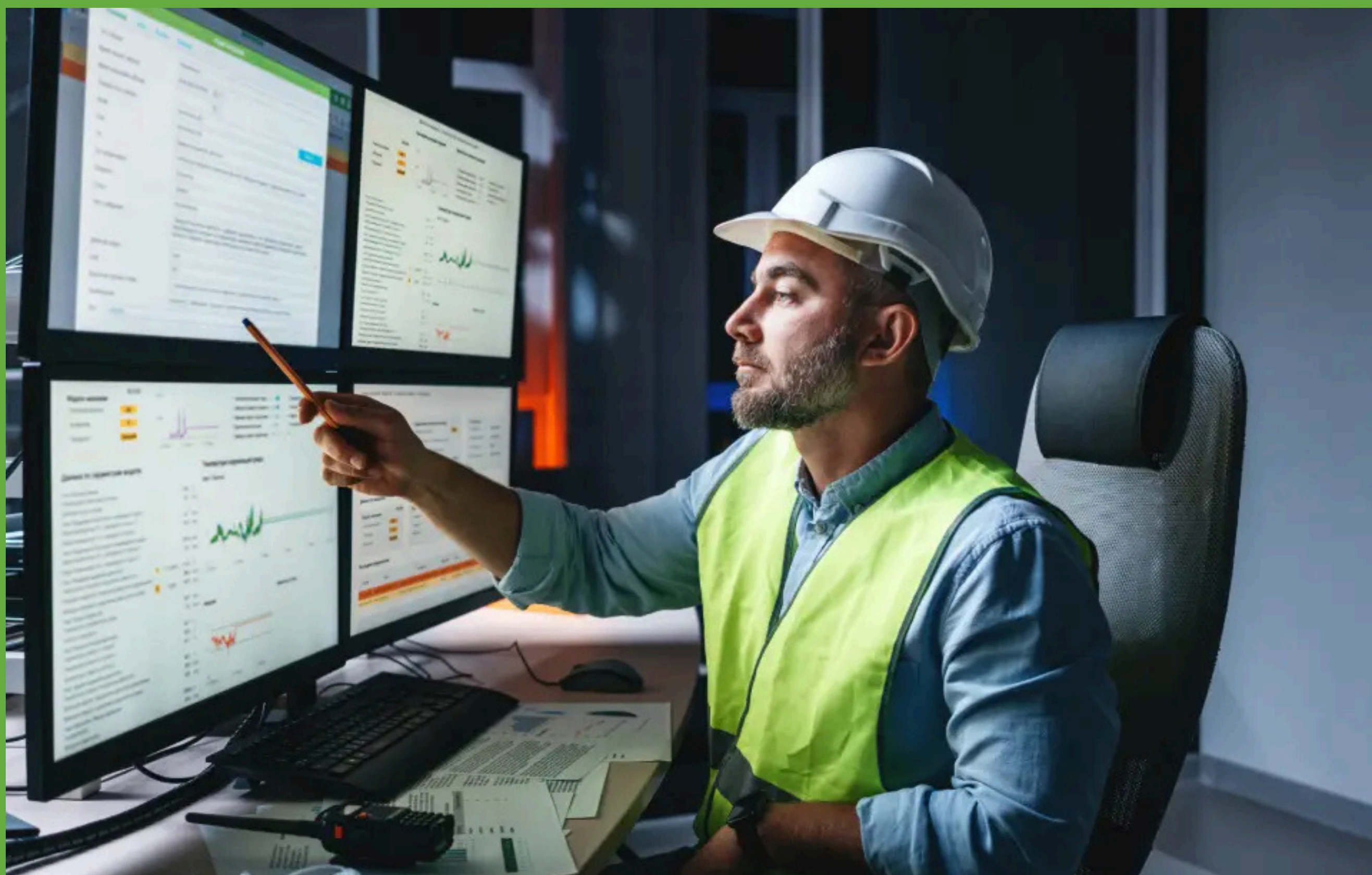
9.1 What Makes a Strong Expert

- Relevant technical experience
- Understanding of the specific failure mode
- Ability to communicate clearly
- Familiarity with arbitration procedures

An expert must do more than analyze data. They must explain it in a way that a tribunal can understand.

9.2 Credibility Matters

An expert who appears biased or overly aligned with one party loses influence. Independence is key.



Chapter 10: Aligning Legal and Technical Teams

Misalignment between lawyers and experts can weaken a case.

10.1 Common Issues

- Late engagement of experts
- Lack of communication
- Conflicting theories

Early collaboration helps avoid these problems. Workshops and joint discussions allow teams to develop a consistent approach.

10.2 Dealing with Conflicting Opinions

If an expert's findings contradict the legal theory, the response should not be to ignore them. Instead, the case may need to be adjusted. A strong claim is one that reflects the evidence, not one that forces it.

Chapter 11: Proving Causation

Causation links technical failure to financial loss. It is often the most challenging element to prove.

11.1 Structuring the Argument

- Identify the failure
- Explain its impact
- Connect it to specific losses

This requires detailed records and expert support.

11.2 The Role of Records

Good documentation strengthens causation. Poor records weaken it. In many cases, the outcome depends on the quality of available data.

Conclusion

Turbine failures sit at the intersection of engineering and law. What begins as a technical issue often becomes a dispute over responsibility and loss.

Successful arbitration claims depend on three elements:

- Accurate technical analysis
- Clear causal reasoning
- Strong, credible evidence

Experts and legal teams must work together from an early stage. They must build a case that is both technically sound and legally persuasive. In the end, arbitration is not just about proving that something failed. It is about showing why it failed, who is responsible, and what that failure cost.

HOW MASIN CAN HELP:

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Recognized as a top-tier firm in construction arbitration, Masin delivers independent assessments in delay analysis, quantum evaluation, and forensic technical analysis.

Masin was ranked #6 in the prestigious GAR 100 Expert Witness List for Construction Arbitrations and our experts are individually ranked in Lexology Index, Chambers & Partners, and The Legal 500, reinforcing Masin's reputation as a trusted authority in dispute resolution.



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