Root Cause Analysis - Field Method Guide

Step	Actions	Field Tips
1. Preserve evidence	Photograph as-found; bag failed parts; capture DCS trends, alarms, operator logs immediately	Do NOT clean fracture surfaces; mark orientation before removal
2. Define the problem	What failed, when, operating context, deviation from normal	Write it as an event statement, not a cause guess
3. Build timeline	Sequence process data, maintenance history, and operator actions	Look weeks back - precursors usually exist
4. Analyze	5-Why / fishbone / fault tree; verify each hypothesis with evidence	Physical evidence outranks opinion; test competing hypotheses
5. Identify root causes	Physical -> human -> latent (system) causes	Stopping at the physical cause guarantees recurrence
6. Corrective actions	Specific, owned, dated actions; verify effectiveness later	Fix the system, not just the part

Reading Bearing & Shaft Failures

Evidence	Points To
Fatigue spalling on race loaded zone	Normal life end or overload; check load path and fits
Spalling at ball spacing intervals	False brinelling (static vibration) or impact during installation
Discoloration / temper colors	Overheating: lubrication failure or excessive preload
Fluting (washboard pattern)	Electrical current passage - VFD common mode, grounding
Beach marks on shaft fracture	Fatigue: origin at stress riser (keyway, shoulder, fret)
45-degree fracture plane	Torsional overload event

The Latent Cause Questions

Why did our systems allow this? - Was the failure mode known? Was monitoring in place and acted on? Did procedures, training, spares quality, or design margin contribute? Would the same event happen on the sister machine tomorrow?