Wire Rope Diagnostic

Mode	Symptoms	Possible Causes
Fatigue	Wire break is transverse -- either straight across or Z shape. Broken ends will appear grainy.	Check for rope bend around too small a radius; vibration or whipping; damaged sheaves; rollers too small; reverse bends; bent shafts; tight grooves; corrosion; small drums & sheaves; incorrect rope construction and size (too big); improper installation; poor end termindations. (In the absence of other modes of degradation, all rope will eventually fail in fatigue).
Tension	Wire break reveals a mixture of cup and cone fracture and shear breaks.	Check for overloads; sticky, grabby clutches; jerky conditions; loose bearing on drum; fast starts, fast stops, broken sheave flange; wrong rope size & grade; poor end terminations. Check for too great a strain on rope after factors of degradation have weakened it.
Abrasion	Wire break mainly displays outer wires worn smooth to knife edge thinness. Wire broken by abrasion in combination with another factor will show a combination break.	Check for change in rope or sheave size; change in load; overburden change; frozen or stuck sheaves; soft rollers; sheaves or drums; excessive fleet angle; misalignment of sheaves; kinks; improperly attached fittings; gift & sand; objects imbedded in rope; improper grooving.
Abrasion plus Fatigue	Reduced cross-section is broken off square thereby producing a chisel shape.	A long term condition normal to the operating process. Short term: see "Abrasion."
Cut or Gouged or Rough Wire	Wire ends cross-section is necked down as in a cup and cone configuration. Tensile break produces a chisel shape.	Check on all the above conditions for mechanical abuse, or either abnormal or accidental forces during installation.
Torsion of Twisting	Wire ends show evidence of twist and/or cork-screw effect.	Check on all the above conditions for mechanical abuse, or either abnormal or accidental forces during installation.
Mashing or Crushing	Wires are flattened and spread at broken ends.	Check on all the above conditions for mechanical abuse, or either abnormal or accidental forces during installation. This is a common occurrence on the drum when the lower layer is installed with less tension than the layer going on top.
Corrosion	Wire surfaces are pitted with break showing evidence either of fatigue tension or abrasion.	Indicates improper lubrication or storage, or a corrosive environment.

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1. Mechanical damage due to rope movement over sharp edge projection while under load.	
2. Localized wear due to abrasion on supporting structure. Vibration of rope between drum and job head sheave.	
3. Narrow path of wear resulting in fatigue fractures, caused by working in a grossly oversize groove or over small support rollers.	
4. Two parallel paths of broken wires indicative of bending through an undersize groove in the sheave.	
5. Severe wear, associated with high tread pressure. Protusion of fibre main core.	
6. Severe wear in Lang Lay, caused by abrasion of cross-over points on multi-layer coiling application.	
7. Corrosion of severe degree caused by immersion of rope in chemically treated water.	
8. Typical wire fractures as a result of bend fatigue.	

9. Wire fractures at the strand, or core interface, as direct from 'crown' fractures, caused by failure of core support.	
10. Break of IWRC resulting from high stress application. Note nicking of wires in outer strands.	
11. Strand core protusion as a result of torsional unbalance created by 'drop ball' application (i.e. shock loading).	
12. Typical example of localized wear and deformation created at a previously kinked portion of rope.	
13. Multi-strand rope 'bird-caged' due to torsional unbalance. Typical of build-up seen at anchorage end of multi-fall crane application.	
14. Protusion of IWRC resuting from shock loading.	

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