Engine, Drive Train, and Hydraulic Repair Indicator Quick Reference Guide







# **CATERPILLAR®**

#### **Planned Indicators**

Planned Indicators	Description
S•O•S <sup>™</sup> Services	S●O●S Services provide the best insight into internal component wear and potential failure.
Service Meter Hours	Operating and Maintenance Manual gives general guidelines for servicing based on service meter hours.
Experience - Observation and Discussion	Talking with your machine's operator can reveal many potential component problems.
Service History	Service history indicates how frequently routine maintenance is performed.
Fuel Consumption	Indicates when a piece of equipment is operating at less than optimum efficiency.
Site Operations Maintenance Advisor (SOMA)	SOMA is a software that assesses customers operating and maintenance practices and provides component life estimates.

#### **CAT<sup>®</sup> Engine Repair Indicators**

<b>Problem Indicators</b>	Possible Causes	Options
Excess black smoke at full load (hot, unburned fuel)	Dirty primary/secondary air cleaner Operating in too high a gear Overfueling Overloading	Faulty Turbocharger Technical Analysis Inspection Customer/Dealer Discussion
Increased fuel consumption	Malfunctioning fuel nozzles/injectors Malfunctioning turbocharger Dirty air cleaner Improper set point Fuel leak	Technical Analysis Inspection Customer/Dealer Discussion Tune-up
Blue smoke (oil consumption)	Worn turbocharger seals Worn rings/liners Worn valve guides Hours on engine	S.O.S Fluid Analysis Component Inspection/Repair Repair Determination Inspection Customer/Dealer Discussion
White smoke (steam: water in combustion chamber)	Cracked head and/or liners Leaking head gasket	Technical Analysis Inspection

### CAT<sup>®</sup> Engine Repair Indicators (Continued)

Problem Indicators	Possible Causes	Options
White smoke (on start-up: unburned fuel)	Incorrect starting procedure Incorrect fuel injection timing Faulty injector	Customer/Dealer Discussion Tune-up
Increased oil consumption (excess blow-by)	Worn or broken rings/liners Worn turbocharger seals Worn valve guides Hours on engine	S-O-S Fluid Analysis Component Inspection/Repair Repair Determination Inspection Technical Analysis Inspection Customer/Dealer Discussion
Unusual Noises	Malfunctioning fuel nozzles/injectors Malfunctioning turbocharger Worn piston pin bushings Worn rod/main bearings Too much valve lash	Technical Analysis Inspection Repair Determination Inspection Component Inspection/Repair Customer/Dealer Discussion Tune-up
Lack of power	Incorrect adjustment of governor linkage Malfunctioning fuel nozzles/injectors Slipping torque converter Improper set point Dirty fuel filter Dirty air cleaner Low quality fuel	Technical Analysis Inspection Customer/Dealer Discussion Tune-up
Overheating	Malfunctioning temperature regulator Incorrect adjustment or worn belts/pulleys Incorrect operator technique Plugged radiator core <i>(external and internal)</i> Low coolant level Dirty air cleaner	Cooling System Maintenance
Hard starting (engine missing)	Malfunctioning fuel nozzles/injectors Improper starting technique Worn fuel injector pump Slipping torque converter Low cranking speed Low quality fuel <i>(low cetane rating or wa</i>	Customer/Dealer Discussion Tune-up ater in fuel)
Oil level over full	Coolant/fuel leak into crankcase Improper oil fill	S·O·S Fluid Analysis Customer/Dealer Discussion
Debris in oil filter	Coolant/fuel leakage into crankcase Extended oil change period Damaged bearings Incorrect oil use Dirt in entryway	S·O·S Fluid Analysis Customer/Dealer Discussion

### **CAT Final Drive Repair Indicators**

Problem Indicators	Possible Causes	Options
Brake Slippage	Worn plates and disks Wrong oil used Linkage out of adjustment	Technical Analysis Inspection Repair Determination Discussion Customer/Dealer Discussion
Unusual Noises	Worn plates and disks Dirt in entryway Low fluid level	Technical Analysis Inspection Repair Determination Discussion Customer/Dealer Discussion
Overheating	Wrong oil used Low fluid level Worn or damaged seals	Technical Analysis Inspection Repair Determination Discussion S•O•S Services Customer/Dealer Discussion
Debris on Magnetic Plug	Dirt in entryway Wrong oil used Extended oil change period Disc disintegration Worn gears or bearings	S•O•S Services Customer/Dealer Discussion
Vibration	Gear failure Sprocket failure Bearing failure	Technical Analysis Inspection Repair Determination Discussion S • O • S Services Customer/Dealer Discussion
Leaks	Worn, hard, cracked seals Sprocket failure Bearing failure	Repair Determination Discussion Customer/Dealer Discussion





### **CAT Transmission Repair Indicators**

Problem Indicators	Possible Causes	Options
Hesitation/Slippage	Worn plates and disks Linkage out of adjustment Low fluid level Linkage not free Incorrect pressure settings Wrong oil used	Technical Analysis Inspection Repair Determination Discussion S•O•S Services Customer/Dealer Discussion
Unusual Noises	Worn gears/bearings Dirt in entryway Aeration/cavitation Low fluid levels	Technical Analysis Inspection Repair Determination Discussion S•O•S Services Customer/Dealer Discussion
Vibration	Bent drive shaft Gear failure Bearing failure	Technical Analysis Inspection Repair Determination Discussion S•O•S Services Customer/Dealer Discussion
Overheating	Wrong oil used Plugged radiator Worn pump/pressure relief valve Worn or damaged seals Low fluid level Worn or dirty control valve	Technical Analysis Inspection Repair Determination Discussion S ● O ● S Services Customer/Dealer Discussion
Debris in Filter/ on Magnetic Screen	Dirt in entryway Wrong oil used Extended oil change period Worn gears/bearings Disk disintegration	S●O●S Services Customer/Dealer Discussion
Leaks	Worn, hard, cracked seals	Repair Determination Discussion Customer/Dealer Discussion





### **CAT Differential Repair Indicators**

<b>Problem Indicators</b>	Possible Causes	Options
Bent or Damaged Lines	External damage	Technical Analysis Inspection Repair Determination Discussion Customer/Dealer Discussion
Unusual Noises (when traveling straight)	Worn gears/bearings Ring & pinion need adjustment Dirt in entryway Low fluid level	Technical Analysis Inspection Repair Determination Discussion Customer/Dealer Discussion
Unusual Noises (when turning)	Worn differential case assembly Worn spiders Worn spider gears	Technical Analysis Inspection Repair Determination Discussion Customer/Dealer Discussion
Vibration	Gear failure Spider failure Differential failure Bearing failure	Technical Analysis Inspection Repair Determination Discussion S•O•S Services
Debris on Magnetic Plug	Contamination entry (dirt/debris) Extended oil change period Wrong oil used Worn gears/bearings	S•O•S Services Customer/Dealer Discussion
Leaks	Worn/damaged seals (pinion/differential) Worn bearings	Repair Determination Discussion Customer/Dealer Discussion
Overheating	Wrong oil used Low fluid level Worn or damaged seals	Technical Analysis Inspection Repair Determination Discussion S • 0 • S Services Customer/Dealer Discussion







### **CAT Hydraulic Repair Indicators**

<b>Problem Indicators</b>	Possible Causes	Options
Leaks	System pressure too high Scored or bent cylinder rod Failed or incorrect seals Improperly torqued hose connection Wom or damaged hoses, tubes & fittings Missing guards	Hose service Thorough visual machine inspection Maintenance and diagnostic services S•O•S Services Custom Hydraulic Service
Excessive cylinder drift	Valve adjustment needed Scored cylinder Failed seal or seals Scored valve Contaminated oil	Identification and measurement Diagnostic services S•O•S Services Custom Hydraulic Service
Slow cycle times	Engine performance Faulty Valve Low fluid level Worn system components Contaminated oil	Machine measurements compared to specs Diagnostic services S•0•S Services Custom Hydraulic Service
Noisy operation	Engine performance Low fluid level Restriction in system Aeration Worn system components Faulty relief valve	Thorough visual machine inspection S●O●S Services Custom Hydraulic Service
System overheating	Faulty oil cooler Low fluid level Plugged fliter Worn system components Faulty relief valve Wrong viscosity or contaminated oil Restriction in system Poor operator habits	Thorough visual machine inspection Maintenance and diagnostic services S•0 • S services Custom Hydraulic Service
Loose cylinder joints	Worn rod or cylinder eye/trunnion Poor lubrication Improper PM schedule	Component Inspection/Repair Custom Hydraulic Service
Blisters or abrasions in hose	Pinhole leaks in liner material Poor hose routing External damage System overheating	Thorough visual machine inspection Hose service Custom Hydraulic Service
Excessive hose movement	Improper clamping or routing of hose Aeration/cavitation	Hose service

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