

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



**CATERPILLAR®**

# Planned Indicators

## Planned Indicators

## Description

### S•O•S<sup>SM</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

## Problem Indicators

## 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® Engine Repair Indicators (Continued)

Problem Indicators	Possible Causes	Options
<b>White smoke</b> (on start-up: unburned fuel)	Incorrect starting procedure Incorrect fuel injection timing Faulty injector	Customer/Dealer Discussion Tune-up
<b>Increased oil consumption</b> (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
<b>Unusual Noises</b>	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
<b>Lack of power</b>	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
<b>Overheating</b>	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	Technical Analysis Inspection Customer/Dealer Discussion Cooling System Maintenance
<b>Hard starting</b> (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 water in fuel</i> )	Customer/Dealer Discussion Tune-up
<b>Oil level over full</b>	Coolant/fuel leak into crankcase Improper oil fill	S-O-S Fluid Analysis Customer/Dealer Discussion
<b>Debris in oil filter</b>	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

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



# CAT Transmission Repair Indicators

<b>Problem Indicators</b>	<b>Possible Causes</b>	<b>Options</b>
<b>Hesitation/Slippage</b>	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
<b>Unusual Noises</b>	Worn gears/bearings Dirt in entryway Aeration/cavitation Low fluid levels	Technical Analysis Inspection Repair Determination Discussion S•O•S Services Customer/Dealer Discussion
<b>Vibration</b>	Bent drive shaft Gear failure Bearing failure	Technical Analysis Inspection Repair Determination Discussion S•O•S Services Customer/Dealer Discussion
<b>Overheating</b>	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
<b>Debris in Filter/ on Magnetic Screen</b>	Dirt in entryway Wrong oil used Extended oil change period Worn gears/bearings Disk disintegration	S•O•S Services Customer/Dealer Discussion
<b>Leaks</b>	Worn, hard, cracked seals	Repair Determination Discussion Customer/Dealer Discussion



# CAT Differential Repair Indicators

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



# CAT Hydraulic Repair Indicators

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

# Commitment of service and support

## **CAT® DEALERS DEFINE WORLD-CLASS PRODUCT SUPPORT.**

We offer you the right parts and service solutions, when and where you need them.

The Cat Dealer network of highly trained experts keeps your equipment up and running to maximize your equipment investment.



For more information, contact your local Cat Dealer  
or visit **[www.cat.com](http://www.cat.com)**

**CATERPILLAR®**  
TODAY'S WORK. TOMORROW'S WORLD.™