

Shindaiwa Piston Failure Analysis

NEW PISTON (REFERENCE)	1
LEAN SCORE/OVER HEAT	2
LEAN SEIZURE/OVER HEAT	3
LACK OF LUBRICATION	4
CARBON SCORING	5
IMPROPER FUEL CONTAINER	6
PRE-IGNITION	7
DETONATION	8
MECHANICAL DAMAGE	9
DIRT INGESTION	10
BROKEN PISTON LAND AREA	11
STUCK PISTON RINGS	12

NEW PISTON (reference)



Intake Side



Exhaust Side



Top

Identification: Note the machine marks on the piston surface, sharp edges and corners of piston ring lands.

LEAN SCORE / OVER HEAT



Intake Side



Exhaust Side



Top

Identification: Deep, sharp scoring on exhaust side of piston particularly on left side, farthest from cooling air produced by the flywheel. This is caused by a build up of excessive heat and metal to metal contact from heat expanded piston. Piston rings may still move freely in their grooves if damage is slight.

Symptoms: Loss of compression due to scoring of piston, cylinder. Engine may restart when cooled, but piston will continue to score while running.

Causes: Expansion of piston surface on exhaust side from overheating. Lean carburetor setting. Lean engine oil mix ratio. Incorrect engine oil. Air leak. Excessive air/fuel ratio from oxygenated fuel. Forcing dull saw chain in cut. Clogged cooling air intake or cylinder fins. Damaged flywheel fins. Plugged fuel filter. Failing to select proper size equipment for the job, overloading.

LEAN SEIZURE / OVER HEAT



Intake Side



Exhaust Side



Top

Identification: Deep, sharp scoring on exhaust side of piston and cylinder from excessive heat and metal to metal contact of excessive heat expanded piston. Piston rings will be stuck in grooves.

Symptoms: Loss of compression due to scoring of piston and cylinder. Seized engine.

Causes: Expansion of piston on exhaust side from overheating. Lean carburetor setting. Lean engine oil mix ratio. Incorrect engine oil. Air leak. Excessive oxygenated fuel. Forcing dull or improperly sharpened saw chain in cut. Clogged cooling air intake or cylinder fins. Damaged flywheel fins. Plugged fuel filter. Failing to select proper size equipment for job. or overloading.

LACK OF LUBRICATION



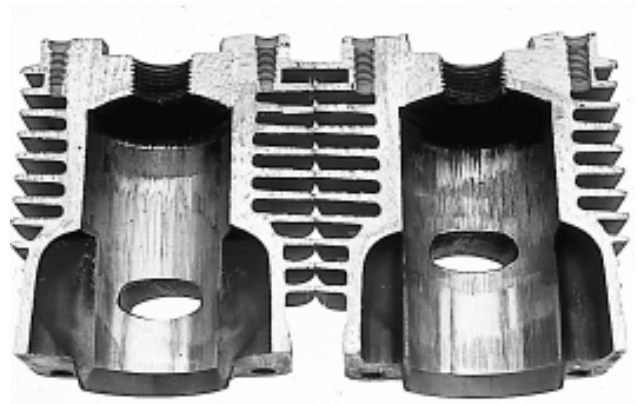
Intake Side



Exhaust Side



Top



Cylinder

Identification: Deep, sharp scoring on exhaust **and** intake side of piston and cylinder. Piston rings typically are not stuck in grooves.

Symptoms: Loss of compression. Seized engine.

Causes: Absence of engine oil and its lubricating properties. Unmixed fuel. Phase separation of alcohol in fuel mix.

CARBON SCORING



Intake Side



Exhaust Side



Top



Cylinder

Identification: Soft-edged, gently rounded scoring on exhaust side of piston that feels smooth (relative to lean score). Piston rings may still move freely in grooves.

Symptoms: Possible loss of compression from irregular sealing surface. Low power from carbon build-up in exhaust port and spark arrestor screen. Engine may be difficult to start or not start at all.

Causes: Minute particles of carbon dislodged from exhaust port jamming between piston and cylinder walls. Rich carburetor setting. Extra rich engine oil mix ratio. Incorrect engine oil. Sustained low RPM/light load operation. (Too cool to burn deposits away.)

IMPROPER FUEL CONTAINER



Intake Side



Exhaust Side



Top

Identification: Black or brown tarry coating around piston surface, cylinder, and crankcase. Stuck rings in grooves.

Symptoms: Difficult to start engine. Sluggish operation.

Causes: Use of improper fuel container such as plastic milk jug, anti-freeze container, two-liter plastic bottle made of polystyrene. Material will dissolve when in contact with fuel and mixing oil, thus contaminating the mix.

PRE-IGNITION



Intake Side



Exhaust Side



Top

Identification: Deep, sharp scoring on exhaust side of piston. Crumbling of piston crown on exhaust side. Small, melted pieces of aluminum deposited on top of piston. Possible melted spark plug electrode. Piston rings may be stuck in grooves.

Symptoms: Loss of compression. Seized engine. May reduce engine life to seconds!

Causes: Ignition of air/fuel mixture a millisecond **prior** to regular spark interval from excessive carbon build-up. Incorrect spark plug heat range. Hot spots on top of piston from piston/cylinder scuffing. Detonation. Lean carburetor setting.

DETONATION



Intake Side



Exhaust Side



Top

Identification: Hole broken (not burned) in top of piston. Broken ring land. Broken cylinder flange. Bent connecting rod. Flattened or cracked piston pin. Flattened or broken bearing cages.

Symptoms: High RPM knocking noise from engine. Seized engine.

Causes: Spontaneous ignition of air/fuel mixture a millisecond **after** regular ignition interval from stale, low octane fuel. Carbon build-up. Lean air/fuel ratio. Excessive ignition advance. Severe lugging of engine. Fuel explodes in chamber instead of burning smoothly. Puts two to three times normal stress on engine components. Has a hammering effect.

MECHANICAL DAMAGE



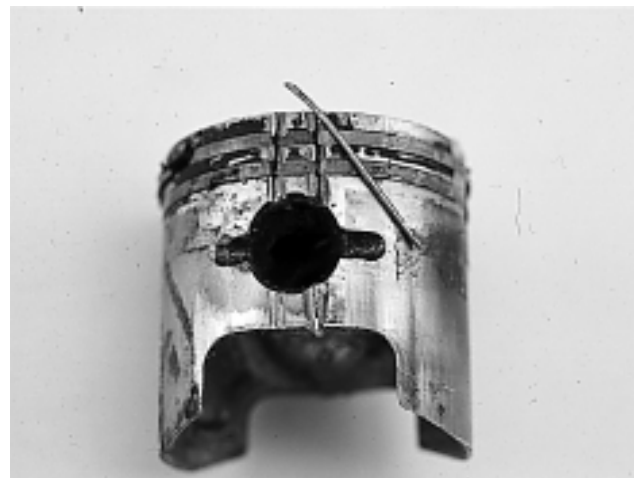
Intake Side



Exhaust Side



Top



Front View

Identification: Irregular gouges at odd locations on exhaust and intake port locations on sides of piston.

Symptoms: Seized engine.

Causes: Foreign object loose inside engine, such as circlip, locating pin, or needle bearing. Dislodged circlip may be due to improper installation; debris in engine wearing pin and knocking circlip out; installation of incorrect circlip (size/diameter). Detonation. Excessive RPM breaking away piston land area. Debris in engine causing wear of thrust washers.

DIRT INGESTION



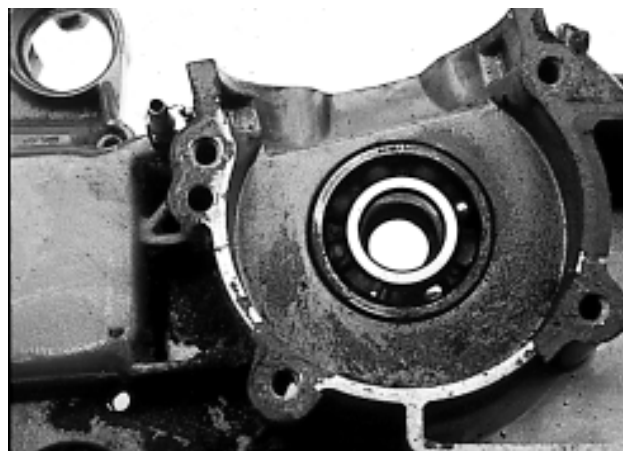
Intake Side



Exhaust Side



Piston Skirt



Bearing View

Identification: Sandblasted condition on piston intake side, dull gray appearance on piston surface. Intake piston skirt worn razor sharp. Rounded piston rings that move freely in grooves. Accumulation of debris in intake/exhaust ports and bearings.

Symptoms: Loss of compression from rapid wear of piston and cylinder. Difficult to start engine. Low power.

Causes: Operating with debris in engine from damaged or missing air filter. Piston pin bosses may be worn, oversized and hammered out. Excessive wear or broken thrust washers may be apparent.

BROKEN PISTON LAND AREA



Intake Side



Exhaust Side



Top

Identification: Area between rings on piston broken away.

Symptoms: Difficult to start engine. No power.

Causes: Over-revving of engine (especially with chainsaws), excessive ring flutter and subsequent land area breakage in combination with excessive wear to piston ring land area from dirt ingestion. Trapped carbon in grooves.

STUCK PISTON RINGS



Identification: Piston rings stuck in grooves.

Symptoms: Very low compression. Difficult to start engine. No power.

Causes: Improper fuel mix usage such as 30 weight engine oil or use of multi-viscosity oil. Bar and chain oil used for mix. Use of improper fuel container such as a plastic milk jug, etc.

By examining the condition of the piston and cylinder, a mechanic can often determine the cause of failure. A solution can then be recommended to the customer to prevent the problem from reoccurring.

The goal of the Shindaiwa Piston Seizure Analysis booklet is to help the servicing dealer diagnose engine problems faster and more accurately. We believe the majority of piston failures can be traced to one or more of the following types of piston and cylinder conditions found in this booklet.

A note on troubleshooting piston problems:

Many piston problems can be traced back to improper fuels or improper fuel mixing. Shindaiwa recommends the following:

- Use only fresh, clean fuel
- Use only fuel with an octane rating of 87 or above
- Mix all fuel with Shindaiwa Premium 2-Cycle Mixing Oil at a gasoline/oil ratio of 40:1 (3.2 ozs. mixing oil to 1 gallon gasoline).

Caution:

Some gasolines contain alcohol as an oxygenate! Oxygenated fuels may cause increased engine operating temperatures! Under certain conditions, alcohol-based fuels may also reduce the lubricating qualities of some mixing oils! Never use any fuel containing more than 10% alcohol by volume! When an oxygenated fuel must be used, an oxygenate such as MTBE is to be preferred over an alcohol-based fuel!

Caution:

Whenever possible, use Shindaiwa Premium 2-Cycle mixing oil or equivalent quality oil mixed at a 40:1 ratio. Be aware that some generic oils and some outboard mixing oils may not be intended for use in high-performance air cooled 2-cycle engines, and should never be used in your Shindaiwa unit.

Important:

Most seizures are not covered by warranty! Whenever an air leak is suspected, always pressure test the engine before disassembly!

**strijds
kampen
alwaars**