These three pistons have piston-crown burn patterns linked to carb jetting and fuel choice. The piston in the center is a great example of a perfect carbon pattern; the color looks like hot-chocolate and the flow pattern resembles a leaf pattern. Looking under the piston crown a dark carbon spot should be visible taking up approximately 25% of the area of the underside of the piston crown center.

The piston on the right is dark stained with no carbon spot under the crown. This means that the jetting is rich, and perhaps the premix ratio or oil type is too rich as well. The transmission-side crankshaft seal may be worn, allowing transmission oil to enter the crankcase and be burned in the combustion chamber, producing smoke at the tail-pipe, spooge at the header, and excess carbon on the piston crown.

The piston on the left suffered from too-lean carb jetting with a too-hot spark plug, heat-range, and too-low octane fuel for the engine’s compression ratio. The piston crown got so hot that it melted. The melted blow-out spot usually occurs on the exhaust side and up to the center where the heat and pressure is the greatest.
Lubrication Seizure
Most pump gas contains ethanol which works to separate pre-mix oils from gas. Piston to cylinder seizures from lack of lubrication is the most common piston failure. The piston in this photo is dry to the finger touch and the piston is deeply scoured and melted. The gas tank has globs of oil and straight volumes of gasoline.

Millennium Technologies does not offer cylinder warranties when the piston and cylinder wall are dry with little or no oil and seizure marks. In some cases the cylinder can be repaired with light diamond honing for a small cost. Millennium also offers competitive prices on brand name piston kits like Wiseco, Wossner, and Vertex.

We recommend Maxima oil products because they contain additives to prevent fuel and oil separation.

Millennium offers a one-time Accidental Warranty special price for any cylinder plated by us since 1997.

COOLANT LEAK SEIZURE
The second most common piston failure is when the cylinder head leaks through the gasket and spills into the bore, and the coolant strips the cylinder bore and piston of oil. The piston in this photo is dry of oil and sticky to the touch with coolant residue. Check out the piston in this photo; when the hot piston is sprayed with coolant the ring land breaks away. The photo of the head gasket shows a blow-out pattern on this steel gasket. The cylinder head may suffer damage as well as the top of the cylinder. The combustion gases propel the coolant back and forth to the gasket surface to produce surface erosion until the gasket, piston, or bore fail. Millennium offers a full line of repairs for cylinder heads and cylinder deck restoration from welding and CNC o-ring groove machining to surface grinding to the finest surface finish. These repair services, combined with high quality American-made Cometic gasket kits, give you a reliable solution to a chronic maintenance problem. Cylinder heads for dirt bikes include an engine mounting point that can cause coolant leaks and warping of the head.

Millennium Technologies will not honor cylinder warranties when a faulty cylinder head is not submitted for repair.

We can help you find the most cost effective repair for cylinder heads, including modifications for high altitude and conversions to running unleaded 10% ethanol pump gas.
MULTI-POINT CLEARANCE SEIZURE
This piston has multiple seizure streaks equidistant around the periphery of the piston face. The clearance between the piston to cylinder wall was too small considering the piston manufacturer’s recommended specifications. Our technicians can advise you on the proper clearance spec for all sorts of fuel types, tuning, and usage patterns. For example, grass-drag snowmobiles and youth mini-cycle racers need more piston to cylinder wall clearance because there is a short time between cold and full-throttle.

Millennium honors warranties for cylinders where we set the clearance spec.

We do not warranty cylinders where the clearance spec was requested by the owner.

Millennium Technologies offers the widest selection of name brand pistons, gaskets, and rings like WISECO, WOSSNER, VERTEX, and PRO-X at a 20% discount. MT offers more inclusive warranties when you buy a certified-measured piston. Whether your preference is cast or forged pistons, MT has the database of manufacturer’s piston to cylinder and head specs to fulfill your engine’s maintenance needs with the highest quality.

4-POINT COLD SIEZURE
The term “cold seizure” refers to starting your engine and putting a big load on it before the temperature of the piston and cylinder normalize. The piston heats up faster than the cool cylinder and expands so fast it seizes the piston on 4 equidistant points around the outside of the piston.

AIR-LEAK SEIZURE
Air leaks can come from a variety of sources such as the intake joints, seals, and even splits in the carburetor. An air leak is a dangerous condition because it can lean-out the air/fuel mixture and cause the piston to heat up and eventually melt. Most air leaks occur at gasket joints and crankshaft seals on 2-cycle engines. The piston in this photo suffered a massive meltdown on the exhaust side of the piston. The cause of the failure was traced to a dry-rotted rubber intake manifold.

Millennium offers a special discounted price under the Accidental Warranty and only for cylinders previously plated in our facility.

RING-GAP SEIZURE
The piston ring end-gap must be checked prior to use. The general rule is .004 inches for every inch of bore diameter. The piston in this photo has seizure marks over the ring end and 180 degrees from the gap.

We do not honor warranties where the customer doesn’t check and set the piston ring end-gap.

We offer a special service to check and set the ring end-gap when you purchase a new piston and gasket kit with your cylinder service. We will also install the rings on the piston and check the side clearance.
Cast Shattered vs. Forge Hammered Pistons
The pistons in these photos have broken or shattered to pieces from either over-revving or having been run for too many engine hours. Generally speaking, cast pistons offer advantages of low friction and better resistance to high thermal loads whereas forged pistons are lighter and more durable. When cast pistons reach their wear limit they can shatter into pieces. Forged pistons get hammered at key wear points and make a lot of noise when the engine is running.

Millennium does not honor cylinder warranties when the piston is run past the service life.

Millennium does offer discounts on purchases of extra piston rings, piston kits, and gaskets when you get your cylinder repaired.

Black Spot Hot Seizure
The pistons in this photo suffered seizures related to the carbon build-up that accumulates on the exhaust side of the piston. This engine had a faulty silencer. The core screen was broke and partially blocked the exhaust allowing heat and burnt gasses to pulse back to the exhaust face of the piston.

Ring Pin Back-Out Seizure
When pistons are manufactured the ring centering pins are pressed in with interference clearance and an adhesive. Unfortunately sometimes these little pins back-out of the piston allowing the ring to spin and break while the pins jam in between the piston and cylinder, or get smashed into the head.

Exhaust Bridge Seizure
Piston seizures can occur at the center exhaust-bridge on a delta-shaped port, or the sub-exhaust bridges on a triple port design. The exhaust bridge is the hottest area of a 2-stroke cylinder and the ring pressure is at its peak because the bridge’s surface area is so small. Seizures happen for many reasons but the most common are 1) Lack of lubrication 2) Too lean jetting or air leak 3) Coolant over-heating 4) Not enough bridge relief 5) No oiling holes in the piston over-lapping the exhaust bridge.
DIRT CRACKS
The piston in this photo was damaged because the air filter leaked, allowing dirt to enter the cylinder. The dirt scoured the intake side of the piston, wearing it thin enough to produce a crack between the boost port and the bottom of the skirt.

COOLANT LEAKS VS. DETONATION, PRE-INTION, PINGING & PINKING
This photo shows two pistons, the small one on the right suffered a coolant/lube seizure. A head gasket leak enabled coolant to spill into the bore and wipe the oil off the cylinder causing a lack of lubrication.
The big piston on the left suffered a detonation seizure, which is evident because of the melting of the crown on the exhaust side. Detonation can often be confused with coolant leaks because the top edge of the cylinder and head can become eroded, which isn’t due to combustion pressure but rather the pressurized coolant flowing back and forth across the surfaces like a water-jet.
Detonation can be an American slang word for a variety of engine problems. Technically speaking combustion problems can be divided between detonation and pre-ignition. Detonation is an abnormal combustion condition linked to everything from too lean jetting, too much turbulence in the squish-band, too much spark advance, ethanol additives in pump gas, and coolant leak contaminates trapped in the mixture. The “sounds” of detonation include used terms like “pinging” in America and “pinking” in the UK. Dieseling is another good term; abnormal combustions sounds like shaking ball bearings in a coffee can.
All of this detonation occurs after the spark plugs ignite during ignition.
Pre-ignition happens before the timed spark when the edge of the spark plug threads or a protruding steel head gasket heats up to auto-ignition temperature and causes the mixture to ignite before the spark occurs. The sound of pre-ignition is a loud, almost scary type of sound from the motor. Auto ignition and stuck throttle conditions make it impossible to shut-off the engine until it suffers a catastrophic failure.
4-Stroke Piston Failures

**VALVE FLOATING**
The piston in this photo suffered a minor valve float and the exhaust valves contacted the piston. The piston and valves need to be replaced and a valve job performed to repair the damaged valve seats.

**VALVE TO PISTON COLLISION**
This engine suffered a catastrophic valve to piston collision. When this occurs the crankshaft must be replaced because the connecting rod is fractured in the collision. Most likely the cylinder head will be as damaged as this piston. Millennium Technologies offers comprehensive cylinder head repairs including heli-arc welding, CNC chamber profiling, bronze seat and guide replacement, valve jobs, and hand porting and polishing. You can also choose to have the valve train assembled and the valve-to-cam clearance shimmed and ready for installation.

Millennium also offers discounts on HOT-ROD Bottom End Rebuild kits with cylinder and cylinder head repair services.

Running a Piston Too Long
Pistons for modern 4-stroke engines have short skirts to reduce friction. The service life is also much shorter. When a piston is run too long the skirts wear and the piston flips sideways in the bore and looses compression. The factory recommended service life of a 250F piston, like the one pictured, is only 6 engine hours. This piston was run for 60 hours!

Millennium Technologies does not honor warranties on cylinders with pistons that look like this.