



## Wrist Pin Application Note

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### Diamond-Like Hard Carbon Coating!

#### Insight Into A Proven Carbon Raptor Application

Several race engine applications require wrist pins to survive surface wear and loads that continue to climb beyond the capabilities of traditional designs. Leading racers and engine builders have turned to Carbon Raptor®, a proprietary diamond-like carbon coating, as the solution for surface wear.

Who should use Carbon Raptor coated pins? All levels of racing where:

#### Eliminating Galling Eliminating Failure Extending Service Life

...are priorities!

High engine rpm, high operating temperatures, and use of dry sump lubricating systems and low viscosity oil are among the factors producing a harsh environment for the wrist pin. Also, increasing engine power, acceleration, and top speed without sacrificing reliability are ongoing objectives. Engine builders often use a lighter weight piston-pin combination to help achieve those objectives. Pin or piston bending is the result, which squeezes out the oil film between them. This causes the harsh environment to become worse, resulting in piston and rod bushing metal galling to the wrist pin.

#### Solution To Galling

While other coatings have been tried in the past, Carbon Raptor stands apart from them in its success across numerous racing venues in solving the wrist pin galling problem.

#### Reduced Wear To Pin Bores

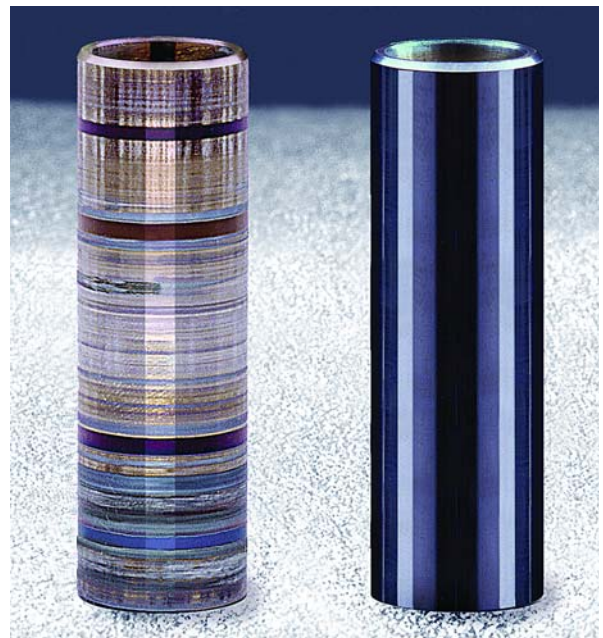
In addition to Carbon Raptor solving severe galling in Sprint Cup™ service, many engine builders report minimal or no wear to honed pin bores, reducing the labor required to make pistons ready for the next race in Nationwide™ and Craftsman Truck™ engines.

#### Unique Properties

A unique set of properties combines for this success:

**High Hardness** – Surface hardness is more than 35 percent greater than R<sub>C</sub> 60 equivalent.

**Low Friction** – Testing demonstrated that Carbon Raptor reduces friction by more than 70 percent when compared to uncoated, similar steel components.



Uncoated and coated pins in similar NASCAR service.

**High Adhesion and Flexibility** – Chemical and physical bonding to the pin and thin film flexibility ensure that Casidium will not delaminate or flake.

**High Surface Conformance** – Highly finished wrist pins retain their finish with Carbon Raptor, with no post-processing steps. Surface measurements on a polished surface with an average roughness (R<sub>a</sub>) of 0.5 μin (microinches) increased by only 0.05 μin after Casidium was applied.

**Heat Transfer** – Unlike other coatings, Carbon Raptor is a good thermal conductor.

## Longer Life

Since Anatech Ltd introduced Carbon Raptor® to U.S. racing in 1999, engine builders report that Carbon Raptor coated pins last longer than uncoated pins ever did. Budget conscious racers ranging from circle track to drag racers, land speed record, boat racing, and others are finding a payback in using Carbon Raptor pins.

## Lightweight Titanium Wrist Pins

Racers and engine builders have long wished for a wrist pin made of titanium for a weight advantage over steel. Carbon Raptor is the first coating to make titanium wrist pins an unqualified success. Some engine builders, such as in drag racing and sprint cars, report using a set of Carbon Raptor coated titanium pins for more than one full racing season.

## Heat Spreader

Used pins reveal heat has been spread from the exhaust side of the piston to the connecting rod and intake side of the piston, reducing peak piston and pin temperatures – another reason Carbon Raptor extends the life of wrist pins.

## Eliminate Connecting Rod Bushing

The bronze bushing pressed into the connecting rod is a soft metal and therefore a weak link in the reciprocating assembly. Bushings in some engines become flattened or deformed, reducing the bushing's ability to bear loads. Some Sprint Cup™ engine builders report successful rod operation with no bushing when run against Carbon Raptor coated wrist pins, allowing the pin end of the rod to be stronger, lighter, or both, all without enlarging rod dimensions.

## Wrist Pin Clearances Not Affected

Carbon Raptor is deposited to component surfaces in a plasma enhanced chemical vapor deposition reactor at a typical thickness of 2 microns (0.8 ten thousandths inch). No changes are needed from uncoated wrist pin and piston bore clearances.

## Advancing Race Engine Technology

Where uncoated pins were a limiting factor in engine design, Carbon Raptor coated pins allow engine builders to use smaller, and therefore lighter, wrist pins, and at the same time increase peak rpm and horsepower.



State-of-the-art electronic technology assures consistency and reliability.

## Proven Experience

Join the racers and engine builders who have used tens of thousands of Carbon Raptor coated wrist pins and are pulling ahead of the competition!

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**Carbon Raptor® – Successful on more than a dozen engine parts!**

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## Ask for it by name!

Available direct and through select wrist pin manufacturers.



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