



IPD DIFFERENTIATION BULLETIN

IPD Differentiation:
IPDSteel™
ONE PIECE STEEL PISTONS

October 2009

IPDDB-0009

First to Market!



A fantastic opportunity for IPD Distributors to compete against the OEM and for engine owners to save money without risk!

Our first official release of IPDSteel™ One Piece Steel pistons follows years of design and testing. They follow other IPDSteel™ pistons with thousands sold that have been in the market for over 6 years in other engine applications.

This is perhaps one of the most significant differentiations, as well as innovations that IPD has to offer our customers. We have listed below and on the following pages a few bullet-points to show the amount of design, engineering, and manufacturing experience that has gone into this product as well as earlier IPDSteel™ applications.

HISTORY:

- Original Equipment Manufacturers have made attempts for years to apply and in some cases receive patents that restrict an aftermarket option – *thus creating an uncompetitive environment.*
- IPD committed in the early 1990's to find a way to manufacture these pistons while not violating any existing patents. It was also critical to maintain the high quality standards and *"savings without risk"* philosophy that IPD is known for worldwide.
- IPD released to market its first IPDSteel™ piston crown with an aluminum skirt (articulated 2-piece design) over 6 years ago after more than 3 years of design and testing. Once again, IPD was *"First to Market!"* in the aftermarket.
- *Thousands of IPDSteel™ cast steel crown articulated pistons have been in the market for applications from 3116 up through high horsepower C15 engines successfully since 2003, proving our patent-pending technology.*

Continued...



D10R with 3412 engine



IPD CMM Equipment

- In the 1990's some OE Manufactures determined that certain higher stressed or higher horsepower applications required something other than the articulated designs. This resulted in the *One Piece Steel pistons we are discussing.*
- IPD at that time began working on the technology that would bring us to today with a *patent pending process based on our articulated steel experience and IPD's ISO9001:2000 procedures*
- IPD began in the late 1990's working with world-class casting experts as well as independent metallurgy specialist to continue to *evolve our IPDSteel™ technology and apply it to the One Piece Steel applications.*

MANUFACTURING PROCESS:



IPDSteel finished product & Wax model



Purpose built piston turning CNC in our Torrance CA USA facility



IPDSteel manufacturing cell In Torrance CA USA

- Modern casting processes *when controlled properly along with the correct metallurgy and heat treating* can ultimately perform as well as other methods as we have proven since 2003 with IPDSteel™ pistons in thousands of engines worldwide.
- The base metallurgy of course plays an important part, which is why this process from IPD includes a 4130 *high strength alloy steel* to control the carbon content of the material. This steel has qualities such as *high strength while controlling brittleness* when heat treated properly.
- Our Patent Pending process continues with a high quality investment casting using the lost wax process. The process is *tightly controlled throughout to assure a high integrity casting.*
- X-ray diagnosis has played a part along the way to *assure the process* and the casting integrity.
- All initial production of IPDSteel™ pistons include machining at our Torrance California, USA facility. We use purpose built CNC machines that allow us to machine the *tight tolerance, complex shapes, and dimensions required.*

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TESTING:



IPDSteel™ One Piece Pistons in a Caterpillar 3412 dyno test February 2007

- As mentioned, the IPDSteel™ technology has been successfully produced and in the market in other applications since 2003. However, IPD treated this project as if it were a “ground-up” design.
- After the concept and designs were run through a variety of *casting experts including independent metallurgical evaluations*, IPD felt comfortable to produce initial test samples for lab testing.
- Our lab tests were subcontracted to a completely independent company specializing in testing power components. One of the tests, a *“Hydropulsator” device was utilized for over 10 million cycles* to simulate various load conditions on the pistons.

- *The first engine dyno test on the IPDSteel™ One Piece Pistons was performed in February 2007 in a 3412 Caterpillar® industrial engine. This engine was then torn down with all components inspected, re-assembled with IPDSteel components and has been successfully working in extreme, high altitude conditions ever since!*
- Testing continued through a series of field trial engines from early 2007 through 2009. This included various customers across the globe *representing many different applications and conditions*.
- *Another IPD innovation built into many of our IPDSteel designs is the patent pending, IPD One Piece Oil Dam Plate. We feel our exclusive design could add to the retention ability of this plate installed under the crown of the piston.*
- *For the future:* In 2008 our first trial field test pistons were installed for *3500 series Caterpillar® applications* and we expect after further field testing to release pistons for these applications soon.

Why bother?

Our complete solution includes providing products that will provide the *engine performance and life that the owner expects without compromise*. While this does not always translate to the lowest priced product – it does assure the best overall value considering cost and performance.

IPD

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