

W WISECO
Performance Products

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Dave Fussner, Research & Development Manager at Wiseco, can often be found at trade shows explaining the benefits of the company's pistons

Piston heads

Wiseco is unique among aftermarket piston manufacturers in the US, as it is the only one which solely produces forged pistons. And with a 70-year history the quality of those pistons is undisputed as Brian Marion discovers

WISECO began the manufacture of pistons 70 years ago when founder Clyde Wiseman started making them in his garage. The pistons he made at that time were destined for use in big bore marine engines, and like so many successful companies that began in people's garages, word of what he was doing spread and soon he was making pistons for friends and so business began to grow. When Wiseco was officially formed in 1941 it serviced the needs of racers and powersports enthusiasts, and today the powersports sector – predominantly motorcycles and ATVs – now accounts for the largest portion of the work done by the business.

The ethos of doing it yourself that led Clyde Wiseman to begin making his own pistons still stands at Wiseco, with the company having the necessary in-house facilities to not only forge all its own pistons, but to making the tooling it needs to produce those pistons too. This ability not only keeps costs down, not having to buy anything in other than raw materials, it also allows for a greater quality of product. While other piston manufacturers may forge one piston design and then adapt it to suit a number of applications with machining work, Wiseco makes each piston as a dedicated forging for the chosen application.

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“In performance engines the increasing inertia loading demands a forged piston”

Dave Fussner, Research & Development Manager at Wiseco, explains the reasoning behind the unique manufacturing process among aftermarket piston makers, that sets Wiseco apart. “A piston may look round from the outside, but really it is not. They have a very special shape to them on the skirt area to allow for uneven expansion under heat, which is caused because the heat is concentrated on the top of the piston, and as it flows through, it meets different thicknesses of metal. The top of the piston expands more than the skirt. As a result of this the pistons need to be specially machined to allow for this.”

The traditional method of machining a piston to allow for the uneven expansion was to cam-grind it, which involves removing material to create an elliptical shape that becomes round as the piston heats up and expands. Unfortunately, cam grinding is not accurate

enough for the demands of extreme high performance engines, as it removes uniform amounts of metal along the piston's length. This results in material being taken away from where it is not necessarily need to be removed.

The solution used by Wiseco to achieve the correct level of machining in the correct places on a piston is variable cam grinding, and like everything else at Wiseco the necessary tooling was developed in-house. Working with CAD design software, the engineers at Wiseco can set the CNC machines to remove variable amounts of material from along the length of forged pistons to create designs that are tailor-made to each application.

This is just one example of the technology and methods employed at Wiseco which are crucial to its meeting the high expectations and demands of the

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What began in a garage in 1941 now occupies a 150,000 sq ft state-of-the-art facility

motorcycle and powersports industry, not to mention various top race engine builders. To insure each of its designs is developed to provide the greatest strength and lightest weight for each application, Wiseco uses the latest 3D design and finite modeling software. For manufacturing it has state-of-the-art forging and CNC machining capability. "An in-house forging process was first established here in the early '70s," explains Dave, "up until then all our products were cast." The precision forging process now used enables Wiseco to forge advanced materials into extremely intricate shapes, providing the strongest part with less weight and machining.

Dave is quick to point out the many benefits of having the forging process in-house: "In performance engines the increasing inertia loading demands a forged piston. So, to achieve the designs we were developing we needed to produce thinner sections, good fill and proper grain flow. This, in turn, demanded a higher-end forging process, over which we had total control." Wiseco's precision process is completely computer controlled so that ram speed and die temperature can be completely optimized. "Also," Dave added, "having our own forging process, as well as our on-site heat treatment and stress relieving facilities, means producing very accurate forgings that allow some machining operations to be reduced along with a certain amount of production cost."

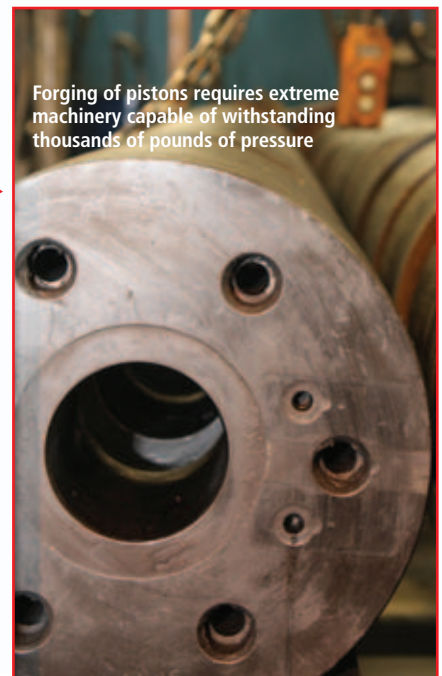
Among the forges available to the engineers at Wiseco are three conventional mechanical presses and two state-of-the-art iso-thermal presses. While the conventional presses are extremely good for producing large volumes of high quality forgings, the iso-thermal



While as many processes are automated as possible, some must be done by hand to insure the highest quality control. — Dave, Manufacturing Director

"In performance engines the increasing inertia loading demands a forged piston"

presses, which are computer controlled, allow Wiseco to work with modern materials such as lithium aluminum alloys, which cannot be forged using conventional presses. The iso-thermal forges also allow the creation of much more intricate forging shapes, thanks to the computer control of the flow rate of the heated alloys used in the production of the forgings. ▶



Forging of pistons requires extreme machinery capable of withstanding thousands of pounds of pressure



Before and after Wiseco clutch baskets



At Wiseco the engineers can machine the tooling needed to forge new designs as well as doing the finishing machine work on pistons

“Gaining the knowledge necessary to produce pistons capable of being used in race engines, and indeed in street motors, is a full-time operation at Wiseco”

Such is the level of skill on hand at Wiseco that the company has used its tooling skills and iso-thermal presses to produce brake calipers for use on Formula 1 cars.

Naturally, the company’s main product, its pistons, benefit from the advanced engineering work that outside contracting brings in to the company. By undertaking work for use in such extreme racing environments as Formula 1, Wiseco gains the benefit of knowledge of working with exotic materials and testing them on various applications, which can lead to new ideas in piston design and manufacture.

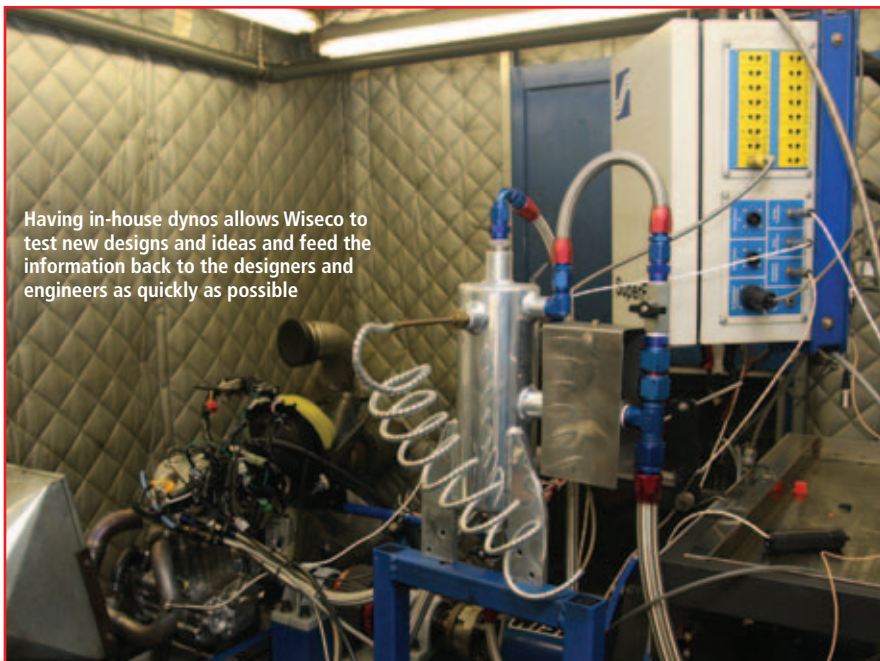
The cross-over between developing pistons for racing use and then taking that knowledge and applying it to street applications can be seen with the materials used in Wiseco’s Harley-Davidson pistons. The company uses the same 2000 series aluminum alloy for H-D pistons as it does for all its race applications. This is done because of that particular alloy’s ability to withstand high temperature environments, being air-cooled Harleys run at higher temperatures than most other contemporary street bikes and so benefit from the superior high temperature strength of the material used for the pistons.



Wiseco is the only aftermarket piston manufacturer to forge all of its pistons

Gaining the knowledge necessary to produce pistons capable of being used in race engines, and indeed in street motors, is a full-time operation at Wiseco and is backed up by the company’s fully equipped testing facility that includes two dynamometers and the latest in piston measurement and inspection equipment.

The investments that Wiseco has made over the years in new technology and product development has seen the company grow not only domestically but internationally too, and it now has customers in Europe, South America, Africa, Australia and Asia. Such wide distribution of the company’s pistons is an outstanding recognition of the quality of its pistons and testament to the skill and knowledge of its employees, who are constantly evolving piston design and development. □



Having in-house dynos allows Wiseco to test new designs and ideas and feed the information back to the designers and engineers as quickly as possible

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In order to achieve the intricate forgings it needs for its piston designs, Wiseco has both mechanical forges and computer controlled isothermals ones

