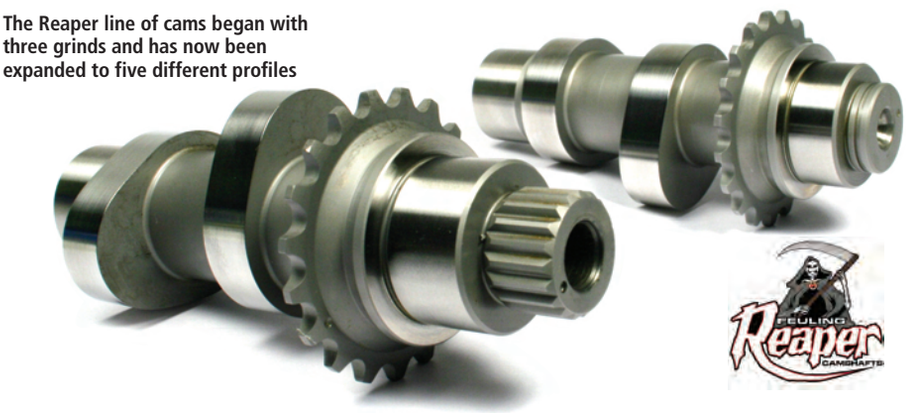
FEULING®

The name Feuling is most often associated with the short-lived W3 three cylinder engine developed by company founder Jim Feuling, from a Twin Cam H-D motor. However, following Jim's death in 2002 the company began to change direction with the emphasis now on oiling systems and valvetrain parts as Marketing Director Luke Leatherman tells AMD

THREE INTO TWO WILL GO

Words by Duncan Moore - duncan@dealer-world.com

A design of Beehive valve springs like the ones now made by Feuling were used by the Wright Brothers in their early aeroplane engines



The Reaper line of cams began with three grinds and has now been expanded to five different profiles

WHAT is now known as Feuling Parts began back in 1974 simply called Feuling Engineering. The company was named after its founder Jim Feuling and specialized in automotive engine development. Describing the work undertaken in the early days, Luke Leatherman, Feuling Parts' Marketing Director, says: "When Jim started Feuling it was more of a 'Skunk Works' facility for engine design and development… conception to completion under one roof."

Such was Jim's expertise in engine development that he went on to hold more than 100 patents relating to the automotive industry, doing research and development work for companies such as Chevrolet, Oldsmobile, Ford, Chrysler, Nissan, and John Deere.

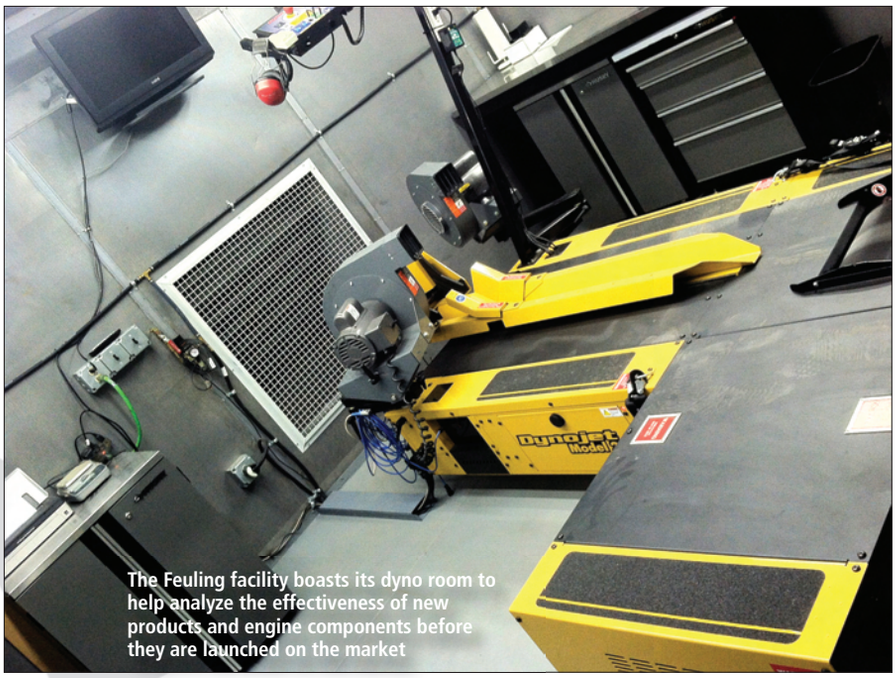
It was Jim's involvement with the auto industry and passion for bikes that led him to work with motorcycle engines. Due to the small scale nature of the Feuling operation Jim was seen as an easy target for one of the major automotive companies which took advantage of his developments without crediting him for his work. Jim tried to pursue the culprit through the courts but due to the company's sizable legal department he was unable to successfully complete his case.

In addition due to the potential advertising revenue the auto maker had, the specialist media of the time would not put Jim's side of the story forward. Hence, very disillusioned with the car world Jim turned to his other passion – motorcycles.

Given Jim's experience and contacts it was not long before Harley-Davidson had contracted him to help out with engine development. At that time H-D's Chief of Engineering had previously worked with Jim at General Motors. The engine he was contracted to work on was the fledgling Twin Cam. While much of the work he did on that engine's design has come to fruition today with the parts being made available by Feuling Parts, at the time it gave rise to what can be considered Jim's best known motorcycle project – the W3 motor.

The W3 was a three-cylinder motor, the design of which was based on a traditional air-cooled V-twin but with an additional cylinder. The thinking behind the design was to increase the capacity of the Twin Cam by 50 percent without sacrificing

Following Jim Feuling death, company employees Luke Leatherman, Allon McBee, and Gene Sheehan (left to right) formed a partenrship to take over the running of the business



The Feuling facility boasts its dyno room to help analyze the effectiveness of new products and engine components before they are launched on the market

practicality, a common issue with bored and stroked motors. Early versions of the motor utilized just six non-factory parts due to Feulings involvement with Harley's own engine development world. Indeed, the company wanted the first option to buy/licence the W3.

The W3 was offered for sale in kit form, engine/frame/electronics/intake/exhaust, all needed proprietary components. Of the 25 W3 engines that were manufactured Cory Ness built a complete custom, standing the W3 engine straight up and it is rumored that the Sands from Performance Machine own one.

One of 18 W3 motorcycles produced by the Feuling Motor Company, this particular example is for sale by Feuling

The motor that made it into production had a 150ci capacity from a 4in bore and 4in stroke. A rotary aero engine style con rod was used for the W configuration, with a central, master conrod carrying two slave rods, one on either side.

Following on from Jim's death in late 2002 the motor was still offered for sale but numbers were so limited that it was eventually shelved and business moved onto producing and selling the other parts Jim had developed while working on the W3. At this point Allan McBee, Gene Sheehan and Luke formed a partnership to take the business forward. The first of these new pieces involved the oiling system of the Twin Cam as Luke points out: "We knew the oiling system for the Twin Cam was marginal, so we knew it wouldn't be any good for the three cylinders when the W3 was in development. That meant we had made an oil pump and a cam plate lifter package and after that we thought if we're going to make this for the three-cylinder let's make sure it's retrofitable back to the two-cylinder."

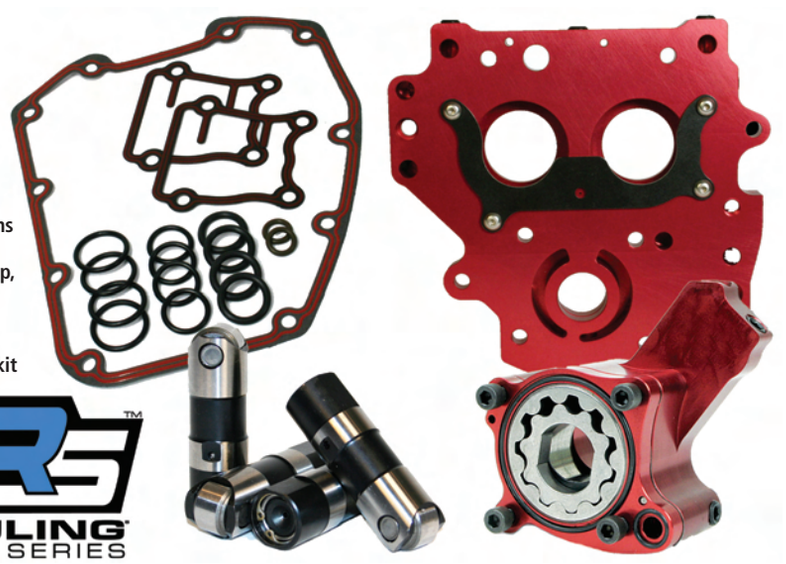
The oiling system that Feuling now retails includes a billet 6061 high volume oil pump, billet 7075 hard anodized camplate, HP+ hydraulic roller lifters and a gasket kit. The benefits of installing the system include increased oil pressure, volume, and flow along with return oil scavenging. It's also said to eliminate wet sumping and drop engine temps by as much as 35 degrees.

A second option is the Race Series kits, which include a blue printed billet 7075 hard anodized oil pump and full travel hydraulic roller lifters. The Race series lifters are designed with tighter internal tolerances to handle heavy valve spring pressures and have increased roller clearance for steep ramped camshafts.

On the subject of camshafts Luke went on to explain about the company's Reaper line. "I know we are really late to the market but what we are pushing these days is camshafts. We did a lot of testing in the early days when we were working with Harley and we did a lot of camshafts back then. So we knew at a very early stage some stuff that worked very well for camshafts and with hindsight we should have brought the cams to market much earlier. It would have made our task [selling them] a lot easier."

Luke then went on to explain the benefits of the Reaper cams, saying: "When we first came up with these cam grinds people looked at us cross-eyed.

"If you look at our cam specs in comparison to other stuff that is out there and available they look completely different. Our cams are extremely smooth on the valve-train and they're easy starting, without the need for extra mechanical



Feuling oiling systems include a billet 6061 high volume oil pump, billet 7075 hard anodized camplate, HP+ hydraulic roller lifters and a gasket kit

The conrod design for the W3 engine was based on that of ones used in radial aero engines

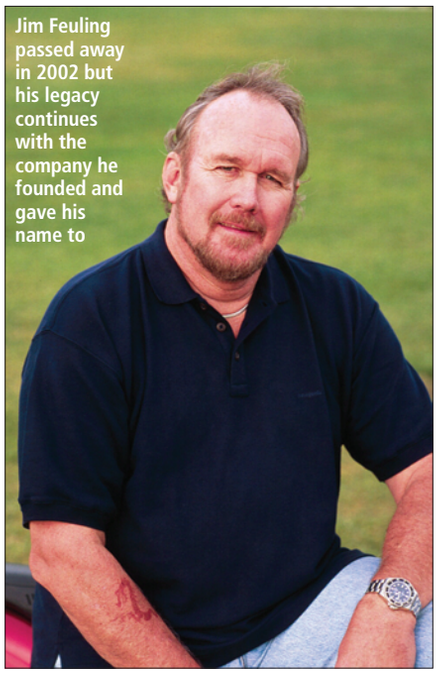
components in them and we're getting very wide power bands. We've really gone after the torque with them because Harley-Davidsons are such heavy bikes. We have everything covered with just three different grinds."

The five grinds being offered in the Reaper line are the 525, 543, 574, 594 and 630. Luke describes the 525 cam as: "A real workhorse, designed to increase torque band width and increase fuel economy." It features 525in intake and 535in exhaust valve lift and is suited for use on stock 88ci and 96ci motors, but can also be used in 103ci applications. It is compatible with factory valve springs, pushrods and lifters and offers increases throttle response and eases starting.

Created for use in modified engines, especially those with modified cylinder heads, increased compression ratio, performance exhaust and intake systems, the 574 is said to provide smooth valve-train motion due to the layout design of its lobes. Performance valve springs are required on '99-'04 engines and performance pushrods and lifters are recommended.

The final grind of the five options is the 630, which is described by Luke as having a: "wide streetable power band from a high lift profile for high performance engines with highly modified cylinder heads and compression ratio." In addition to the head work any engine the 630 is used in needs carburetor and/or throttle body work along with a performance exhaust and intake system and high performance valve springs, pushrods and lifters.

Following the production of the cams



Jim Feuling passed away in 2002 but his legacy continues with the company he founded and gave his name to

Luke says: "hooking up with ARP, Timken & James Gaskets has made it possible for Feuling to be the only company capable of offering a complete camchest package replacing all of the factory components. Once installed the camchest kits offer 25-35 degree drop in cylinder head temperature, 15-30 cooler oil temperature, 15-30 more Lbs. of oil psi over the factory, SE or other aftermarket oiling system components."

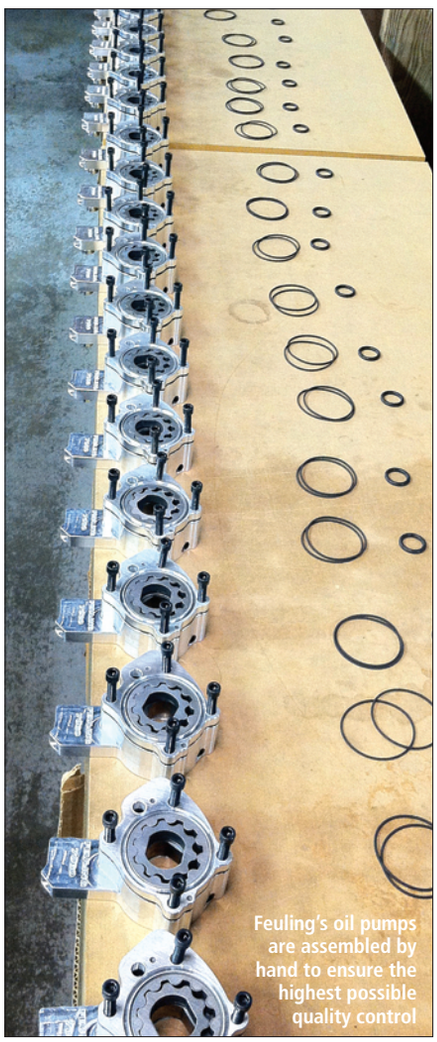
Luke and the staff at Feuling have also been working to cover the other areas that need attention in the Twin Cam engine when a performance cam is used, as he explains: "Bit by bit we've been increasing the product line. Customers are now getting used to the idea of beehive valve springs for instance.

"People used to be very wary of them. Part of the problem was companies selling beehives made out of inferior material, which caused failures of the springs. However, the beehive spring design dates back to the Wright brothers who used beehive valve springs in their airplane engines. The technology has been around a long time but the advances in material development have allowed us to use them in high performance engine applications," Luke concluded.

The 'Econo BeeHive' valve springs in the Feuling product line are made from the same premium stress relieved conical ovate wire, which is said to have an excellent level of fatigue life, and the springs are designed to handle the demands of performance engines. Each spring kit not only features the BeeHive valve springs but also lightweight seven-degree steel retainers, machined, heat treated, chrome moly spring seats, seat shims and valve locks and a set of Viton valve seals equipped with a spring loaded valve stem wiper system. An advantage of using the Econo BeeHive valve spring kits is that the use of lightweight retainers allows the engine to rev quicker and more smoothly in comparison with a motor fitted with regular dual valve springs.

The valvetrain component range of parts from Feuling is completed with the Race Series lifters, which are full-travel hydraulic lifters with a machined steel body. The lifters have been designed to exceed the needs of large lift camshafts and higher valve-spring pressures with a slower bleed down rate. The lifters are said to maintain proper oil flow to the top end, increase engine RPM, and valve-train stability, while at the same time decreasing valve float to promote maximum valve lift.

Moving on from the motor's valvetrain, Luke was keen to talk about Feuling's newest project which is a one-piece crank for V-Twin applications. It was decided that a crank would be the next engine part to come from Feuling due to the run out on the end of the stock crank that can



Feuling's oil pumps are assembled by hand to ensure the highest possible quality control

Jim Feuling's many achievements include competing in land speed record attempts with a streamliner

sometimes be excessive. While this is not an issue on a completely stock motor, it can be a problem when a Feuling cam plate is bolted to the end of the crank. Luke explains that it is a development that came about from the work done on the W3 motor. "In a way this is bringing us back to the W3. The conrods we used in that were based on the design of those used on a radial aero engine which uses a slave rod off the rod bolted to the main conrod on the crank. And we're going to use a similar idea to connect the rods to our one-piece crank.

"Our crankshafts are being machined as one-piece and the flywheels bolt on. It makes them much easier to balance," he concluded.

While the cranks are not yet in production, once they do become available they will be offered not only directly from Feuling but also through the various distributors that carry the Feuling line of parts.

It is not just parts for V-twin motorcycle engines that are in development at Feuling these days. An ongoing project at the Mojave, California, facility is the company's Green Flight Challenge for the NASA and CAFÉ aeronautical contest.

The contest is a comparative aircraft efficiency race where teams enter aircraft that can average at least 100mph on a 200-mile flight while achieving greater than 200 passenger miles per gallon.

To win, teams entering the challenge must use cutting-edge technologies in mechanical and electrical engineering, structures, aerodynamics and thermodynamics. As a national showcase of green technology, the challenge is expected to help advance all three of the major climate mitigation initiatives: efficiency, conservation and zero-carbon energy sources. These technologies will support advances in aviation and may have broader applications in transportation and energy storage.

Luke believes he and the team at Feuling have a good chance of winning because: "By using the latest in stretch technology, we plan to exercise our experience in engines and aeronautics design to achieve the most efficient system possible in the future. Unfortunately we had a last minute motor failure which kept us from making the competition, we currently have the airplane ready to fly at a moments notice with a quick charge to the batteries"

Whether the team succeed or not, one thing is certain that the new technology developments that come through the research for the project will make their way through to the motorcycle industry in one form or another.

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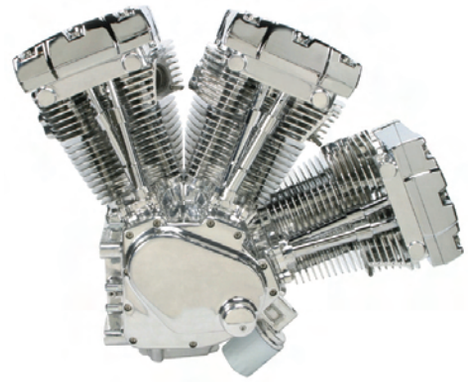
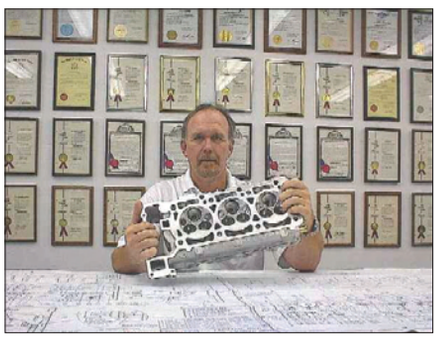

Early versions of the Feuling W3 engine used just six non-Harley-Davidson parts in their construction


Luke Leatherman (left) and Gene Sheehan (right) working on the carbon fibre wings of the Feuling entry for the Green Flight Challenge


Jim Feuling in front of the many patents he had for engine design and development

A new chapter in the Feuling story is the development of an all electric aeroplane capable of averaging at least 100mph on a 200-mile flight while achieving greater than 200 passenger miles per gallon