A ROTARY-POWERED PUBLICATION

# RX TUNER

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# It's All In The Details

BY RYAN SCOTT AND ADAM HEYMAN OF RX-7 SPECIALTIES
PHOTOS BY RYAN SCOTT AND VINCE KOCH (VK CREATIVE PHOTOGRAPHY AND DESIGN)

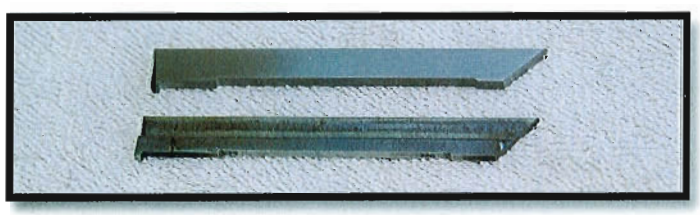
OVER THE YEARS I'VE LOST TOUCH WITH MOST OF MY OLD FRIENDS. The group of people I hang out with has been whittled down to fellow rotor-heads. When you're seemingly blowing motors every other week, it forces you to keep in touch, both for mechanical and psychological support. Some of these guys have become my closest friends, and when I hear that one of them has lost another motor, it hurts me too.

So, this time when my good friend Gary Hagner lost a motor, I decided to do what I could to ensure that he get something bulletproof. Of course, bulletproof in the rotary sense is a relative term, but with the right guidance even a rotary can put down some serious power and remain reliable. At least, that's the hope for this particular build.

Over the past number of months I've been talking with Adam Heyman at RX-7 Specialties in Calgary. I've come to realize that he knows as much about rotaries as anyone I've ever dealt with. He's a talking encyclopedia who knows how to build high horsepower engines, and as luck would have it, he has many unique product offerings he is anxious to showcase in the magazine. So I played match-maker, putting Gary and Adam in contact with each other; hopefully for what will lead to the realizations of Gary's horsepower dreams.

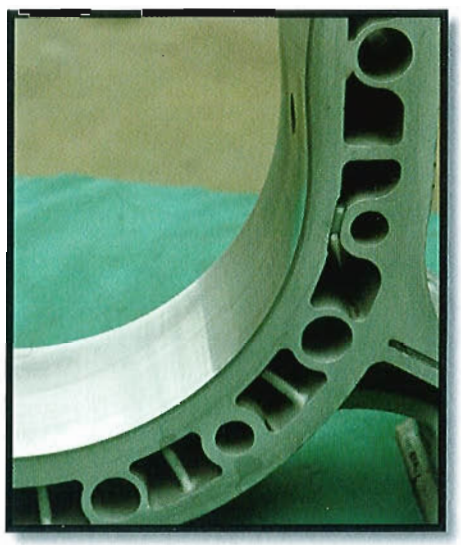
Gary and I have been hoping to coax ~450 rwhp out of his car, but it just hasn't happened yet. With me as the tuning buddy we've come close, but overall it's been quite frustrating for both of us. For instance, the last motor let go on our very first under-boost tuningrun. No detonation even, just a puff of smoke and the telltale exhaust note were the only signs of what had just happened. In talking with Gary afterwards, there were some 'questionable' things done in building the motor. I'll just leave it at that!

This motor would be built to feature all of the expertise and engineering held by RX-7 Specialties, no shortcuts...no weak areas. At the heart of any rotary are the Apex Seals, and RX-7 Specialties has developed their own custom seals. They are available in 2mm, 3mm, and 12a versions. All



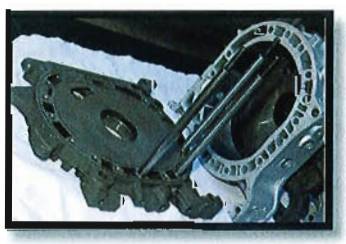
are designed to use a double spring setup. They can, however, be used with a single spring. The design is almost identical to the factory design, using a small end piece rather than the long end piece that we see many manufacturers use. In fact, RX-7 Specialties includes a factory end piece with all the offered seals which is temporarily glued onto the long piece for assembly. "We have seen too much wear on the rotor housings and poor sealing between the cut with long end seals. Most long end manufactures claim that the long end helps sealing with worn or grooved rotor housings claiming it will help fill the "gap" where the housing is worn. This is ridiculous since the seals effectiveness is to stay "flat" and tight to the rotor housing surface. If the long end was to fall down into worn areas of the housing as some manufactures and "believers" predict, the sealing effect would be worse...where as our seals have only the tip of the short end to be concerned with when it comes to seating or wandering. Overall the design is less harmful on rotor housings and will effectively prompt better sealing and less HP loss!" The seals are an alloy with a natural lubricant present. They are all heat treated to high temps, have ground spring seats, and are externally lapped for precision. "We have found them to be the strongest on the market able to withstand unpredicted detonation to the point where the rotor is caved in and the seal is still intact." They are all laser engraved and ink dyed with our company name and logo. The retail price is $295 with springs for 2mm set, $295 with springs for 12a set, and $345 with springs for 3mm 13B set.

Dowel pinning a motor refers to boring new holes through the motor assembly and inserting extra pins to strengthen the assembly. This is something highly recommended on high horsepower motors. Adam says



anything over 200hp per rotor should have this done. So, this was a must-have for the build of Gary's motor. RX-7 Specialties has developed a unique way of adding dowel pins to the rotary.

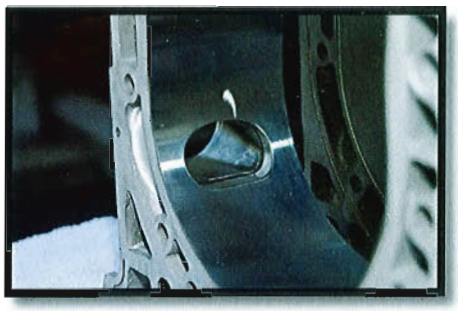
Their dowel pin kit includes 3 additional 1 piece pins with a stud kit for each pin. The pinning process is in addition to the factory dowels. This method is ideal for strength and easy assembly as the pins go all the way through all 5 pieces (7 pieces on a 20B) without a break in the middle like the factory ones. The pins are located in the combustion area where the additional strength is most needed. Also, the pins are installed in the last stages of assembly right before the rear housing is installed. All machining is performed on each piece, milling the holes referencing the center of the threaded hole in the front housing. This is done instead of locating off the clearance holes, as each casting is slightly different from the next.



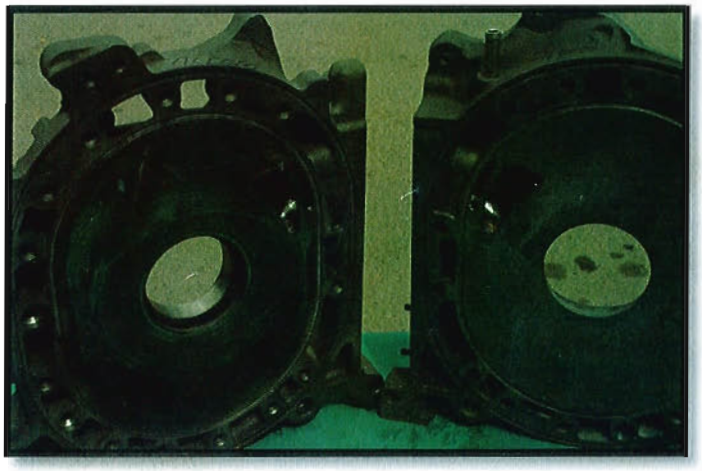
Next up on the laundry list of motor modification was milling the rotors for 3mm wide Apex Seals. Adam highly recommended the 3mm seals for Gary's application, saying that many of the rumors of seal chatter and diminished sealing are bunk. Adam believes in 3mm seals so much, he developed his own dedicated milling machine for in-house use. "Our 3mm machine work on rotors is performed in house using a custom machine which we had made, dedicated to doing nothing but 3mm rotor grooves. This ensures no binding between the corner seal and the apex seal.

Whenever we use our seals for performance applications, we install the solid corner seals for optimum durability."

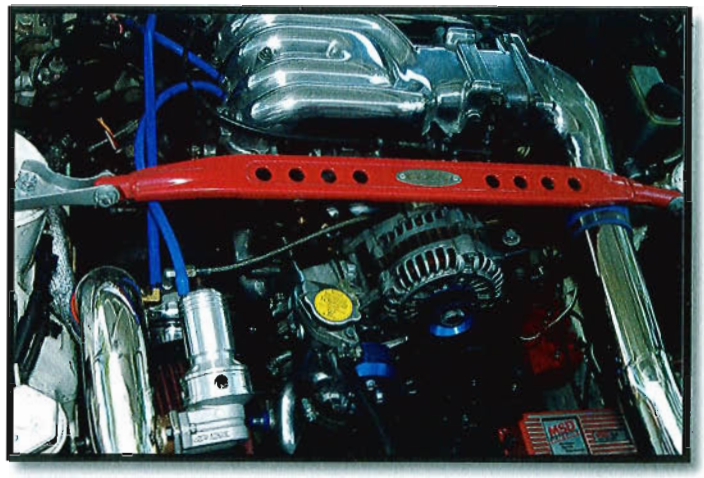
These days, lapping housings has become almost essential. Even brand new housing from Mazda has dropped in build quality, and can have an irregular surface. Adam knows this, and built a machine just for this purpose. "Likewise with our in house lapping, we use a dedicated machine that we designed and had built for us. We strongly believe that removing minimal material is essential as we have seen too much expedited damage when penetrating past the factory nitride coating. If the end plate has too much stepped wear, we recommend that if lapping will not suffice alone, the housing should be replaced."



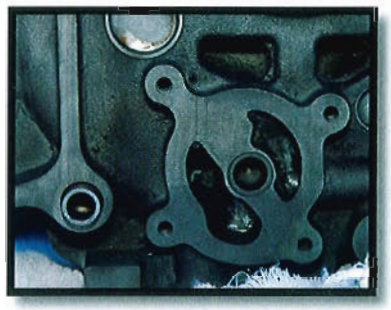
Clearancing and ceramic coating the rotors is another common modification for all high HP and high RPM applications. The ceramic coating is excellent for keeping oil temps minimized as it creates a great thermal barrier. It also minimizes carbon and coking on the rotor and in the combustion chamber. The clearancing is an effective modification which reduces the chances of the tips of the rotor contacting the side housings. As the tips are the furthest away from the centerline of the eccentric shaft, this becomes the most likely part of the rotor to contact within crankshaft deflection. So logic follows that high HP high RPM motors will be most likely to see conditions where deflection and damage will occur due to the increased angular forces inside the motor. "We have witnessed several conditions where the side housings are "bruised" and damaged even though the bearings are in good shape." This damage can be prevented by the clearancing process.



Of course, any high horsepower rotary needs a serious porting job. Adam has perfected his over the years. To be good at porting, you almost need to be able to visualize and understand the physics of fluid dynamics.



From talking with Adam, and now seeing his porting work in person, I'm confident his theories will hold up to real world use and produce excellent results. "Porting on all engines is done in house. We do the bridge on bridge ported engines on the mill rather than by hand. Series 6 ports for street ported engines are generally performed the same way. As the ports are the largest ports next to the cosmos 13B & 20B, we tend to maximize on the volume and duration of the secondary ports while keeping the primary ports only 50% larger or less. The exhaust ports are kept relatively the same size as stock but we improve the blend between aluminum and sleeve and create a smooth transition at port closing."



Oil mods include; improving the matching of passages and flow in oil pump land, rear dowel hole, and oil filter adaptor portion of rear housing. Gary and Adam also opted for the Racing Beat MFR high pressure oil regulator and shimming of the oil relief valve. A hardened pump never hurts either as the pump gears tend to wear.

Other tips passed along from Adam are to use the Teflon wrapped coolant o-rings, which seem to withstand high combustion temps and pressures better than the stock ones. They also have good success with a "Viton" o-ring kit which covers the stationary gear o-ring, dowel o-rings, front cover o-ring, oil filter stand o-rings, and oil control ring o-rings.

## About RX7 Specialties

RX7 Specialties is the only complete engine exchange program shop, whereby, you can custom order from their large inventory or have an engine custom built for your application. They have a very quick turn around time and offer worldwide shipping to your door. RX7 Specialties can offer you any combination of modifications requested to suit your needs. With 14 years of dedication to this industry, they have gone to extremes to manufacture specialty equipment to accommodate specific rotary parts. These include custom machines for manufacturing, refurbishing, modifying, and performance. Most of the latest improvements to rotary engines and engine parts include: 3mm machining, block dowel pinning, rotor and bearing clearancing, end housing lapping, rotor housing coatings, ceramic coating, porting, apex seal manufacturing, and manufacturing of many other custom products. In addition to custom engine work, we provide complete servicing and performance modifications... specializing in 20B conversions. RX7 Specialties sells partial or complete kits to convert your 7 into a 3 rotor "rocket". **RX**