

# WEIGHT WATCHING

SHEDDING 15 POUNDS FROM YOUR ROTATING ASSEMBLY

STORY SAM LOGAN

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THE CHIEF ADVANTAGE OF AN ALUMINUM HIGH-PERFORMANCE FLYWHEEL IS SAVING WEIGHT. FOR WEIGHT SAVINGS, ALUMINUM IS THE MOST POTENT MEDIUM WE HAVE AVAILABLE IN FLYWHEEL MANUFACTURE.

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Using aluminum sheds 10 to 15 pounds from the rotating assembly of a conventional steel flywheel, but it is the effect the weight loss has on the

addition, the component is not very expensive, and the installation process is not very laborious.

We were treated to a tour of the

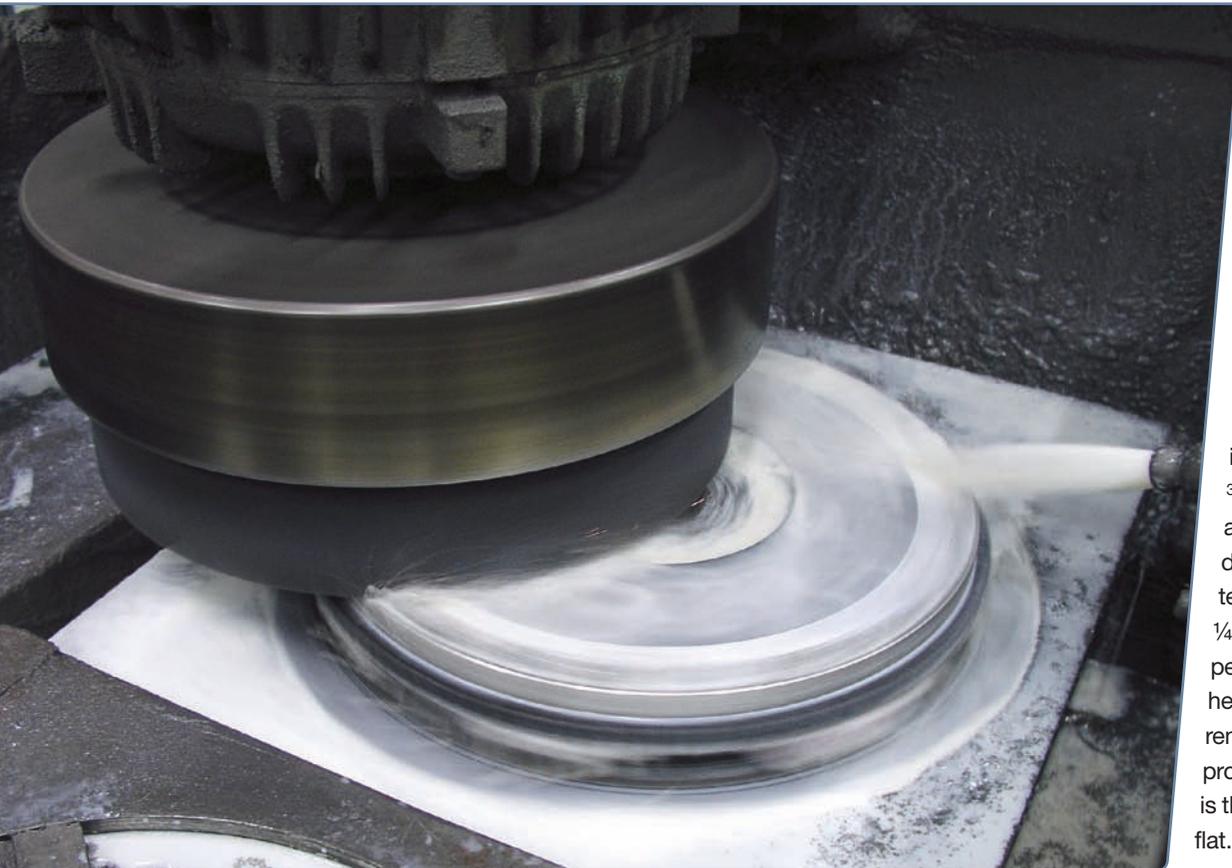
mild steel friction insert to dissipate heat faster, maintain a flat friction surface and reduce the likelihood of distortion. Thinner, unground

inserts have a tendency to buckle under the severe heat of hard clutch duty. Though replacement inserts can be renewed by the factory, rarely do the flywheels require them. Typically, they are resurfaced on a Blanchard grinder when wear exceeds 0.015 inch, and this resurfacing process could be applied several times over if necessary.

“You may not think there is much difference between a  $\frac{3}{16}$ -inch-thick steel insert and a  $\frac{1}{4}$ -inch-thick insert, but the difference is huge,” insists Ram’s technical director Pat Norcia. “The  $\frac{1}{4}$ -inch-thick material, with 33 percent more metal to dissipate the heat, ensures clutch engagement remains smooth. A common problem with thinner  $\frac{3}{16}$ -inch inserts is that they don’t always remain flat. As the heat builds, distortion occurs, and the lighter plate lifts between the rivets. This leads to reduced clearance of the clutch disc. Also, if the surface doesn’t remain flat, a smooth clutch engagement is compromised. Clutch chatter will occur if one area is high, which makes the clutch grab unevenly and chatter follows.”

moment of inertia – the measure of an object’s resistance to changes to its rotation – that contributes the real gains. The lower moment of inertia in the aluminum flywheel provokes an instant response, delivering not only faster acceleration and faster deceleration, but also suppressing wheel spin. In

Ram Clutches facilities to see how they manufacture aluminum clutches for the performance-minded enthusiast. Ram Clutches, a competition clutch and flywheel manufacturer since the early 1970s, designs their aluminum flywheels as rebuildable units. Moreover, they feature a thick  $\frac{1}{4}$ -inch,



Aluminum flywheel blanks are derived from 6061 material with a T6 temper, and they arrive at Ram's facility in Columbia, South Carolina, in a variety of thicknesses and diameters from 12½ to 15 inches. They are classified by their diameter and by the number of teeth on the starter ring gear that encircles them. The most popular blanks are 13½ and 14 inches. The smallest of these suit the 2300/2000 Ford (135 teeth), and the largest are used on the big-block Fords (184 teeth). The most popular flywheel for a Chevrolet carries a 168-tooth ring gear and is produced from a 13½-inch blank, as is a Ford with a 164-tooth gear. The Chrysler unit usually features a 143-tooth ring gear and is machined from a 13¾-inch blank.

Flywheels provide 50 percent of the friction surface to which the clutch disc mates; therefore, they contribute half of the holding power of the clutch system. Premium flywheels possess four essential elements: a proper friction surface finish, a perfectly flat friction surface, a friction surface parallel to the crankshaft flange and a fine balance. Approximately one in

20 flywheels is endowed with perfect balance; the remaining 19 will display drilled balance holes. Ram's Pat Norcia reports they balance their units to within half-ounce/inch.

"To provide a proper friction surface and to ensure the flywheel is parallel to the crankshaft flange," says Norcia, "we use a Blanchard grinder that enables us to grind the flywheels flat to within 0.001-inch." A Blanchard grinder not only spins its grinding head but also its table with the flywheel attached. By

**“WE USE A BLANCHARD GRINDER THAT ENABLES US TO GRIND THE FLYWHEELS FLAT TO WITHIN 0.001-INCH.”**

rotating the flywheel and the grinding stone in two different directions, a perfect mating surface is achieved. With a 36-grit grinding stone, this device provides a true surface; hence, smoother clutch engagement and greater clutch longevity.

On the edge of the flywheel, a groove is machined to accept a starter ring gear. On its back face, three button-head securing screws are installed after the ring gear is heat-

expanded then shrunk in place. The securing screws offer a safety margin on competition cars by keeping the ring gear from rotating on the flywheel. "If for some reason," comments Norcia, "the flywheel is exposed to excessive heat, perhaps through severe clutch slippage, the ring gear could become loose as the cooling rates of the steel ring gear and the aluminum flywheel differ. For this reason, Ram fits retaining screws." He added that on billet competition drag racing clutches,

where slipping is normal practice, retaining screws are essential.

The principal failings on aftermarket high-performance aluminum flywheels are often a steel friction insert of inadequate thickness (usually 3/16-inch), the omission of a properly ground surface on the friction insert and the lack of balancing. Here is how Ram Clutches avoids these pitfalls in building their high-performance lightweight flywheels.



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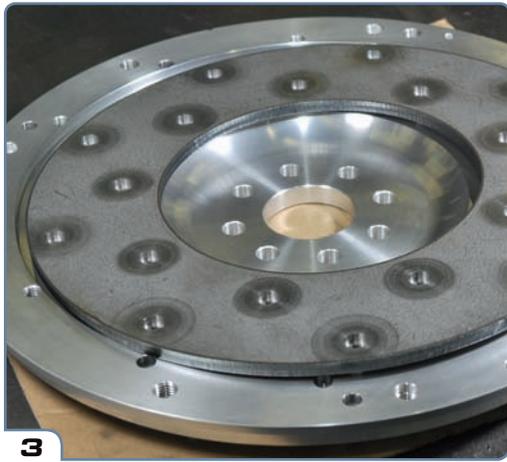
**1** Flywheel blanks are received in a variety of thicknesses and diameters from 12½ to 15 inches.



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**2** Initial machining of the flywheel blank establishes the outer diameter and the inner areas where the crank flange pattern will be drilled. Carbide-tipped cutting tools have

the durability to machine about 90 flywheels before they're replaced. Note the dispersal of the small chips which take away the heat, keeping the flywheel cool.

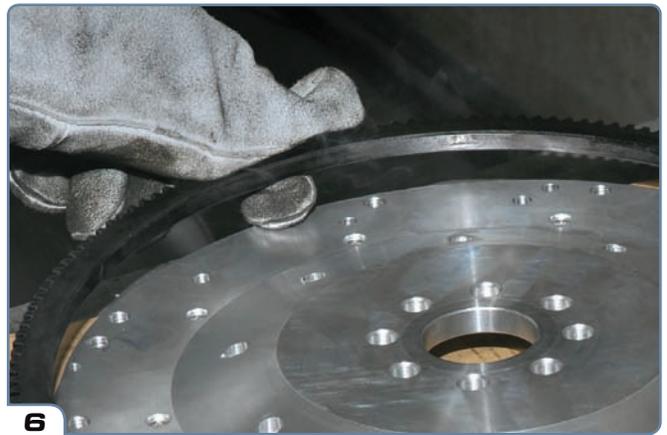


**3** To ensure the insert dissipates the heat generated by the clutch system, RAM uses a ¼-inch-thick steel insert on all their aluminum flywheels to avoid distortion. The 18 rivet holes are provided to ensure the ¼-inch-thick insert remains flat.

**4** This orbital riveter has a spinning tool in the head, so it rotates as it compresses the rivets, ensuring a tight rivet bond between the ¼-inch-thick steel insert and the flywheel.

**5** Using an oxy/acetylene blowtorch, ring gears are heated and expanded, allowing them to fit over the flywheels.

**6** Once the ring gear is hot, it is dropped onto the flywheel ring gear groove. When it cools, it shrinks and tightens to the flywheel, giving an interference fit of .030 inch.



**7** All Ram flywheels are drilled for multiple clutches. Here is an eight-bolt example for the new Mustang, which features holes to accept the original equipment 11-inch diaphragm clutch, the earlier 11-inch three-finger long-style clutch, or the 5-liter 10.5-inch diaphragm clutch.

**8** The surest way to overcome clutch snatch or chatter is to use a Blanchard grinder. The grinding wheel spins counter-clockwise while the flywheel table spins clockwise.

**9** Counter-boring the back of the flywheel in three places facilitates securing screws that prevent the ring gear from moving on the flywheel. These offer a safety margin on street-strip cars, but on drag racing cars where clutch slippage is a requirement, they are essential.





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**10** Though not universal practice among all aftermarket flywheel makers, final balancing in the form of shallowly drilled holes endows the flywheel with perfect harmonics.

**11** SFI provides safety guidelines to the racing industry; you'll observe them on flywheels, wheels, harmonic balancers, even chassis. This official sticker tells you that the materials used in the manufacture of this flywheel are certified and that it has met SFI specifications. 