Rotor Port

Blake Qualley looks at the joys of porting rotary engines

For piston engines to gain more performance it is not uncommon to buy aftermarket cams and perhaps even to get the heads ported and polished. The cams may alter timing, duration, lift, and/or overlap, and the porting increases the flow potential of the engine, with often dramatic results.

Further, there is almost an infinite combination of variables to play with to achieve specific goals. Do you want a tame street engine, a fire-breathing monster, or something in between?

But, what do you do in a rotary engine to change these variables? As most of us know, rotaries use fixed ports that are opened and closed by the movements of the working chambers. No cams, no valves, etc.

Are we then stuck with factory specs? Not at all! In fact, you can accomplish – with a die grinder – what boinger-lovers could never do on their own. On the other hand, it's remarkably easy to turn expensive engine components into piles of junk if you grind away too much or go in the wrong direction.

Custom port jobs differ radically from factory

Options galore

Fortunately, we have many options: (1) pay a professional to do it, (2) buy a porting template, or (3) learn everything you can about ports and then take a chance and try it yourself.

No matter what option you choose, it pays to understand what's going on so you can figure out what option is best for you. As with boingers, you have a tremendous range of variable with which to play. You can advance opening timing, extend port closing, add 'lift', increase overlap, and so forth. You can even change how suddenly the ports open and close.

What I am about to share comes from one of the exalted rotary high-priests, Rob Golden. Rob has been building rotary racing motors for 20 years in the United States; he is the proprietor of Pineapple Racing (www.pineappleracing.com). He has spent a whole career playing with port modifications – and he taught me everything I know. With his permission, I am passing some of it on to you.

Port Terminology

Rotary engines have two major types of ports: peripheral and side. Peripheral ports are those directly in the rotor housing, while side ports are located in the side housings on either side of each rotor section. For reasons that will become apparent, common street engines produced by Mazda have side intake and peripheral exhaust ports. This allows minimal overlap and better control of intake timing, but permits very free exhaust flow. The side intake ports are triangular in shape. There is no truly universal terminology, to my knowledge, so I shall establish my own.

Please refer to the illustration. The outside edge is the leading side of the port, as it determines when the port opens. The top edge is the trailing side of the port, as it determines when the port closes. And the remaining side we shall refer to as the inside edge.

Further, the port has three corners, which we shall call the tail (pointing down), the nose (facing inside), and the shoulder (connecting the leading and trailing sides). By altering the location and shape of these elements we can change any port variable.

In general, moving the leading edge out advances the opening timing and increase overlap, and moving the trailing edge up extends the port closing.

Changing the angle of the port edge (scissoring) or its curvature (rounding), with respect to the rotor face, alters the rate of opening or closing, which affects torque characteristics. Gradual opening and closing of the ports