Intake Port Types

Similar to how cams of various profiles are available for boingers to achieve desired goals, there are many varieties of rotary engine port shapes that have been developed for different purposes. Some shapes simply extend the closing timing for turbo applications, while others create massive amounts of overlap and maximise port volume for ultimate peak horsepower on a non-turbo race engine. Unfortunately, again, there is no universal naming scheme, but I will do my best to categorise them and explain their purpose.

First, any port that keeps within the ordinary physical boundaries is essentially a variety of street port. Within these boundaries, a number of shapes is possible and a several naming conventions have been used to describe them.

In non-turbo applications, there are usually three basic sizes/shapes of port: street, tear, and rally, going from smallest to largest. A street port is a very minimal enlargement that does not affect idle quality. A tear port is a bit bigger, with more overlap, and fully supports the rotor's corner seal. And a Rally port is typically a maximum effort, advancing the leading edge to the point it only supports slightly more than half of the rotor's corner seal and extends the duration as far as is practical for ultimate high-end power. Some people simply call these small, mild (or medium) and large street ports.

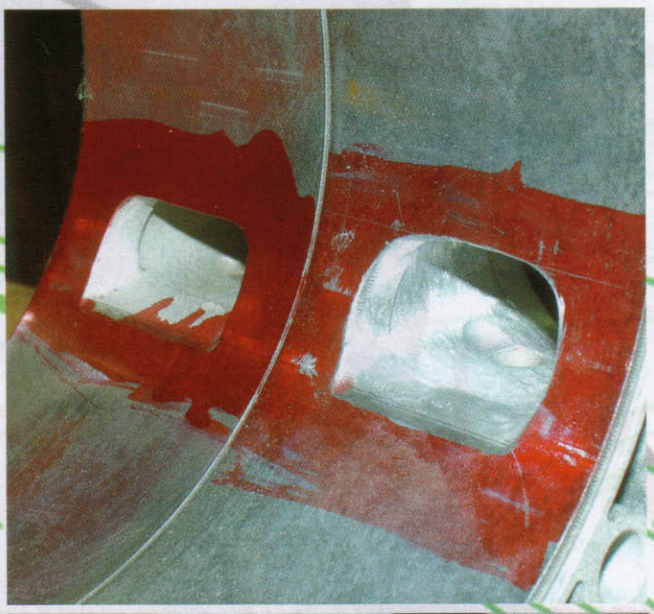
In turbo applications, increased overlap is generally avoided so that opening timing is not advanced. Instead, the duration is increased by extending the trailing edge to the desired degree. A moderate increase in duration is usually called a 'mild port' and a more extreme case is sometimes called an 'extend port'.

Which port for you?

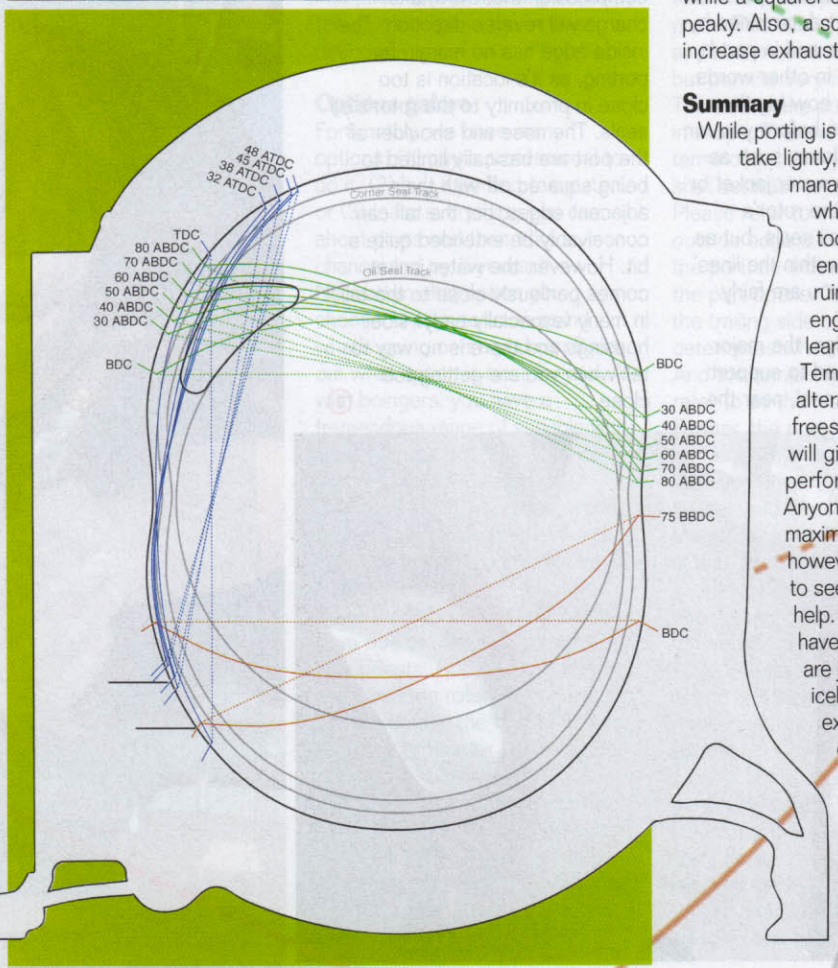
Ports that work around the conventional boundaries generally fall into the race category, though some are streetable to one degree or another. Typical race port types are bridge ports, J-ports, monster ports (semi-peripheral), and all-out peripheral ports.

The first three all utilise a sort of bridge of material on the side housing that supports the rotor's corner seal as it passes over. The effect is a separate port opening on the surface to the outside of the normal port, but the runner is shared with the normal port opening.

The ordinary bridge port is one that does not compromise the housing water seals between the side and rotor housings, though the rotor housing might get notched a little to maximise port volume. A J-port is a slightly larger version of the bridge port that does compromise the water seals, but does not go all the way into the water passages behind them. Modern silicone-based sealant is used to prevent coolant seeping out of the water jacket.



Markings show where the new port will be ground



The next step up is the monster port, which goes all the way into the water jacket and requires some degree of back filling to block off the coolant from the port, in addition to the use of sealant. Sometimes these are referred to as semi-peripheral ports due to the large amount of 'match porting' (notching) done to the rotor housing to provide a straighter/larger air path. Peripheral ports simply dispense with the side ports entirely and bring the intake charge through a huge hole in the side of the rotor housing.

Each step towards the extreme increases top-end power, reduces low-end torque, and narrows the power curve.

Exhaust

When talking porting, it is all to easy to forget about the exhaust. A rule of thumb is that the exhaust ports should be 70-80% of the size of the intake. Nitrous users should go 100-110% of intake size. Port sleeves should not, as a rule, be removed (except 1974 housings).

Later non-turbo rotor housings have a baffled sleeve that is a serious pain to remove, so replacement turbo rotor housings are recommended. As with the intake, the shape of the exhaust port will have a dramatic affect on the power band. The more round it is, the broader the torque curve, while a squarer shape will be more peaky. Also, a squarer shape will increase exhaust noise.

Summary

While porting is not something to take lightly, it is something manageable for those who are handy with tools and brave enough to risk ruining perfectly good engine parts in the learning process. Templates are a safer alternative to the freestyle approach and will give very nice performance gains. Anyone seeking maximum performance, however, is encouraged to seek professional help. The variables I have mentioned here are just the tip of the iceberg and an experienced rotary engine builder is likely to have a proprietary port design that he has found particularly effective.