STROKER ISSUE: EJ/SR/RB

IT'S BIGGER, IT'S BADDER, IT'S...

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TITAN V8 350Z
5.6-liter Drop-Top Drifter
- no turbo
- no supercharger
- no problem?

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REDLINE TIME-ATTACK
SEASON OPENER

WATER+METH INJECTION
GAIN 123 HORSEPOWER
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GOING SINGLE

1188WHP RB30 GT-R
OS GIKEN'S 9-SECOND RH9 DRAG SKYLINE

FIRST DATE: KIM LEE
Higher Octane, More Boost, More Power

High-octane race gas delivered some serious performance gains in part one of our testing. With the right blend of high-octane race gas fed into our SR20DET engine, the boost pressure could be safely raised from 15.6 psi up to 23 psi. This higher boost pressure helped to deliver a greater mass of air into the engine. This increased mass of air mixed with additional fuel provided some serious power gains. Whereas 91-octane pump gas ended the party at 322 wheel horsepower, VP Import or VP Racing Q16 race gas blends allowed for 23 psi boost levels. This higher boost level kept the party going to 413 horsepower at the wheels.

Just about everyone understands how race gas allows a forced-induction engine (turbo or supercharger) to produce more horsepower. What many people have trouble understanding and accepting is how injecting a water-methanol mixture into the engine can also allow for some significant power gains.

100-Proof Performance

During World War II, both the Allies and Axis powers found that water-methanol injection systems could be used on supercharged aircraft engines to realize power gains on the order of 25 percent. With water-methanol injection, a gain of over 450 horsepower could be realized on an engine that would normally produce 1775 horsepower.

Working along the same basic principles of race gas, water-methanol injection allowed the effective octane rating of the fuel to be increased. When the water-methanol mixture changes in phase from liquid to gas, heat is pulled from the charge air and the burn rate is slowed so that detonation is avoided. The phenomenon allows the boost pressure to be increased way beyond the limits set by limited-octane fuel. Quite simply, water-methanol injection allows for more boost and, in turn, more power to be realized. To realize more power with a water-methanol injection system, either a more aggressive ignition timing curve or higher boost pressure are required.
WHAT IS YOUR ENGINE’S FAVORITE DRINK?
Two months ago, we realized the benefits of a high-octane, race-fuel mixture in part one of “Chemical Romance.” This month, we see how a well-mixed water-methanol cocktail compares to a finely distilled race gas. Depending on your ultimate goals, a water-methanol injection system may prove to be a great bang-for-the-buck investment for your forced-induction streetcar.

“What many people have trouble understanding is how injecting a water-methanol mixture into the engine can also allow for some significant power gains.”

Not Our First Time At the Bar
Almost a year ago (Sept 2007 edition), we had the opportunity to perform our first dyno test on a water-methanol injection system. With a water-methanol system installed on a 2005 Subaru Legacy Spec-B (fitted with an aftermarket sport turbo), we were able to realize a gain in peak horsepower of just less than 10 horsepower while a 50 horsepower increase was recorded at 4,000 RPM at the wheels. While these numbers were impressive, it was our contention that the turbocharger on the vehicle was “too small” to deliver the mass of air needed for the higher gains that we believed were possible.

The Perfect Test Bed
Our TOMEI-sport-turbo-equipped SR20DET had already proven that it had the flow potential to realize over 410 horsepower at the wheels. Considering this same engine combination was limited to roughly 320 horsepower on 91-octane, we would now be able to see how the performance increase from a water-methanol injection system could compare to a serious high-octane, leaded race gas.
“It is a good idea to fit the largest reservoir possible to maximize the time between refills. It is also acceptable to use the original washer-fluid reservoir if so desired.”

SNOW Time Like The Present

SNOW Performance builds some of the most comprehensive and well-designed water-methanol injection systems on the market. We selected the company's Stage-2 Boost Cooler offering ($499) for our S15. The Stage-2 system delivers additional tuning over the entry-level Stage-1 system. Whereas the Stage-1 system only allows for the setting of when the water-methanol injection initiates, the Stage-2 system provides for the initiation point and a linear boost-dependent delivery that's user adjustable.

Installation of the system is relatively simple. Since we plan to keep the S15 in our D’Garage lineup for some time, we made some custom components to sanitize the installation. SNOW Performance offers a variety of reservoirs to fit any application. It is a good idea to fit the largest reservoir possible to maximize the time between refills. It is also acceptable to use the original washer-fluid reservoir on the vehicle if so desired. The high-pressure pump should be mounted as close to the reservoir as possible. Be sure to mount the electronic controller where it can be easily accessed for tuning. Likewise, a nozzle location no more than 12-inches before the throttle body (that can be easily accessed) is also highly recommended. We spent a full day on the install, but some vehicles should require more than a few hours.

A good amount of the installation time was spent fabricating a custom bracket for the reservoir. Had we elected to modify the original washer-fluid reservoir, we would have save a couple hours on the installation. We also spent extra time making a mounting plate in the engine bay to have a suitable location for the SNOW Performance controller electronics.
Get the Lead Out

SNOW Performance recommends a 50/50 mixture of distilled water and methanol to be used with its systems. They also offer a pre-mixed solution branded as “Boost Juice” for those looking for the added convenience of a ready-to-go mix.

Injected Performance Tune

As with any tuning session, our first step was to establish our baseline. With 91-octane in the tank and the boost set to 15.6 psi (1.1 bar), we realized a peak of 318 horsepower at the wheels.

Following the recommended tuning procedure outlined by SNOW Performance, we started at the lowest boost pressure possible and leaned out the fuel delivery while dialing in the water-methanol injection. We began with the medium jet (375 ml/min) and eventually worked our way up to the large jet (625 ml/min). As we increased the water-methanol jet size, we would have to cut the fuel injector’s duty cycle to maintain the desired air-fuel ratios. In the end, we tuned the engine with 91-octane and the water-methanol injection system all the way to 24 psi of boost pressure. While the water-methanol injection plus 91-octane setup did not allow for as much ignition timing as the VP Import or VP Racing Q16 race gases, it did allow for significantly more ignition timing and boost than 91-octane fuel without water-methanol injection.
The SNOW Performance Stage-2 Boost Cooler system allowed for significant power increases over 91-octane fuel alone. At 5,500 RPM, the SNOW Performance water-methanol injection system and 91-octane fuel delivered nearly the same horsepower as VP Racing C16 leaded race fuel, an increase of 123 horsepower at the wheels.

"THIS MAKES THE SNOW PERFORMANCE STAGE-2 BOOST COOLER A VERY COST-EFFECTIVE POWER-PRODUCING PLAYER ON A FORCED-FED STREETCAR."

The Bottom Line
The Dyno graph displaying the best 91-octane, the best 91-octane plus water-methanol injection and the best VP Racing Q16 race gas pulls sum up the entire story. The VP Racing Q16 race gas allowed the engine to deliver more power and torque throughout the powerband. However, the SNOW Performance Stage-2 Boost Cooler system allowed for significant power increases over 91-octane fuel alone. At 5,500 RPM, the SNOW Performance water-methanol injection system and 91-octane fuel delivered nearly the same horsepower as VP Racing C16 leaded race fuel, an increase of 123 horsepower at the wheels.

So here is the deal. A SNOW Performance Stage-2 water-methanol injection system is going to run you about $499 and you are going to spend $4 to $7.50 per gallon to make or buy the boost juice. Since the boost juice is only going to get used once the engine reaches the predetermined boost level, you are likely to get 20-40 ¼-mile blasts per gallon of boost juice. This makes the SNOW Performance Stage-2 Boost Cooler a very cost-effective power-producing player on a forced-fed streetcar.

If you only plan to crank up the boost at the track, a high-quality race fuel like VP Racing Q16 at about $12 a gallon will deliver the highest performance available. Just remember that the race gas is going to be consumed at idle, part-throttle and any time the engine is running. Hence, you'll likely go through five gallons or more on any given race day. If you want to be able to run the high boost pressures and you cannot afford to fill your tank with $12-per-gallon race gas, a capable water-methanol injection system is a great option.

While we are still working out the details, our plan is to test E85 against pump and race gas in part three of our Chemical Romance series. Stay tuned.

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