

# And The Winn

**T**wo weeks prior to SEMA '06, we worked alongside VW of America to host the GTI Tuner Challenge (*et* 1/07). Four elite tuners were invited to build an '06 GTI, and compete for an industry award plus a prime spot in VW's SEMA booth. Although *et*'s scoring meant APR's project placed second (by one point), it won the overall award based on the scores of our sister magazines *Sport Compact Car* and *European Car*, as well as taking VWoA's own award.

The highlight for APR at the challenge included fastest lap at our Streets of Willow track day, as well as the highest numbers at the dyno: 356hp and 389 lb/ft of torque. After a minor software adjustment the tuner made a second dyno run, demonstrating its potential with an impressive 387hp and 405 lb/ft of torque.

With all this coming at the end of '06, it was just the icing on the cake for APR. There was history and future plans behind the project, so we sat down with the project's coordinator, Chris George, and uncovered the exclusive inside story. "Early last year we heard rumblings about the possibility of a collaboration between us and VWoA to build a project similar to the previous R GT cars at SEMA '05," he explained. "So we traveled to their headquarters and showed them what we've done with the 1.8T. We also demonstrated our capabilities with the 2.0T – mainly our K04 kit – and VW wanted to see more. Eventually, we were chosen as one of four tuners to compete in the GTI Challenge."

With the success of becoming part of VW's SEMA presentation, APR started to build a bigger turbo kit, with plans to make it available to the public. When VW heard about this, they explored the possibility of incorporating the kit into the official SEMA concept car, the new R GTI (*et* 12/06). VW wanted to produce a car the public could replicate more easily, rather than a complete one-off concept like the '05 SEMA cars. So when VW designers were preparing the tuning program for the R GTI, they consulted with APR.

## TURBO TUNING

APR's stage 3 turbo upgrade for the 2.0T is expected to be available in spring '07. The engineering team had developed the kit using only its in-house expertise and equipment. "Even before we were selected for the Challenge, we planned to produce a turbo kit for the 2.0T," Chris elaborated. "The SEMA opportunity gave us a kick in the pants because the project had to be completed sooner than we'd ever done in the past. It was the quickest turnaround on a turbo kit in the history of our company."

...Meet the award-winning SEMA project car from APR, showcasing the first big-turbo kit for the Mk5 GTI.

*Words & Photos: Sam Du*



Although development was carried out at an astonishingly fast pace, reliability and drivability remained APR's top priorities. The existing APR K04 kit for the 2.0T gave the engineers an excellent starting point, but essentially none of the hardware was carried

over. What they learned most was the need to increase fuel flow. "By seeing what we were able to produce with the K04 (300hp, 323 lb/ft), it gave us an indication of what we knew we could get from a big turbo," Chris explained. "What it came down to was how to

# er is...



manipulate the fuel. The FSI motor wasn't like anything in the industry and was one of the biggest hurdles to overcome. FSI cars have a tremendous amount of fuel pressure, making them very sensitive and resulting in problems if the changes were incorrect. Fixing

the fuel problem was the key to gaining power."

Once APR identified the obstacle, the engineers made haste to rectify it. "We had to find specific injectors," Chris admitted, "but there weren't any available in the time frame we had. Basically, we took the stock injectors

and reworked them. It was a lengthy process."

Injectors were one part of the problem but APR also had to deal with the fuel pump. "For the 2.0T FSI, a mechanical pump on the head controls the amount of fuel that reaches the injectors," Chris explained. "Hitachi-made the



fuel pump but didn't have any upgrade options at the time. We contacted them several times, but they had nothing that would work."

Off-the-shelf parts were non-existent, so it was the task of engineers to discover a different solution. "The existing pump is almost like a piston pump," he continued. "It compresses a finite volume of fuel and quickly reaches its limit. To overcome this we had to change the pump internals. We took a lot of calculations and remanufactured them to a different diameter size – the tolerances inside are crazy! It's literally microns that drastically changed how the fuel would flow and only a few places in the US can produce parts with this tolerance. Fuel flow is where most people are hitting the wall, so looking into the future we wanted something simple for the customer to do. The new parts needed to have repeatable results with customer-oriented design. The key to the whole thing is our experience and know-how in changing the variables of the ECU, and our understanding of how it affects the hardware. You can't just throw this pump on the car and go. You have to get the ECU to understand the data so it can make the car run properly."

The correct fueling allowed engineers to use a Garrett GT2871R turbo, sourced from APR's stage 3 kit for the 225hp Audi TT, but it was re-clocked and re-configured with a different wastegate.

Along with the big turbo, a new exhaust manifold was added. Because the factory manifold is incorporated into the turbo, APR reproduced it with more breathing room. The manifold is also manufactured from inconel to prevent the heat and energy dissipating.

A redesigned front-mount intercooler sits in the stock location. APR designed its own version with a similar length and height as stock, but it's 50% deeper for increased cooling. Silicone hoses were used to connect the end tanks to the turbo and throttle body.

Another key ingredient is the diverter valve. The 2.0T has an internal DV and an upgrade isn't needed with a factory turbo or K04 conversion, but the Garrett turbo made it necessary. "This DV is a diaphragm valve, similar to the factory one but with a cast bottom and machined top. It's stronger but has the same appearance."

"To aid air flow we designed an intake pipe with the factory MAF inside. We snaked a 3" carbon pipe to the front of the car where a

filter sits," Chris continued. "Because the Mk5's airbox is part of the engine cover, retaining it would limit the flow, so we designed a flow straightener into the pipe for accurate air readings. Without the straightener, it gets really turbulent inside and disrupts the sensor readings."

APR already had a 2.0T exhaust with downpipe in production, but engineers opted to develop a 3" system featuring dual tips for this project.

While APR's 2.0T produces plenty of reliable power, it's important to note this particular GTI had forged connecting rods. "We fitted rods to ensure everything would stay together," Chris added. "It was done for SEMA and the GTI Challenge because we didn't want to push or break things before we'd done our real testing. It won't be something we're going to require for the production kit, though."

## TRACK TUNED

In addition to the fuel and turbo upgrades, APR had to make sure the GTI would be fit for the track, so a Spec stage 3 clutch was installed, as well as a Quaife differential.



## APR BACKGROUND

Audi Performance Racing (APR) was formed in '99 by Stephen Hooks, Brett Augsberger and Chris George. Before the company started, they worked on a '97 Audi A4, one of the first with the 1.8T. Once developed, the engineers began prototyping a '99 Beetle, the first transverse 1.8T, in anticipation of the Mk4 Golf and Jetta. So when the Mk4 hit in '00, the newly-formed company had a selection of parts available from software to turbo upgrades.

The key to APR's initial upgrades was ultimately the manifold design, which utilized a larger MAF housing. This allowed the turbo to spool at low rpm without lag to improve daily drivability.

APR continued to build and improve parts, taking 150hp A4s to 280hp with the first redesign. It continued to upgrade its turbo kit, eventually reaching 340hp.

Today, its first 2.0T kit is expected to reach 400hp – a truly phenomenal improvement, doubling horsepower in its first iteration.

APR's goal is to continue exceeding expectations. The company has updated its equipment and technology through the years and has recently invested in a larger R&D facility with its own test track. Stay tuned for more innovative European tuning from these performance engineers.

Tweaking the suspension was also crucial but there weren't many options available, so APR fitted Koni coilovers with custom-valved shocks and Eibach springs. An H&R rear sway bar corrected understeer and the combination handled exceptionally well during the GTI Challenge.

Brakes were next on the list and 14" Alcon slotted rotors with four piston calipers ensured ample stopping power.

Wheel and tire selection proved to be just as important and APR contacted BBS. "They had to make us wheels," explained Chris.

"They didn't have the right offset for our brakes, so took a Porsche face and put it on a Mercedes barrel. They were reluctant to do it because BBS didn't want people thinking they offered wheels for this application. It's definitely not a wheel the public can get." Once the 19x8.5" RS-GT wheels were finished, APR painted the centers black and the lips red. Finally, 235/35-19 Michelin tires gave tremendous traction at the track.

## SHOW-STOPPING

As an investor in and partner of Oettinger Germany, APR was able to acquire their first

Mk5 body kit in the country, with a special dual exhaust rear valance. The aerodynamics were molded in. APR applauded VW's decision to resurrect the white GTI but had artistic plans for the exterior. "We didn't want to abandon the white," Chris stated, "but we wanted an eye-catching, streamlined look. So we looked at several different schemes from graphic artists until it came down to a time issue where we could only paint it once. We didn't want to make it too complicated to preserve the lines of the car. So we pulled a black stripe off the front grilles and took it into the door mirrors. We then tinted the windows to break it up on the sides. We also wanted the GTI crest on the side but it would have been too much, so it was ghosted in."

On the rear, red accents highlight the emblem and a red stripe flows between the tail lights up to the front fenders.

APR's relationship with Hella meant the GTI had prototype headlights with an illuminated bar not even available in Europe. They made such a great impression at SEMA, VW plans to offer them through its dealerships.

The clean exterior warranted a special interior, so APR replaced the factory cloth with leather and alcantara. The seats were

# TECH SPEC

OWNER NAME: APR

LOCATION: Auburn, AL

OCCUPATION: VW/Audi tuners

2006 VW GTI

**ENGINE:** two liter turbo FSI with APR stage 3 GT2871R Garrett turbo kit on inconel-cast exhaust manifold, forged rods, fueling components, cast aluminum piping, silicone hoses, front-mount intercooler, 3" dual exhaust, software

**DRIVELINE:** six-speed manual transmission with stage 3 clutch, Quaife limited-slip differential

**SUSPENSION:** Koni coilovers with custom-valved shocks, Eibach springs and rear sway bar

**WHEELS & TIRES:** 19x8.5" custom BBS RS-GT wheels, 235/35-19 Michelin Pilot Sport Cup tires

**BRAKES:** 14" Alcon slotted rotors and four-piston callipers, stock rears

**EXTERIOR:** Oettinger body kit, Hella headlights with LED city lights, custom paint

**INTERIOR:** OE Recaro R32 seats, alcantara inserts on seats, door panels, rear side panels, armrest, headliner, pillars and trunk floor, color-matched dash trim

**AUDIO/VISUAL:** StreetDeck infotainment system including 7.5" touchscreen, navigation, voice activation, XM Radio, backup camera, Verizon Wireless internet, MP3, data storage, Apple Mac hard-drive and an 8" subwoofer

**CONTACT:** [www.goapr.com](http://www.goapr.com), [www.streetdeck.com](http://www.streetdeck.com), [www.bbs-usa.com](http://www.bbs-usa.com), [www.michelin.com](http://www.michelin.com), [www.hellausa.com](http://www.hellausa.com)



also replaced with OEM leather Recaros from a European Mk5 R32 thanks to APR's ties with Oettinger. All four seat inserts were then torn apart and reupholstered in alcantara, along with the headliner, armrest, door panels and trunk. The sides of the trunk received new leather to complete the upholstery. Afterwards, APR color-matched the trim pieces for more impact.

The key to the interior is the new technology featured with the help of StreetDeck. The infotainment system works as an in-car computer, offering real-time data-logging through a 7.5" touchscreen. The system is

also connected to wireless internet through a Verizon PC card. And if that's not enough, it also incorporates XM Radio, iPod integration, voice activation, a navigation unit and a backup camera.

An Apple Mac Mini with Intel duo core processor controls the system. Finally, a compact 8" sub in the trunk provides bass for audio applications.

It's interesting to note APR didn't attempt to lighten the car yet earned the fastest lap in the GTI Challenge. This proves the tuner's achievement in building an excellent engine upgrade and balanced chassis. 

