

# OPEN THE GATES OF HELL

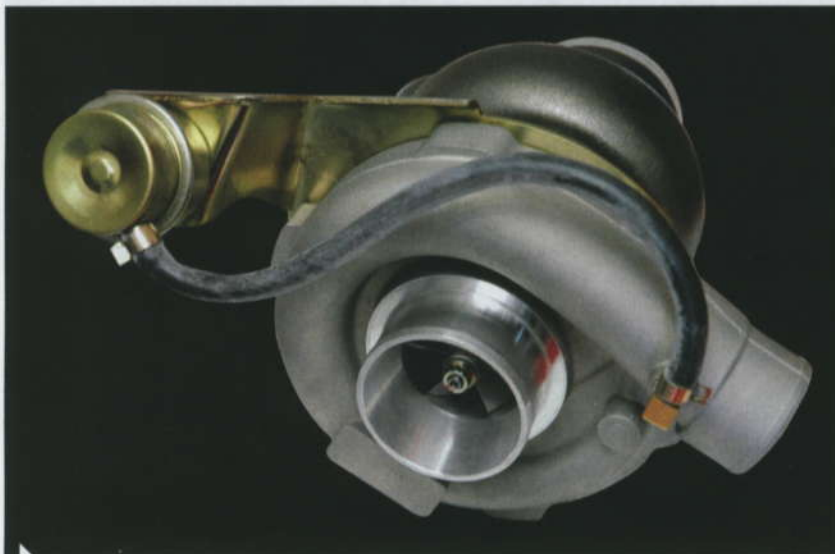
## QUESTION

I have recently been baptised into the realm of forced induction by a Familia GTX. Even though I traded in my '98 SR20DE N14 Pulsar for a much older '90 GTX, I still consider it an upgrade because of the much improved performance. After reading Issue 45's section on blow-off valves, I have resisted the urge to simply whack one on as I understand the merits and problems now. What I don't understand is what a wastegate does and why is it needed?

Jack  
Email

WITH THE INBOX SECTION RUNNING TOO FULL TO ANSWER TECH QUERIES, OUR TECHNICALITIES SECTION WAS BORN. IF YOU HAVE A QUESTION THAT REQUIRES A MECHANICALLY FLAVOURED ANSWER, SEND US AN EMAIL TO [INBOX@AUTOSALON.ORG](mailto:INBOX@AUTOSALON.ORG), WITH 'TECHNICALITIES' AS THE SUBJECT.

**"THE GATE SHOULD BE POSITIONED IN A LOCATION WHERE PULSES FROM ALL CYLINDERS HAVE BEEN COLLECTED."**



IN TURBOCHARGED ENGINES, a wastegate is a valve that redirects exhaust gases away from the turbine wheel and its primary function is to regulate the amount of boost pressure being produced. Without a wastegate, the amount of boost a turbo creates fluctuates according to an engine's speed and exhaust. As RPMs rise, more boost will be created, but an engine can only have enough capacity for a certain amount of boost before something goes bang. Essentially, a wastegate acts as a window which only allows a certain amount of exhaust gas to spin the turbine blades.

The term wastegate is derived from the fact that its purpose is to waste exhaust energy. Although wastegates are the gun choice for turbo engines the world over, the concept does have a few drawbacks. Firstly, its chief function is to waste energy making it an inherently inefficient component. Secondly, the wastegate is a progressive valve and without the use of an electronic boost controller it begins to open while the boost is rising (but under maximum boost) to set itself in position to control the desired maximum boost. What this means is a wastegate set at 10psi will begin to open at around 5psi, resulting in exhaust energy being wasted that could be used to spool the turbine more efficiently. The partial opening of the wastegate also causes problems such as wastegate flutter, a common hitch in internally 'gated turbos.

There are two types of wastegates - internal and external. Internal 'gates are built into the turbo and are controlled pneumatically by an actuator, which is commonly attached to the compressor housing. Other sources for the actuator signal include a plenum before the throttle or the intake manifold, each with their own pros and cons. Internal 'gates route exhaust gases back into the turbine housing which means design of the downpipe is critical. Ideally, a down pipe with a splitter should be used as the wastegate gases do not interfere with the central exhaust flow and it offers the lowest back pressure. Some enthusiasts like to use a down pipe design with a completely separate wastegate pipe, which is routed back into the main exhaust.

External wastegates are completely separate units, which are not built into the turbo, and do not require an actuator to open. Typically mounted on the turbo manifold, to ensure optimum load balance between cylinders and correct response of the wastegate, the wastegate must be positioned in a location where pulses from all cylinders have been collected. It is also equally important to ensure the flow of the exhaust gas, otherwise known as bleed angles, has no trouble

changing direction to exit through the 'gate. Put simply, there should be no sharp angles to disrupt the flow of the gas.

After the gasses exit an external wastegate, there are two ways in which it can be setup. Firstly, the wasted gases can be plumbed back into the main exhaust to make it friendlier for Mother Nature and the authorities, and once again it does not interfere with the main exhaust flow. Secondly, external wastegates can dump the divorced gas directly to the atmosphere, to prevent turbulence to the main exhaust flow, offering that much sought after banshee howl, hence the term 'screamer pipe'.

The decision as to whether to use an internal or external setup can be made by evaluating the costs versus performance. Internal wastegates setups are more cost effective than external 'gates but external wastegates do offer better performance and power outputs.

■ **STREET**