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Technical Release

OEM Intercooler Waterspray Upgrade Kit MY02-07 Impreza STi

The Standard Car

One of the features of the Australian delivered MY02-07 Impreza STi model is a manually operated intercooler waterspray setup. While several of the more competition orientated STi models (typically JDM spec such as the Spec C, STi RA, etc) have a fully automated system controlled via the engine management system, the system on our model is only manually triggered.



All good and well, but it does pose a slight problem. At the time your intercooler needs all the help it can removing heat from the intake charge air (high load, high boost situations), the last thing on your mind will be taking a hand off the wheel and eyes off the road to go looking for a switch to press!!



While in theory the basics are all there (dedicated tank in boot with 6.0L capacity, good pump, nozzle integrated with intercooler scoop air splitter, electronic timer with 2 sec operation time, etc), the OEM system can only be triggered via the dash mounted "I/C Water Spray" switch. If the switch isn't pressed, then the spray doesn't function – there is no form of auto operation in standard trim! Fortunately we have a newly developed kit to automate the factory STi system as a neat solution to the problem. ☺



The Basics – How An Intercooler Works

Before we get into the details of the kit, it is probably important to understand just what an intercooler does, and why on earth you would want to spray it with water! In simple terms, when a turbo or supercharger compresses air the temperature of this air increases dramatically. The hotter the air temperature, the less dense it becomes (meaning less oxygen available for combustion for each engine cycle) and subsequently the less power/torque your engine will produce. To make things worse, the more the air is compressed (ie the higher the boost pressure), the greater the temperature increases.

An intercooler is effectively a device which helps manage and reduce intake charge air temperature – think a radiator that instead of lowering the temperature of the coolant flowing through, actually has your intake charge air flowing through before it reaches the throttle body. The most common intercooler found on road cars (such as the STi and EVO) is an air to air type (meaning air passes through the core to cool your charge air).



Use of an intercooler means consistently lower intake air temps, and more power/torque as a result (this is why your car always feels like it is at its best on a cool Winter evening). Lower intake temperatures also reduce the risk of detonation occurring. Most late model OEM turbo charged vehicles are fitted with an intercooler to help lower the intake air temperature, with the WRX and STi having it mounted above the engine and fed air through a bonnet scoop (shown in picture left).

Much of the time an intercooler actually acts primarily as a heat sink to absorb heat from the charge air (before dissipating it over time when you are back off the throttle again). However, under higher demand situations (eg sustained load such as towing or track days) you put more heat into the intercooler than the ambient air flowing through can reasonably take out in the time available (both on and off the throttle). The key here is that the more efficiently the intercooler is operating, the lower the intake air temperature and the better performance your car will have as a result.

Why Fit An Intercooler Waterspray System

In many cases fitting the biggest, baddest and most efficient intercooler is the best way to achieve lower intake temperatures, however this can also be relatively expensive (the main reason why the OEM spec item is often a compromise). But often this brings about additional issues of its own (eg additional lag through fitment of a larger front mounted intercooler).

Another way of improving the efficiency of your existing intercooler setup (be it either a standard or a larger aftermarket item) is to add a water spray kit. Spraying an intercooler with a fine mist of water helps aid the heat transfer qualities of the core as ambient air passes through. How I hear you ask?



When the water evaporates it takes additional heat away from the surface of the core, more so than just air passing through the core alone. Taking more heat away from the intercooler core means the intake charge air temperature is lowered further than what was possible with air alone. A fantastic demonstration of this is on a warm dry day when you are next driving along, put your finger out the window. Then lick your finger and put it out the window again - you will notice it feels much cooler. As the moisture evaporates from your finger it cools the surface down much lower than was possible with the air flow alone previously. The same principle applies to your intercooler.

The MRT Performance Upgrade Kit - Specifications

A well setup intercooler spray system will only trigger automatically when it can be of the most use. This provides the best improvements in intercooler efficiency, without wasting limited water reserves stored in the vehicle. The water doesn't need to be sprayed at all times, just when the intercooler is working hard to remove heat (ie during or just after full load/boost) as this is when the most efficiency is required.

Many of the more complex OEM systems use a combination of coolant temperature, boost and inlet air temperature (among other things) to ensure thrifty water use. The Mitsubishi EVO 7-9 model requires 12 varying parameters to be met before operation!! Remember though, the greater the complexity the higher the cost – probably why Subaru Australia didn't tick the option box when specifying our STi model!



The JDM spec Subaru models mentioned earlier in the article use the engine management system to control water spray activation (based around a variety of conditions similar to the EVO), but this isn't really feasible when upgrading a system as an aftermarket option. The ECU found in our Australian model doesn't have this functionality built in and attempting a retrofit would be very expensive. Good results can be had relatively easily though through the integration of an adjustable pressure switch (in association with additional switchgear) with the factory system.



An adjustable pressure switch, fitted in line with an OEM dash switch to activate the system, is set so that above a predetermined boost level the factory spray system will trigger automatically. Through testing we have found that around 10 PSi (factory peak boost is 14.9-16.5 Psi depending on year model) is a good trigger point to ensure efficient use of water. This level allows good coverage of water over the intercooler around the time that the engine is working at its hardest, with residual water remaining on the core when off boost to further assist reduction in temperatures.

The MRT Performance Upgrade Kit - Bill Of Materials

Only the highest quality materials are used and supplied with the kit (eg Tefzel insulated wiring and crimps sourced from Motec, an Aquamist pressure switch as proven on WRC and competition cars worldwide, genuine Subaru OEM dash switch from the JDM model etc). Full installation instructions including additional photos are also supplied for those who wish to fit the kit themselves, however if you don't have the experience or the time, either we or your local MRT reseller can easily arrange full installation as needed. <NB: This kit is ONLY suitable for above listed STi models, a regular WRX kit is presently under development and will be available in the coming months.>

The full kit part number is **KITICSPRAYUPG1** and kit components include the following:

- AQ 806 155 x1 - Adj 3-28 PSi pressure switch
- AQ 806 165 x1 - Rubber boot for pressure switch
- AQ 806 166 x1 - Mount kit for pressure switch
- SUWB253D x1 - Genuine OEM STi Dash switch
- LOOM x1 - Custom made loom to suit
- MISC x1 - Wiring connections and pins
- MISC x1 - Cable Ties (small and medium to secure wiring)
- MISC x1 - Heat Shrink (adhesive lined and regular to secure wiring connections)
- MISC x1 - Vacuum Line and fittings to facilitate installation of pressure switch
- MISC x1 - M4x10 bolts and Nyloc nuts for secure fitment of pressure switch



Peace of mind is assured with kit components fully covered (like the majority of our products) by our regular warranty terms and conditions.

<Note picture is as a guide only - not all kit components are shown in above photo>.

The MRT Performance Upgrade Kit - Additional Options

While the upgrade kit comes with everything you need to automate your factory system, this isn't to say that further improvements can't be made! Some additional options are also available:



SUWE127G

Alloy 10.0L replacement tank to suit the MY02-07 STi. Replaces OEM 6.0L (approx) capacity tank, fitting under standard carpet and rear trim in boot of car like OEM item (reuse factory pump and water lines as needed). Extra capacity is ideal for customers completing track work or competition events, or who simply want to fill the tank up less in their road car!



SUWE125B

Additional spray nozzles for fitment in intercooler ducting - allows for additional water flow onto intercooler core to allow for improved cooling potential. These are great for use with larger top mounted intercoolers where additional flow may be required to better suit the larger core design.

Additional Information And Resources

If you have any queries after reading the above and require further assistance, then the below should be of use to you!

Pricing of the kit and many other performance upgrades can be found on the MRT Performance online shop at <http://www.mrtperformance.com.au/shop> (simply search via part number KITICSPRAYUPG1 for upgrade kit, or part numbers listed above for optional accessories).

Orders or installation can also be arranged through your local authorised MRT reseller. Details of resellers can also be found on our website at <http://www.mrtperformance.com.au/performance/dealers.htm>.

If you want further information on water spray kits (especially how an OEM system works) then you can also check out our article on the EVO VII-IX system among other technical data documents on the website at http://www.mrtperformance.com.au/magazine-technical_data.htm.

Of course for further information on any of our products, just give us a yell. We are only a phone call or email away and too happy to help. ☺