



Exhausted Performance

The way a high performance exhaust should and shouldn't be built...

By Michael Knowling

Are all aftermarket exhausts the same? We all know how mufflers can cause differences in flow, but what about the workmanship of the exhaust and the quality of the components that are selected? Here's one car that had a power variation of 10 per cent, depending on which aftermarket exhaust was on it....

Peter Gibbs' 1.8 litre 1999 Holden Astra is a typical modified street hatch, with its 17-inch rims, tint, lowered suspension and full body kit. And as with many, the next item on his list was to create a little more power by modifying the exhaust - a logical step if you ask us. Being an everyday consumer, Peter was swayed by a recurring advert for a local high performance exhaust shop and decided to take the car to them.

"Sure, no problems," they said, "just leave it with us..."



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Around 1200 hard-earned dollars later, Peter's car was returned to him with new 4>2>1 custom extractors, 2 inch stainless steel piping, aftermarket cat converter, central resonator, Genie Turbo rear muffler and dual shiny tips. Spread over two consecutive visits, the total time taken to complete the job was around one full day - in hindsight, not really enough to achieve a high quality end product.

On the road it was immediately obvious there was something wrong - mainly because the new extractors had created a dangerous lack of low-down response. In fact, Peter said it was sometimes scary pulling out into traffic - "Seconds would pass before you even took off," he told us. "Up top, though, there was some improvement over standard - but it still felt and sounded restricted by the exhaust."

But rather than take the car back to that particular workshop again, Peter opted to drive the car to another exhaust specialist - Mark Marchesan of Exhaust Technology - and ask for his evaluation.

The verdict - "You've been given a crap system."

The answer? - "Start again."

The Wrong Way to Make an Exhaust System...

Mark took us on a guided tour of the bad exhaust to show us why it was so sub-standard...



"The extractors," he said, "would have caused most of the restriction." These were press-bent (ie squashed!) pipes of 1¾ inch diameter (for both primaries and secondaries), and of randomly un-equal lengths.



Inside, the join between the primary and secondary pipes at the collectors was extremely sloppy. Feeling around inside the pipe with a finger, it was obvious that the secondary pipes had been slipped about 2cm up inside the collector and a bead welded around the outside. Needless to say, the leading edge of a pipe protruding around 2cm into the gas flow impedes flow quite dramatically! The outer welds were also very thick and messy in order to help plug gaps between those pipes that weren't aligned properly.



Also notice how the EGR (exhaust gas re-circulation) pipe has been blocked off in an attempt to gain power. Very naughty indeed!

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A little further back, the flex joint (necessary in any transverse engine'd car) was joined to the front pipe at an angled cut. Mark says this will eventually cause the joint to wear abnormally and it also won't do any favours for gas flow.



Then we come to the cat converter. Immediately upstream of this was a press bend that terminated at the mouth of the cat with a messy weld, complete with small leaks. Mark said the probable reason for the leaks was because the system installation had been performed on the car - the exhaust had not been removed to have welds made a full 360 degrees around the pipe.



After passing through a central straight-through resonator, exhaust gasses again choked up through a press bend over the rear axle. They then made their way to the Genie Turbo rear muffler (offset inlet and centre outlet) that was hung off butchered Astra hangers - which means the factory system couldn't be simply re-installed in the future.



Furthermore, the pipe leading to the muffler joined it at another angled cut. Mark informs us that the problem with this is the packing inside the muffler will be eaten away more rapidly in one area, in addition to adversely affecting flow.



At the end of the system is another shiner. Instead of selecting a muffler with dual outlets, the single outlet of the Genie box was faced up against tight Y-piece whose main function in life was to impede flow. We'd guess that the pressure drop through this Y would be larger than that created by the muffler...



Oh and, once again, isn't that welding just el-supremo?!

And the Right Way...

Here's how - over the course of two full days' work - Exhaust Technology built a better system. How much better? - you'll see a bit later on when you look at the dyno graph!

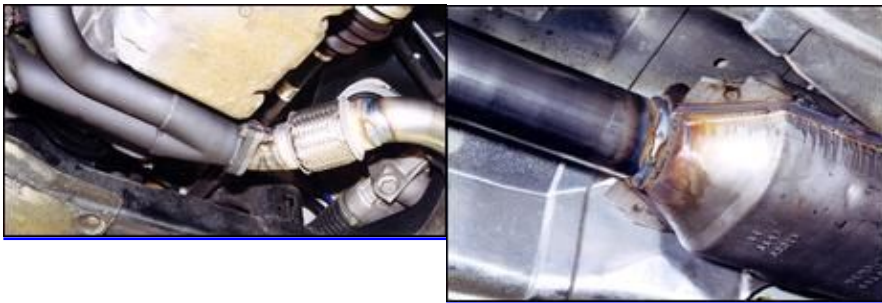


First up, a template for the extractor mounting plate was made from the factory exhaust manifold gasket. After cutting out the mounting plate from steel (with special attention to port shape), much patience was required to piece together a collection of 1 5/8 inch primary and 1 3/4 inch secondary mandrel bends. These were set at a "custom length" (which was very near equal) in a 4>2>1 configuration that was a whole lot more elegant and, you'd expect, higher flowing than the last shop's attempt.

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Notice how from underneath the pipes are of equal length, the bends are more constant in diameter and the collectors are fitted with a neat bead of weld, 360 degrees around the pipes. A lot of time was spent making sure the flow of gas through the inside of collectors was as free of turbulence and restriction as possible.



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Post-extractors, the new flex joint of the Exhaust Technology system was led into with a bend, rather than being mounted on the angle-cut tube. An ET (Exhaust Technology) cat converter was also used. Notice how the pipe leading into the converter is the same diameter as its inlet nipple.



A length of straight 2-inch diameter (as before) mild steel pipe then makes its way into a custom central resonator.



And while work was being done at this stage, the extractor-back pipe assembly was removed from the car and checked at ground level. This enabled welding to be performed 360 degrees around each pipe and a close visual inspection of all joints to be made.



Low-restriction mandrel bends were used to go over the top of the axle and, once again, quality assembly was achieved by the removal of the pipe from the car. Careful fitting also allowed a much shallower angle of entry into the rear muffler.



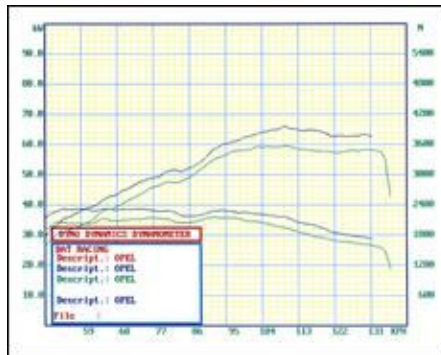
From there, a couple of tough looking tips were welded onto the dual outlets of the Japanese sourced straight-through muffler - but not without some slight fibreglass and metal work being required!

After a bit of final spit'n'polishing it was "mission complete".

Proof's in the Puddin'

Exhaust Technology were so sure they could improve power, they organised for Peter an independent dyno run pitting their system against the "crap system". The difference is truly astounding.

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The engine power and tractive effort of the "crap system" is shown by the green line, with the car's performance with the second aftermarket system indicated by the blue line. At low rpm the improvement in power with the second system was about 11 per cent, with peak power up by about 10 per cent. Importantly, there was a major gain across the whole rev range, meaning that in the real world, performance would be noticeably improved. And remember that the power hike is over an already "high performance" exhaust system!

Having been charged A\$1580 for new system, Peter's rapt in the car's new exhaust. "It's now 100 per cent better. It sounds better, is made better and it's got a lot more power. Throttle response is also improved radically over the last system," he enthused.

Obviously there's more than one good exhaust shop around, but there's also a host of bad ones. And a bad exhaust can really drop those power gains that you're chasing. Just goes to show there's exhaust systems and there's exhaust systems...

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