AND NOW BY POPULAR DEMAND ... ? - BY ROBERT LEGERE

Wow, I'm impressed. Over the last fourteen years, I've submitted various articles to many of the "Opel mags" in circulation. It started with OPEL U.S.A. (now defunct), The Opel Drivers Club of America (O.D.C.A., also out of circulation), and most recently THE BLITZ (The newsletter of the Opel Motorsports Club). Through the course of all this I've never received a single specific request for an article, even though I used to plead for people to get involved and submit ideas. It seems everyone wants to read about Opels, but nobody wants to make any effort to find fresh new ideas to write about.

But this is no longer the case, since none other than Charles Goin of the Opel Association of North America has become the first ' to submit an official request. The Opel gods have listened! (Actually, I don't think Charles really counts here, since he is far from your average Opel enthusiast, but what the heck, I'll humor him.) As the editor of the O.A.N.A., Charles can surely relate to the difficulty involved in finding printable matter for his newsletter.

I know the feeling well. When I'm on a roll and turn out a bunch of articles, it doesn't seem to matter much to most people. I get the occasional reference to something I wrote two years ago during a conversation, but for the most part there seems to be little in the way of comments, good or bad. So what's my incentive to keep on writing? Do I do another story on a cam test, or performance evaluation, or dyno pulls, or on shiny hubcaps? Without feedback, I have no idea. Occasionally I get someone asking why I haven't written an article lately. Have you asked for one lately? I mean specifically, on a particular subject. No? Well, that's why I haven't written. I get burned out, and I lose my creativity without input. I'd like to think I'm helping people or at least informing or amusing them, but if I'm not, why should I spend 2 or 3 hours writing about nothing? It can only help all of us, since you'll be getting (hopefully) the answers you need, and I'll be getting more initiative. Perhaps I'm creating my own controversy here for no reason, but regardless, I've been requested to write an article about Opel intake manifolds. Which ones to use, which to avoid, and the how and why of modifying them for better performance. Read on if you like.

The first thing I'd like clarify here is that I'm going to be referring only to the standard type single carburetor intake manifolds for the 1.9 litre engines. I could delve into the sidedraft manifolds or the "Sprint" dual downdraft intake manifold or any of the many numerous custom possibilities (including fuel injection), but that is not what this is all about. This is about getting the most out of a single downdraft carb and intake.

To start off with, getting the proper core is essential. I say this because there were numerous variations of the 1.9 intake manifold. I've personally seen seven different intakes for the U.S. 1.9's, and a few other European intakes that have made it over the ocean. Unlike most things Opel, the older manifolds are *not* better than the later smog-style intakes. Keep away from the old ones, unless the outward appearance is important to you. They can be improved, just not as much and with more work. In fact the later smog intakes are far superior for airflow and even air/fuel distribution. Notably, the older intakes have a pronounced "ramp" at the outer (towards the fender) side of the plenum wall. The plenum is simply the large open area directly beneath the carburetor. The inner side of the plenum wall (towards the valve cover) is more or less vertical.

Besides the casting dates, the easiest way to identify a smog intake is by the presence of three ports or threaded holes in the plenum area. The third port *(most* have two, some only one) is the true identifying one, as it shows the presence of an EGR system. You'll see this on all 1973 and 1974 intakes, as well as some later 1972 intakes. Many of the 1974 intakes will also have "U.S.A." cast into the bottom of the plenum, albeit *inverted.* These intakes are my favorite to work with, as I've seen the best results with the least amount of work.

The interesting thing about the various intakes is the carburetor mounting pad height. Apparently, Opel changed the heights to allow for installations in various chassis, or perhaps for different driving characteristics. I've seen three different heights myself, but that doesn't mean there aren't others. While somewhat confusing, it explains why some GT owners have hood clearance problems and others plenty of room when it comes to aftermarket air filters. I had always assumed that the clearance problems were due to settled engine mounts, but the intake heights are a more tangible reason.

These variations are in increments of approximately 1/8". This can lend some advantages to tuning, particularly to those racers out there who run different tracks and are not allowed by the rules to add carburetor spacers. To lend credibility to the tuning possibilities, let me relate an experience I had. I used to have a 1973 Ascona with a stock low compression engine and hydraulic lifters. According to period magazine tests, the top end potential of that particular body style, transmission, and gearing was 98 mph. I got 99 out of mine. Later, I added a 1975 exhaust manifold and a complete 2" exhaust system, a ported intake manifold with a 3/4" carb spacer and a 38 DGAS Weber carb, and a Jacobs electronic ignition. With this noticeably better breathing combination, the top speed was increased to 117 mph. That takes a significant improvement in top end horsepower to add 18 mph to the top speed. However, the around town torque was not especially great. To try to enhance this, I removed the 3/4" carb spacer, and installed just a 1/4" spacer. Within 20 minutes of running 117, 1 had the car back on the same highway, and could not break 108 for the life of me. But the torque and driveability at lower rpm's was improved dramatically. I think this shows what can be done with intake tuning, even on a standard engine with 80,000 miles on it. If you decide to increase the spacer thickness on a Manta or Ascona beyond 1/4", be sure to place spacers under the throttle linkage bracket as well to prevent binding. You'll need to go to longer fasteners too.

Regarding carburetor spacers, if you decide to buy or make one up, go for the two-hole type spacer instead of the open type. These seem to have far better torque no matter what the situation. If you should happen to come across a later European intake, they seem to be the tallest. They are also usually identifiable by the bimetallic strip on the outside of

the plenum facing the fender. Some of the later U.S. intakes also have the boss for this bimetallic strip, but don't actually have one in place. These came on late '70's 1.9 liters and non-injected 2.0 liters. But you don't need to search one out if you aren't restricted by any rules, such as on a street car. I would use a 1/4" spacer on a standard or nearly standard engine, preferably made out of plastic or some other phenolic material to prevent heat transfer. Aluminum is O.K., but hotter climates seem to be tough on restarts after a good hot-soak. Up to 150 h.p., a half inch spacer works well, and after that, try a 3/4" spacer.

After finding the proper intake for your use, decide how you're going to use your car, and which carburetor you intend to fit. It makes no sense to modify an intake for racing use and then putting it on a grocery getter with an automatic. First of all, remember that porting the runners gives no improvement. I've seen no improvements on the flow-bench in airflow, and not even a one horsepower improvement. The narrowest part of the intake runners is at the radius'. If you cannot increase the cross-sectional area at this radius, and/or increase the radius, then porting the rest of the runner will do nothing but increase the volume, and therefore reduce throttle response by delaying the time it takes to fill the runner with the next air/fuel charge. You *definitely* don't want to enlarge the runner right at the junction of the intake/cylinder head, because doing so risks reversion by mismatching. I've never seen a stock intake runner bigger than the port in the head, and it should stay that way. Port matching is highly over-rated, unless the port in the head is smaller than the intake runner.

The area to concentrate all porting work on for a stock Opel intake is the plenum. Even if you have a stock intake with a 32/36 Weber carb, you should at least match the plenum opening to the carburetor base size. There is a mismatch of up to .100" on the secondary throttle plate. On most engines, this is a difference that you can feel. For those of you with a 38 DGAS Weber or larger, then you *must* open up the intake to the size of the larger throttle plates, or you will find that the larger carburetor offers no improvements over the smaller "standard" Weber.

The 38 DGAS Weber has a wide range of uses. It can be installed on a completely standard engine and jetted accordingly for the 65-85 h.p of a stock Opel engine, or it can be used on a 140 h.p. engine with excellent throttle response and superb tuneability. This carburetor can even be modified to feed as much as 170 h.p., but at that level the top-end power tapers off much more than with a larger carburetor. Boring out the venturis from 27mm to about 31 mm , streamlining the auxiliary venturis and increasing the fuel inlet and needle/seat will allow those higher numbers to be achieved. Another thing to consider is this: You'll know when you're making power when you have to increase the fuel line to 3/8" and go with a bigger fuel pump. The 5/16" line is not enough with a single Weber. You'll empty the fuel bowl out at 140 h.p. while you're somewhere in third gear. Twin Webers and Holleys have more fuel capacity, so that limit won't be reached until much later, around 170 h.p. A neat trick I've tried was to bore out a 32/36 Weber on the secondary side only, and rejet accordingly. The impression was that of a four-barrel kicking in. Good fuel economy on the small barrel, with a heavy kick on the second barrel. Plus, it looks stock externally, a great way to confound the unknowing!

Another carburetor that can be used on the Opel engines with success is the Holley 2-bbi. I'm not talking about the Holley-Weber 5200 series. Those should never be used on an Opel engine, as the primary and secondary barrels are reversed, and they tend to run the center cylinders lean. I'm speaking about the 2300 series carburetors, specifically the #4412 500 cfm carb. You can use a 350 cfm 2-bbl but they're more expensive than the 500 and are only a marginal step above the 38 DBAS Weber (330 cfm). By the way, the 32/36 Weber is 270 cfm. The #4412 Holley can be put on a stock Opel intake with a 1/2" aluminum adapter plate such as the Trans-dapt #2138. There will be a massive amount of material to grind away from the intake to match it to the adapter, but the improvement will be worth it. You will have to make your own throttle linkage, but I've found that a universal motorcycle clutch cable works well and is inexpensive, about $16.00. You'll also need to experiment with air filters for hood clearance on the GT.

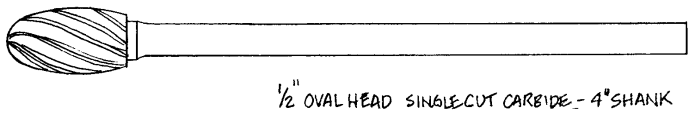
Getting back to the intake mods, concentrate on the transition from the plenum to the beginning of the intake runners. You almost can't make this area too big. For instance, I typically break right through the casting in eight different places when porting an intake. These will need to be either welded up or epoxied with the proper material. I use a material called Kop-Coat A-788 Splash Zone Compound. It is actually designed to be applied to boat hulls *under* water, and it will cure under water beautifully. It's impervious to 400 degree heat, oils, fuels, water obviously, and any other chemicals I've thrown at it. It is also not on sale to the public unfortunately, and the smallest amount sold is in two gallon lots for about $100.00. But it's much cheaper than welding if you're doing more than a couple of intakes, and its easy to work with. You can use Marine-Tex marine epoxy with slightly lower results, but at least that's sold to the public for about $45.00 a quart. The down side to the Marine-Tex is it will absorb gas unless sealed with another epoxy, and for this I use West System marine epoxy, #105 resin and #206 hardener, and its available at many marine shops in gallons or quarts. This is liquid epoxy that is water clear, while the others mentioned above are colored and putty-like in consistency. After the other epoxy has hardened, I brush on the liquid epoxy with a disposable acid brush. Even when I use the Kop-Coat epoxy, I apply the liquid epoxy to the inside & outside exposed epoxy putty. This will seal the surface and prevent lifting or saturation with gasoline, which may cause later lifting. This process has taken years of trial and error to figure, but it's been reliable in its' latest incarnation, even for racing applications. The prep-work prior to any epoxy adhesion is also important. All grease must be removed, but the important thing is to have a rough surface for proper adhesion. Any area that has been sanded with porting instruments is probably O.K., but other areas that may need epoxying such as the plenum bottom (more on that later) -will be relatively smooth. I glass-bead the entire intake before beginning to apply

epoxy, and also clean it with brake-clean. I don't recommend lacquer thinner, as it will leave a film that does not promote adhesion, while the brake-clean solvent will leave it spotless.

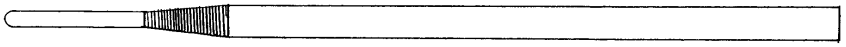
As far as the plenum bottom goes, in some applications, it's beneficial to fill the plenum somewhat to improve torque. It has the same result as the smaller carburetor spacers, i.e., it decreases the plenum volume for better bottom-end power, and prevents fuel puddling that could be a problem on an engine with low vacuum. How much depends on the intended usage. I'll explain that later and illustrate it as well.

Over the years I have developed various degrees call them stages!) of preparation for the 1.9 intakes based on flow bench work, street testing, and race testing. While I no longer sell prepped intakes, it makes sense to base this article on those proven items, as they were developed in a progressive series, from mild to all-out. Even if you have no intention of hot-rodding your Opel, at least do yourself a favor and match the top opening of the intake to whatever carburetor you decide to use. While it will only improve power a little, it will also help with throttle response and even fuel economy.

What you will need



½" OVAL HEAD SINGLECUT CARBIDE - 4" SHANK

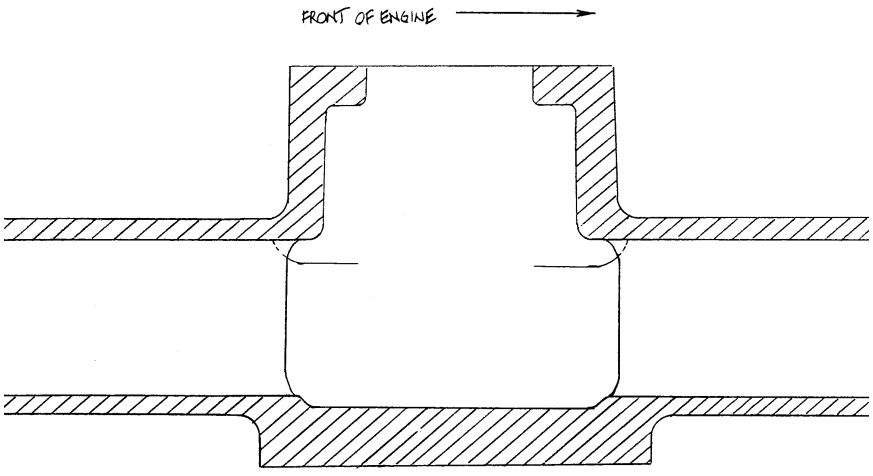


6" CARTRIDGE ROLL MANDREL - ⅛" ROLLS

½" X 1½" X ⅛" STRAIGHT CARTRIDGE ROLL - 36 GRIT

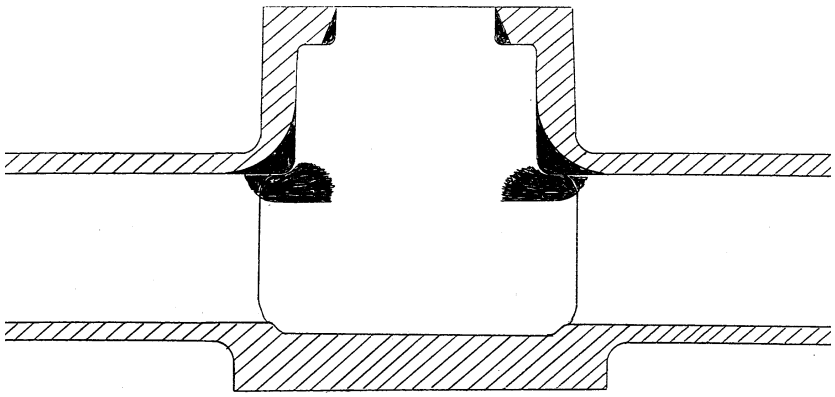
OTHER MATERIALS:

- AIR OR ELECTRIC DIE GRINDER
- KOR-COAT A-788 SPLASH ZONE COMPOUND (EPOXY)
  —OR—
- MARINE-TEX EPOXY
- WEST SYSTEM EPOXY - #105 & #206
- NEW HOLD-DOWN STUDS?
- KEROSENE OR WD-40 FOR CARBIDE LUBRICANT



CUT-AWAY VIEW OF A TYPICAL STOCK 1.9 INTAKE

The Street-Ported Intake



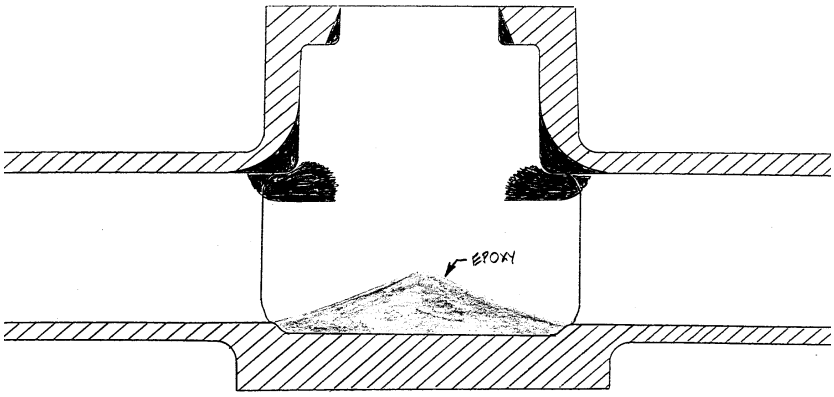
CUT-AWAY OF STREET-PORTED INTAKE

* GRIND AWAY DARK SHADED AREAS

Here it is, the easiest way to put 5 - 8 h.p. into your Opel, everywhere in the power band. After grinding the opening of the intake to match your carb, (I like to make it slightly larger than the carb to avoid possible reversion from misalignment, about .080" larger) simply smooth out the sharp angle at the top of the runner opening, where it meets the plenum. It's very tight there, but a substantial amount of material can be removed. The intent is to increase the radius. To avoid breaking through, limit the material removal to about .250" on the diagonal. You'll need at least a 4" long carbide burr, and it should be a single-cut type so it doesn't clog easily. I use kerosene in a coffee can for a carbide lubricant, and dip the carbide in it every minute or so, as needed. A 1/2" oval head cutter works *very* fast, in fact it's easy to port through in no time if you don't pay attention!

Another place that can have material removed for better flow is the area near the through-bolts that hold the intake to the stock exhaust manifold. Be careful here as they can break through easily as well, since they are very thin to begin with. I probably remove around .100" of material from each of the four protrusions. After all the appropriate areas are ground away with the carbide burr, you'll probably want to use a few cartridge rolls to polish the material smoother. Avoid the temptation to make it shiny. All you are looking for is a uniform surface, not a mirror. In the case of intake manifolds (or intake ports for that matter), rougher is better. I used to polish my intake manifolds with 80 grit, thinking that was rough enough. But I now use 36 grit, as it helps to break up the air/fuel droplets *much* better, retaining atomization, and therefore better power with less fuel, hence greater economy. I use a 1/2" x 1 1/2" straight cartridge roll for easier access. With this degree of porting done, the outside of the manifold will look standard, and the stock exhaust manifold can be used too. By the way, any intake porting is easier if the carb studs are first removed. Porting is very difficult to describe in print, so I have some sketches to help clarify it, but even then I realize that it's not an easy thing to translate to real life.

The Torquer Intake



CUT-AWAY OF TORQUER INTAKE

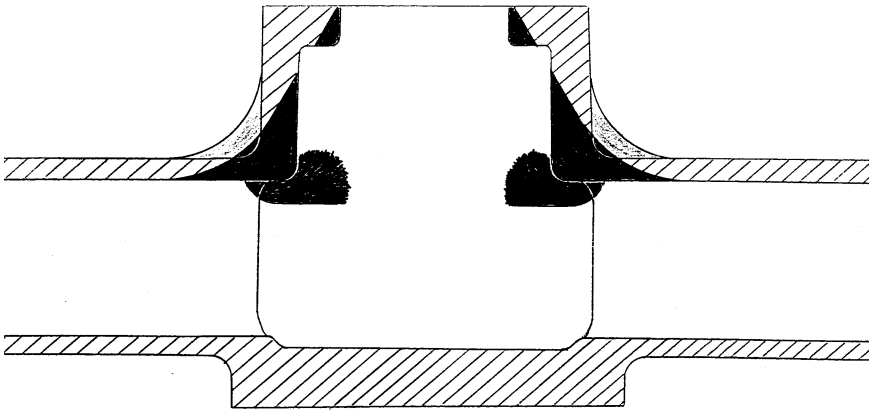
* GRIND AWAY DARK SHADED AREAS
* EPOXY @ LIGHT SHADED AREAS

The Torquer Intake Cont.

This is a more recent development, at least compared to the other manifolds, which I've done for the past seven or eight years. One of the biggest complaints from most Opel owners is simply this, "Not enough torque!". True, if you install a larger carburetor, especially on a stock engine with low compression, there is not enough "oomph" down low. There are tons of reasons for this, but it doesn't help that the standard Opel intake plenum is fairly large to begin with. Porting the manifold only makes it bigger. But if the shape could be improved by porting, and the volume remained as stock or smaller, then you'd have the best of both worlds.

So the porting work performed is actually identical to the street-ported intake talked about above, but the plenum is reshaped with epoxy. O.K., a lot of epoxy. Basically, the entire plenum floor is filled somewhat, but in a specific shape. The intent is the create a "roof' shape, with the peak running the direction of the cars axles, or side-to-side. This prevents puddling of fuel, takes up plenum volume, helping engine vacuum and torque/throttle response, and it also directs the air/fuel to the runners, rather than just dropping it to the plenum bottom and letting it find its' own way. Forming the epoxy is a bit time consuming, although that Kop-Coat has an advantage over the Marine-Tex in that it forms better with water, almost like clay. I still recommend using the clear epoxy as a sealer after the putty has cured. This type of intake ***shouldn't be*** used with a standard exhaust manifold, as the heat might release the epoxy from the floor of the intake. In addition to the normal prep work before applying epoxy, I also drill shallow 1/8" holes on the plenum bottom to help with adhesion.

The Hot-Street Ported Intake

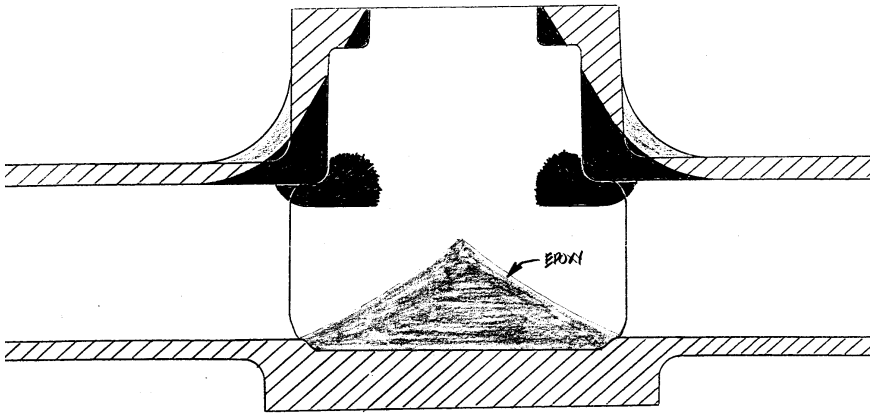


CUTAWAY OF HOT-STREET PORTED INTAKE

* GRIND AWAY DARK SHADED AREAS
* EPOXY @ LIGHT SHADED AREAS

When you want you car to boogie, here's the ticket. I've seen 12 h.p. from one of these intakes. And as I've said in the past, there is no other singular item you can bolt onto your Opel that will give that much power, short of nitrous oxide. You will feel ***and*** hear a difference. At this point, not much concern is given over if you'll port through the intake casting, but rather *when.* In fact, the porting through is used as a guideline to determine if you've gone far enough. When I see four equally sized holes at the junction of the plenum and the runners, I know I'm just about there. And those intake-to-exhaust manifold bolt bosses are also broken through as well in four spots. Now we're getting somewhere! A bunch of epoxy is applied and then sanded level after curing, then coated with the clear resin for protection. This cannot be used with a standard exhaust manifold for sure. A header or 1975 manifold is necessary. I'd estimate that 1/2' of material is removed from the junction between the plenum and the entry roof on the runners. It'll leave oval holes about 1/2" by 3/4" in size. At the sides of the plenum, not only do I break through the casting to the machined area for the intake/exhaust manifold bolts, but sometimes I'll keep right on going 'til I hit the actual bolt hole. You'll want to also fill those bolt holes from below if you get this far.

The Torquer/Hot-Street Combo Intake



CUTAWAY OF HOT-STREET/TORQUER COMBO

* GRIND AWAY DARK SHADED AREAS
* EPOXY @ LIGHT SHADED AREAS

Just as the name implies, this matches the porting of the Hot-Street with the plenum epoxy job of the Torquer. It really is the best of both worlds in a sense, and is especially useful for lower compression performance engines, or engines that will not see much high rpm usage. This is much more labor intensive, but the payoff is worth it.

The Race-Ported Intake

Even more grinding is done for this intake on the upper radius, but the big change over the previously talked about intakes is that epoxy is not used, but rather the intake is welded-up prior to any grinding. This'll take any amount of heat even in a high stress racing application, and there's little concern over low-end torque. The intake has to be jigged to prevent warping, but even still it needs some mild surfacing to bring it all true.

The Racer 11 Intake

All-out balls-to-the-wall power is all that matters here. Gotta run a stock intake because the rules say so? No problem, just weld it like the intake above, then cut the bottom off and port the hell out of all the runners from plenum to head. The inner radius of cylinders 2 and 3 are welded 1/2" and the radius increased drastically, then the bottom is welded back on and the whole thing sandblasted. Too much work for anything but a pure race car.

What's it gonna cost?

Well, if you don't have any tools or materials of your own, then it's gonna cost a bunch. You'll need a high-speed die grinder and an air source. A 4" single cut carbide burr is $35.00 to $45.00. The sanding rolls are about $25.00, and the mandrel is about $5.00. All that epoxy will set you back at least $100.00 for the smaller quantities, plus there's your time. Never did it before? It'll take you two to six hours, depending on how crazy you go. However, if you have a friend with the tools, or you own them yourself, and maybe you split the material costs with some other Opel owners, then it wouldn't be so bad, and I think you'd get a lot of bang for the buck. I hope that this has helped to unlock some of the mysteries of the Opel intake manifold. I still believe that it's one of the simplest ways to make a big difference in power and torque. The 1.9 manifold can also be modified with some minor welding to fit the 2.2 and 2.4 Opel cylinder heads. This provides a user-friendly and cost effective alternative to the Opel fuel injection. Happy Opeling.