Everything to know about Boost

Making a car somewhat less reliable, but a whole lot faster!

Through this article I'll explain how turbocharging, supercharging, and twincharging work. As well as how you can implement them, pros and cons, and more.

What is "Boost?"

Any device that compresses intake air in order to push more air into the engine than if one is not used is classified as a "forced induction" or "boost" device. This excess air allows the engine to be tuned to put more fuel into the engine because more air allows for more fuel to be there as well.

By adding this extra fuel more power can be created. The essential principle behind any form of boost is to make a smaller engine push out the same power a larger engine would. Because of this many tuners take to adding them to make their cars go faster.

Manufacturers are catching on that they can make small four-cylinder cars that fit within emissions guidelines because they have stuck a turbocharger to them. Thanks to the rise of this, not every vehicle fitted with a turbo is fast, so one might choose to upgrade their stock turbo or supercharger. Or stick one on a "naturally aspirated" (non-boosted) vehicle, because no car is fast enough stock, right?

Turbocharging

What is a Turbo?

A turbocharger is a forced induction system that uses cooled exhaust gasses to push more air into the engine's air intake. Thereby allowing you to use more fuel as well, creating more power.

Turbos pressurize air before it enters the intake, and this is powered by the kinetic energy of the exhaust gasses from the engine. The cooling occurs through the air- or water-cooled intercooler. Where gasses pass through and are cooled down either by exchanging heat into the ambient air using cooling fins, or into a cooler liquid in liquid cooled setups.

There are two sides of the device. The hot-side or exhaust-side is the turbine section of the turbo. Where the force is created from kinetic energy. This energy is transferred to the cold-side or intake-side through the turbine.

A compressor on the other side draws in ambient air through the engine's intake system. Pressurizing it using the compressor driven by exhaust gasses. This is then fed into the combustion chamber. This cooler and more dense air allows the engine to increase the fuel through the fuel to air ratio.

Turbocharger performance is directly related to it's size and ability to compress air. With larger sizes requiring more pressure to spin up before being useful, but also being able to put more pressure into the air, making it denser.

Parts

Making up the cold side are the impeller, diffuser, and housing. The impeller spins in the air, the diffuser helps more the air, and the housing houses all of this.

The turbo is connected to a center hub rotating assembly or CHRA. Which holds the shaft that connects the turbine to the compressor. Lighter shafts help to reduce turbo lag by being easier for the exhaust gasses to spin. The bearing is also important as it allows the shaft to spin at speeds as high as 250,000 rpm.

Some CHRAs help with cooling by having pipes that engine coolant can flow through. This can stop overheating of the turbo's lubricating oil.

Types

Twin Scroll

Two separate exhaust gas inlets are used so the pulsed flow of exhaust due to cylinders firing at different times can be better utilised. Whereas in a standard (single scroll) turbo the pulses from different cylinders interfere with one another. This system uses the scavenging effect of maximising the pulses to pull more energy off the exhaust gasses and thereby help the turbo to be more responsive at low engine rpms (revolutions per minute).

Some twin-scroll turbos have different sized nozzles on the exhaust inlets. In order to have low rpm response the steeper angle one is used. The larger nozzle is less angled and better for high rpms.

Variable Geometry

Altering the aspect ratio (inlet radius from center of turbine) of the turbo as conditions change using vanes; the vanes are adjusted on the turbine housing affecting the flow of gasses towards the turbine on the hot side. Some turbos electrically actuate the vanes, others pneumatically.

Large aspect ratios cause the turbo to be useless at low speeds, but too small of an aspect ratio and the engine may choke at high speeds and lose power. Using these vanes to adjust the size of the housing keeps the boost at optimal levels throughout the engine's rpm range.

Electrically Assisted

To reduce lag, an electric motor is included that powers the compressor in addition to the usual power from exhaust gasses. This allows for the compressor to push through more air at all rpms compared to a solely exhaust gas driven turbo.

Single or Twin??

One turbo can be used, which depending on the type and reason for boosting can be quite sufficient. Or a large turbo can be used in order to only provide more power at higher speeds. Although, for most intents and purposes will be inefficient as there is no response for low rpms. However, setting up one sub-optimal is cheaper and still gives you power.

The most common multiple turbocharger setup is to run twins, and more turbochargers on a production car is rare (like the Bugatti Veyron with 4). Twin turbo setups use two turbochargers in order to increase the horsepower output of the engine and/or combat lag. The most common setup is to use two identical devices on each half of a V-engine.

Twin Setups

Parallel

Equally sized turbos with half of the exhaust gas sent to each one. The resulting intake charge from both is either combined or separated into an intake manifold for each turbo.

Such a setup is well suited to V-engines as each engine bank can be separated to each boost device. This is called parallel twin-turbos or biturbo. Although that really just depends on the marketing team.

The benefits of this system are being able to use two smaller turbos to work better at low rpms rather than a single larger turbo, but get the same amount of boost. And, that it can simplify the exhaust system in V-shaped engines.

Sequential

Using one smaller turbo for low rpms and a second for higher rpms. Since large turbos are ineffective at low engine speeds the larger turbocharger is only fed a small amount as it is brough up to speed. Most of the exhaust gasses being fed to the small turbo. Once the engine is moving fast enough the exhaust is diverted to the larger turbo which provides boost for such speeds. The smaller one is kept off to avoid choking the engine since it is now ineffective due to the high exhaust flow.

Series

Sitting as somewhat of a midground between parallel and sequential, series setups have turbochargers connected in series. With the gasses feeding into one turbo, then being further compressed by a second turbo.

These devices may be the same size, or the second one may be larger. This allows for there to be lots of boost put out by this system. Unfortunately, there is also a lot of lag put out by this system, so it is not a great setup for most applications.

Lag

The lag that I have made mention to is the time between when you hit the throttle and when the turbo begins adding power. In the early days of turbo technology this was a big issue as it was hard for drivers to predict when it would kick. Getting a ton of power right in the middle of a corner proves quite disastrous. Therefore, most motorbikes don't have turbos, it's hard to put modern anti-lag on them.

This delay is caused by how much air it takes for the hot-side to spin fast enough to get the compressor on the cold-side to pressurize enough air to make boost. Nowadays we have smaller turbos that still make power, and ways to mitigate lag.

Combatting Lag

- Lower rotational inertia of turbocharger.
- Changing aspect ratio of turbocharger (variable geometry.
- Increasing air pressure of compressor discharger, and wastegate response.
- Reducing bearing frictional losses.
- Variable-nozzle, or twin-scroll turbos.
- Decreasing volume of piping from turbo to intercooler.
- Using multiple turbos with sequential or parallel setups.
- Turbo spool valve to increase exhaust gas flow speed to turbine.
- Use a butterfly valve to force exhaust gas through a smaller passage in turbo inlet.
- Electric turbo/hybrid turbo.
- Antilag systems…

Antilag

Working to reduce the lag before the turbocharger spins up. The basic function is to delay (retard) ignition timing and add extra fuel to balance the loss in combustion efficiency by increasing pressure at the charging side of the turbo. To do this more fuel is added to the fuel to air mixture. And pushed through the exhaust valves, combusting in the exhaust system before the turbo.

This tends to be used on race cars as they are able to ignore most reliability, noise, and exhaust restraints applied to street cars. As well, rally cars famously use it in order to keep the turbo ready during the long periods of off-throttle that are common in the sport.

To accomplish an anti-lag system (ALS) you need an air bypass. Either a throttle bypass with an external bypass valve or a solenoid valve that holds the throttle 12 to 20 degrees open. Or, use a bypass valve that feeds charged air directly to the exhaust manifold.

Blow-Off Valves

These prevent excessive pressure on the turbo when the throttle is closed at high rpms (like changing gears). And, because of this reduction in pressure it also helps the turbo spin up quicker. This happens by opening its valve and allowing the air to vent out either to the ambient air in an atmospheric venting system. Or a recirculating type will send air back to the intake upstream of the turbo where it isn't pressurized.

Blow-off valves work by connecting a vacuum line to the air intake after the throttle, a valve is installed before the throttle. When the throttle is open the pressure is equal on both sides of the BOVs pistons, so it stays closed. But, when the throttle closes the pressure after the throttle is lower than the pressure before it, which causes the valve to open.

Wastegates

The wastegate in a turbocharged car controls exhaust flow to the turbo's hot side. This is used to regulate maximum boost pressure. There are two types of wastegates.

One is the external wastegate which is used on turbos that do not include one internally. The manifold of the turbo must include a runner to the wastegate. Due to the extra parts they tend to be more precise. Pneumatics control the opening of the valve, although some use butterfly valves. The blades of the turbo trying to vent air cause you to get those beautiful flutter sounds with this system.

Other turbos have a built-in bypass valve to allow pressure to bypass the turbine into the exhaust. These systems are simpler than the external ones and are more compact. Although, you are limited in how much exhaust pressure you can bleed off because of the small size of the valve.

Most modern wastegates are controlled either by pneumatic or electric systems. These integrate a boost controller to choose their maximum boost. This is important to prevent the engine from pushing too much power through the engine and turbo, causing critical failures and damage.

Installation of a Naturally Aspirated Engine

Things to Worry About

Before you can even consider what parts to investigate you must determine if your engine can handle the boost. You must decide if your engine is in good condition and if it was built strongly enough to handle the extra power. Look at where your engine is weak online, people will have posted about it. Testing the compression and oil of your engine is also a necessary precaution. Donut Media did a good video on this, and honestly their whole turbo series is quite solid. Keep in mind that checking the health of the engine applies to all forms of boost.

To hook up a turbocharger you will have to change out the exhaust system, quite possibly the manifold, and add a downpipe. The tubing can get rather nasty, and you also must consider the heat that will inevitably build up.

Hooking up an extra oil line and possibly coolant line are needed steps, and this will put some extra drain on your engine oil and coolant. In addition, a better fuel system is key to use all the extra air you are pushing into the engine. This will possibly include injectors, maybe a whole fuel rail, and perhaps the pump too. It all depends on the age and power of everything on your engine.

Of course, as with all boost, you will need to get your engine tuned. Otherwise, it is almost pointless to stick a turbo to it. If you neglect going to a tuner you risk the safety of your engine, and all the money you spent on the parts is no longer worth the power output they were rated for. So, you have paid for far less than you are getting.

Upgrading a Turboed Vehicle

Working off of a stock system tends to be easier than fully building something. This is true for turbochargers as well. Your options are just about as open if not more so as upgrading from a naturally aspirated system. Dropping in a larger turbo can be quite simple with looking at what fits with the OEM plumbing and wiring.

Changing out the BOW and wastegate can change how your turbocharger operates. Cooling can always be upgraded with a larger or better intercooler. Water spray, methane injection, or just better plumbing. Most Turboed cars have a lot of support for tunes, and just changing little things can open a lot more performance. Even from an otherwise stock engine.

Buying a Turbocharger

Ratings and sizes do differ brand to brand. So, size does not always determine power. Because brands have different features and build their products to different standards. Talk to a tuner because they will understand what will work with your goals and if the engine can handle them.

Although, you can do a lot of the research yourself and determine what is realistic. Having the knowledge of your car's strengths and weaknesses, and an idea of what power you wish to push for what reasons, start the search for the turbo itself, then the accompanying parts.

Sized go by either the flange size or compressor diameter. T4 and T6 are examples of flange sizes. The lower the number, generally the larger the flange is. They do mean specific measurements, but that is a whole learning curve in itself. You can figure out which one you need simply by googling the sizing of the turbo you are looking at.

Flange sizing also depends on whether it is divided by a cross section. Divided flanges allow you to use a fully designed exhaust that can help your turbo to spool faster by directing the hot exhaust air.

However, without a built exhaust it tends in most cases to simply limit the air going into the turbo. Sort of like the restrictors used in races to keep the power down on some cars for fair play.

Universal turbos can be used with many different cars, pipes, and plumbing designs. Engine-specific and even chassis-specific turbos do exist and will nearly perfectly fit in with an already Turboed car. These offer increased performance or tuning options above what the stock turbo can do.

Your air to fuel ratio, peak engine rpm, and other stats can help you figure out the turbo and parts you should buy using an online calculator tool like that on Garret's website. Some are found here, and here.

Cooling

Intercooler

Intercoolers are used to reduce the temperature of the compressed air to be pushed into the combustion chamber. Allowing for more air to be added in rather than if it was not cooled. Cooling is provided in two ways.

Air-to-air cooling uses heat exchangers to transfer heat away from the air on the inside of the intercooler to the ambient air outside. This is done as the air travels through the cooler and scrubs heat off to the conductive metal of the intercooler.

With air-to-liquid the heat of the air is transferred to a liquid that transfers it to the atmosphere. These work in a similar fashion to the radiator in most cars.

Importance of Cooling

Any forced induction vehicle can explode if you push it hard enough. The only way to prevent this (other than by being nice to your car) is by putting more parts or upgrading existing ones in order to combat the extra heat created that inevitably damages the turbo and engine.

If your turbo comes with a water-cooling port, you absolutely should use it. Otherwise, you will not get the performance it states, and your engine and turbo most likely will grenade somewhere.

If you really want to go the extra mile, you can look into water or methane injection kits. These spray cooling mist directly into the engine through the valves. Cooling down the temperatures when things get too hot to prevent premature detonation. Additionally, with a decent tune you can squeeze more horsepower out of your engine with such kits.

Alternatively, there are mist kits that spray water onto the intercooler and increase performance that way. This is not much a preventative measure as it is a performance boost.

Depending on how hot your boost device(s) and engine are getting, it could be prudent to upgrade the intercooler and supporting parts. As this is the central cooling system for boost applications, and inherently is the main way your turbo will chill out.

Supercharging

What is a Supercharger?

As opposed to a turbocharger, this type of forced induction system is driven by the belt of the engine instead of by exhaust gasses. The popularity of superchargers is decreasing lately due to the increased efficiency and smaller size of turbochargers.

On average, adding a supercharger can increase an engine's power by 46% more horsepower, and 31% more torque.

There is a drive gear powered by the engine that rotates the compressor gear. The compressor has a rotor that draws in air and condenses it down before it enters the intake manifold. Because as pressure and volume increase, so does heat, so an intercooler must be used in order to cool the air before it enters the intake manifold. Otherwise, the performance will go down with engine speed and usage.

In summary, the rotor is turned by the power of the engine via the drive gear, which pulls in air and condenses it. This hot condensed air is then pushed through an intercooler where it is cooled before entering the intake manifold and creating boost.

Advantages

Compared to otherwise equal naturally aspirated engines, superchargers will have more horsepower. Compared to turbocharged engines they have no resulting lag before the boost kicks in. This is due to the compressor being spun by the engine and not exhaust gasses. So, there is no time delay before it can spin quickly enough to pressurize the air.

Also, superchargers are generally easier to install on naturally aspirated engines because the exhaust system can remain stock. Simply bolting the device to the top or side of the engine and hooking up the intercooler is sufficient to get started.

Because of the reduced number of parts, they tend to be more reliable, as well as easier to fix and maintain than turbocharged engines.

Disadvantages

Parasitic loss is a con of all superchargers. They inherently are powered by the engine, which means they steal away some of the horsepower, up to 20% in fact. However, the trade-off is often beneficial because you can still add significant power.

Any boost system will strain the engine, it is smart to take some time to let the car get up to operating temperatures and to let it cool down after driving. Such is important with superchargers; they are designed to work best at operating temperatures and rpms.

Types of Superchargers

Positive Displacement

These are defined by having near-constant levels of boost pressure increases across all engine speeds. Their increases can be plotted linearly. The volume of air is fixed per rotation of the supercharger and is usually rated at capacity per revolution. With higher numbers being directly related to increased performance.

However, there is a maximum upper limit to how much capacity is useful for an engine's ability to inject fuel into the air. This is determined by the fuel system and engine displacement.

Roots-type

Named after their inventor Philander and Francis Marion Roots, they're the most common, using two meshing lobes to spin air through the device. Superchargers of this type must only be used within their parameters because otherwise the lobes will heat up enough to jam and prevent air from reaching the engine. So, the capacity is more than just a suggestion.

Capable of moving lots of air, however compression is lacking. Often there are multiple staged roots blowers used to combat this issue.

Rotary Screw-type

Also called "twin-screw type superchargers" these push air through two meshing worm gears. Low leakage levels, and lower parasitic losses vs Roots-types are some characteristics. Screw-types are driven directly from the engine's crankshaft via a belt or gear drive.

They can compress air within the housing as it moves through. Whereas Roots-types must rely on resistance to flow at the intake in order to increase pressure. Although requiring high-tech manufacturing to get the gears to fit within close tolerances results in them being more expensive to other forms.

Sliding Vane-type

A rotor with vanes mounted to it spins air through a cavity. Depending on the design the vanes may adjust to maintain contact with the walls as the pump rotates inside the cavity.

This system can easily be made to be a variable-displacement pump if the eccentric ring can pivot or translate relative to the rotor. One can even make a pump reverse its flow if the ring moves enough. Although it will only perform well in one direction of flow.

Scroll-type

Not a common pick, mostly due to the other setups being superior and easier to manufacture. A scroll compressor used as an orbiting-spiral supercharger. This is a compromise between screw and sliding vane designs. Balancing the efficiency, noise, and pressure fluctuations well.

A disc has identical spirals on each side, and two other spirals (or scrolls) are fixed to the walls of the compressor chamber. The scrolls intertwine to allow the disc to pivot in a circle, thereby compressing the air through the spirals towards the center.

It works somewhat like a rotary engine with the air being pulled in when the disc is furthest away from the entry of the fixed scrolls, then exhausted when it closes the entry point. The scrolls are shaped to decrease gap size as air moves to the centre, causing it to compress.

Dynamic Superchargers

These are characterized by pressure rising exponentially with engine speed, above a certain threshold. They accelerate the air to high speed and then slow it down in order to gain pressure.

Centrifugal Superchargers

Considered the simplest of all superchargers and use centrifugal force to increase the pressure of the air. And are usually attached to the front of the engine and are either belt or gear driven. You must take care where one is mounted due to heat transfer from the engine affecting performance.

These tend to be easy to integrate intercoolers into and are offered as full systems by many manufacturers. They visually look similar to turbochargers and have some similar parts. However, the compressor housing is called the volute when it comes to superchargers. A transmission is also included in order to change the ratio from the input shaft driven by the engine where it connects to the output shaft and powers the impeller.

Air is drawn into the volute and spinning force pushes air into the diffuser, where air is pressurized through travelling at slower speeds. A benefit is that they generate less heat than Roots, although they also make less torque at the low end. Compared to all positive-displacement options they are more energy efficient in terms of both power and heat.

Multi-Stage Axial Flow

Rotating airfoil-shaped blades compress the air and direct it towards the output. The blades are mounted in disc configurations with some spinning and other discs not. This allows for the air to be moved by the moving blades and slowed by the stationary blades. Slowing the air is important as it adds pressure.

Benefits are high flow and efficiency, but this system requires lots of blades and thus causes them to be complex and expensive.

Types of Drive Systems

All superchargers are driven by something that is powered by the engine. Directly powered setups will have less to service, however there is the issue of connecting the blower to the side of the motor. This can cause direct-drive systems to be more complex and possibly take up more space.

Belt setups are by far the most common. And tend to be rather simple when upgrading an OEM supercharger or adding one to a V6 or V8 engine. The blower (supercharger) will likely sit atop the engine, and you will loop the belt over the drives.

Chain drives are like belts, although they obviously use a chain. This is like timing chains versus belts, the chains wear out slower and often do not need to be replaced unless something fatal goes wrong.

Gear drives use a gearbox that connects the engine and supercharger drive. Because it is an enclosed device it needs little to no maintenance as there are no belts to wear or things to get stuck in it.

There is another way to drive a supercharger though. Electrically.

Electrically Driven Superchargers

There are a lot of fake products claiming to be this, but it should be mostly obvious that a little spinning thing in your intake is not going to help. If it did it would probably cost a lot more and modern superchargers would likely be a lot smaller than they are.

The real deal works like electric turbos do, with instead of the blower being spun directly by the engine, it is powered off electricity from the engine. This allows for the supercharger to have less parasitic loss. Although, due to constraints do not tend to produce as much power. There is also the issue of powering it. Your stock car battery likely will just crap out if you use it to power all the electronics already stuck in it, and a motor trying to add 50-100 hp.

Installation/Purchase

The two main parts that you need to make sure will fit are the drive method and the line to the intake. Of course, the air capacity of the supercharger is important. The size of your engine can help you determine how large of a supercharger you need and are able to use. Put in some searches and see what others have found works.

You'll also need to upgrade your headers, intercooler, and tuning in order to make everything work. Most kits include all this so long as it is designed to work on your car. Roush offers mile-based warranty on their models so long as you get it installed by a licensed mechanic or dealership (reliability is better than with turbos).

Contrasting with turbos they are often far simpler to install. Because you do not have to worry about exhaust air management. Kits designed to work on your vehicle will likely slot right in without too much thought or effort. Although that only applies if you purchased yours from a reputable brand.

Consider the options, there are likely to be a couple different designs available. Refer to the differences between the types of superchargers to determine which one fits best with how you drive and what your goals are. Universal kits are not really possible for most applications. The way you must get it to hook up with your intake manifold is slightly more complicated than that would allow for. On most cars there simply isn't enough space or engine strength to allow for you to drop one in so manufacturers don't make them. If you are going to go ahead and custom build all the things you need to make it work, you know more than me on this topic, and power to you!

Twincharging

What is a Twincharger?

Twincharging is a compound boost system using both an exhaust-driven turbo and a mechanically driven supercharger. Resulting in a high-torque low end and a high-power top end. The low rpms power is provided by a supercharger, and at higher the turbocharger kicks in and adds power.

It tends to be used on smaller engines, particularly those with large operating rpm ranges. In spark-ignition engines, low compression ratios must be used if the supercharger makes high boost.

Smaller turbos are more effective throughout the engine speed range and are not as useful for the purpose of twincharging. The turbo is only needed at high engine speeds. Large turbos are very ineffective at low rpms, and to combat this lag in power delivery the supercharger is added.

This is different than twin-turbo applications where two turbos are used, although this is often put in to combat the lag in the larger turbocharger just as twincharging is. Complexity and price of components are cons.

Types

Series

The series setup is more common with one compressor feeding into the inlet of the other. A supercharger provides almost instant pressure, but once the turbocharger is up to speed th4e supercharger either continues operating or is mechanically bypassed via an electromagnetic clutch and bypass valve. This incrases the efficiency of the system.

Non-bypass systems continue to multiply the power of the turbo. Often the supercharger used is less powerful itself. However, is more durable to hold up under the beatings of racing.

Parallel

Parallel types typically require a bypass or diverter valve to allow one or both compressors to feed the engine. The supercharger blows backwards through the turbo if no bypass is used, instead of pressurizing the intake manifold as this is the path of least resistance. A diverter valve must be used to vent turbo air until it reaches pressure in the intake manifold. Expensive and complex electronic controls are needed to accomplish this.

Manufactured Twincharging

Some of the manufacturers that currently use twincharging are Volvo with their T6, T8 and Polestar models. These use a 1969cc inline-four engine, as well the T8 adds a rear electric motor. Jaguar Land Rover with their twin charged 3.0L inline-six engine. And the Zenvo St1 on a 6.8 litre V8 engine.

Installation

To start, you will want an engine that already has a turbocharger, as otherwise it is unlikely that the block will not explode under all the extra pressure. Maybe you could run low boost and very low compression ratios, but then what is even the point of all of this work?

Cooling immediately becomes an integral issue. With a turbo alone your oil temperature guage can fly past middle. So you have two options and an optional addition. Either run a very large single intercooler, or run two intercoolers and have one for each boost stage.

With one you may run into issues with organizing all the plumbing to and from the radiator. Although intercoolers are inherently large parts, and having two could be taxing on engine bay space.

There are of course trade offs with both systems depending on how well you can connect everything, the quality of the parts, and just chance.

The optional addition is liquid spray cooling. Using either water or nitrous you can help cool down the boost systems by spraying liquid onto the intercooler(s) and thereby cool the air inside. Both setups benefit from this, and often is put on cars with only one boost system, famously on earlier WRX models.

Getting the belts on and plumbing the cooling and air is considered the easy part. Tuning the engine is obviously required with this modification and can be laborious. Boost and fuel to air ratios are way off stock, and the boost is likely non-linear. Lower compression ratios are necessary to avoid grenading the engine now that it has a second boost system.

So, an aftermarket ECU tune is needed, although for most intents and purposes you will not have to deal with retuning from stock as just about everything is different. But if you have a weird engine, it could be easier to adjust from factory rather than creating it all new. I have not tuned an engine so the process might differ slightly or greatly from anything that I say.

Last things to keep in mind are that the throttle body has to be between the turbocharger and supercharger in order to prevent backpressure from detonating the supercharger. This can happen at high rpms with a closed throttle.

Also, all rules with turbocharging a naturally aspirated engine apply to twincharging a turboed engine. More on those above.

If you are going to boost an engine this way power to you! This is incredibly complex even for engine building, so best of luck my friend!

Let me know what you think, I love any feedback.

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