ENGINE BREAK IN PRODECURE

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Thank You!

We are thrilled to welcome you to the M45 Automotive family! Your trust in us for your automotive needs means the world to us. We are honored that you have selected us for your engine build. Our commitment to quality and customer satisfaction is unwavering, and we are excited to be a part of your automotive journey.

Should you have any questions or need further assistance, our dedicated team is here to support you every step of the way. Thank you for choosing M45 Automotive, and we look forward to exceeding your expectations!

M45

SUBI STARS
Accelerate Dreams

SNAIL
PERFORMANCE

Before You Start

- Engine break-in must be performed on pump gas, not ethanol, to properly seat the piston rings. Ethanol can reduce the effectiveness of the break-in oil's protective properties during this critical period.

- DO NOT use synthetic oil during the break-in period! Permissible Break-In Oils: Motul Break-In Oil (preferred), Penngrade Break-In, Amsoil Break-in, Lucas Break-in, Driven Break-in, HPT Break-in.

Engine Failure Prevention:

Failure Points	Preventing Failure:
Bearing Failure	If there is evidence of bearing failure or signs of metal contamination in the oil, it is imperative to replace the oiling components. This includes the oil pump, oil cooler, oil pan, oil pickup (strainer), oiling lines and fittings (such as banjo bolts), AVCS cam gears, and other model-specific parts.
External Debris Contamination	In the event of a catastrophic failure, such as a dropped valve, broken piston, or damaged turbo, it is common for debris to spread beyond the engine to components like the intake manifold, header, TGVs, and turbo. It is essential to inspect and thoroughly clean these parts to prevent reintroducing debris into the new engine.
Cylinder Heads	Following a major engine failure, such as a dropped valve, shattered piston, or compromised turbo, debris often extends to external components including the intake manifold, header, TGVs, and turbo. To prevent contamination of the new engine, it's crucial to meticulously inspect and cleanse these parts.
Accessory Parts Installation	During the engine build, it's important to inspect the condition of various components such as lines, fittings, gaskets, the timing belt, tensioner, timing rollers, and guides. Any parts that are found to be worn or damaged should be replaced as needed.
Air/Oil Separator Not Installed	It is essential to use a high-quality Air/Oil Separator or catch can with a forged piston engine in your Subaru. There are many options available in various designs and colors to meet your specific requirements.
Improper tune, or no tune	It is crucial to understand that M45 Automotive engines necessitate professional-grade tuning. A base map is recommended for use during the engine break-in period, followed by in-person dyno tuning upon completion of the break-in.
Overheating	The cooling system of your vehicle must be appropriately sized for the intended usage and power output. Prior to installation, all cooling components should be thoroughly inspected for any signs of wear and to ensure proper functionality.

Engine Break-In Procedure:

Priming/Initial Start Up:

- Pre-fill the oil filter before installation.
- Fill the engine with 10w40 Break-In Oil to the appropriate level.
- Monitor oil pressure via a manual oil pressure gauge during engine priming.
- Crank the vehicle with the crank sensor disconnected in 10-second intervals until oil pressure registers on a gauge.
- Once oil pressure is registered, connect the crank sensor, start the engine, let it run for 5 seconds, and then shut it off.
- Check for leaks. If there are no issues, proceed to run the engine for 30 seconds, monitoring oil pressure. Shut off and check for leaks again.
- On the final start-up, let the car idle, check for any oil or coolant leaks, and ensure oil pressure is above 30psi at idle.

Piston Ring Seating & Camshaft Break-In:

- Slowly bring the vehicle up to 2000 RPMs and hold the throttle for 5 minutes.
- After the first 5 minutes, start varying RPMs in increments up to 4500 RPMs and back down to 2000 RPMs, holding a steady throttle while moving between the RPM range every 30 seconds for a minimum of 10 minutes.
- While running the engine to operating temperature (monitored via coolant temps), carefully watch oil pressure and keep an eye out for leaks. Run the engine until coolant fans cycle at least twice and the thermostat opens.

Post Initial Start-Up/Heat Cycle Check:

- After running the engine through several heat cycles, recheck all fasteners and fluid levels. It’s not uncommon for external fasteners to need retorquing after the engine has been brought to temperature several times.
- Change the oil and oil filter after this initial heat cycle.

Engine Break-In:

- Drive the vehicle very gently for the first 50 miles, keeping RPMs below 3000 and boost as close to zero as possible (1-2 PSI max). Vary RPM and load conditions while driving and use engine braking whenever possible.
- Continue driving and shifting at a maximum of 3000-4000 RPMs. It is important to vary RPM and load conditions, and to avoid using cruise control or maintaining steady RPM and load conditions. If the vehicle is modified and has a break-in ECU map, use it until the car is tuned.
- Change the oil and oil filter again after reaching 500 miles, use non synthetic 5W30 or 10W40.
- Check your oil and coolant levels every time you fill your gas (every few hundred miles). Be conscious of the amount of oil consumption and top off when needed.
- Finally, change the oil at 1000 miles, and now you are able to switch over to synthetic oil. See the document for recommendations for your engine and interval change.

Dyno Tuning

- Our engines can be professionally tuned once they have reached approximately 750-1000 miles of break-in driving. Monitor ECU readings by logging the vehicle and continuing your relationship with your tuner to ensure that the car is running properly and safely.
- Change your oil once more after the dyno session or tuning, and from there on, stick to your recommended oil change interval.

Oil Specifications

EJ Engines:

- For 91 or 93 Octane: Use Motul 5w40 8100 X-cess Gen1 or Gen2 Synthetic. Change oil every 2500-3000 miles.
- For E85 or Race Gas: Use Motul 10w40 6100 Synergie+ or Motul 300V. Change oil every 1200-1500 miles.

FA20DIT Engines:

- For 91 or 93 Octane: Use Motul 5w30 8100 X-clean EFE. Change oil every 2500-3000 miles. *In climates where the average ambient temperature exceeds 80° Fahrenheit, Motul 5w-40 8100 X-clean Gen2 is a suitable choice. Please ensure that the oil selected carries the GM dexos2 rating.*
- For E85 or Race Gas: Use Motul 5w30 8100x - CLEAN+ or Motul 5w40 8100 X Clean Gen2. Change oil every 1200-1500 miles.

FA20 BRZ / FR-S / GT86 Engines:

- For 91 or 93 Octane: Use Motul 0w20 8100 Eco-lite. Change oil every 2500-3000 miles.
- For E85 or Race Gas: Use Motul 5w30 8100x CLEAN+ or Motul 5w40 8100 X Clean Gen2. Change oil every 1200-1500 miles.

Race Car Specific Instructions

- These instructions are for cars that are not driven on public roads.
- Follow all steps from pages 2 and 3 for priming, initial start-up, camshaft break-in, and ring seating.
- Load the car on the dyno, simulate normal driving conditions, accelerate at light throttle to 6000 rpm with an immediate transition to full engine braking, and repeat this process 10 times or more.
- Change oil to a good Non-Synthetic race oil with high amounts of ZDDP (zinc and phosphorus) after tuning.
- EJs running E85/Race Gas should use Motul 10w40 8100 X-CESS or Motul 300V.
- FAs running E85/Race Gas should use Motul 5w40 8100 X-CESS.