I am not writing this to rain on anyone's parade but more to help the new comers to the E31 community and also hope to bust some of the myths that have been floating around.

Chips:

Performance chips generally do help a bit to increase the HP and torque of the V-12 but nowhere near many published claims. Dyno test can be and are misleading. The V-12 does not go "open loop" until 4200 RPM at full throttle so no fuel enhancement may be made as the loop is closed around sensors that feedback stoichiometric conditions, that is, "perfect" air/fuel mixture. Best power mixture cannot be obtained until 4200 RPM and higher, BUT, the torque peak on most stock V-12 is right around this RPM range and declines quickly after that. Cutoff is at 6000 RPM (6400 for CSI in some gears) but after 5000 both torque and HP numbers are declining.

DMEs are adaptive to some small degree i.e. minor changes are made to compensate for driving habits and conditions. If a vehicle is put on a dyno after thousands of miles of driving, torque and the derived HP numbers will be the result of the DMEs modified during usage. Then when new chips are installed, power has been removed from the DMEs and all the data points are erased giving the new chips a "virgin DME" baseline plus whatever mapping changes that were made by the chips author. Torque surely will be higher but probably by a higher amount then if the DMEs with the original chips were powered down for a period of time to baseline the DMEs before the dyno testing commenced. To get a better estimate of power gain, the original chips should be returned and dyno tested again. Many vehicles will show higher numbers on consecutive tests because many of the lubricating fluids thin during testing and in many cases the real operating temperature of the driveline hasn't been reached during the first or second dyno run.

Intake manifolds:

Subject of much debate whether polishing the interior of the intakes will gain HP and how much. Yes it will help but again nowhere near numbers that have been stated. Many have reported "seat of the pants" dyno results that suggest 20 HP or so, however, it is usually the case where a dirty, crudded up manifold is replaced with a clean, shiny one. The baseline is not a clean fresh engine but one that has many 10Ks miles and the HP is naturally down from where it should be. If the "dirty, crudded up" manifold were replaced with a clean one, HP gains would be nearly what is reached by the polished manifold. All that is needed is to have the manifolds cleaned and then a bit of work with a brake hone, round sanding flapper or ball hone (1 ½ inch diameter) with a drill extension to get nearly the same results as sending them out for internal polishing. Difference in Hp will be less then 3-4 HP.

A dyno test a few years ago suggested 18 or so HP gain using polished intakes, three things wrong with that test:

1. Comparisons were made between two different vehicles, No correlation could be made using this test method!

2. No baseline test was done on the subject vehicle to show what the HP was originally before the modified manifolds were installed.

3. No subsequent dyno test with original intakes re-installed to verify baseline.

Unless the engine is tuned to "full race" conditions with high compression, extreme valve lift and overlap, any real benefit v.s. cost would be hard to justify!

Cam shaft timing:

This may be the single biggest overlooked area of the V-12 as it ages! The timing chain stretches and as it does, the cam timing relationship to the crank is retarded, worse yet is that the (left) drivers side cam retards by a smaller amount then the (right) passenger side cam resulting in uneven power between the left and right banks. M70 cams are timed at a rather mild 248 degrees so any retardation will further lower the Torque and HP!

How Much stretch v.s. degrees?

I have measured 3 degrees and 6 degrees respectfully left, right to the crank. This is around 1.5 (left cam) and 3 (right cam) crank shaft degrees which doesn't sound like much but will effect HP and of course smoothness! The latest measurements that were taken were on engines that were in mid life, around 120K-150K miles. I have also seen extreme chain wear on engines that had less then 50K miles! I don't want to create mass hysteria here but, IMNSHO cam timing should be checked anytime the valve covers are removed for any reason particularly on engines that have over 100K miles, visual evidence of chain wear, or suspect maintenance.

There is only one method to measure and correct the cam timing! Use the correct tools as recommended by BMW, any other method will result in poor results. The cam timing ***CANNOT*** be set by eye, one ***MUST*** use the correct tools which consists of a crankshaft lock pin and two cam shaft tools. Proper procedure must be followed to insure engine is firmly locked at TDC (top dead center cyl #1) and all slack is taken out of the chain ***ON THE TENSIONER SIDE ONLY*** before final tightening of the cam gear retaining bolts.

Does this suggest the timing chain should be replaced? Not necessarily! There are no reported incidences of timing chain failure on the V-12, it is a BIG job to replace the timing chain and cannot be done without removal of all front covers of the engine. The original and replacement chains do not have a removable links.

Head work:

There have been many attempts to improve the breathing of the V-12 engine by substantial head work. Mostly this work is and will result in cosmetic improvements but with no real substantial HP improvement. Here again the real issue is what are the "newly ported and polished heads" in comparison with? If ported and polished heads replace a tired set with many miles, leaky valves, crudded up intake valves (and stretched timing chain) sure HP gains will be realized and power improvement will be felt, but the real question is what is real the contribution to the HP gains made by modified heads over a clean refreshed set of stock heads?

The BMW V-12 head is one of the poorest designs around the exhaust port, with a very flat floor, shrouded exhaust valves (the earlier heads with smaller exhaust valves may flow better, less shrouding) and very small squish area. Replacement of pistons is out of the question because of the Alusil design so ***ANY*** material taken out of the combustion area will result in a loss of compression ratio, which at 8.8:1 is already very low!! (CSI is 9.8:1, better but not great!)

Many have reported no gain or actual loss of HP when using headers, this is so contrary to conventional wisdom but in consideration of how bad the exhaust port design of the head is, any change after this region doesn't seem to matter which confirms the original observation that the head design is in question.

M73 engine heads are different and cannot be interchanged without substantial modifications.

Cam shafts Choices:

Only three choices are available for the V-12:

1. CSI cams, a modest increase of 0.4mm from stock (11.0mm v.s. 10.6mm) with an increase in duration. 10-15 HP gain over stock M70 cam.
2. Schrick, same lift as CSI but further increase in duration. 15 to 20 HP gain over stock M70 cam, 25 HP when used on a S70 engine
3. Powerplant Racing, greater lift longer duration then Schrick uses roller followers from the M73 engine. Requires pistons to be relived (can be done in block) no HP information available.

Replacing cams on a M70 engine is not going to result in HP increases that one would expect, the compression is so low that effects of longer duration and overlap can not be fully realized, on a CSI engine with nearly 10:1 compression, a Schrick cam for example would probably produce 5 HP more from base HP.

Sorry to say, there are no cam options for the M73 engine or heads, roller followers can not be used from the M73 engine on the M70/S70 engine unless the cams from Powerplant racing are used. The M73 cams have same lift but a slightly longer duration then the M70 engine.

Boring the block:

In general any Alusil block can not be bored! The Alusil process leaves only 0.005" of hardened material at the bore surfaces and once that is compromised, the block is junk! Pistons can be replaced so long as the bore is not "out of round" or deeply scratched. The biggest single problem with the Alusil block of the V-12 is if it is ever overheated badly, the bores will go "out of round" and can not be honed or bored to correct. The only successful 6.0L versions have been created by boring and sleeving (using a ferrous sleeve) or using an original new CSI block with a stroker crank. Pistons have to be ferrous coated.

When replacing pistons and rings, it MUST be determined that the bores are straight and not out of round first, then a very light buff with "Scotchbrite" once up and down, the bores will be sufficient to seat the new rings.

An attempt to re-plate the bores with a Nikasil process is underway but no engine has been built or tested yet. Nikasil has gotten a bad name because of the troubles with the M60 V-8 but many manufacturers have used this process for years with no trouble and could be a viable process to reclaim the V-12 after it has expired due to age or distortion.

4 Valve heads:

No one has yet to complete a set of 4 valve heads for the M70 and test an engine. There are several attempts underway but as of this writing, non have hit the dyno yet. The cost will be prohibitive for the average E31 owner, probably in excess of $75K for a set of unfinished heads.

NO, the F1 V-12 will not fit! The only thing in common from the F1 engine and the M70 engine is the bore spacing! This is directly from the BMW engine designer and published in the BMW Mobile Traditions Engien book.

There is more but this covers the basics.

Ed
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