# Dyno rules in other classes

Posted by Sterling Doc - 21 Oct 2013 04:47

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I thought it would be helpful to look at rules on dyno compliance in other classes in comparison to ours. While discussing dyno rules is somewhat like politics and religion on Facebook, if we can pick out some things that other classes have found to work, that can be constructive. It's also illuminating of how simple some of the other rules are (for better and worse).

Our current rule:

*11.3 Dyno Testing Procedure*

*11.3.1 No adjustments affecting the car's power output may be made during the race, or at any time between the race and dyno testing is completed.*

*11.3.2 Cars will be operated by a dyno operator or NASA official. NASA is not responsible for any failures during this operation.*

*11.3.3 Only Dynojet brand Dynos shall be used.*

*11.3.4 All dyno readings must be corrected to SAE J1349 Rev JUN90 (29.23 in/hg, 77F, zero Humidity) and the dyno's smoothing function must be set to 5.*

*11.3.5 Drive wheels shall have tire pressures set to 30PSI prior to dyno testing.*

*11.3.6 Electric engine fans may be used, as well as external fans.*

*11.3.7 Hoods shall be open during the dyno runs.*

*11.3.8 Engines should be warmed up, and show a minimum oil temperature of 160 degrees F before compliance runs are initiated. This may be verified by external means. "Practice pulls" are highly recommended to ensure proper drivetrain temperatures and stable power outputs.*

*11.3.9 The average power output of 3 consecutive dyno runs will be used to determine a car's maximum power output. Starting RPM shall be no higher than 3000. Ending RPM shall be at least 6,400 RPM, or when the cars' RPM limiter is engaged. The rev limiter must be engaged during at least one run, unless RPM exceeds 6750 RPM without engaging the RPM limiter.*

*11.3.10 Any motor reaching 6750 RPM or more without engaging the RPM limit will be disqualified, regardless of engine power output.*

*11.3.11 Any test that does not comply with this rule shall have the following written in the logbook: "May not compete until proof of compliance with all aspects of the power cap rule is presented to the series director"*

ST:

*For compliance testing, the dynamometer operator and the Super Touring Director or NASA Official will determine the dynamometer testing procedures and how many test runs will be performed for any given car being tested in order to obtain accurate test data. Prior to the dynamometer inspection the competitor may top off any fluids needed to ensure the engine and drivetrain are not damaged during testing. The fluids must be added with a NASA Official present. No other modifications or adjustments may be made to the car. To ensure fairness, a NASA Official, or an individual appointed by a NASA Official, will operate any cars being inspected on the dynamometer. SAE correction with a smoothing factor of five (5) will be used. Any run that results in an erratic or non-reproducible result may be dismissed by Super Touring officials.*

GTS:

*Competitors must use a Dynojet brand dyno, and all compliance runs at events will be made on a Dynojet Model 248, 224, or 424 in SAE mode with a smoothing factor of 4 so it is highly recommended to use one of those dynos with those settings for certification to avoid any errors in classification.*

*To allow a small safety margin for dyno variance, a forgiveness of 4WHP will be given to cars*

*with WHP greater than WTQ and a -4 factor will be applied to the formula for cars using the averaging method for WTQ greater than WHP. However, if a car does not meet the minimum weight listed on the certification sheet, the forgiveness cannot be used to arrive at a compliant number.*

*Protest procedures will be handled per the NASA CCR with the exception that a protest requiring a dyno run must be accompanied by a bond from the protestor in the amount of the cost of a dyno run. The losing party of the protest will be required to pay for the run, so if the protest is upheld the protestor shall have their funds returned and the protestee will be required to pay for the run.*

PT:

*For compliance testing, the dynamometer operator and the PT Director or NASA Official will determine the dynamometer testing procedures and how many test runs will be performed for 29 any given car being tested in order to obtain accurate test data. Prior to the dynamometer inspection the competitor may top off any fluids needed to ensure the engine and drivetrain are not damaged during testing. The fluids must be added with a NASA Official present. No other modifications or adjustments may be made to the car. To ensure fairness, a NASA Official, or an individual appointed by a NASA Official, will operate any cars being inspected on the dynamometer. SAE correction with a smoothing factor of five (5) will be used. Any run that results in an erratic or non-reproducible result may be dismissed by NASA officials.*

CMC:

1. Only dyno runs on DynoJet brand dynamometers are acceptable.

2. One dyno report may be performed and used for the entire season provided that:

a. It is performed after the last event of the prior season and before the first race entered for the season.

b. No performance modifications are made to the car.

3. All dyno readings must be corrected to SAE J1349 Rev JUN90 (29.23 in/hg, 77F, zero humidity) and the dyno's smoothing

function must be set to 5

4. Car must be in "ready to race" configuration with regards to engine and drivetrain.

a. American Iron Class: All engine or drivetrain components that are adjustable and affect power (carb jets, timing,

restrictors, etc.) must be explicitly allowed by the vehicle's class rules, must be written down in section 1 - 6 of the

inspection sheet, and must match at all times.

b. Camaro Mustang Challenge Class: All engine or drivetrain components that are not stock and affect power or are

adjustable (restrictors, air intakes, timing, etc.) must be explicitly allowed by the vehicle's class rules, must be

written down in section 1 - 6 of the inspection sheet, and must match at all times.

5. Rear tires must be set to 30psi.

6. Hood shall be open during dyno test runs.

7. Electric engine fans and or external cooling fans may be used.

8. Dyno pulls will be made in 4th

gear or at a 1:1 ratio.

9. Altitude of the dyno shop must be recorded. Dyno runs made at locations with elevation greater than 1,500 feet higher than the

track will not count as being valid at that track. Class Officials may decide to waive this requirement for certain

circumstances. Check with your local class director ahead of time.

10. Three consecutive runs shall be made under full power. The RPM range shall be consistent for all three runs. Starting RPM

shall be no higher than 2000. Ending RPM shall be clearly beyond max horsepower.

11. Dyno runs shall be made with water temperature in the normal operating range of 165F-210F and drivetrain fluids up to a

normal running temperature. (A “practice pull” is highly recommended prior to 3 consecutive runs to ensure proper drivetrain

temperatures.) Water temperature may be verified using external temperature measurements such as an infrared temp gun at a

thermostat housing or a metal tube section of the line returning water to the radiator.

12. The peak horsepower and torque of each run will be noted on the inspection sheet.

13. The average of the three consecutive runs will be calculated and noted on the inspection sheet. This average horsepower and

torque number is what must be used to determine the vehicle’s required minimum weight, using the car’s specific class weight

rules.

14. One dyno certification may be valid for an entire race season as long as no performance modifications are made to the car.

15. All HP & TQ results will be rounded to whole numbers. In the case where the measurement falls exactly on the halfway point

(.50), it shall be rounded down in favor of the competitor i.e.- 260.50 = 260 and 260.51 = 261

AI:

*All official American Iron dynamometer tests will be open. All American Iron Series competitors have the*

*option to be present for official chassis dynamometer testing.*

*Prior to the chassis dynamometer inspection the competitor may top off any fluids needed to ensure the*

*engine and drivetrain are not damaged during testing. The fluids must be added with a NASA Technical*

*Inspector present and no other modifications or adjustments may be made to the car.*

*To ensure fairness, an American Iron Series appointed official or an approved technician will operate*

*any cars being inspected on the chassis dynamometer. 3 consecutive "official" dyno pulls must be performed and*

*the average horsepower and torque value from the 3 measured runsshall be used for power to weight and*

*torque to weight compliance. Should any run result in an erratic or non-repetitive result, series officials may*

*dismiss the result or request another dyno pull. The dyno shall use the SAE correction factor for the*

*compliance pulls with a smoothing factor of “5”.*

*Any car exceeding the maximum power to weight ratio for their declared class shall be penalized in*

*accordance with the NASA CCR and these rules.*

SE30:

Engine Dynamometer Testing Procedure

To ensure fairness, a SpecE30 Series official, an appointed official, or an approved technician will operate any

cars being inspected on the chassis dynamometer. Three consecutive "official" dyno pulls must be performed

and the highest run of the 3 three will be used for compliance. NASA, its officers, officials, and assigns are not

responsible for any mechanical failures or damage otherwise while the dyno runs are being performed.

1. The DynoJet brand is the required type of dyno for testing and inspection. All dyno readings must be

corrected to SAE J1349 Rev JUN901

and the dyno’s smoothing function set to 5. Location of the dyno

shop should be recorded.

2. Prior to the chassis dynamometer inspection the competitor may top off any fluids needed to ensure the

engine and drive train are not damaged during testing. The fluids must be added with a NASA

Technical Inspector present and no other modifications or adjustments may be made to the car.

3. All dyno pulls will be made with the hood opened.

4. Prior to the first official run, an official or technician will confirm that the accelerator pedal opens the

throttle completely and that the wide open throttle switch is properly connected.

5. Dyno pulls will be made in 4th gear or at a 1:1 ratio.

6. During an official dyno test, the car must be fitted with the tires used on the car in the previous session

with the rear tire pressures set at 36 psi.

7. Electric engine fans and or external cooling fans may be used.

8. Dyno runs shall be made with water temperature in the normal operating range of 165F-210F and drive

train fluids up to a normal running temperature. Water temperature may be verified using external

temperature measurements such as an infrared temp gun at the thermostat housing.

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## Re: Dyno rules in other classes

Posted by Sterling Doc - 24 Oct 2013 04:34

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Ken,

I think it is great to codify that the compliance dyno testing is open to all, as well as to clarify adding fluids (in practice this has been allowed all along).

Jim,

I hear you. All classes deal with this, and we can only minimize this through averaging runs, checking tire pressures, etc. We have incorporated all the ideas from other classes.

As far as the example you bring up, the 3 run average difference was about 2 (HP +TQ)/2. It was close on both sides. On any given day it might fall just over, or just under the limit, even with fairly little variation. Everyone makes their choices on how close they want to run. The results were not an anomaly. Weather conditions were quite different from the test to retest (delayed overnight due to rain).

Despite this, results were fairly close, though in this case, just on one side, vs. the other of the hard cap (both were over the soft 138 cap). I think this is an object lesson in the gamble of pushing the cap. Sometimes it may work, out others not.

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## Re: Dyno rules in other classes

Posted by rd7839 - 24 Oct 2013 08:12

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I have a few thoughts but I should say that I'm not the most informed about dynos and the intricacies involved so take what I say with a grain of salt.

My first thought, and I've felt this from the beginning of the dyno rule is that there should not be a hard and soft cap. We set the limit at 138 but really it's 140 so people are shooting for that. However we adjudicate the dyno findings lets pick a number and stick to it. If it is found over then that's it, and I prefer 138 by the way. It seems that if we are splitting hairs and discussing rules minutia when you are pulling in the 140's the spirit of the dyno rules were ignored(I'm not thinking of any car in particular so this is not a knock against anyone who may have pulled higher numbers).

I haven't thought out all the details of this idea but what if we had an average from a few different cars factored in. Say we get a dyno sheet early in the season and then when you are tested again and go over some math wiz who didn't go to public school like I did could figure the percentage you are over. Then take say 3 or 4 other cars, have them do pulls and see what percentage difference from their original run they are at. If you are the outlier you are in violation but if everybody is pulling about the same percentage better than we will call it a dyno anomaly. Of course engines wear at different rates and are maintained differently but if a big enough sample is taken then we should be able to get an idea of where the median is.

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## Re: Dyno rules in other classes

Posted by rd7839 - 24 Oct 2013 08:33

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One other quick thought, again not well thought out but it occurred to me that we don't have this trouble with scales. They differ from set to set, are somewhat weather affected, and if aren't taken care of properly will be out of spec. I'm not aware of how often they are recalibrated but I am certain no two sets read alike.

There doesn't seem to be much controversy with them and the question is why? I believe the answer is we all build in a little cushion so we don't have to sweat it. Why don't you do this with your motor? I'm not worried ever about pulling over the limit and I think most everyone else is in the same boat so if you built your motor to pull right on the limit, you should take the chance of pulling over and being disqualified and not worry about small variations.

It's been said repeatedly that 5 horsepower doesn't make a difference so build a quality motor that is 5 horsepower under the limit and we won't need to hash out these details.

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## Re: Dyno rules in other classes
Posted by Sterling Doc - 24 Oct 2013 09:30

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Thanks, Ron.

We had a competitor at Nationals last year who nearly bumped themselves off the podium with a weight of 2601 (!). He runs a little extra ballast now, and has no worries about weight. For regional competition, the weight rule is more onerous than the dyno rule. If a competitor goes under in weight, it becomes a non-droppable DQ, and must be taken as 0 points. Other classes handle dynos the same way. We made a specific rule to lower the standard CCR penalty to a "move to last" for the first offense in our class. BTW, I do hear some complain about scales, but the rules remain.

While I'd agree that the spirit of things is to have all cars equal on any given day. Try to make a rule around variations from mean would require a statitician to regulate at the event. What we have been pursuing over the last year is ways to get as close to equal as is practical (and as close as to make no difference). This requires the top motors to detune a bit, and the guys on the lower end to do some dyno tuning. Norm saw some good results from tuning his AFM at the track, as did Neal. I think most motors can get into the mid 130's (from either direction), and that's what we should shoot for. We dyno'd a lot of cars at Nationals - most were in that range, at least after some effort at tuning the AFM.

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## Re: Dyno rules in other classes
Posted by RacerX - 24 Oct 2013 13:08

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**rd7839 wrote:**

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It's been said repeatedly that 5 horsepower doesn't make a difference so build a quality motor that is 5 horsepower under the limit and we won't need to hash out these details.

I believe you  have a very valid point.  Why is it that we give on the dyno but not on scales.  They are the very same principal.  If your over your over.  On one hand you get a slap on the wrist and with the other your DQ'd.  Not very fair!!!  I think that should be changed to fall in line with the scale rule of being DQ'd if one goes over.

Live by the rule, die by the rule.

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