STAHL HEADERS
www.stahlheaders.com
1515 MT. ROSE AVE. - York, PA 17403
Phone: (717) 846-1632 Fax: (717) 854-9486 E-mail: sales@stahlheaders.com

Dyno Information

by Jere F. Stahl

This information is for your use and the content has been changed several times. For some years we included sample computer printouts from a computer program we developed in 1980 to key in dyno data. However, due to the common availability of data acquisition systems we no longer include the samples although they are still available by request. We also developed a computer flowbench program in 1981 which we no longer offer and we now recommend "FlowPro" from Audie Technology.

The horsepower correction chart was originally from Champion Spark Plug (based upon 1951 SAE Spark test which corrects to 29.92 and 60 deg F), but their original had a formula error and in the process of correcting it, the Champion Logo/name came off. Some years ago I compared data corrected with Stuska's chart and the Go Power chart and believe me the Champion based charts are the lesser of the evils. The Superflow "Standard" correction factors result in inflated numbers averaging 2% higher than this method due to their frictional horsepower corrections.

The most cost-effective method of achieving valid wet/dry bulb readings is to use a Taylor "Masons Hygrometer" from a hardware store. Set it up just inside the dyno cell window. Rig up a hose or duct from the carb air blower duct so that the same air that the engine breathes is passed right across the wet/dry bulb. If properly done the carb air temp will be the same as the dry bulb air temp. Remember to use only distilled water, or else the cotton sock around the wet bulb will harden quickly from mineral deposits in the water.

A good barometer is a must. None of the dial types except the little 3" Taylor Engineers barometer ($400 in 1976) are acceptable. (This unit is perfect to carry to race tracks for the engine man that really wants to be in touch w/weather.) I have never seen any other dial type that is useable. The recommended barometer for the dyno facility is a absolute mercury laboratory type: Model: Princo No 469 Nova Mercurial barometer with Fortin type cistern from Precision Thermometer & Instrument Co (See dyno parts list.)

Procedure: Read the barometer, correct it for temperature and Latitude as per instruction manual w/barometer. Refer to the vapor pressure charts using the Wet & Dry bulb readings to determine the Vapor pressure number. Then subtract Vapor pressure from the temperature and latitude corrected barometer reading for a final corrected barometer value. Using the "HORSEPOWER CORRECTION FACTOR CHART", locate your final corrected barometer reading on the very top of the chart. Locate your carb air temp, which should be the same as your dry bulb reading, and find the point of intersection. ie 29.10 and 70 deg = 1.038. Multiply your torque and indicated HP values by the correction factor to determine the corrected values. All the published SAE HP correction formula's I have seen use dry throttle pressure, which is Barometer less Vapor Pressure, which is calculated from Wet-Dry bulb readings.

All dynamometers should have a permanent calibration arm attached to the brake. I suggest using a 3' long arm measured from the center of the brake shaft to the center of where the weight hangs ie. like a heim end. Procedure requires warming everything up, make 2 or 3 pulls at a convenient RPM and then walk in and hang the weight on the calibration arm. Use a weight that will give you a torque reading in the middle of the torque range for the engine you are testing is best practice. With a Superflow dyno use 100 RPM p/second acceleration testing and repeat each test twice for a total of 3 tests w/each engine combination. Make absolutely sure your oil temperature is within 5 deg at the starting RPM for each test. Oil pan tests for windage HP loss should also be run to 8500 (Higher for drag engines). Dyno outlet water temps should be monitored and not permitted to exceed 140 deg F.

It appears the most effective engine oil INLET temperature should is 205 deg F +- 5 deg. The most cost-effective method I've seen so far is to wrap the dry sump reservoir w/a 110 v electric band heater & insulate the return & inlet lines. Put a large engine oil cooler in a tank of water with 1 or 2 4500 watt electric hot water heating elements under the cooler. Procedure: Warm up your dry sump oil reservoir, start engine and turn on the oil cooler heaters. When your oil temp gets up to 190 or so then make a couple of pulls, do the calibration check. Make several pulls to get the oil temperature back up and then proceed w/your tests. Due to the enormous time required to achieve the 205 +- 5 with most systems some people are using an oil cooler in the upper radiator hose between the engine and the cooling tower. As most of us

1515 MT. ROSE AVE. - York, PA 17403
Phone: (717) 846-1632 Fax: (717) 854-9486 E-mail: sales@stahlheaders.com

will agree it's never a problem to achieve engine water temp quickly and thus it works well to use the engine outlet water to heat the engine oil. Since most people run 180 to 195 deg water temp, that means we have to lower our preferred oil inlet temp.

The dyno exhaust system should be made from 8" or 10" stainless flex pipe (8" will handle 400 hp p/tube) going into 8 or 10" tubing through the rear dyno cell wall into 90 deg elbows. (available from HP products. Ph: 216-875-5556) The mufflers should be made from 30 gal barrels. Your parts cleaner man will usually give them to you if you ask. Cut the bottoms out of all but the bottom barrel (put in a 8" hole) and mig weld together. Go to a sheet metal shop /contractor and have expanded metal rolled and welded into a 10" dia shell. Center the shell inside the barrels. Pack the gap with mineral wool available from a insulation supplier. Use a trap door (remote controlled air cyls make it easy) or 2 more 90 deg elbows at the top to keep rain/snow out. If you are in a area w/noise limits, going straight up is most effective.

Cell ventilation is probably the most over-looked and most screwed up part of most dyno cells. I believe you must blow air in the front of the cell and pull it out the rear. That means using 2 cell air blowers that pull air from outside the building. Locate 1 on each side of the dyno cell window on the roof of the cell. A wood box plenum to sit each blower on will help air flow. I suggest using pegboard spaced at least 4" away from the front cell wall, which should be made from concrete blocks for safety reasons. The air blows comes down the cavity between the block & the pegboard and come out every hole in the pegboard. We used a 2" holesaw to enlarge some holes directly under the cell window to encourage air movement under the engine. We have a 42 x 42" hole in the rear cell wall that all the air and exhaust pipes go through. There is a 42 x 20" (inside dimensions) duct w/expanded metal & fiberglass that goes up the side of the building. At the top of this duct there are 2 exhaust fans. Another blower is positioned on the roof of the dyno cell to supply air from inside the building to the engine through a duct (referred to as a carb air blower). There is sufficient evidence to prove that no testing should be done with a carb air temp under 70 degrees F. All the blowers & fans have 2 speed motors to provide flexibility in the air movement volume. I believe we want to move somewhere between 8000 & 10000 cfm through the cell during hot weather testing. There are reasons for not moving more air through the cell. Less air is required for colder weather. Exhaust fan ratings become somewhat meaningless because as you add more and more blower to the cell air side, it creates a supercharging effect to the exhaust fans. The suggested (Grainger) part numbers are available. See the article "Dyno Parts and Sources" for more information.

Based on conversations w/some of the country's most successful engine builders I have come to the conclusion that repeatable dyno data will do more to reduce confusion that any other single item.