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STAHL HEADERS/CAMS NEWSLETTER
ISSUE #10

WHAT'S NEW

This year we have improved our cam design software and the ability to use a spline method for designing lobe shapes. Combined with the normal polynomial equation method used by the few of us who can design cams now gives us more design capability than others.

The major effort has been our new dyno software. I believe we have developed the most powerful software intended for dyno data analysis in existence. Considering the time investment and programmer's ability, it will be a long time before this software is equaled. I give Dave Manzolini of Depac credit for raising the standard of dyno analysis software to the heights he has with his Depac Link program that was originally written by Audie Thomas while he was an employee of Depac. We looked at software from many different sources and tried to incorporate the most desirable ideas. We even created new flexibility. The software is written in C+ + so there is no piece of code that was ever used in any of the Depac programs. It is the full time effort of a programmer who has done part time work for me over the past 12 years.

There will be several versions of the software available. Depac owners who are tired of the restraints or bugs from the Depac program will be able to buy a version that will read present Depac files and permit converting them to the Stahl format (not required but desirable). It will still be necessary to use the Depac program to get those tests to your computer disk... so it is not a replacement for creating the data file ($495.00).

For those Superflow owners who have had the computer option and have been saving files for years... the best news is there will be a version available that can be used to convert those files from Superflows's .SD9 format to the new Stahl format and have a very easy graphical interface program to use to analyze their tests ($495.00).

A third version will permit all those that do not have a computer connected (and would like to computerize their dyno but find it difficult to pay Superflow $2000 for one of the most antiquated pieces of software I've seen over the past 7 years) to now have an option. This program will permit hooking a computer up to the cable that goes from the dyno to the printer, or from the terminal to the printer to be connected to a computer and have the data saved in files and permit computer graphical analysis ($695.00).

Demo disks available. ($25)

STAHL HEADERS/CAMS NEWSLETTER QUESTIONNAIRE

Your Name: _____

Company _____

Address: _____

_____

Phone: _____

Flow Bench: _____
Brand Model

Dyno: _____
Brand Model

Computer:

Specialty:
Drag Race : _____
Oval Track: _____
Road Race: _____
Other: _____

Cams Used Most:
Flat Tappet : _____
Roller : _____

Please complete & return to:
STAHL HEADERS/CAMS
1515 Mt. Rose Ave.
York, PA *17403*
(717) 846-1632 *or 846-3123*

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????? Return above questionnaire to remain on our mailing list for future issues.
XXXXX This will be your last issue unless you return your questionnaire. Those that do not respond are either not reading our newsletter or don't care and, in any event, we don't need to waste. Previous issues are available upon written request only.

WHAT'S NEW (continued from front cover)

In addition, we are developing a dyno data acquisition system made up of all off the shelf parts except for 1 board. The software is divided into 3 major parts. The data acquisition aspect permits the user to establish the individual sampling rate of each channel from ie. 1 p/second for something like oil temp to 1200 times p/set for rpm, torque, fuel flow and whatever_ you want in between. However there is no free lunch. Taking a lot of data samples results in a lot of numbers to work with. It is possible to create a data file with 30,769 records that takes up 132,837 bytes of desk space in a 25 second test. We then use a raw data analysis program to study that data to determine exactly what the rpm and torque values were during the entire test. If the engine stumbles you will see it, if a cyl misfires you will see it, if it's connected to a computer controlled dyno and the controller hunts around, you will see it. You can see the data in anyway you can imagine including using the screen for ie. all 25 seconds or .0l seconds or anything in between. It indicates the number of samples collected for the variables with highest sampling rate, the number of cylinder firings, area under the curve and on and on. The object is to study the raw data, smoothen the data to whatever degree if you like, apply an acceleration factor if you choose and then create a finished dyno data file that will have data in whatever rpm increments you want... be it 10, 50, 100,200,400,500. The intent is to keep the RAW data files forever, so that as time causes our perceptions to change, we can go back to the raw files at any time and manipulate them in any aew way to create finished dyno files. Yes, it took me a long time to recognize the reality that we have to do some data manipulation in order to get a clearer picture of what happened. If the Depac owners who are so happy were aware of how much manipulation of data goes on in their systems I'm sure some would have their confidence shaken. When put in proper perspective, the dyno is just a measuring tool. We need it to provide us with repeatable data so we can learn what engine components and arrangement will make the best shaped power curve to make the race car perform at its optimum. It appears to me the best method is to collect a hell of a lot of data, do whatever is necessary to produce readable repeatable data and go on.

This system is not for first time dyno owners. It is for people who are somewhat computer literate. If you can't format a disk, or copy a data file then I suspect this system will be too much for you. It will require more time at the keyboard than the Depac program. For those people who are uncomfortable dealing with me, it appears we will have a qualified person selling the systems in addition to ourselves.

DYNO TESTING with DATA ACQUISITION

If you are a first time dyno data acquisition user and have a **manually** controlled dyno such as a Stuska, Go Power or whatever, you have no choice but to buy a Depac. Like it or not, it's the only choice I've seen. The software for the other systems leads me to believe the people involved do not have any idea of the task. Depac has a patent on taking data and applying an acceleration compensation which they call "Inertia" before they present the data to a user.

Certainly people including Superflow have been taking data electronically for a long time before the Depac unit become a saleable device. It appears many people seem to think that because a data acquisition system is computer driven that it is an infallible device and want to believe the the numbers are accurate and correct. In reality it is possible to repeat tests as close as .2% or as poor as 3%. Lets see, 600 hp @ .2% is .002 x 600 = 1.2 hp (pretty good). However 3% is 18 hp and that's not worth anything. So unless the first 2 tests have no more than 5% difference which is 3hp on a 600 hp engine, then you're not doing a valid job of testing if you don't run the 3rd test. If cell ventilation/air supply and dyno exhaust are correct you can achieve the 5%.

Incidentally, I prefer to look at torque below 5200 and hp above 5200. As a customer, Jake Savanni, has pointed out to me, a 400 ft pound engine with l/2 % (5%) torque variation is 2 ft lbs and at 5252 rpm is 2 hp. However at 9500,2 ft lbs of torque is 3.62 hp. So I guess a person really needs to have software like the Depac that lets you see the % difference graphically. I still like to be able to put columns of numbers along side each other at times. On too many occasions the differences are very subtle when looking at a graph. Eventually we will be able to measure air consumption and then we can come up with a new unit for rating racing engines using torque, rpm and air consumption.

As time passes and more engine builders send me dyno data on a disk, I find the same mistakes being repeated over and over. Most changes in engine components will result in less than 2% power difference. I tell people that parts like manifolds, cams, headers and oil pans are 3% items. That means that very seldom will you be able to find one of those items that will make as much as a 3% power change. I've known people to run 10 cams through an engine and not see more than 1.2% power difference in all 10. What are MISTAKES? Making a 1 run test and making a decision based on it. I have looked at so many 3 run tests and have thrown out the 1st test at least 30% of the time. So when I tell you than a 1 run test means nothing, it is not an opinion, it is a fact based upon studying hundreds of tests. I now have over 2500 dyno tests on my computer from 7 or 8 different Depac owners. There are times when I spend 3 to 4 hours working with no more than 50 tests.

The 2nd most popular mistake is not controlling oil temp. Time after time I see 1% difference in runs that are within 2 minutes of each other with no change to the engine. There is usually 15 to 20 degrees oil temp difference. Depending upon oil temp, the acceptable range can be very small. For example, at 155O to 185O the range can be no more than 5O. Is it expensive to correct the oil cooler system? No, and as my Dad used to say to me, "Son, if its worth doing, it's worth doing right." Think about it, what is the sense of wasting the time, burning the fuel and creating the wear and tear on the engine if the test is not valid enough to support conclusions. I also am not telling you that you must make 3 full sweeps with an engine in an unknown state of tune. All my references are to a reasonably well tuned engine.

The guy who sends me the best test data has been verbally beat up by me many times until he got it right. The procedure he now uses is to run the first sweep and not record the data. Step 2 is to breath the engine, check oil temp and then run a recorded sweep test. Step 3 is to breathe engine, check oil temp and make another sweep. Step 4 is to look at the two tests graphically while breathing the engine and if they look like l/2% repeatability or better, he moves on to the next change. If the tests aren't close enough he has to make a 3rd test.

To date it appears that methanol fuel does not produce the repeatability of gasoline. Drag race engines don't appear to repeat as well as oval track engines (probably amount of camshaft.) So people please...do everyone a favor...repeat your tests.

If you've not read a paper I wrote several years ago called "Measurement" then I suggest you call or write asking for a copy. My office people kept some records of how much time they were spending copying and mailing out the Stahl Newsletters, Measurement, dyno parts lists, etc. and I was shocked to see how much it was costing me. The worst part was that many of the recipients were not buying customers, so we started asking for $10.00 to cover the handling costs. Several people have suggested I need to install a 900 phone line so we can charge for the dyno related advice. I'd be happy if everyone bought a set of our dyno headers.

I can understand buying the least expensive header system for an odd ball engine combination or to run engines built and owned by outside customers who cannot provide headers that will fit the dyno....but to run poor headers on your small block Chev race engines built inhouse ....shame. Reminds me of the well known engine builder who used to be one of the country's top drag racers back in the 60's. A customer brought in his Stahl headers for his Nascar modified and asked the engine man to test them. They made over 20 hp more than his "dyno" headers which were Hooker early Camaro in the chassis headers with who knows how much dyno time and carbon/rust build up. Aha you say, Stahl that blows your 3% bs. Yes but, it was not a relative test because relative testing requires running the car headers against a respectable dyno header.

Hopefully there will be no great punishment for all those owners of dyno facilities that are not capable of running race car exhaust systems. I cannot understand engine builders who tell their customers to buy 180° headers and yet they can't test them. It appears I have been confused all these years. I thought race engine builders wanted their engines to win races. Aha you say, they do. And to that I say back, yes, but I know many engine builders without dynos who's engines win races. Of course, as more and more race tracks are requiring the use of 1960 type race engines which meant put in a cam, manifold and headers in an otherwise stock engine...then I guess some people will finally get around to fixing their dyno facility to accept race car exhaust systems because it will be one of the few things they can change. Especially after a few of them find out how much power is available from headers under 5000 rpm.

This past summer a test was run on a 685 hp 406 dirt late model engine. Out of the box Schoenfelds were down 62 ft lbs at 4500 from the same tube size Stahl headers. Try finding something other than Nitrous to produce those results gang. (Even the newest copy kats didn't do it right.)

INERTIA WHEEL DYNOS

With the incredible number of hours I have spent this year working with and thinking about engine dynamometry it has become very clear to me that I can no longer procrastinate in building an inertia wheel system. So I've had to throw out those plans and design I did in 1978 and '79 and with the help of numerous people we are progressing down the path of design. With any luck we'll have a prototype running by summer. Yes, we are aware of Mandolini's system in the Chicago area, of Gus at H&G's system in Limmerick Pa, and the ones Clayton built into many chassis dynos. Each of those people deserve great credit. Gus in particular has had visions of how to do things long before many of us. However, it is my plan to develop a system that can be retrofit to present day water brakes. I don't see an inertia wheel being a total substitute for a water brake. Since most of us deal with drag race or l/2 mile oval track engines we need to be able to simulate the engine acceleration down the race track. The typical oval track engine is at full throttle from 3 to 5 seconds and is running through a 2500-3000 rpm range. Thus, dyno testing needs to permit starting very low and running as high as valve train reliability permits. Keep in mind the data acquisition hardware required to do acceleration testing in the 1000 rpm p/set range might cost as much as $10,000 with all thermocouples, and other sensors not including the full gambit of fuel flow transducers. If you really want to go top shelf and use laboratory quality flow transducers they will cost from $500 to $1000 each. It has become very clear to me however, that in order to learn more we have to do things differently than we have the past 5 years. Hopefully more data and the ability to run the engine at ie. 1000 acceleration will provide us with the insight into what counts on the race track.