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STAHL HEADERS/CAMS NEWSLETTER

ISSUE #4

PEAK HP

For years we thought it was optimal to gear a car to rev the engine to the RPM where it made peak HP. Then we discovered the car would go quicker if the engine was geared to run some 500-700 RPM past peak HP. In 1986 a typical NASCAR Sportsman 311 V-8 with a 390 cfm Holley pulled peak HP at 7200-7400. Many racers geared the car to rev the engine to 8000-8300. One racer found he could gear the engine to turn 8800 and that the car felt like it was pulling all the way. In fact he ran a race at Bristol turning it 8800 every lap. The engine builder dyno'd the engine as high as 8500 and found it was down some 70 HP from peak. They ran the engine 3200 laps on the same set of Howard Stewart titanium valves.

Why did the engine keep pulling so far beyond peak power and the car keep going quicker? Why have formula and motorcycle engine designers who have had to deal with rules that limit engine displacement attempted to raise the operating RPM of engines. For 20 years most of us have related to the engine as an air pump. Yet some of us never really understood the reason for raising the operating RPM was to increase the airflow through the engine. If the engine is **MECHANICALLY STABLE,** the higher you rev it, the more air will be pumped through until turbulance in the ports reduces the volume of flow. Does this mean that the camshaft and valve train have been limiting the useable RPM range of pushrod engines more than we realize? We understand many dirt late model racers run 420/430 cubic inch engines geared to rev 6500-6800. Yet the 420/430 engine with the best win record is geared to run 7500 and it doesn't have that big a camshaft. A local 355 won two unlimited Model races by gearing to run 8300-8400. Is it possible that cam lobe shape affects combustion efficiency at higher RPM's which creates a driver illusion of when the engine stops pulling or flattens out. The one comment that comes back time and time again is how smooth our cams are to drive and that the engine feels like it never stops pulling.

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*

ATTENTION!
DO YOU WANT TO CONTINUE **TO RECEIVE THIS NEWSLETTER?**
Check you mailing label!

ZOOMIES vs HEADERS

It appears that most current late model dirt engines are 406's to 430's. Zoomie pipes (8 individual exhaust stacks) will run quite well from 3500 to 4500 and from 7000 to 7500. But, they give up from 25 to 35 HP at 5500 to 6500 which ends up being on the chutes where you can use all the power you can make. However, compared to Zoomies the "Shorties", as we have labeled that collection of pipes that vary in pipe length from 14" to 16", are the real disaster. Reports from several prominent dirt late model engine builders indicate as much as 45 to 50 HP difference between 5500 and 6500. Several well known drivers state they typically have to run .1 more gear with Stahl Headers vs Zoomies but the car is much easier to drive and definitely pulls harder on the chutes.

DYNO CELL VENTILATION

Dyno cell ventilation is the single most important factor for data repeatability. We think we have seen all possible types of systems used and the ones that work the best push outside air in the front of the cell with blowers and pull it out the back with exhaust fans. A separate engine air supply blower should be used to supply engine inlet air sourced from inside the building if you encounter any outside ambient temperatures below 65 deg. If you are interested in our recommendations call or write for a list of part numbers and sources.

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CONVENIENCE TIP

Plastic trays to hold all major engine components are available from P-AYR Products, RR#4, Box 230, Hiway 7 3 , Leavenworth, Kansas (913-651-5543).

HEADER PARTS

HAVE TO BUILD YOUR OWN HEADERS? We sell flanges, U-bends, bending mistakes, weld-on and removable collectors. Bending mistakes are pre-bend tubes that were bent incorrectly for a production header. They are boxed by the pound and the average box contains 45 feet of tubing with an average of 45 bends. Priced well below production costs. Bends & tubing from l-l/4" to 4" are available.

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ROAD RACE ENGINES

Got a road race engine? Call Lee Swartz (415-887-6596). Lee built the engine that powered the fastest (on the radar gun) Trans Am independent at Sears Point. Ask him for his results with Stahl Cams shifting at 9,000 for three races with **NO MAINTENANCE.**

WINNERS AND LOSERS

THE WINNER is always a part of the answer,
THE LOSER is always a part of the problem.
THE WINNER always has a program,
THE LOSER always has an excuse.
THE WINNER sees a green near every sand trap,
THE LOSER sees two or three sand traps near every green.
THE WINNER says "Let me do it for you.",
THE LOSER says "That's not my job."
THE WINNER sees an answer for every problem.
THE LOSER sees a problem in every answer.
THE WINNER says, "It may be difficult, but it's possible.",
THE LOSER says, "It may be possible, but it's too difficult."

Which are you? -- a WINNER or LOSER?

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CYLINDER HEADS

To open Pandora's box does not make one feel comfortable. However a few engine builders and cylinder head experts have created heads that made great strides in air flow and horse-power over the past 2 years. It appears the major emphasis has been on intake ports with neglect of exhaust ports. One person has shown it is possible to achieve an almost flat BSFC curve from 5000 to 8000 with a single 4-barrel carburetor once the exhaust ports are improved. In general, as the exhaust port is improved the BSFC values will be lower, the fuel curve will flatten and the engine will not fall off as fast past peak power. It will have a smoother power curve and be much smoother and easier to drive.

The recent improvements have generally resulted in larger intake ports which has not made life any easier for drivers. The 1987 engines do not throttle recover as well as the 1985 engines nor are they as smooth to drive. Engine people need to pay more attention to what drivers are saying. The less a driver has to compensate for a engine, the easier it is for him to make the car go quicker. I suspect that drivers have to compensate more than 50% of the time due to the way the engine runs. Our cam lobe shapes came along at a very opportune time. They are proven to throttle recover better than any comparision cams to date. How much power the engine makes and the shape of the power curve is dictated more by cylinder heads than any realistic combination of rod length, stroke, camshaft, intake manifold and headers. The camshaft and headers can have a large effect on the driveability of the engine. What is driveability? A combination of throttle recovery power and full throttle **TORQUE CHANGE** over the RPM range while the car is STILL TURNING. The driveability of an engine can make more difference in winning races than the amount of power it makes in 1/2 mile racing. Rod length and stroke can be used to cover up lazy intake ports and/or slightly too much cam. The cylinder head fiasco will become more con-fusing as the head manufacturers are becoming more creative via raising ports, changing valve angles and locations. The solution **IS NOT** to simply require IRON bow tie cylinder heads and flat tappet cams as the cost of doing development work to acid dip iron heads to meet "Stock Rules" is incredible. Flat tappet cams wear out.

We have started to collect cylinder head flow numbers. For now we need the numbers at 29", .050 increments from .050 to .300 and then .100 incre-ments to .700. Use a radiused inlet and nothing on the exhaust port. I will not reveal anyone's flow numbers and will only make suggestions as to what area to work in. We need to establish some sort of standard as to what to put on the exhaust port. We further need help in arriving at a practical way of measuring port length as volume relativity goes down the tube when you start raising ports.

Ideas please!

AIR FLOW INFORMATION

The most well written explanation of air velocity measurement and air density that I have ever seen is in the Dwyer Instrument catalog section labeled Air Velocity Kits (used to be available at no charge by asking Dwyer in Michigan City, Indiana). Dwyer manufactures the manometers used by Superflow. Based on this information I do not understand how a "Air Density" gauge that would be relative can be made to sell for less than $1000. They also sell CFM meters that are being sold as blow-by meters for use on dyno or race car.

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HEADER HORSEPOWER

A long term customer recently discovered a significant power increase when he tested a Stahl header (Troyer modified) against his dyno header (Hooker Camaro). He then ordered Stahl dyno headers. Remember our previous Newletter suggestion to test your customers race car headers.

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SAME VALVE SPRINGS!

Ask Bill Gwyn (804-539-6040) about Stahl Cams and going 3200 laps with the same valve springs and valves running as high as 8500.

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DIGITAL DIAL INDICATORS

Interested in a digital dial indicator that reads out in .0001. Available from Material Control, Inc. (312-892-4274) for around $300. If you call please mention you saw this in the Stahl newsletter.

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QUESTION???

If engines see 8000 on the race track, why do so many engine builders shy away from testing at 8000 on the dyno? We believe an engine should be tested from 1000 rpm below its normal race track rpm to 500 rpm above. To get the most out of an engine, the car should be geared to run 500-700 rpm beyond the HP peak.

CAM DEGREE METHODS

Some engine builders are in the habit of degreeing a cam in by lift at TDC. This method had some relativity in the days of symmetrical lobes. However, it is totally unusable for asymmetrical lobes. Depending upon the amount of non-symmetry, the cam will end up advanced, thus negating a fair comparison to previous or subsequent cams. There really isn't much room for discussion on the topic. The only fair method of comparing the way different cams run is to degree them in by the lobe centerline. The procedure we suggest was in Newsletter #1, is on the back of all Stahl cam cards and available by request.

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CORRECTED HP

There are several standards for correcting engine dynamometer data. The most popular is the 1951 SAE Spark Test that corrects to a barometer of 29.92 and 60 degrees carb air. This "standard" also produces the highest numbers. The 1958 SAE Spark Test corrects to 29.60 and 85 degrees. The shop foreman for one of the country's leading engine shops discussed the "FICTION" factor with us. He was referring to the "FRICTION" factor calculated by the Superflow dyno and said they call it "FICTION". By entering 0 for stroke and bore they get no "Fiction" factor. Some years ago a Chevrolet engineer told me they used 17 HP for frictional HP for a 302 engine. The normal method is to add Frictional HP to observed HP, apply the correction percentage, subtract the frictional HP, to obtam net corrected HP. Certainly if you elect to consider frictional HP there should be some consideration for cam type, valve spring loads, ring types, and clearances. It is our understanding that the SAE standards are empirical derived data and thus DISSIMILAR engines respond differently to weather changes resulting in the correcting formulas not being truly accurate which several people have further substantiated.

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REMINDER!

LAST ISSUE UNLESS YOU RESPOND!