STAHL HEADERS/CAMS
1513/1515 Mt. Rose Ave.
York, PA 17403

June 1988

STAHL HEADERS/CAMS NEWSLETTER

ISSUE #5

COOL DOWN HORSEPOWER

A phenomena noted as far back as the middle 1960's where a new/fresh engine sitting overnight on the dyno would always make more power the next morning (Bobby Meeks - Edelbrock) and it was not necessarily a function of cooler carb air temperature in the morning. The same power increase can be obtained the same day by a quick cool. Drain the hot cooling system water, (save it) run cold water thru the engine, dump it, then pour the hot water back in, start the engine and you'll have more power. The quick cooling many drag racers perform achieves similar results. Whatever is taking place leaves room for speculation but one presented theory that may be correct is the temperature cycle of the rings causes them to make some molecular alignment and change to conform to the bores. I have done the quick cool on the dyno and have seen blowby be significantly reduced for some 30 to 45 seconds of full throttle. Iron cylinder head exhaust valves that were leaking have mysteriously stopped leaking after a quick cool. Let us know what you find when you play with it.

ENGINE WEAR

We believe there are two major causes of wear in a properly filtered engine: cold starts and bore rust. Gasoline fuel wash with a cold engine will in most cases remove much of the cylinder wall lubrication. Combine this with the rust that forms on the bore surface each time the engine cools from approximately 120 deg F to 70-90 deg F and you've got a mess. The solution appears to be to use Cimguard made by Cincinnati Milacron each time you shut the engine off for the day via spraying in the plug holes and pouring a little down the carb. DO NOT use WD40 or similar snake oils that have any penetrating qualities as they will loosen the carbon which can then become a hot spot, glow and cause pre-ignition. (Which causes tuliped intake valves and holes in pistons.) The use of electric pre-heaters in the block, lower radiator hose or use of large quick disconnect fittings and connecting the race car to the tow vehicle as some of us did in the early 70's to pre-heat the engine. Even 150 deg F water temp makes a significant cold start difference. Always fill an engine on the dyno with hot water (another Jenkins trick).

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!

Some of you receiving this issue had XXX's on your last issue label and a red stamp "LAST ISSUE UNLESS YOU RESPOND". Because you were added to the list after September 1, 1987, we will send you issues 5 and 6 with out a response but then we will drop you from the list unless you fill out and return the above questionnaire. We require a response to indicate your interest. If you care enough to respond we feel you are reading the newsletter. Those that didn't respond are either not reading it or don't care and, in any event, we don't need to waste. For those of you who have responded, we're off for the second year!

BLOCK CORE SHIFT

Many of the top engine builders ultrasonic test blocks to check core shift. The early units some of us use are time consuming and require reading the wall thickness on a CRT Oscilloscope screen. The new ones have a digital readout. If you're going to buy one try Krautkramer - Branson (717-242-0331 Doug Lutz) who make a really neat digital read-out type and also offer a even neater hardness tester.

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The man who knows HOW will always have a job. The man who knows WHY will always be the boss.

FREE INFORMATION

Upon request: Article titled "MEASUREMENT". Seven (7) pages discussing aspects of dynos and flow benches from a perception and business standpoint. Started out to be a ditty for the newsletter and grew out of proportion. Recommended reading for those who like to think.

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IGNITION SYSTEMS

It appears too many racers refuse to properly maintain connections and switches on battery operated ignition systems. The more sophisticated systems are critical of grounds and actually should have a braided ground strap running from the engine to the frame. The metal should be scraped and after the connection is made it should be weather protected. The battery cable connections on both ends need careful attention. We have been told that some sophisticated CD ign systems such as those used by Honda racing motorcycles are to be used only with crimped connectors and never soldered. (We cannot figure this one out. Can anyone help?) We've seen batteries that had loose plates cause irregular terminal voltage which results in a significant power loss.

BORE PREPARATION

Is there a need for bore preparation sequence? It is my opinion that at least .005 should be honed out of any freshly bored bore. Tom Hoover, the ex-Chrysler hemi engineer initially preached bore preparation to me. The honing should be done in sequential steps. ie. .0015 w/180 grit, .0015 w/220 grit., .0013 w/280 grit and .0007 w/400 grit in ring travel only. We know that drag race engines need this sequence and I believe oval track/road race engines will also respond. Incidentally you may be interested to know that Bill Jenkins discovered bore distortion. That I honed a Hemi block upside down in September 1966 using the cylinder head to stress the block and that Stuart Matthews and I came up with the honing plate concept in October 1966. In fact, Stuart honed a block with a plate in a tank of hot water around December 1966. The use of a honing plate was one of the best kept secrets in racing and the "World' did not find out about them until 1969 (when Tony Pizza told Hank the Crank). However this bore preparation sequence was worked out 16 years ago, so there should be some new ideas. I'm listening -- so please call or write.

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DYNO CALIBRATION

Good dyno test procedure calls for a calibration arm to be permanently mounted on the brake. Warm up the engine etc., hang the calibration weight, do your test series and re-hang the weight. Of course a person with this desire to do things right will also have previously calibrated the torque readout system for both ends of the range in which they normally test. However, warm up must not be overlooked. The calibration weight will always be true weight and eliminate any question about how much weight the arm adds to the calibration as it is left mounted on the brake at all times. Another positive side effect is that the induced weight tends to reduce the hysteresis of the system. Calibrate before and after every series. Check the span once every 30 days. 999 times it will be a waste of time and but 1 time it just might save your ass.

NEW CAM PROFILES

We are pleased to announce several new profiles:

259	@.050	.420	Intake	.940 base circle.
264	@.050	.410	Exhaust	.940 base circle.
261	@.050	.426	Intake	.920 base circle.
267	@.050	.419	Exhaust	.920 base circle.
261	@.050	.426	Intake	.980 base circle.
267	@.050	.419	Exhaust	.980 base circle.
277	@.050	.442	Intake	.980 base circle.
283	@.050	.429	Exhaust	1.000 base circle.

Due to the tremendous success of our 264-270 and 267-274 in some drag race bracket engines, we brought out the above 277-283 and soon it will be joined by a 271-277, and a 274-280. We also will have a hydraulic 243-249, and street "Efficiency King" cam plus some flat tappets.

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STUDS INSTEAD OF HEAD BOLTS

When installing studs in place of head bolts, torque to 5 ft lbs. Counter sink block after decking. Re-machine head bolt contact surface on cylinder heads after angle milling the heads.

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MEASURING CAMS

Comparing cams in a block? Are you measuring the duration at a bunch of cam lift points and charting or graphing so you can get some idea of how one cam compares to another? Unless they run the same valve lash, you are trying to compare oranges to apples. However, if a cylinder head is installed and all lift measurements are done at the spring retainer with a race spring and hot valve lash clearance, then you can get some idea. In 1974 we did a study checking in this fashion and changing valve lash .008 changed the duration from 3-l/2 to 4 degrees from .050 to .500 valve lift. We recently completed a modification to our cam check machine to permit measuring at the spring retainer. So we are counting on opening a new can of worms or two.

FLOWBENCH TEST STANDARDS

At one time the depression standard was 3" or 10" depending who you were. Then it was 16", and now it seems to be 28". I have reason to believe we should be using something like 45" to 60" for intake ports. Perhaps development work needs to be done at 2 or 3 different intake depressions to investigate the velocity map. To put exhaust port flow into perspective we probably need to be flowing at 5 psi. If a top shelf normally aspirated race engine is making over 1200 psi cylinder pressure at peak, then think about how much cylinder pressure exists when the exhaust valve opens. My understanding of using the term "Reynolds number" as applies to cylinder heads means the flow through a port will remain laminar (controlled) until the air flow (volume) is increased until the velocity has become too great for the port shape which then causes separation of air from the port wall which results in the air becoming turbulent which results in less air flowing through the port. Thus air flowing at 10" depression may become turbulent at 18", air at 28" may go turbulent at 34". When the air becomes turbulent it makes noise and most of the time once it becomes too turbulent the port will flow less air. Therefore it may be desirable to flow at much higher depressions than those values now being used. I suspect the reason some engine people are more influenced by how a exhaust port sounds than its flow numbers may tend to be the proof. Depending upon the source, there is some variation in the following specs.

1 "Hg = 13.596 " H20 (water)
1 "psi = 2.036 " Hg (Mercury)
1 "psi = 27.673 " H20 (water)
5 "psi = 138.365 " H20 "

311 cu in NASCAR engines with a 390 cfm carb have been observed at full throttle with 7" Hg manifold vacuum on the dyno at 7500. If an opening intake valve can see 7" Hg of vacuum pulling on it from the manifold side then how much exhaust is pulled back into the manifold. Think about how much vacuum there must have been before it got reduced by exhaust residuals being pulled in from the cylinder. Think about how an intake manifold must fill with exhaust when a driver closes the throttle going into a turn. If we are communicating, then perhaps you can see part of the reason why I don't believe there is such a thing as exhaust scavenging in full throttle race engines. It is my opinion that when people make the statement that they are over scavenging an engine, the cylinder head has a poor balance between intake and exhaust port flow, and the intake is a little too large and "slow" and the exhaust does not flow enough air. The solution in most cases is to change the cam to less exhaust. We need to establish some standards reference depression, thickness and shape of the radiused entry on the intake port, and what to use on the exhaust port. We have made up several l/2 headers for a few people, ie. - a NASCAR Winston cup flow bench header consisted of the first 17 or 18" of the header. How can we measure the port length to put relativity back into port volumes? Please call or write in your ideas.

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FUEL INJECTION

The way a driver moves the throttle will have an affect on how a fuel injected engine runs on the race track. Sudden lifting of the throttle forces all the bypasses to open further which probably riches up the mixture in the cyl even more and then if the driver suddenly opens the throttle demanding instant fuel, it won't be there and the engine will be lean. Thus a driver has several reasons to want to move the throttle slowly. First to keep the engine cleaner and the second by being very smooth with the throttle less weight change happens from wheel to wheel as a result of less torque change into the chassis. In other words, the driver can upset the engine as well as the chassis with throttle movement.

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B.S.F.C.

Sorry, we ran out of time to write a discussion on BSFC. Look for it in the next issue. It is interesting to hear several people say that the best NASCAR Winston Cup engines without any 200 HP loss restrictor plates are the best engines with a restrictor. Maybe port shapes should be developed using a restrictor plate!! as the quality must be more critical.