K-TECH NEWS

SPRING 1996 THE **KAWASAKI** TECHNICAL MAGAZINE VOL. 9 NO. 1

INSIDE

Features	30 Years of Progress	2
Regional	Update	4
Micro-K	Open Your Mail	5
News	Latest Information	5
	ID Replacement	6
Tech Tips	Clutch Leaf Spring	7
	Find Hull Leaks	7
	Rich-Running Jet Skis	8
	ZXi Speedometer	8
	Hull Repainting	9
	KX Cylinders	9
	KLF400 Air Intake	9
	New Fuels	10
	MULE™ 4x4s	11

How Far, How Fast

A Celebration of Kawasaki Technology

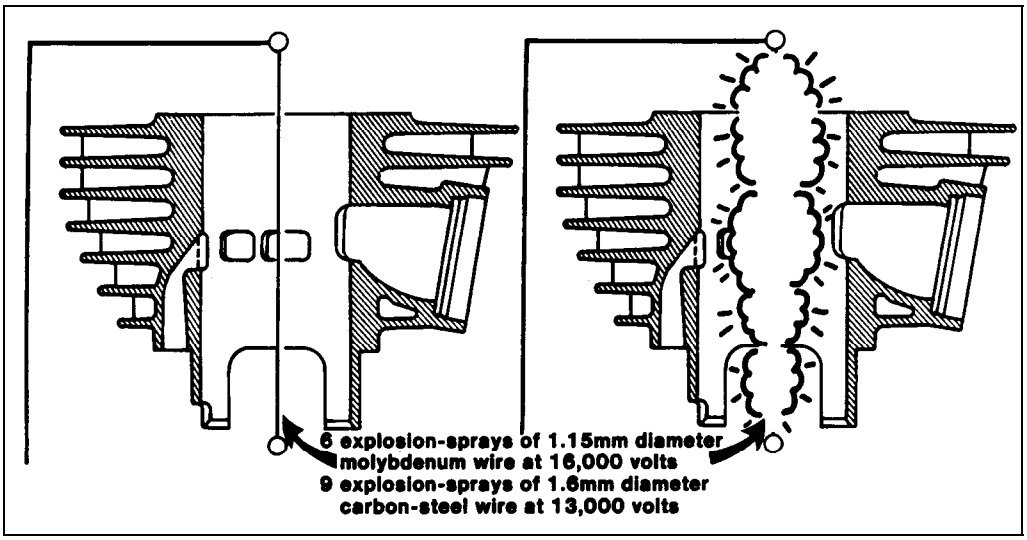
by Ray St. John
Supervisor, Technical Writing

Kawasaki has come a long way in 30 years in the United States. From an enthusiastic start in a dusty Chicago warehouse to a real office in Gardena, Calif., then to a small building by the freeway in Santa Ana, and finally to our own building in Irvine with regional offices in several cities around the country, Kawasaki has come a long way. The Kawasaki corporate entity, the Kawasaki dealer network, K-Share, K-FAX, and all the other business advances remind us of how far we've come. Another reminder is the technology of the Kawasaki product line. Technology has been a hallmark of Kawasaki products from the beginning. Not just any technology, not tech for tech's sake, but intelligent use of the technology appropriate to the product, the time, and the marketplace.

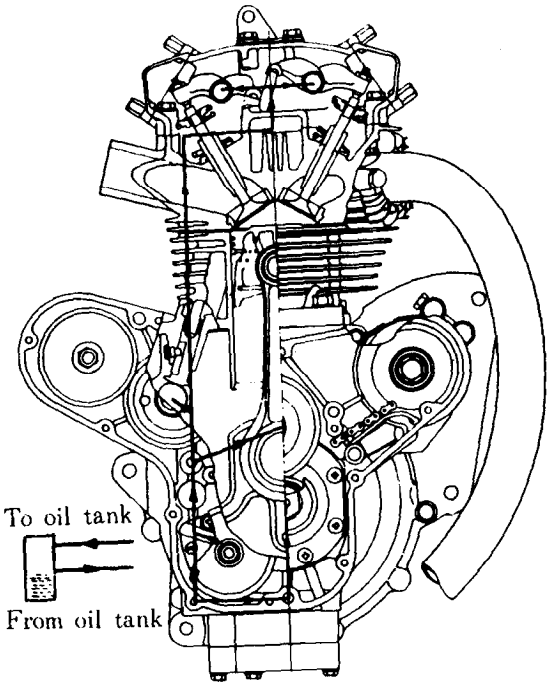
In the late sixties, Kawasaki gained its reputation in the United States: a reputation for speed and performance. The Al Samuri was a 250cc, two-stroke twin, with advanced technology for its day. The engine breathed through two carburetors mounted on each end of the engine, so that rotary valves could be mounted on the crankshaft just outside each crank chamber-a simple solution to controlling two-stroke intake for better power and fuel mileage. Since then, Kawasaki rotary valve engines have won major road races and motocrosses all over the world. The rotary valve engine gradually gave way to the reed valve engines we know today. Even simpler and more powerful than either of their predecessors, the piston port and rotary valve, reed valve engines today rule the two-stroke racing world.

In 1968, few people thought a S-cylinder, in-line two-stroke was feasible-especially if it was air-cooled. Everyone thought the center cylinder would overheat. Kawasaki proved them wrong with a whole series of two-stroke, air-cooled triples. First came the 500cc H-l, then the incredible 750cc H-2, followed by a string of 250cc, 350cc, and 400cc machines, all performers from the word go. The trick to beat the heat was to make the side fins on the center cylinder deeper than on the inner sides of the two outer cylinders. This asymmetrical finning worked like a charm. Overheating was never a problem for Kawasaki's triples.

But overheating can be a big problem for a small two-stroke racing engine. A steel sleeve in a cast aluminum cylinder goes part of the way towards the solution, but the invention of the Electrofusion process (combined later with liquid cooling) in 1979 went the rest of the way. The ideal cylinder surface retains lubrication and has good wear characteristics while carrying away excess heat: Electrofusion is a micro-thin coating of ultra-hard metals on the inner surface of the aluminum cylinder casting. This coating supplies the needed wear characteristics and retains lubricant to cut piston



Electrofusion is the process of treating the cylinder bore with a very thin, durable, and porous layer of high-carbon steel and molydbdenum. Thin wires of these metals are alternately "exploded" at high voltage in the cylinder bore, causing particles of the exploded wires to fuse to the cylinder.



wear. Because it is so thin, the coating quickly carries away damaging heat, reducing cylinder distortion in the process. Electrofusion is applied by electrically exploding lengths of wire in the bore of the cylinder casting. Each explosion deposits a little bit of the coating. Different metals are used consecutively, applying the now-familiar gray coating.

Other Kawasaki engines solved other engineering problems. The original Z-l cylinder head casting was so complex that it was studied by Porsche Engineering in Germany. It was said to be the most complex die cast aluminum part in mass-production, in any industry! The Z-l broke other ground as well. It was the first mass-produced superbike engine with dual overhead cams. The resulting combustion chamber shape and spark plug location allowed it to make a lot more of the smoothest power over a wider range than had ever been seen in a motorcycle. And the Z-l was priced so just about anyone could afford it: $1,995 in 1973!

Kawasaki's latest engines go even further. The dual overhead cams are still there, but now they're pushing four valves per cylinder instead of two. The hemispherical combustion chamber has given way to the pent-roof chamber, but the aim is still the same: lots of usable real-world horsepower. Today, air cooling has moved aside for liquid cooling. At modest power outputs, air cooling can handle the heat generated that doesn't get used to make power. When engines are making the kind of power the ZX-6R makes, they need liquid cooling to handle the heat. Liquid cooling also helps engines to run cleaner, helping to meet exhaust emissions requirements. The water jackets around the cylinder and combustion chamber muffle the noise a bit, so today's engines run quieter than yesterday's. The curved radiator has replaced the flat radiator on those models that need the ultimate in cooling area and good streamlining, too. Obviously a Vulcan doesn't need a curved radiator, but the Ninjas put its advantages to good use.

Engines aren't the only place Kawasaki technology has advanced over the years. Look at suspension. Kawasaki's first Uni-Trak system on a street bike appeared on the 1982 GPz 550. Its rocker arm system gave it a rising-rate, progressive action that could handle the corners, as well as a rough road under a big load: comfort and handling, all in one light-weight, centralized, stylish package. Uni-Trak is the norm today, not the exception, on Kawasaki's street offerings-even the Vulcan 800 has it. Today's Uni-Trak system has the rocker arm under the swingarm, keeping the center of mass lower. Springing and damping rates can be adjustable, and either progressive or linear, whatever the designer wants or the market needs. The best part of the Uni-Trak system is its versatility.

The front suspension has not been forgotten either. Thirty years ago, hydraulic forks were a big deal. Today we have upside down forks, cartridge forks, forks with replaceable bushings, forks with all kinds of adjustments, and they look

Continued on page 12

K-TECH News

Vol. 9 No. 1
Spring 1996

K-TECH News Staff

Publisher
Kawasaki Tech Services

Publications Manager
Don Church

Executive Editor
Gary Herzog

Editor-in-Chief
Gregg Thompson

Regional Editors

North and East
Fred DeHart

Central and South
Walter Rainwater

West
Robert Taylor

Contributors
Shannon Beeson, David Behlings, Joe Heim, Kenny Osberg, Keith Pestotnik, David Pyle, Mary Sola, Ray St. John

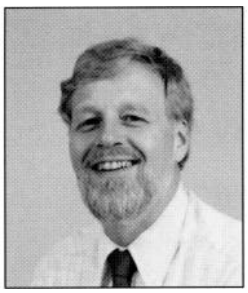
Graphics/Production

Graphic Art
Gregg Thompson

Photography
Dave Corey, Rich Cox, Kevin Wing

Copy Editor
Pat Shibata

Production
Holland Marketing Services



NORTH & EAST

In the years 1969 through 1972, two-stroke motorcycles ruled the street. Kawasaki's 500cc H1 and 750cc triples were king of the hill. The Harley contingent was shocked because high school kids on Kawasaki A7 350cc twins, Suzuki X6 Hustlers and Yamaha Big Bear Scramblers beat them from every stop light. Then came the 1973 Kawasaki Z-l and nothing has been the same. Four cylinders, double overhead cams and as fast as the 750cc triple H2.

I was working in a Kawasaki dealership at the time and the owner sent me to a service seminar on the Z-l -it was a requirement that each dealership have a mechanic that had been to the Z-l seminar before he received the bulk of his order.

One of the first Z-1s I took out of the crate wouldn't shift out of first gear into second. That's how I learned about Kawasaki's automatic neutral finder! The ball bearings under the fourth gear sliders in the transmission were stuck in place because of congealed soap used in the deburring process. A few frantic calls to Kawasaki's Regional Service Department in Avenel, N.J., solved the problem. I will always remember that Z-l -it was frame number 19.

In late 1973, I was fortunate enough to be hired by Kawasaki Motors, East Region as the warranty coordinator. It was my responsibility to process, by hand, all the regional warranty claims and forward them to corporate headquarters in Santa Ana, Calif.

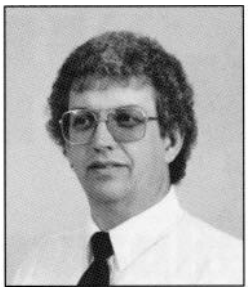
The Regional Service Departments were much larger in the early 1970s. We had a service manager, two service trainers, a service technician, warranty coordinator and a service secretary.

In late 1974 and early 1975, Kawasaki centralized all of their warranty processing directly through corporate headquarters in California. I was asked to stay on as one of the service trainers in the East Region and was happy to do so. Our training engines at the time were two-stroke triples, the Z-l and the new KZ400.

The early 1970s were the beginning of everything we take for granted today in motorcycling. Disc brakes that work, electrical systems that allow us to ride after dark without running out of our headlight beam, suspensions that work and engines that start at the push of a button.

Is there more innovation to come? I'm betting there is! That's why I'm still here!◆

Fred DeHart
201 Circle Drive N. #107
Piscataway, NJ 08854
(201) 469-1221



SOUTH & CENTRAL

I have enjoyed more than 24 years at Kawasaki as a service instructor. My first year with Kawasaki was in Avenel, N.J. After the first year I moved to Atlanta. I have always been a service instructor. My other responsibilities through the years were warranty coordinator, customer service, and the Hot Line. Of course, the warranty and customer service were done in Atlanta, long before these services were consolidated to California.

I have seen the company grow and have seen the introduction of many new exciting models. When I joined Kawasaki in 1972, the latest and hottest model was the H2-750 triple. It was the fastest of a long line of two-stroke motorcycles that gave Kawasaki its image as "King of performance."

I remember hearing rumors about T103—that was the project name for the legendary Kawasaki Z-l. The Z-l elevated Kawasaki to a level all its own in the industry with speed, beauty, power, and unmatched reliability.

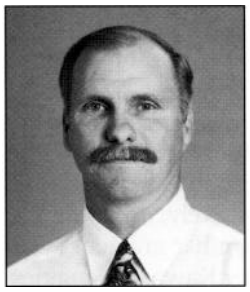
Kawasaki was known only as a motorcycle company. In 1972, people were surprised when we started selling a "boat" known as the Jet Ski. It started slowly, but over a period of about 10 years Kawasaki created the personal watercraft industry.

In 1974, Kawasaki opened a manufacturing plant in Lincoln, Neb. It was the first of several manufacturing plants in the states.

Kawasaki continues to explore areas of new product designs such as the MULE. The basic MULE design evolved from changes to an ATV, and its project name was Pony.

As I look back over the years, I have seen Kawasaki grow and prosper. I am proud to be a part of it. I am anxious to see what the next 30 years will bring. ◆

Walter Rainwater
6110 Boat Rock Blvd. S.W.
Atlanta, GA 30378
(404) 349-2000



WEST

I would like to take this time to say hello and introduce myself to all of the technicians in the West Region. My name is Rob Taylor and I look forward to learning all of your names in the upcoming training year.

My main responsibility at Kawasaki is in the area of training and technician development. I am a firm believer that a well-trained and up-to-date technician is a must for the new breed of motorcycle, ATV and Jet

Ski products, and I am dedicated to providing that service to you!

I am very excited about the new direction and commitment that we are making at Kawasaki, and look forward to providing you with the best factory training and support available. This summer we will be re-organizing and upgrading all of our courses, so be prepared for something new on the training horizon.

There are a limited number of classes still available in this training season; the last class in the West Region is Fuel Systems to be held on April 12. If you need a copy of the training schedule (TR96-0l), you may obtain one by calling K-FAX (714) 460-5663 and ordering document number 1305.◆

Robert Taylor
9950 Jeronimo Road
Irvine, CA 92718
(714) 770-0400

New Phone System In Consumer Services

Over the last several months, we have been making some changes in the way we handle incoming telephone calls in Consumer Services which we feel will help us give better service to our customers. We now use the same telephone system the Hot Line uses except for the pop-up screen feature. Incoming calls are routed to the first available Consumer Analyst.

Most importantly, Consumer Services now has a direct line just for customers. They no longer have to go through the switchboard to reach our agents. The new number is (7l4) 460-5688, with assistance available from 8:30 a.m. to 4:30 p.m. Pacific Time. Please use our new number when referring customers to Kawasaki. Also, your customers will have an opportunity to leave a message if all the analysts are on line, and they can't (or don't want to) wait for the next available person. Any customer who does leave a message will receive a return call within 24 hours, usually sooner. We think these improvements in our phone system will result in better, faster service for our customers.◆

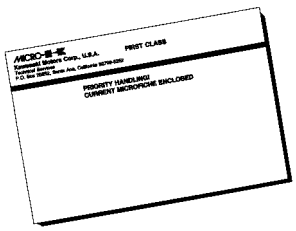
–May Sola, Consumer Services Assistant Manager

Micro-K

Open Your Mail!

by David Pyle
Parts Publications Specialist

Every month we send your dealership an envelope containing new and revised microfiche that are very important to you. One recent mailing contained a revised microfiche card for the KX250-K3 that included some changes that were very time sensitive. In



other words, you needed the new fiche card in your deck ASAP! I made a few calls to dealers to see if they had received their copy, and was surprised to find that the dealers I called had received the microfiche envelope several days before but had not filed them yet. In addition, they had the envelopes from the previous two months' mailings sitting next to their microfiche reader...unopened!

We know that as a dealer you receive large quantities of mail from Kawasaki as well as other OEMs and countless aftermarket companies. With that in mind, we have tried to design an envelope that is clearly marked and different from the rest of the mail you receive. The envelope that we use has a lime green and fire cracker red stripe across the front along with a red "Micro-K" and large bold black letters that state "PRIORITY HANDLING! CURRENT MICROFICHE ENCLOSED." We've tried to make it easy to spot if you're looking for it, and hard to overlook if you're not.

The bottom line is: If your new microfiche is sitting in your IN basket or on your parts counter and you're using the old ones instead, you could be ordering the wrong parts and running into other problems. Be sure to open those envelopes as soon as they get there; you never know, there may be a surprise inside some day!◆

Product labels and Replacement ID Numbers

by Don Church
Manager, Service Training and Communications

This is an article that started out simple enough, but it quickly grew in proportion. Originally, I just wanted to explain why some product labels are not available; but then the subject of hull and frame replacement came up and what should be done about putting new ID numbers on them. So, here we go.

Labels Not Available as Spare Parts

- Jet Ski watercraft: U.S. Coast Guard Exemption label.
- Street Legal Motorcycles: Vehicle Emission Control, Motorcycle Noise Emission Control, and Compliance with Federal Motor Vehicle Safety Standards information labels.

None of the above labels are available as spare parts because their purpose is to verify that the vehicle meets all required government standards ***at the time of manufacture.*** The latter two labels even have the vehicle's VIN printed on them, and are preprinted by the manufacturing controls group for application to that specific vehicle.

All of these labels are for manufacturers to indicate that their products are legal when they roll off the assembly line. There is no way Kawasaki can supply these labels as spare parts because Kawasaki cannot ensure that they would be installed on the exact vehicle for which they were intended, nor could Kawasaki ensure that the vehicle is completely stock and not modified.

ID Numbers for Replacement Frames and Hulls

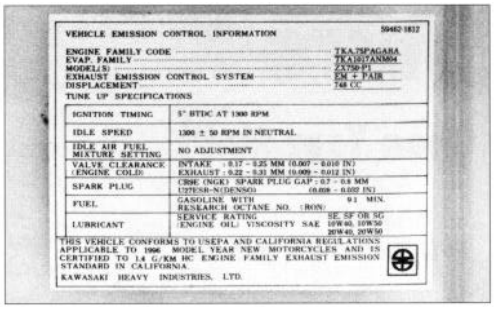
As you know, replacement frames and hulls are available as spare parts, and they do not come with ID numbers. It is very important that you or the registered owner of the vehicle obtain instructions from the state agency responsible for registrations. Get these instructions in writing.

For a replacement motorcycle frame, your state may or may not issue a new VIN. The state may request that the VIN be stamped on the replacement frame by the state highway patrol or other state agency, or it might be OK for the dealer to do it. Just follow the written instructions from your state. Also, be sure to provide the owner with thorough documentation such as a detailed repair order and sales receipt for the replacement frame.

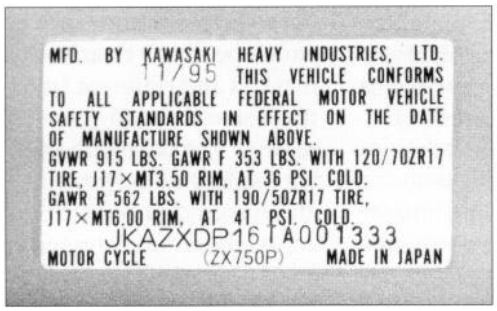
Replacement hulls may not be handled by your state in the same manner as replacement motorcycle frames. This, of course, is something you will need to investigate. What you should know is that Kawasaki can provide replacement HIN plates for Jet Ski watercraft. If the state assigns their own new HIN, Kawasaki will not be able to make these plates; the only plates we can make are copies of original plates. If the state does allow the original HIN to be used on the replacement hull, call Kawasaki's Consumer Services Department. We will ask for copies of the written instructions from the state and the owner's current registration showing the HIN, plus the old HIN plates removed from the damaged hull. KMM will make replacement HIN plates (specify one or two). Provide us with the name of someone in your store and KMM will send the plates directly to that person.

Because the regulations vary so much from state to state, we suggest that you do a little research now. If you know what steps to follow, you can be very helpful in getting your customer back in action as quickly as possible. Don't wait until the customer is ready to pick up the vehicle, because these things take time.◆

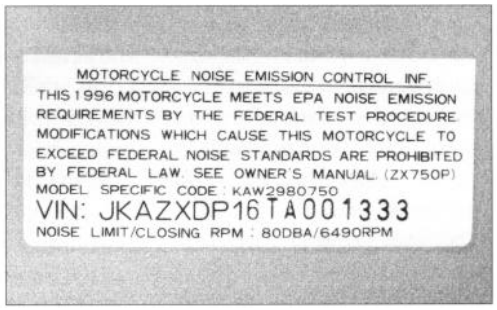
U.S. COAST GUARD EXEMPTION



VEHICLE EMISSION CONTROL



FEDERAL MOTOR VEHICLE SAFETY STANDARDS COMPLIANCE



NOISE EMISSION CONTROL

Clutch leaf Spring for Concours and Voyager

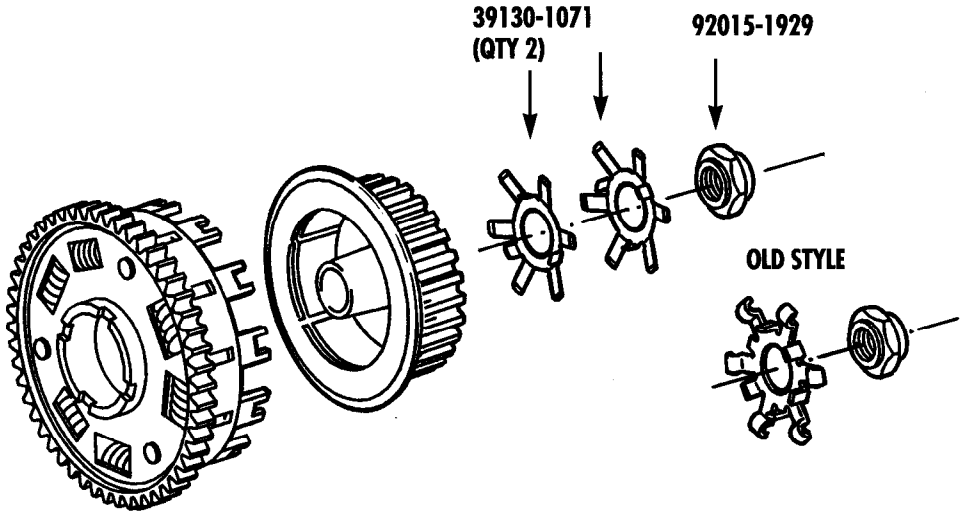
by Gregg Thompson
Product Support Supervisor

We've had some problems in the past on our Concours and Voyager XII motorcycles with a small leaf spring that is located in the clutch hub. For reasons not known to us, this spring has had a tendency to break. In itself, the spring breaking seems to have no effect on the vehicle. The broken pieces are trapped inside the clutch hub with nowhere to go, and the loss of the spring's function is not noticeable to the operator. However, a piece of the spring will eventually fall between two clutch plates and cause the clutch to slip. That's when the customer brings the bike to you.

In the past you had a choice of either assembling the clutch without the spring or putting a new one, just like the old one, back in it. Repeat failures of this spring have been common, so replacing it has not always worked out well. We are not certain what the purpose of this spring is, but we believe it serves as a damper to prevent rattling noises when the clutch is disengaged.

Recently, this spring was replaced with a newly styled one, which is actually two springs stacked one on top of the other. These new style springs require a new clutch nut as well. The depth of the machined shoulder on the nut is changed to go with the new springs.

So far we have not heard of any breakage problems with the new style springs, but it still presents a little problem for us. Since the new springs require a different clutch nut, the old part number does not substitute to the new one and the parts microfiche for older noncurrent models do not show the new parts. Anyone ordering off the fiche for an older model will be using the old part number which is no longer available and has no automatic substitution. The newly styled **spring** (P/N 39130-1071) will work in any of these older models, but the new **nut** (P/N 92015-1929) must be used with it.◆



HERE IS A LIST OF THE MODELS THAT USE THIS LEAF SPRING IN THE CLUTCH:

- **ZG1000-A1/L through Present (Concours)**
- **ZG1200-B6/L through Present (Voyager XII)**
- **ZL1000-A1/L (Eliminator)**
- **ZL900-A1/L, A2/L (Eliminator)**
- **ZR1100-A2/L (Zephyr)**

An Effective Way to Find Hull Leaks

by Kenny Osberg
Product Support Specialist

If you've ever had trouble finding hull leaks in a personal watercraft, I have an idea that will make it a lot easier. First of all, the only really effective way of finding a hull leak is to fill the hull with water and watch for it to leak out. The problem is that if the leak is not real fast, it can be hard spotting it and finding the exact location of the leak. You can make it easier by dyeing the water with Kool Aid™ (don't add the sugar). On a white hull, it's a lot easier to find a trickle of red water.

You might find water leaking out of cable fittings, rivets, exhaust outlet, drain plug fitting, bolt holes, water pipe fittings or the driveshaft tube. With all of these, *except the driveshaft tube,* you will probably fix the leak from the outside. However, if water is leaking *through* (not around) the driveshaft tube, the repair must be done from the inside. Any time water leaks out through the driveshaft tube, either the driveshaft bearing seal or holder is leaking, or the front of the tube is not properly sealed to the bulkhead. If the driveshaft tube is not sealed to the bulkhead, remove the driveshaft and bearing holder and seal it with epoxy putty (such as Kawasaki Hull Repair Kit, P/N W61080-001).◆

Mysterious Rich-Running Jet Skis

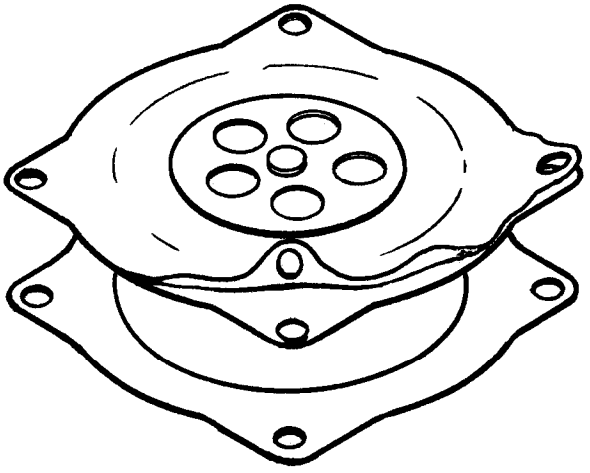
by Keith Pestotnik
Senior Product Quality Engineer

We have recently discovered a strange little problem on a few (very few at this point) Kawasaki watercraft. The units in question had intermittent but nagging problems with rich running at partial throttle openings, and a cylinder would occasionally flood with fuel. There are a number of things that can cause rich-running symptoms, but the inconsistent nature of the problem in these few cases made them very hard to find.

The defect that was discovered was in the carburetor. With these symptoms, most technicians wouldn't waste too much time getting to the carbs, but this particular defect was still not easy to find. What was found in these cases was a defective fuel regulator diaphragm. These diaphragms were found to have two of the thin rubber membranes rivoted together instead of one.

It's not obvious even when disassembled because the membranes tend to stick together and the black paint that is added after the carb is assembled hides the edges. These double diaphragms didn't look or feel much different from a normal one.

This same diaphragm part number has been used in our watercraft carburetors for 10 years. We've only seen a few of these double diaphragms, so we don't know how common it is; but we suggest you keep it in mind in case you ever work on a Jet Ski watercraft with intermittent rich running.◆



DIAPHRAGM WITH TWO RUBBER MEMBRANES

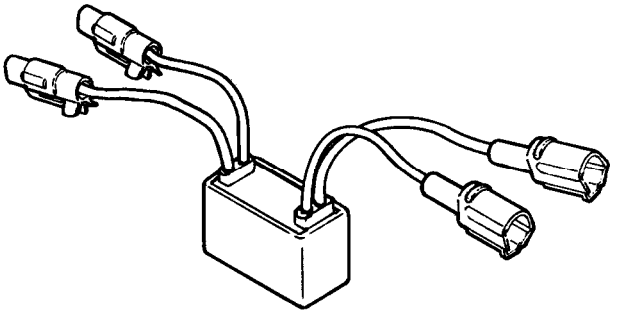
REGULATOR COVER GASKET

750 and 900 ZXi Speedometer Sensors

by Joe Heim
Quality Assurance Engineer

We had an unexpectedly high number of failed speedometer sensors on both 750 and 900 ZXis in 1995. In addition, it seems that some units will go through more than one sensor in a riding season, while most units never experience the problem at all. An investigation has revealed that these sensors are failing as a result of voltage spikes in the electrical system that are not filtered out before reaching the speedometer sensor.

An in-line voltage regulator (P/N 21066-3713) has been added to late 1996 units on the production line. This regulator will protect the speedometer sensor by filtering out any abnormal voltage surges. It is installed in series between the speedometer sensor harness and the main harness, and is secured to the main harness with a zip tie.

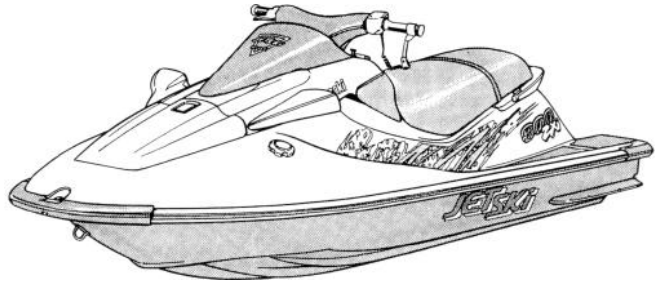


In the future, if the speedometer sensor fails on any 1995 or early 1996 750 or 900 ZXi, you should install one of these regulators along with the new sensor to prevent a repeat failure.

This in-line voltage regulator is not used on the 1100 ZXi. The new 1100 has a similar voltage regulator incorporated into the speedometer assembly.

Note: This article does not constitute warranty authorization. Normal warranty policies and procedures apply.◆

HULL REPAINTING— Take a Picture First!



by Gregg Thompson
Product Support Supervisor

Last year, with the colored hulls on the 900 ZXi, we had an unusually high incidence of hull paint problems. This was partly because we had more actual paint failures on these hulls than normal, and partly because it was much more obvious to the customer when some paint did come off.

This increase in paint failures has resulted in some of you becoming so familiar with the whole process that you've been having the hulls painted without calling us first. This shouldn't present any problems if you know that your painter's price is OK with us, and you *follow all the other rules* pertaining to hull repairs.

The problem is dealers have been forgetting to take pictures of the hulls before sending them off to be painted. Let me be real clear about *this: Not taking a picture of the paint failure before having it repaired could jeopardize your getting reimbursed for the work!* There are times when we must have a picture of the failure. If you don't have one.... well, don't put yourself in that situation. Take a good picture of every paint failure (more than one if needed to show all the affected areas), clearly mark it with the HIN number, date, work order or log number, etc., and file it.

When you call for authorization, or any time in the future, someone could ask to see that picture. ◆

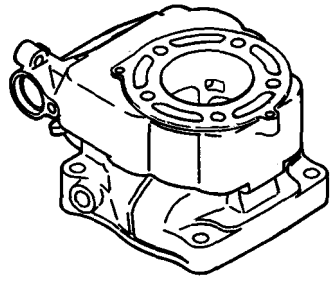
KX Cylinders

by David Behlings
Product Support Specialist

We have received a number of phone calls from concerned dealers about what they thought was "missing electrofusion" on KX cylinders. Most of the calls have been regarding KX125s and involved what the dealers describe as dull gray areas around the ports (especially the exhaust port bridge) that looked like the electrofusion coating had come off.

I've had a few of these cylinders sent in for inspection and most of them had no missing electrofusion. Instead, there are areas around some of the ports that are slightly low and therefore not polished by the ring. These low spots appear as dull gray areas usually on or above or below the exhaust port bridge. The truth is these spots are common and not significant to the performance of the cylinder.

It looks to us like the factory does some clean up work around the ports of the casting before the electrofusion coating is added. The resulting slightly lower spot in the cylinder surface does not get polished by the ring like the rest of the cylinder. On the cylinders we inspected, these low spots were so slight that they disappeared from view with only very light honing.



If you have a cylinder that you are concerned about, we suggest you run a ball hone through it lightly and then inspect it. Any areas with missing electrofusion will show up clearly against a clean cross-hatched cylinder wall. ◆

KLF400 Air Intake Snorkel Kits

Just a reminder: We have air intake snorkel kits for KLF400-Bl through B3 in stock. These kits are priced very reasonably and will update an older unit to the 1996 model system. If you have customers who have trouble keeping dirt out of their engines (used daily in dusty conditions on a farm, for example) you should recommend they purchase one of these kits.

For more information about the kit, see the article on pg. 8 of the Fall 1995 issue of *K-Tech News.* The Kit P/N is 99995-1350. *-Ed.*

New Fuels: Oxygenates and Reformulation

by Shannon Beeson
Product Support Specialist

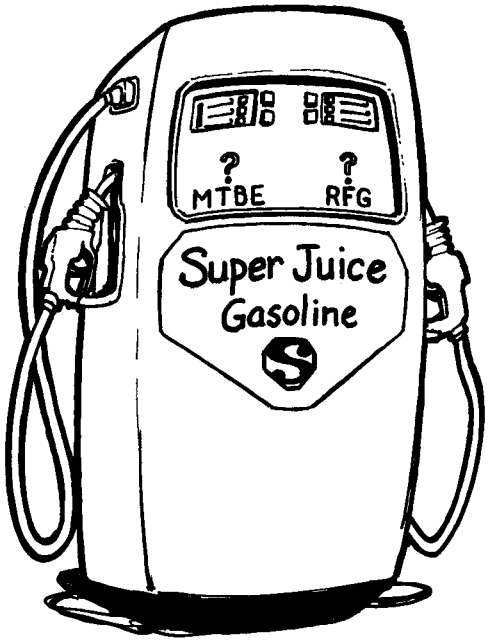
Over the past several years, two new variations of conventional gasoline have begun to be the norm, rather than the exception, at gas stations across the United States. These new blends of gasoline are oxygenated fuel and reformulated gasoline (RFG). As with most things that are new, there are several misconceptions about these fuels and the effect that they have on the vehicles.

Oxygenated fuel is simply conventional gasoline with an oxygen bearing compound added. The addition of this oxygenate reduces the amount of hazardous carbon monoxide (CO) emissions from vehicle exhaust by 10-30%. Originally, oxygenated fuels were found only in larger urban areas, mainly in the wintertime due to higher levels of CO emissions during cold weather; but now they are becoming common in areas across the United States all during the year.

In the United States, the most common oxygenates are ethanol (grain alcohol) and methyl tertiary butyl ether (MTBE); and although other oxygenates are available, they have yet to become widely used. Laws controlling the use of oxygenates allow that (by volume) up to 10% ethanol or up to 15% MTBE to be added to gasoline. At these levels, oxygenated fuels have not shown any evidence of causing abnormal deterioration in most fuel systems. However, on some older fuel systems, certain rubber parts have shown signs of swelling when oxygenated fuels have been used. When this problem is encountered, these parts must be replaced with newer, more fuel-tolerant, parts

Another concern is long-term storage of vehicles with oxygenated fuels and its effect on some fuel system materials. For the most part, fuel containing oxygenates should be drained from the fuel system if the vehicle is going to be stored for a long time. Not only may these fuels attack some rubbers and plastics, over time they generally tend to absorb water into the oxygenate-which will promote corrosion of metals in the fuel system. Additionally, today's fuels contain more aromatic hydrocarbons and "light end" components to boost octane, but these components also evaporate out of the fuel more easily, causing the fuel to become stale and unusable more quickly.

During the mid-1980s, oxygenated fuels were mistakenly blamed for causing vehicles to vapor lock in hot weather. This.



problem was actually more related to the previously mentioned aromatic hydrocarbons and "light end" components. Refineries began adding these new compounds to gasoline to maintain the octane as the lead, which had previously provided the octane, was being legislated out of the fuel. Fortunately, since these evaporative emissions are undesirable and a health hazard, laws have been passed to limit the amount of these compounds that can evaporate from fuel. This effort has also eliminated the hot weather vapor locking problems that were encountered in the 1980s from using these fuels.

It should be noted that these evaporative emissions are related to the ability of the fuel to vaporize. A fuel's tendency to vaporize decreases as the temperature decreases, and since only vaporized fuel burns, an engine without vaporized fuel will not start. Therefore, to aid in cold weather starting, fuel suppliers mix special blends of fuel for winter-time use. These winter fuels are more volatile and vaporize more easily, but are much more likely to cause vapor locking if they are used in hot weather. Conversely, if a summer fuel is used in cold weather, the unit will be more difficult to start or may not start at all. These situations often occur if a customer stores units with fuel in them or fuels their units out of personal storage tanks that have fuel blended for use in a different season.

Although vapor locking is no longer a problem related to this fuel, some idle and running problems may be related to the use of oxygenated fuel. It is possible some units that are carbureting very lean on conventional gasoline may develop an unstable idle or die at idle when running on oxygenated fuel. This is a result of oxygenated fuel running leaner than conventional fuel, and can be overcome by adjusting the pilot air/fuel mixture to compensate for the additional leanness of the fuel. Also, since more of an

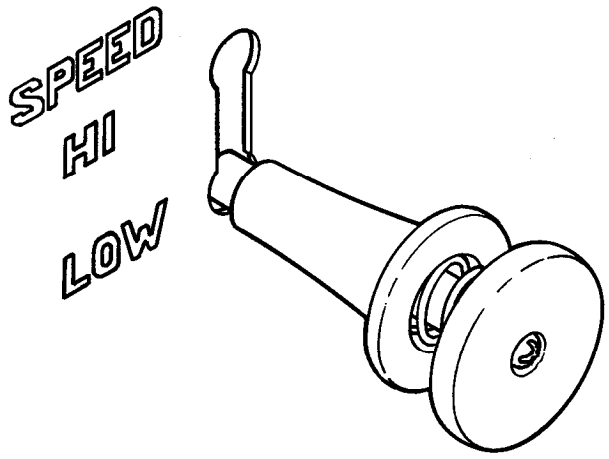
oxygenated fuel is required to make the same amount of power as a conventional fuel, a fuel mileage decrease of up to 2% can be expected when compared to an equivalent conventional fuel. This is negligible considering that variations between summer and winter fuels combined with personal driving habits can affect mileage from 10% to 15%.

The other new term that is often heard when talking about fuel is reformulated gasoline (RFG). All RFGs are oxygenated fuels, but not all oxygenated fuels are RFGs. RFGs are simply oxygenated fuels that follow guidelines altering or limiting the amounts of certain ingredients in order to lower the amount of vehicle NOx emissions, the main ingredient of smog, and also minimize engine and fuel system deposits. At present, RFGs have not exhibited any additional problems that had not already been encountered in other oxygenated fuels and the same precautions should be taken when using an RFG.

Although oxygenated fuels and RFGs have been blamed for a wide range of problems, for the most part these fuels are responsible for only a few minor running problems (but have been a great benefit to the environment). Given the results that have been seen so far, one can expect to see much more widespread use of these fuels in the future. A basic understanding and familiarity with these fuels will dispel many of the myths that have been spread about these fuels in the past.◆

Proper Use of low Range on MULE™ 4x4s

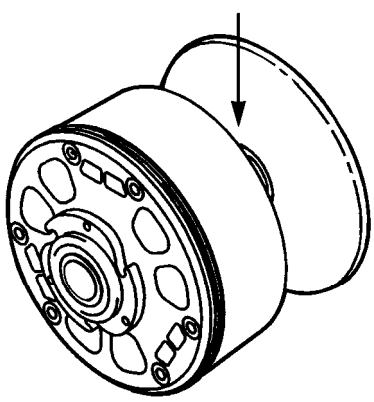
by Gregg Thompson
Product Support Supervisor



Most of you already know that Kawasaki's Four Wheel Drive MULEs (KAF540-C MULE 2010 and KAF620-A MULE 2510) come with a High/Low range subtransmission. Unfortunately, some dealership personnel, and even more customers, are not aware of a serious problem that can result from improper use of this dual-range subtransmission.

Due to the automatic torque converter primary drive system, these MULEs will do most heavy jobs (towing, hauling and hill climbing) in either High or Low range. While the vehicle is in High range and doing heavy work, the torque converters maintain low overall gearing by not shifting through their normal range of movement. In other words, the torque converters try to compensate for the high gearing when under heavy loads. The problem is this results in accelerated wear on the torque converter drive system components.

When the drive converter first begins to apply pressure to the belt as engine RPM rises, the heavily loaded vehicle (with the subtrans in High range) resists movement and the driven converter resists shifting. At that point, the load may be great enough to cause belt slippage and excessive heat. As the vehicle begins to gain speed, the belt slippage stops but the heavy load prevents the torque converters from upshifting; so the belt runs in a very small area of the drive converter sheaves, resulting in extraordinary wear. As the converter sheaves wear, the belt becomes even more prone to slippage, compounding the problem. The belt and drive converter will suffer the most from these conditions, but the driven converter may also experience abnormal wear.



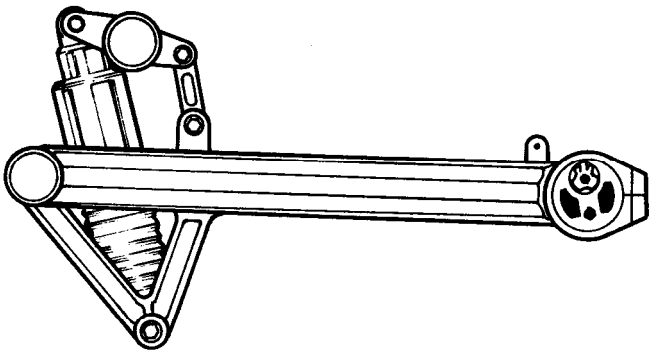
When the vehicle is being used in High Range under heavy load conditions, the drive converter will be worn at the innermost (smallest diameter) part of the sheaves and the driven converter will be worn at the outermost (largest diameter) part of the sheaves. If you see this kind of wear, you can be pretty certain how it was caused.

Be sure you educate all your dealership personnel as well as all your Four Wheel Drive MULE customers about the proper usage of the High/Low range selector on these models.

By the way, these same conditions can be created if the vehicle is driven frequently with the emergency brake on partially. If the customer insists that they don't do heavy work in High range, you should talk to them about emergency brake usage and inspect the emergency brake to make sure it releases completely.◆

How Far, How Fast

Continued from page 3



The best part of the Uni-Trak system is its versatility. Springing and damping rates can be adjustable, and either progressive or linear.

good, too. Air adjustable Kawasaki forks appeared in the early eighties, and today's ZX-7RR forks are incredibly adjustable: 13-way rebound damping, 28-way compression damping, infinitely adjustable spring preload, even adjustable rake! Today's suspension systems handle and ride better than yesterday's, and they are more reliable and durable in the bargain.

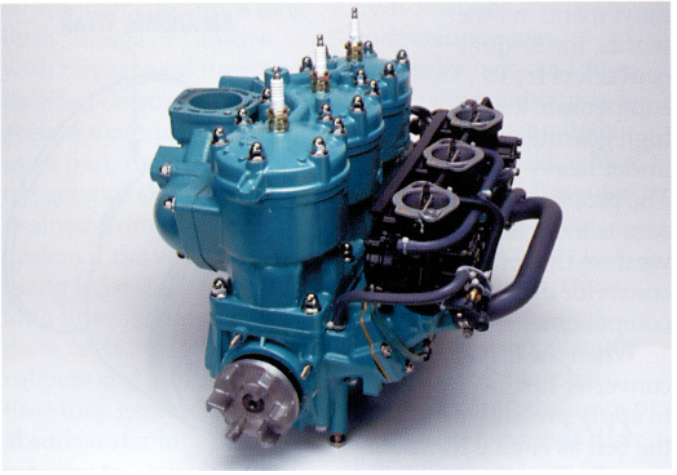
The frame has progressed, too. In the old days, small diameter steel tubes wound from the steering head to the swing arm pivot, loaded with brackets and hidden away under the fuel tank. That's been replaced by smoothly pressed aluminum beams arching gracefully across the motorcycle's flanks, rigid, strong, and light—and still loaded with brackets (you gotta mount the electrics somewhere). The design of the modern aluminum perimeter frame allows it to be stronger, yet lighter, than a conventional frame, though it can be a bit more expensive. This is why Kawasakis that do not need the ultimate in handling prowess don't have aluminum perimeter frames.

Brakes have changed incredibly over the years. Drum brakes were just fine in 1969, but today's conditions and markets demand disks: hydraulic disks, stainless steel disks. Kawasaki's first disk brakes in 1972 were good... then. We started out with a single piston caliper gripping a solid stainless steel disk. We still have single piston calipers today (where they make the most sense), but we also have double piston calipers, double opposed piston calipers with semi- and full-floating drilled and slotted disks, and even quadruple- and six-piston opposed calipers. There's just no stopping the march of brake technology.

Other chassis parts have changed as well. Radial tires in the nineties wear longer and handle better than anything offered in the sixties. Anything! An O-ring or X-ring chain will last as long as the average shaft drive did 30 years ago. And they'll carry twice as much power doing it.

So much has happened in 30 years of motorcycling that we haven't even had time to mention watercraft: stand up boats; sit-down boats; 300cc singles; 400cc, 44Occ, 55Occ, 65Occ, 75Occ twins; triples to 1100cc; one-person craft, two riders, three! Twenty-six horsepower to 120. The progress is stunning. And it isn't over yet!

Here are some other things we haven't talked about: CDI (magneto and DC powered), TCBI, computer-aided design, digital ignition, electronic fuel injection, shaft drive, cast wheels, CB radios, halogen headlights, dual-foam seats, gear driven engine balancers, double wishbone front suspension, push-to-cancel turn signals, detachable sub-frames, positive crankcase ventilation, wind tunnel designed fairings, Kawasaki Clean Air System (air injection), CV carburetors, Superlube, electric fuel pumps, limited slip front differentials, four-speaker stereo systems, automatic cam chain tensioners, positive neutral finder, the first ever U.S. factory for a Japanese motor company, hydraulic valve lash adjusters, varied pitch impellers, dual-mode differential, rev limiters, Kawasaki Ram Air System, semi-downdraft carbs, hollow camshafts, Kawasaki Integrated Powervalve System (KIPS), cruise control, air shocks, quad-link rear suspension, anti-lock braking system (ABS), Injectolube, straight-pull spokes, automatic nozzle trim, accelerator pumps, liquid-to-air and liquid-to-liquid oil coolers, and many others we can't think of and have even forgotten altogether. How many did you recognize?



1100 ZXi Engine

Kawasaki technology, the technology behind the product, is the result of the continuing efforts of everyone in the Kawasaki family: from the engineers who design it, to the dealers who sell it, to the customers who demand it. Congratulations! ◆