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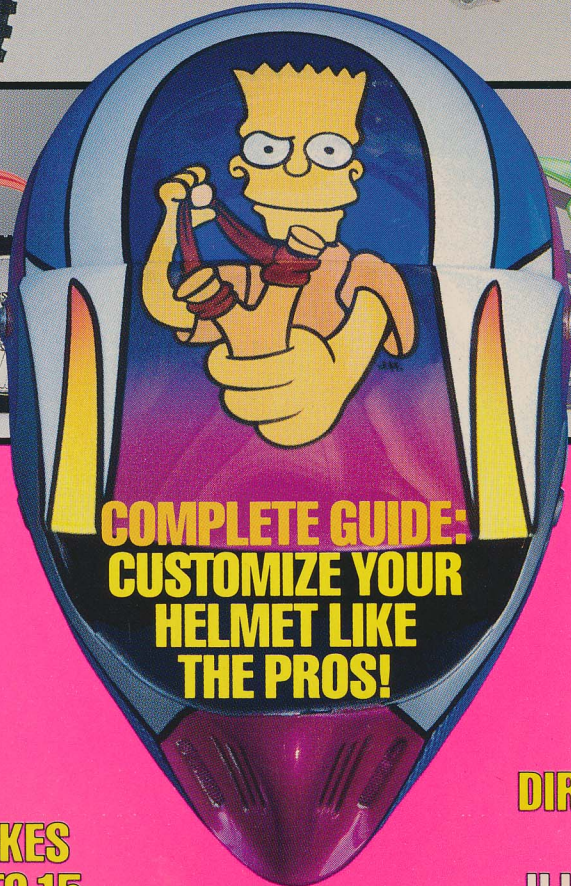
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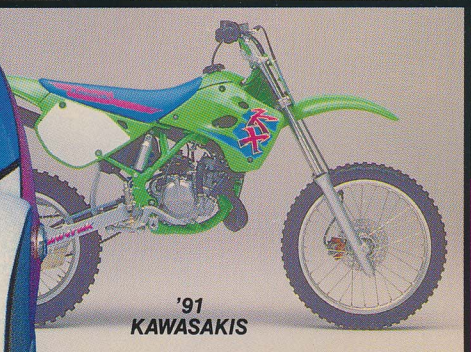
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CUSTOMIZE YOUR  
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**AERIAL TRICKS  
YOU WON'T BELIEVE:  
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**CAN THE NEW  
RACE FUELS MAKE  
YOUR BIKE FASTER?**

**DAYS OF THUNDER  
SHOOTOUT:  
DIRT BIKES vs. RACE CARS!**

**ILLEGAL SECRETS: HOW TO  
MAKE YOUR BIKE 10 LBS. LIGHTER!**

**BEST BIKES  
FOR 5-TO 15-  
YEAR-OLD RIDERS!**



ISSN 0364-1546

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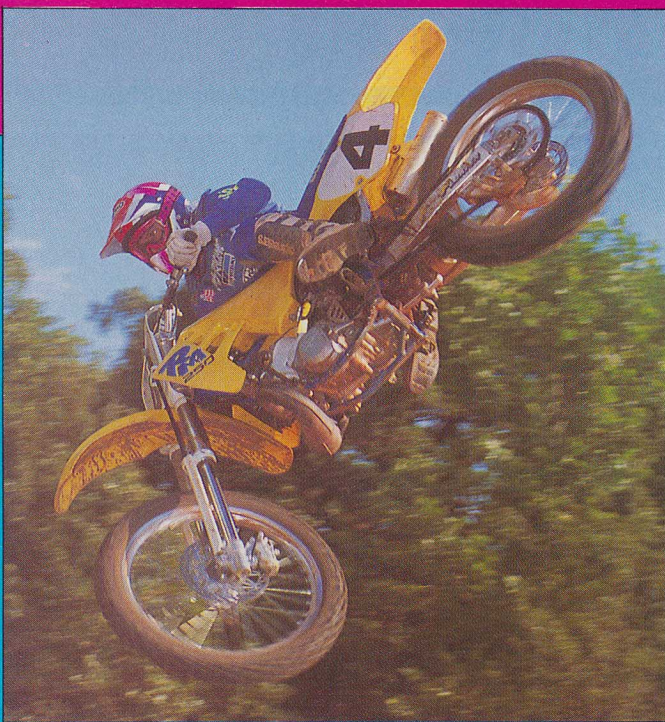
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ON THE COVER: 1991 motocrossers from Yamaha, Honda, Kawasaki and Suzuki vie for "rarest bike" honors without even moving. Kirby Concepts' custom-painted Arai MX-Pro helmet demonstrates how paint can identify you as a pro racer and say a bit about your role models at the same time. Photos by the press relations departments of the respective motorcycle manufacturers and by Kirby Concepts, except for Tim Tolleson's RM shot. Cover design by DeWest; color separations by Valley Film.



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**WARNING:** Much of the action depicted in this magazine is potentially dangerous. Virtually all of the riders seen in our photos are experienced experts or professionals. Do not attempt to duplicate any stunts that are beyond your own capabilities. Always wear the appropriate safety gear. *Dirt Bike* does all of its testing and photography legally on public land, or private land with permission from the owner(s), and we abide by the local laws concerning vehicle registration and muffler/spark arrester requirements. We are not responsible for quality of aftermarket accessories we use.

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# RACING GAS & OCTANE BOOSTERS

*Power in a can, or hype from the hose?*

By Rick Sieman

It all started with a letter to Mr. Know-It-All about racing fuel. A Kawasaki rider filled his gas can with what he thought was racing fuel and a good two-stroke oil. When he hit the track, he wasted a fresh motor—big-time. It turned out that he had purchased a “pseudo-racing gas” with alcohol in it. Alcohol is an oxygen carrier and it had the immediate effect of adding air to the engine, enough air to seize the engine tighter than a rusty chain.

The Kawasaki rider tried to do the right thing, because his bike pinged and rattled on normal pump gas. The mistake cost him over 800 hard-earned bucks.

So what's the answer? Can it be found in a can? Do octane boosters work? What about racing gas? How can you tell one racing gas from another?

## RACING GASOLINE: HOW IT'S MADE

To get some straight answers, we spent a day with Bruce Conrad, owner of F&L Fuels and Lubricants. Bruce makes Pro-Gas and knows what works. He's also the man we did a story on last year: “The Man with 54 Huskys.”

Also answering questions was Randy Scoville, the Champion spark plug rep to IMSA and the NHRA. Both Randy and Bruce have extensive racing backgrounds, as well as a solid background in racing fuels.

**Q:** How are racing fuels made?

**A:** All gasoline contains the same general family of hydrocarbons—low-test, high-test, racing gas and aviation gas. General refiners are set up to make a large volume of gasoline, hundreds of thousands of gallons per day, to satisfy their retail market.

Making a racing gas goes like this: you start with a blending stock of gas, then you're going to add your own additives to



end up with whatever octane level you're after. A blending gas is a raw, basic gasoline with no additives or detergents. Iso-octane is an example of one that can be used.

You have to calculate what you want in a racing gas before you start adding things to a blending stock, or even what kind of blending stock you start with. For example, for the fuel that we make, we want to end up with an octane of approximately 108 research method with a motor octane that will blend back to about right at 103-104 RM/2. That's an average of research and motor methods of testing octane and is the most commonly accepted rating.

We add lead, lead scavengers, various aromatics, naphthenics and light-end hydrocarbons to get the correct Read Vapor Pressure to control vapor lock.

You have to change gasoline from a liquid to a vapor to get it into a proper state for an air/fuel mixture ratio so the spark plug

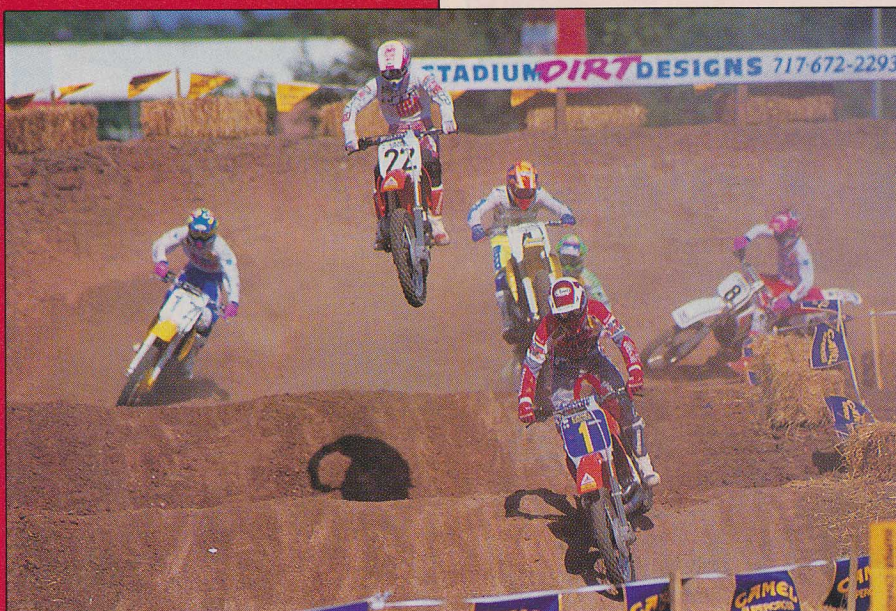
**Improper head dimensions or ignition timing in stock machines can cause detonation; so can running pump fuel in a highly modified engine. How much octane do you need for your dirt bike? Read on.**

can ignite it. A carburetor does this job of turning the liquid into a vapor.

**Q:** We see ads all the time, “this gas has 102 octane,” “this gas has 115 octane,” or another with 118. What do we need? Let's say you have an engine with 8.5:1 compression ratio; how much octane does it require?

**A:** That's a tough question. It has a lot to do with the combustion chamber shape, location of the spark plug, condition of the combustion chamber, the air/fuel ratio you enter into it—a huge number of factors including the air temperature and the load the engine is put under.

What we're talking about is trying to defeat detonation; that's the real problem. I



**With a National title bringing lucrative bonuses and future contracts, the factory motocross teams leave nothing to chance. The motors are highly modified for optimum performance, and correct octane ratings and specific gravity of fuel are critical for perfect jetting.**

can give you some approximate guidelines: If you're using a 10:1 and over engine, you need racing fuel. On a 9:1 engine, you're probably in the 98 octane area, and there are a lot of good strong 9:1 engines out there.

There is no real linear type of relationship between compression ratio and the octane requirements. You can have an engine with extremely high compression and really have a low octane requirement. I know people who have had engines in the 13:1, 14:1 or 15:1 compression ratio range and have used 103- to 104-octane fuel with no problems.

**GOOD GAS/BAD GAS:  
MAKING IT HAPPEN**

**Q:** *What makes a good racing gasoline? Any secrets you'd like to give away?*

**A:** We buy a blending stock from two different companies. There are two different stocks and we co-mingle those. Now this is important: these stocks are sold by an ASTM specification and it means they'll be the same quality and molecular weight each time.

We try to control the variables as tightly as possible, by buying the same group of chemicals, time after time, with the same chemical characteristics. What we end up doing is giving you a base fuel that you can tune with and use, and it doesn't change.

It has the same chemical components, the same chemical characteristics, the same specific gravity and all of this is very important for consistency. A racer doesn't want to change the variables; fuel is one of them.

We've done our own testing, and without naming names, I can tell you some startling facts. We've sent samples of certain racing fuels to the lab for testing and one time it's 114 octane, a month later the same brand of fuel tests out to be 108. It's got a specific

gravity of .76 one time and the next batch tests out at .73.

You splash it in the motor one time and it runs great. The next time, the specific gravity of the fuel is different and it flows differently. Different specific-gravity fuels flow through the jets, or the carburetor, at different flow rates. By just changing the fuel, you can richen or lean out your engine.

Let's say a major refiner wants to make an 86-octane fuel and they want it blended as economically as possible. The building blocks used to make a higher-octane fuel are expensive! The benzenes, toluenes, xylene complexes, or the BTX complexes—they want to use as little of these as possible. That's why lead was always so effective, because they could splash a lot of lead in it and bring the octane way up, and do it really cheap. These major refineries are only making a cent, two cents or three cents a gallon profit once the smoke clears. They have to keep production costs down.

Refiners of race gas are not under that restriction, because these fuels usually cost three dollars a gallon or more and the profit potential is greater, at least on a per-gallon basis.

Given the reliability of race gas, you should be able to make a good fuel, with repeatable characteristics, time after time. A consistent standard is the single most important thing to look for in a racing fuel, I feel.

**Q:** *More important than high octane numbers?*

**A:** Absolutely! Look, if you had a bike where you used a dozen pipes during testing and all of them were different, you wouldn't know where you were at! You couldn't time the motor . . . you couldn't jet it.

Take a drag racer, for example. He might go through three or four sets of pistons in a race. If each piston had a different compression ratio, how would they know what to do? They'd be lost. So the important thing in any racing situation is to have the

same kind of fuel, day after day, time after time, year after year.

**WHY DOES RACE GAS  
COST SO MUCH?**

**Q:** *So the real expense for racing fuel is in the quality control, the assurance that it's consistent all the time. Why can't this be done with pump gas?*

**A:** For a major refiner to make racing fuel is out of the question; he's not going to touch it. It's a pain in the butt to make, there's a lot of quality control that has to be done and there has to be a level of cleanliness you're not going to find in high-volume production.

**Q:** *How can we, the consumers, tell a good racing fuel from one of lesser quality?*

**A:** Given that they all can provide you with an octane, say 103, it may be just window dressing. A lot of people think that by buying a higher octane, it'll make your bike get to the finish line quicker and you may do better. As to usability in a motor, ultra-high numbers are questionable.

Octane will make up for some sins that an engine builder might have built into the motor, but an engine only needs what it needs . . . not a bit more.

What makes a fuel better? Our fuel has been identical for ten years . . . same specific gravity, same Read Vapor Pressure, same octane, whether it be research or motor method of rating.

Some people advertise outrageously high octane readings, which makes it particularly attractive to people who don't understand what they need.

Consistency, reliability, cleanliness . . . these are all important. If you're putting a three-dollar-per-gallon fuel into your gas tank, much of what you're paying for is careful filtering, the water traps, the care taken in delivering it and testing it.

**TOO MUCH OCTANE  
CAN BE BAD!**

Right now in the racing fuel business, there's a race to market the highest octane fuel that can be made. People relate the highest octane to "my motor is making more power." That couldn't be further from the truth.

One the downside to building a fuel with ultra-high octane is adding components that really slow down the flame front in the combustion process. You can get the flame front so slow that the engine is now running in a too-rich condition. This takes away horsepower. So here you are, slowing down the flame front and getting rid of detonation at the expense of losing horsepower. I see this all the time at the track. I see engines running "heavy"; they're trying to tune it to lean it out, when actually the flame front is causing the problem.

**Q:** *Are there good ways to get the good octane numbers and are there bad ways? I guess our question is, are there shortcuts?*

**A:** I've seen some fuels with compositions of 25 to 30 percent aromatic content. Aromatics are a reliable, correct way to build oc-

# RACING GAS

tane, but people tend to think that if a little bit is good, then more ought to be better and a whole lot is just great!

If you run reliable lab tests on octane and incrementally increase the aromatic content, most lab people feel that if you get up above the 10 to 15 percent aromatic content, your octane falls off.

What the engine does is start making more heat, which requires more octane, which makes more heat: a real vicious cycle. It's like a dog chasing its own tail.

The bottom line is this: let's say your motor needs 92 octane to run correctly and you fill up with 125-octane wonder gas. You will not run any faster. In fact, you might end up running slower because of a radically slowed flame front.

## MIXING THE GOOD STUFF WITH THE BAD STUFF

**Q:** Let's say that we have a racer on a budget. He's got a lightly modified engine and would like to run racing gas, but can't afford it. Can he mix race gas with pump gas, and if so, what ratios?

**A:** On a stock motor, I don't think the racer would need to run racing gas, except during the summertime when it's very hot. Here, you stand a very real chance of vapor lock with pump gas. I'd recommend that the racer start out with a good stock major brand gasoline of at least 92 octane rating, then go out and test. Find an area where the engine is going to be taxed hard, like a long uphill sand wash. If the engine runs fine and doesn't ping or detonate, that's good. You can use that gas. Just make sure you buy it at a very busy corner with a high volume turnover. This way you stand a better chance of getting fresh gas, and no substitute gas.

If you do have some pinging and detonation, try one gallon of racing fuel to three gallons of pump gas. In a stock motor, this should do it. Test it again under the same circumstances to check it out. You're going to have to check this regularly, because the variables in the street gasoline will change, while the variables in a good racing fuel will not.

The combination of 92-octane street gas and 103-octane racing gas will kick up the actual octane two or three points. There's no real chart you can draw . . . it's not a linear thing, but that's all it might take to make the motor happy.

Now the racer with the mildly modified motor should notice some real improvements. There should be a little crisper, quicker throttle response. Say the racer is running a 9:1 or 10:1 compression ratio—he might be able to get away with one gallon of racing fuel to one gallon of street gas.

Here's something startling, and I almost hesitate to say it. You don't get any increase in performance with racing fuel. Not a bit. Not any racing gas. Good racing fuel allows you to run your timing more radically, to ex-



The 1990 KTM 250 requires 92 octane or better, so unleaded premium or regular fuel with an octane booster is needed for good engine life. Dan Smith and other top KTM off-road pilots use racing fuel for a winning edge.

tract more horsepower out of what you've got. I can take any racing fuel made—including ours—and make the engine hammer and detonate by have the timing set too far out. Timing lead is critical.

You want to make the engine ping? Easy; just add too much lead. Conversely, running the timing closer to top dead center will cool things down. Remember the TT bikes of ten years ago? They ran so much lead, they could not be kick-started; they had to be push-started.

## HOW TO KNOW WHAT YOU'RE GETTING

**Q:** How can a customer—a user of race gas—know what to look for when he lays his money on the line? Everyone has big numbers . . . everyone tells you their stuff is great . . . is the best. What can a person do to check quality himself?

**A:** One way is to look around and see what successful teams are using. That's one indication. Ask for information about the racing fuel . . . not just flashy hand-out brochures, but test data and ASTM and VVG test numbers. You can show this to someone knowledgeable and have them in-

terpret it for you, because without experience in this field, the numbers are next to meaningless.

I would not buy any racing gas with alcohol in it. That's the first thing I'd ask: "Does it have any alcohol?" It's not that you can't use alcohol. Ethyl alcohol is a good additive; it can be used up to ten percent in most cars. Alcohol really offers a different fuel/air ratio than gasoline. Racers who do run alcohol have to use enormous jets and really drink the stuff through the carb.

Make sure that the fuel does not have MTBE in it. It's a very effective new additive, but it may be illegal in your organization, as it is in many. It's an oxygen- or nitrogen-bearing compound.

Probably the single best thing you could do is to test several containers of the racing gas you're considering buying with a hy-

# RACING GAS



**Off-road racers can face cool, dense air in the morning and hotter temperatures or even severe elevation changes as the event progresses. Hours of demanding terrain can cause a motor to ping or over-heat if the fuel doesn't have sufficient octane rating, but too much octane can actually hurt performance.**

drometer. This will give you the specific gravity of the fuel, and if it varies from container to container it will tell you a very sad story about quality control. You can buy a gas testing hydrometer for about four or five bucks. All savvy tuners test with them *before* they start tuning, or if they cannot use their regular gas.

You don't see the privateers using a hydrometer, because they just don't know any better, but you can bet the top teams test their fuel on a regular basis.

#### **AVIATION GAS: MYTHS & FACTS**

**Q:** *What about using AvGas, or aviation gas, for racing fuel?*

**A:** There's an old wives' tale about AvGas out of World War II and I don't know who started this, but it says that if you put AvGas in your car, you'll burn the valves. There's no doubt that aviation fuel can be used in any internal combustion engine and driven up and down the highway at cruising speeds.

It doesn't make much sense to use it for that, as it goes for something like \$1.75 or \$1.85 in this area, and it is leaded and not easily obtainable.

They have two versions now, even though there used to be three. Now you have 100 low-lead, which is blue, and 100/130, which is green. Some 115/145 [purple] is used by the military only.

A racing bike and an airplane really live in two different environments and they make the gas differently for those environments. A dirt bike runs on the surface of the earth from sea level to normally 6000 feet or so. Outside temperature is generally 50 to 100 degrees.

An airplane generally takes off, climbs to its altitude and the general outside temperature is at or below zero. Even in the summertime, it maxes out at 10 or 20 degrees up there. An airplane does not turn high rpm; a typical prop job loafs along at 2000 to 3000 rpm. Of course, there are some high-performance exceptions. The engine just drones along at low power settings, except for take-offs.

#### **MIXING LEADED & UNLEADED GAS FOR A GAIN?**

**Q:** *Here's a story that's going around: some people say that if you mix leaded regular—typically 87 octane—together with unleaded high-test—92 octane—you end up with an overall gain in octane. True?*

**A:** That's chemically and technically impossible! One and one don't add up to three. Some people will believe anything.

**Q:** *Any last thoughts on racing gas?*

**A:** Yes. Because many racing gasolines contain lead—ours contains 1.75 grams per

gallon—you have to treat it with great care. Do not wash filters in it, or any gas for that matter. If it splashes on you, wash it off quickly and completely. If you soak clothing in gas by accident, do not wear the clothing.

Lead is absorbed through the skin into the kidneys and can accumulate and hurt you. Wear rubber gloves when you handle racing fuel.

#### **PUMP GAS: IT'S NOT WHAT IT WAS A FEW YEARS AGO**

Everyone complains about the new-generation pump gasoline we burn in our cars, trucks and bikes. You know what? They're right! Take a gallon of leaded regular gas, for example. In the good old days, a gallon of decent regular leaded gas contained about two and one-half grams of tetraethyl lead. Today, the average amount is less than four-tenths of a gram! You can find leaded regular with as much as seven- or eight-tenths here and there, depending on the rules and regulations of a certain area, but, by and large, four-tenths is the norm. Old-fashioned high-test [premium leaded] gas used to come with about 4.27 grams of lead per gallon. Hot stuff! So we now have to deal with a future of unleaded gasoline.

This wouldn't be so bad, except that the new gasolines suffer from more than just the removal of lead. Among other things, modern gas does the following:

- Builds up varnish and deposits much faster than "good gas."
- Won't tolerate high-compression engines.
- Stores poorly.
- Reacts poorly to the presence of oil, as in a two-stroke pre-mix situation.

#### **OCTANE: WHAT DO THE NUMBERS MEAN?**

The octane rating of a gasoline is the measure of the anti-knock quality of the fuel. Knock is just that . . . a hammering sound inside your engine.

When a charge of fuel is introduced into an engine and ignited, the flame spreads out from the spark plug to the cylinder wall. If this happens all at once, you get detonation . . . or knock. A steady, even, slow burn is desirable.

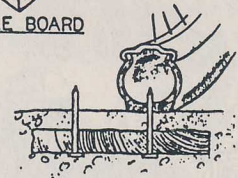
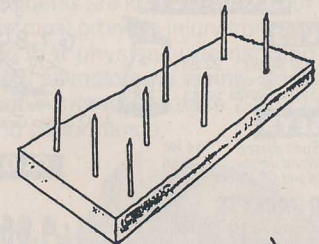
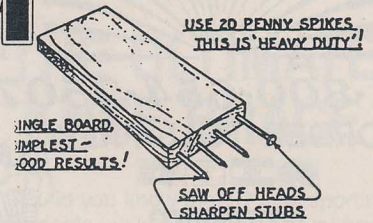
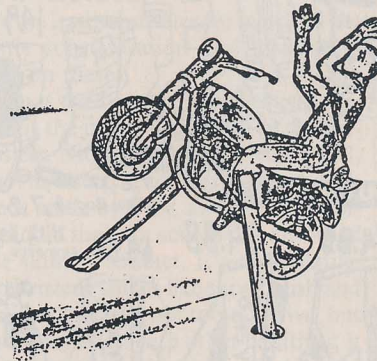
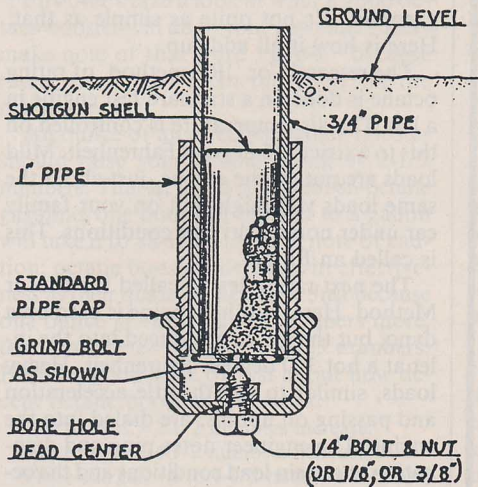
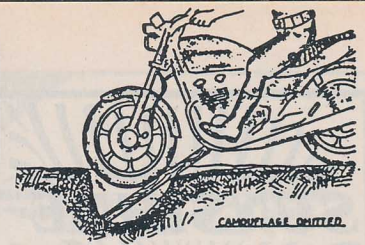
Octane, or an increase in the octane level, will not increase your horsepower, no matter what your buddy tells you. However, insufficient octane can cause an engine to lose horsepower. All the octane you need is what your engine demands to keep from detonating. Higher compression ratios and full racing engines invariably need higher octane levels.

#### **ENGINES & OCTANE REQUIREMENTS**

Some theory is needed here. Without getting into upper trig, you can assume that the higher the compression ratio of an engine, the higher its octane requirement. The mechanics behind compression ratios is simple,

# DEATH TRAPS!

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**SHOCKING?** Yes, but it's happening. Eco-freak groups like Earth First are spiking trees, putting traps on trails, destroying equipment and trying to put an end to off-roading as we know it.

**WHAT ARE YOU GOING TO DO ABOUT IT?** You can find out who these people are, who gives them money for their terrorist activities, where they meet, where they live and how they go about their immoral and illegal activities. You can do it by joining **THE SAHARA CLUB**.

**DO IT! OR LOSE IT!** If you don't get off your butt, public land will continue to be taken away from us at a staggering rate. The Sierra Club, for example, has over 500,000 members. We have millions of off-roaders in this country who simply will not even lift a finger to fight. We could easily match the clout of the eco-freaks... but you'll have to get involved. Join. Tell a friend.

**WHAT IS THE SAHARA CLUB?** Formed by Rick Sieman and Louis McKey, the SAHARA CLUB was formed to fight the Sierra Club head-on, just the way they fight. We plan to use the legal system like a battering ram to get more than our fair share of media coverage.

**WHO ARE THESE GUYS?** Louis McKey, also known as the Phantom Duck of the Desert, has been fighting to keep our public land free since 1974. Rick Sieman was the first editor of *Dirt Bike* over 20 years ago, and is now a professional off-road racer on the SCORE/HDRA circuit, as well as a writer for several off-road publications. Together, they won a landmark case in 1981 that kept all existing roads and trails open for public use. Lou and Rick have been battling for your right to use your land for a long time . . . and now they're ready to turn pro and go for the throat full-time!

**WHEN WAS THE LAST TIME YOU FELT GOOD ABOUT OUR SPORT?** Are you sick and tired of making excuses for having honest fun off-road? Do your own industry "leaders" make you feel guilty about disturbing a patch of sand? What's more important . . . a kid sharing fun off-road with his family or closing off millions of acres so we don't disturb a tortoise? Stand up to the wimps and to the enemy . . . join the Sahara Club and put some pride back in your life!

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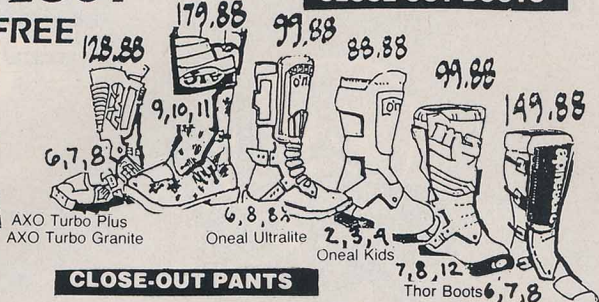
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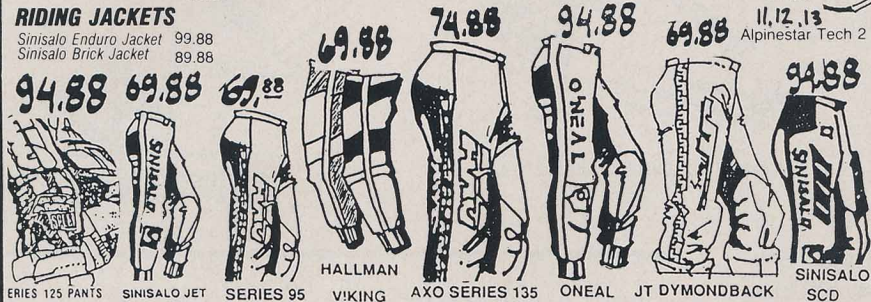
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# RACING GAS

brutal and creates problems for high-performance engines. The smaller the space you try to squeeze the burning fuel into, the more power you'll develop—all other things being equal.

## READING THE PUMPS

The number you see on the gas pump is supposed to tell the octane reading of the gasoline. It's not quite as simple as that. Here is how it all adds up.

The research, or "R" method, of rating octane is done on a standard test engine in a lab. The air temperature is controlled on this to a strict 125 degrees Fahrenheit. Mild loads are put on the engine, just about the same loads you might put on your family car under normal driving conditions. This is called an F1 test.

The next rating test is called the Motor Method. Here, another engine is used on a dyno, but the air is introduced into the inlet at a hot 300 degrees Fahrenheit. Heavy loads, similar to full-throttle acceleration and passing on uphills, are dialed into the engine. The engineer notes ping and detonation at certain load conditions and the octane rating is determined by its ability to control the detonation. This is called the F2 test.

The number you see on the face of your gas pump is known as the Road Octane rating and is a combined average of the Motor and the Research Method. In fact, if you take a close look near the posted octane number, you'll more than likely see . . .

$$M0 + R = 92 \text{ OCTANE}$$

or whatever the actual octane rating is of that particular gas. For example, if the F1 test showed 94 octane and the F2 test indicated 86, then the Road Octane rating would be 90.

## MEXICAN GAS

For you folks who drive in Baja, here is the scoop. Pemex is the government-controlled gasoline, and it's not as bad as the stories would have you believe. However, the octane rating is in the low 80s and that's why most engines will ping and detonate badly when using it.

Mexican gasoline feels very oily compared to United States stock. That's because their refining process is not as elaborate as ours and there are less light ends and volatilities than in typical U.S. gas. Also, contamination and the presence of water is a very real problem.

If you buy Mexican gas in a busy city location, chances are it will be of decent quality, even though the octane rating is low. Buy your gas along the road at a small station, and you'll more than likely buy a fuel that's been stored for a considerable time and suffers from contamination. If you drive in Mexico, a good fuel filter is a must and it should be checked and cleaned regularly.

One last word of warning: the very low octane rating of Mexican gasoline can cre-

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ate a lean condition in an otherwise properly jetted carb. Consider going larger on the jetting, or even backing the ignition timing off if you must run this gas for any extended period of time in a high-performance engine.

**OCTANE BOOSTERS TO THE RESCUE**

You've seen them on the shelves at your local bike shop and on the counter at local discount auto parts stores: cans of octane booster in every color of the rainbow, ranging in cost from a buck to five dollars.

Do they work? Sure! The good ones do. First, let's take a look at what a good octane booster will do to your gasoline. Please make note of that word "good," because there is a lot of trash out there on the market.

An ounce of an effective octane booster should raise your octane rating by 2-1/2 numbers. That is, if you start with 86-octane gasoline, one ounce of booster to a gallon will take it to 88-1/2 octane. A note of caution: octane boosters decrease in effectiveness as their quantity increases. Just because one ounce gives you 2-1/2 numbers more, ten ounces will not give you 25 numbers. Here's a good scale of just about how decent octane boosters will work:

- One oz./gal. = 2-1/2 numbers increase;
- Two oz./gal. = 4-1/2 numbers increase;
- Three oz./gal. = 6 to 6-1/2 numbers increase;
- Four oz./gal. = 7 to 7-1/2 numbers increase.

A good rule of thumb is that anything over three ounces per gallon is wasted. Some crazies dump in a whole can of booster,

thinking they're going to get radical gains. Actually, they'll get a decrease in performance, as excessive ratios can cause the volatiles in the gas to deteriorate and excessive aromatics can make the engine run "heavy," or rich.

**WHAT ARE OCTANE BOOSTERS MADE OF?**

There's no mystery here. Most octane boosters are nitrogen carriers. Common ingredients are methanol, isopropyl alcohol, naphtha, xylene, toluene, benzene, hexane, nitro benzene and aniline. Available octane boosters do not have tetraethyl lead in them, as lead is very toxic.

There are lead substitutes for sale also, but very little substantiation and research is available on these.

Aniline is the best octane booster available and is the prime ingredient in the better boosters. Nitro benzene also works well, but is not as effective and costs a great deal. Aniline is made by Dow, and is a very poisonous liquid that can actually be absorbed into the skin on contact. It's not volatile.

Nitro benzene smells like shoe polish and castor oil. Alone, it's not too effective, but used in conjunction with other additives, it can do a decent job. You'll also find it used as an additive in some of the more expensive castor bean oils for use in two-stroke engines.

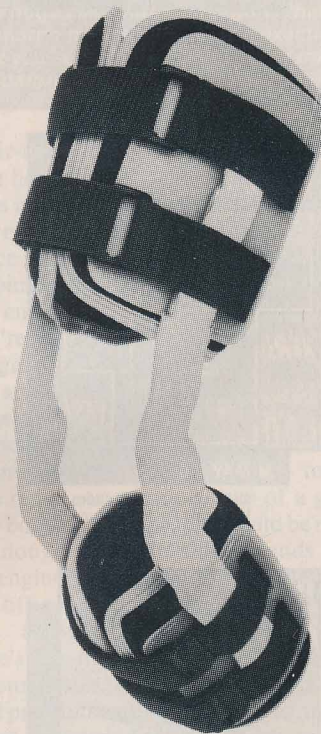
Octane booster is completely legal in all racing associations, such as AMA, HDRA, SCORE, Baja Promotions, etc., because oc-

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# RACING GAS

tane boosters are not oxygen carriers *per se*; it's not considered a power additive.

## WILL OCTANE BOOSTERS ADD HORSEPOWER?

No. This is a misconception. Octane in itself does not add power. However, an engine that's forced to run on fuel with a lower octane than what's needed will run hot, detonate and eventually lose power. The proper octane level will let the engine run to its full potential, but won't transform it into something special.

When a combustion chamber gets a charge of fuel, the plug sparks and it's burned. With the right octane level, the burn is clean and even. With too little octane, the burn can be uneven and a hammering can result.

## BAD SIDE EFFECTS OF OCTANE BOOSTERS

- Will attack plastics, rubbers and some fiberglass.
- Will discolor and attack most paints.
- Foam filters will deteriorate if cleaned in a booster-carrying gasoline. So will the glues holding the filter together.
- Some oils are affected by octane boosters. Most normal oils are not bothered, but if you have any doubt about your favorite brand, check with the manufacturer, just to play it safe. Two-stroke users have to pay particular attention to this.
- Can make an engine run rich. Re-jetting may be necessary.
- Are toxic to the skin, and the fumes can make you sick.
- Exposure to air can cause a 50 percent breakdown in effectiveness.
- Ultraviolet rays—that's plain old sunlight—will make octane boosters deteriorate.
- Will attack gas tank sealants and could plug up your entire fuel system if used together.
- Cost a lot of money.

## NOW . . . THE GOOD SIDE

Don't let all of that scare you. Octane boosters have a real place in the off-road world today. Here are some of the good things they can do:

- Give better throttle response. You can actually feel it.
- Gets better mileage. Also, you can often lean out the carb slightly when using octane boosters, which will give improved mileage.
- Best performance possible from your engine, short of using race gas.
- Reduce detonation and pinging—clean out deposits. A good booster will actually let the engine run cleaner and inhibit carbon build-up.
- Acts as a gasoline stabilizer when the machine is left to sit for a period. Gas stores longer with a good octane booster in the fuel.
- Lets you use whatever gas is available at the time.
- A good booster doubles as an emulsi-



fier and can keep small amounts of water in suspension. Fuel system condensation is a very real problem, especially when the machine sits for long periods of time between uses.

## HOW TO TELL A GOOD OCTANE BOOSTER FROM A POOR ONE

The market is loaded with octane additives. Here's one rule of thumb: If the product comes in a clear or transparent bottle, don't even consider it. Ultraviolet rays cause deterioration.

There should be specific directions on the label—how much octane booster to use to how much gas, for example. There should be a listing of how many numbers the octane will be raised per ounce of booster used to each gallon of gas. A good octane booster will raise a gallon of gas by two-and-a-half numbers with one ounce added. If the label isn't specific, don't bother with the product. We've had good results with Octamax, but there are a few other good brands around.

Consider the cost per ounce. You can get a good octane booster to add 2-1/2 numbers per ounce per gallon for around 30 cents per ounce. Some of the cheaper products might not be as efficient as the more expensive ones.

Make sure the label has a toxicity warning. If it isn't toxic, it isn't going to work. If it is toxic and there's not a prominent warning, the manufacturer is bordering on criminal negligence. Some of the better octane boosters are aniline, nitro benzene and toluene. Additives like acetone and sulphurs can be very corrosive.

Better octane boosters also have metal deactivators in them. This lessens the corrosive action of the additive on brass. As you know, all of your jets are made of brass, as are a number of parts in the carb and fuel system. Traces of brass can destroy volatilities in the gas.

## HOW MUCH OCTANE BOOSTER SHOULD YOU USE?

Ideally, you should only use what you need to stop pinging and detonation. An engine makes the most horsepower and has the best throttle response when there's just a light trace of pinging under a maximum load situation.

**Jetting can be a nightmare for supercross, because of the changing air density and temperature. Some stadiums have huge air conditioning units that supercharge the air, so knowing exactly what you're putting into the fuel tank is mandatory. Pump gas won't get it here.**

In air-cooled engines, play it safe and allow for heat build-up and potential detonation, as it does happen. A water-cooled engine is much more stable during the time of the race and can be jetted much leaner; a bit of pinging can be tolerated without harm to the engine.

You're better off starting with the best pump gasoline you can buy and then adding small amounts of octane booster, rather than getting low-octane gas and adding a lot of booster. Most gas stations have available unleaded premium in the 90- to 92-octane range. An ounce or two of a good octane booster added to this should be more than enough to handle the demands of a stock engine running hard under hot and heavy off-road conditions.

## SUMMING IT ALL UP

Here's how the *Dirt Bike* staff goes about it. In our hauler trucks, we simply run unleaded premium with the highest octane we can find. If there's a rattle in the engine under a load, we add a small amount of octane booster, as needed.

In most enduro bikes, we run normal 92-octane unleaded premium gas with a fairly lean oil ratio. None of the staffers go any richer than 32:1 (most run leaner). In high-strung enduro bikes, we add an ounce or two of octane booster to a five-gallon can; that seems to do the job nicely.

In all-out race bikes, one ounce of octane booster per gallon of 92-octane unleaded premium works well for us. Some of the highly modified 125s demand three ounces per gallon. If the temperature is high, we like to add one gallon of real race gas to three gallons of pump gas.

Naturally, top pro racers cannot afford to take any chances, and you'll see them using only pure racing gasoline. When your livelihood is on the line, you get rid of all the variables and only take chances with the terrain, not with what goes into your tank. □