exceptional thermal and oxidative stability, they have poor solvency and seal swell characteristics because they lack polar groups (groups that contain oxygen or nitrogen). Esters, on the other hand, are polar because they contain oxygen and are made by combining an acid and alcohol. This will lead to a reaction that gives you ester and water. Esters also have exceptional thermal and oxidative stability, and they are excellent solvents and provide good seal swell.

Alkylafed naphthalene (AN) is a special kind of aromatic that is mid-way between PAO and esters in terms of solvency and seal swell, but provides improved wear protection over esters. By combining these different base stocks, it is possible to create a base fluid system that has superior thermal and oxidative stability, yet maintains the same solvency and seal swell characteristics of the tried and true Group I base stocks we have used for years. Mobil 1 motorcycle oils use a PAO/ester base fluid system, while Mobil 1 TriSynthetic automotive oils also utilize alkylated naphthalene.

SYNTHETICS

Where do the stories about synthetics come from and how do we stop them? One on the most frustrating questions I'm asked again and again is. "Don't synthetics wear flat spots on roller bearings because they are too slippery?" Okay, let's try to end this once and for all. The short answer is no! See, all of the compounds we call synthetics are found in normal mineral oils. It's just that they coexist with a lot of other compounds we don't want. You can either start with simple chemical building blocks and make only the compounds you want and call them synthetic, or you could take regular crude oil and refine and modify it until you come up with mostly the same kind of stuff. It's just that no commercially viable technique to do the latter exists, so it's cheaper, although still very expensive, to go the synthetic route.

The tractive coefficient, which is the measure of the ease with which a lubricant facilitates sliding, is essentially the same for both mineral oils and synthetics. In other words, synthetics are not more slippery than mineral oils. Let's say you still don't believe me. Look at it another way. Suppose synthetics were vastly more slippery than mineral oil. The only way a roller bearing would not turn would be if you had perfect hydrodynamic lubrication, which simply means the cam surface and the roller would always be separated by an oil film. In this case you would have perfect lubrication, the metal surfaces would never touch, you would have no wear, and it wouldn't matter if the roller turned or not. This never happens, which is why ZDDP is so important in your oil.

By the way, Mobil I Tri-Synthetic automotive oils are factory fill in all Corvettes. Vipers, and Porches, all of which have engines that use sophisticated roller/follower technology, and they don't seem to have any problems with roller bearings not turning. The only way the roller will stop turning is if the needle bearings supporting the roller fail. Please, spread the word. At Daytona and Sturgis next year, I'd like to be able to not have to answer this question.

In a nutshell, formulating and manufacturing engine oils is a complicated process that involves a lot of engineering and a little bit of creativity. For this reason, the consumer should not get too wrapped up in formulation components and chemical analyses when choosing motor oil. Rather, base your decision on the reputation of the product and the company producing it as well as the performance and results that you experience personally. If this performance is aligned with cost and, more importantly, your expectations from that brand of motor oil, then you will be a happy rider.

SYNTHETICS VS. MINERAL

It's time to talk performance! Now, you can view the following as merely the biased opinion of an Exxon-Mobil employee who was also the chief engineer responsible for the development of Mobil 1 Motorcycle Oils. Or you can view it as the expert opinion of

someone who has spent the last 30 years developing and testing engine oils, is a Harley-Davidson owner and a H-D supporter.

The Motor Company makes the point that your engine oil is the trash dump for the engine, which is correct. H-D states that all of the water, soot, and acids that are byproducts of fuel combustion end up in the motor oil. (Actually, only some of these byproducts end up in the motor oil. The remainder go out with the exhaust gases.) H-D continues by stating that this is the major source of particles that can form deposits in the engine. The Motor Company adds that this is the reason for draining your oil and changing the oil filter at the intervals recommended. I agree completely. However, what The Motor Company overlooks is the fact that higher quality motor oils like Mobil I V Twin 20W-50, through carefully formulated synthetic technology and the use of high performance additives, can withstand the trash, even at extended drain intervals.

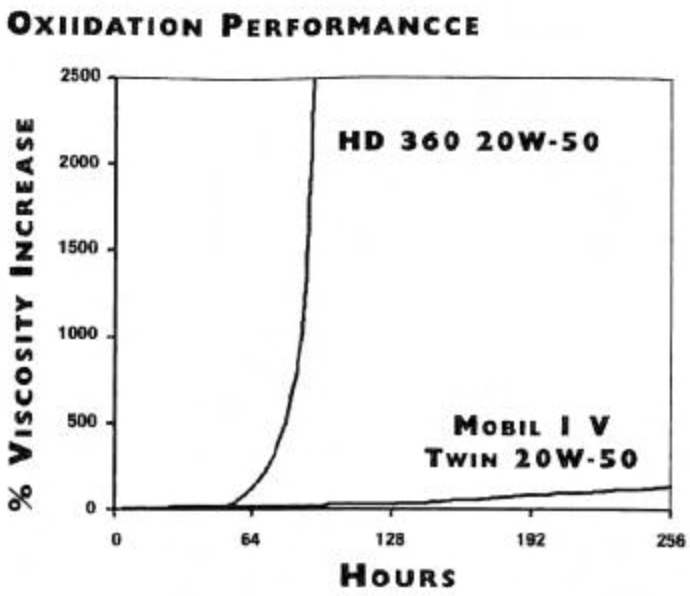
Further, The Motor Company's position on synthetics is that all motor oil breaks down in use and can be a source of engine deposits. Of course, H-D grudgingly admits that synthetics are inherently more resistant to oxidative and thermal breakdown. The Motor Company states, however, that this breakdown will only occur under severe conditions of lengthy exposure to extreme heat and that these conditions are not normally experienced in your typical car or motorcycle. But what happens when you do encounter severe conditions and experience high oil temperatures...?

OXIDATION

One of the biggest differences between a Harley-Davidson and a passenger car is heat. With an air-cooled engine, particularly in the case of the Twin Cams, where oil is sprayed directly on the underside of the pistons for cooling, the engine oil can be subjected to very high localized and bulk temperatures. Since your Harley is air-cooled it tends to heat up when you are not moving, like sitting on Main Street in Daytona or Sturgis. If you've been there and been caught in traffic for an hour or so, you know what I mean. Your engine gets hot, your oil gets hot, and so do you. In these situations oil coolers don't help because they also only work when you have airflow. Ideally you want the bulk oil temperature in your bike to run between 215 and 225 degrees Fahrenheit, which is hot enough to boil off any fuel or water that has found its way into the oil system. Temperatures up to 240 degrees Fahrenheit are not uncommon and, under very severe conditions, you can see temperatures in the 280 to 300 degree range.

Okay, so what does that mean in terms of your oil? First, you have to understand how oils oxidize. When oxidation occurs, the result is an increase in the viscosity of the oil until eventually, in the extreme, it becomes a black, sticky, semi-solid that will not provide any lubrication and ultimately will allow catastrophic engine failure. The general rule of thumb in the industry is that above 250 degrees Fahrenheit, the rate of oxidation doubles for every 10 degrees increase in bulk oil temperature. This doesn't mean the oil viscosity increases in a linear fashion. Rather, it means that the time it takes for all of the antioxidant and the natural oxidation resistance of the base stock to be used up is cut in half each time the temperature increases 10 degrees.

Again, what does all this mean? One of the best ways to understand this is to look at oil thickening in an actual engine test. An easy way to do this is to run the oil in the same type of engine and under the same test conditions used to measure oil oxidation performance in past and present automotive industry tests. In this case, the test used involved a 3.8-liter V-6 engine running at 3000 rpm, near wide-open throttle condition with the bulk oil temperature maintained at 300 degrees Fahrenheit. As shown in the accompanying graph, HD 360 20W-50 starts to break (dramatically increase in viscosity) after about 72 hours of operation and is essentially solid at 112 hours. In the same engine test, Mobil I V-Twin 20W-50 has not broken after 256 hours of operation at which point the test was stopped. I like to call this difference performance reserve. For me, performance reserve provides peace of mind when I encounter unusually severe operating conditions.



All of this leads to The Motor Company's statement: "The question that the rider has to answer is 'Does the incremental benefit in the resistance to thermal breakdown afforded by the use of synthetics versus fossil oils, in the absence of extending oil drain intervals, make up for the added expense of a synthetic fluid?'"

Again the Motor Company and I are in complete agreement. This is the crux of the issue. The Motor Company states that "most (riders) will conclude using the right oil (HD 360) for (their) engine and changing it and the filter at the recommended interval, is the best and most cost efficient way to maintain (their) engine."

Now, if you only ride your bike under average conditions, and you desire to maintain your engine at the lowest possible cost, then I agree with the Motor Company: use HD 360 and change your oil and filter at recommended intervals.

But if you're like me and you love your bike (just ask my wife), then you don't want minimum cost performance or an average quality oil for the motorcycle on which you've spent so much money and time. Or perhaps you have a modified engine and you like to ride hard, or maybe you just don't want to have to worry about your oil holding up when you are stuck in city traffic. If any of these descriptions apply to you, then you are like me and hundreds of other Harley owners I've met. You want performance reserve to protect your investment, and you want the peace of mind that goes along with that. You get both of these with Mobil I V Twin 20W-50.

AIM