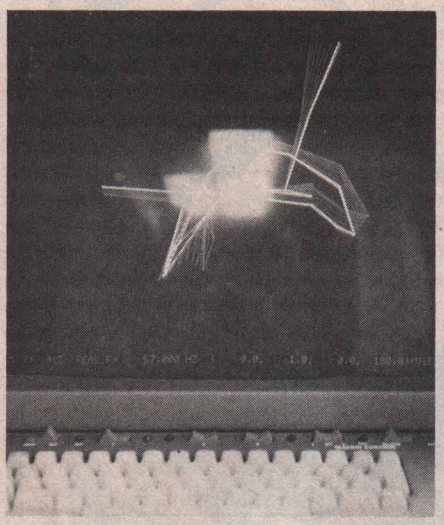
HARLEY-DAVIDSON: What Lies Ahead

Awake After A Decades Long Dreamless Slumber, America's Motorcycle Company Prepares To Kick . . . Plastic Tail Fins

By C.D. Bohon



A computer simulation of highway vibration reaching a rear-fender/sissy-bar shows engineers where the stresses are.

The Harley-Davidson vee twin. As American as Maxim's machine gun or Cyrus McCormack's reaper. As elemental, as practical, as efficient. Although there have been other motors—singles, flat twins—it is the big-inch vee twin that makes a Harley-Davidson a Harley-Davidson. Could a Harley be an *American* motorcycle without a vee twin engine?

The question is no idle one as Harley canters into its ninth decade, seemingly fighting a rear-guard action, together with a band of fanatically loyal customers, against the overwhelming tidal waves of technology sweeping in from across the Pacific. Has Harley retreated into a marketing box canyon by its doggedly cautious insistence on building machines it knows it can sell to Made-in-USA cultural jingoists, older riders who finally can afford a 20-year-old dream, and the analyst-couch candidates overdosed on macho pseudo-masculinity who collect in front of beer joints in every state of the Union come Saturday night, but few others? Is the old big incher all there is to the Harley mystique? Can there be anything more?

If you've bothered to begin reading this story it's because either you're a Harley nut—and already ticked off by our characterization of Harley riders—or you are, like this writer, someone who would love to own a Harley if only, as the derisionists say, the company made motorcycles. There is a vast gap between the two groups. The first may never have owned any motorcycle but a Harley—and never wants to. The second has probably never owned a Harley-Davidson, but secretly somewhere in their heart of hearts *would* like to own a Harley; not the traditional "hog" so loved by H-D purists, but a machine as technically sophisticated and fine performing as any in the world—*and* made in the USA. To these riders the Harley is a standing embarrassment. They became confirmed riders as much because they are mesmerized by machinery, by technology, by engines, as they are by sheer performance and the pleasure of riding. Deep within them they feel betrayed by Harley-Davidson for forcing them to ride foreign motorcycles in order to experience state-of-the-art motorcycling. "Damn it," as one such rider remarked, "if the country has the know-how to build manned lunar-landing ships, we ought to be able to build a decent motorcycle."

The rest of this article is directed at these riders. Harley freaks are outraged by such heretical slurs. For them Harleys work just fine and all they worry about is the possibility the Milwaukee firm might be lured into abandoning the mighty vee twin in favor of some wimpy vroom-vroom motor. Harley lovers can rest assured: Harley-Davidson plans to keep on building air-cooled vee twin powered motorcycles as long as there is a demand for them. And the company simply is not about to go out of business.

Does that leave the non-Harley rider out in the cold forever, doomed never to know the pleasure his teenaged father or grandfather had when he bought a Harley, confident it was the best engineered motorcycle in the world, manufactured in the most modern of factories? Edward Turner, designer of the famous Ariel square four and inventor of the Triumph parallel twin, rode Harleys for years and took pleasure in running Velocettes and Nortons into the ground. There is a photo somewhere of a young and grinning Soichiro Honda astride his mud-bespattered Harley-Davidson VH. Has that era passed forever? Can Harley again seize a leading place in design and manufacturing excellence?

We've just spent a good part of a week peering up under Harley's corporate bloomers and were thoroughly excited by the tantalizing goodies we saw. Harley-Davidson has embarked on a sober evolutionary improvement of its motorcycle line that will not only keep them in business, but, we suspect, enable them to challenge the Japanese in design and manufacturing quality, increase their market share and make a lot of money. The company is not about to repeat BSA/Triumph's blunder of continuing to build a once popular design long after it has ceased to be profitable. Nor is it about to commit Indian's error of abandoning its traditional bread-and-butter machine in favor of building a me-too imitation of a design some other manufacturer has had success with. Nor has it any intention of trying to increase short-term profit by hanging on to obsolete tooling when the imperatives of the marketplace demand it equip its factories with the very latest computerized automated equipment.

"When AMF took over Harley-Davidson," in 1969, Dr. J. L. Bleustein, former lecturer in mechanical engineering at Yale and now Vice President in charge of Engineering at H-D, told us, "the immediate situation was one of sales department order takers. And a dealer could wait up to 13 months for a bike. Production capacity was somewhere around 15,000 units." The first goal of the new owners was to increase production capacity. In 1972 it was decided to convert AMF's York, Pennsylvania production facilities to motorcycle

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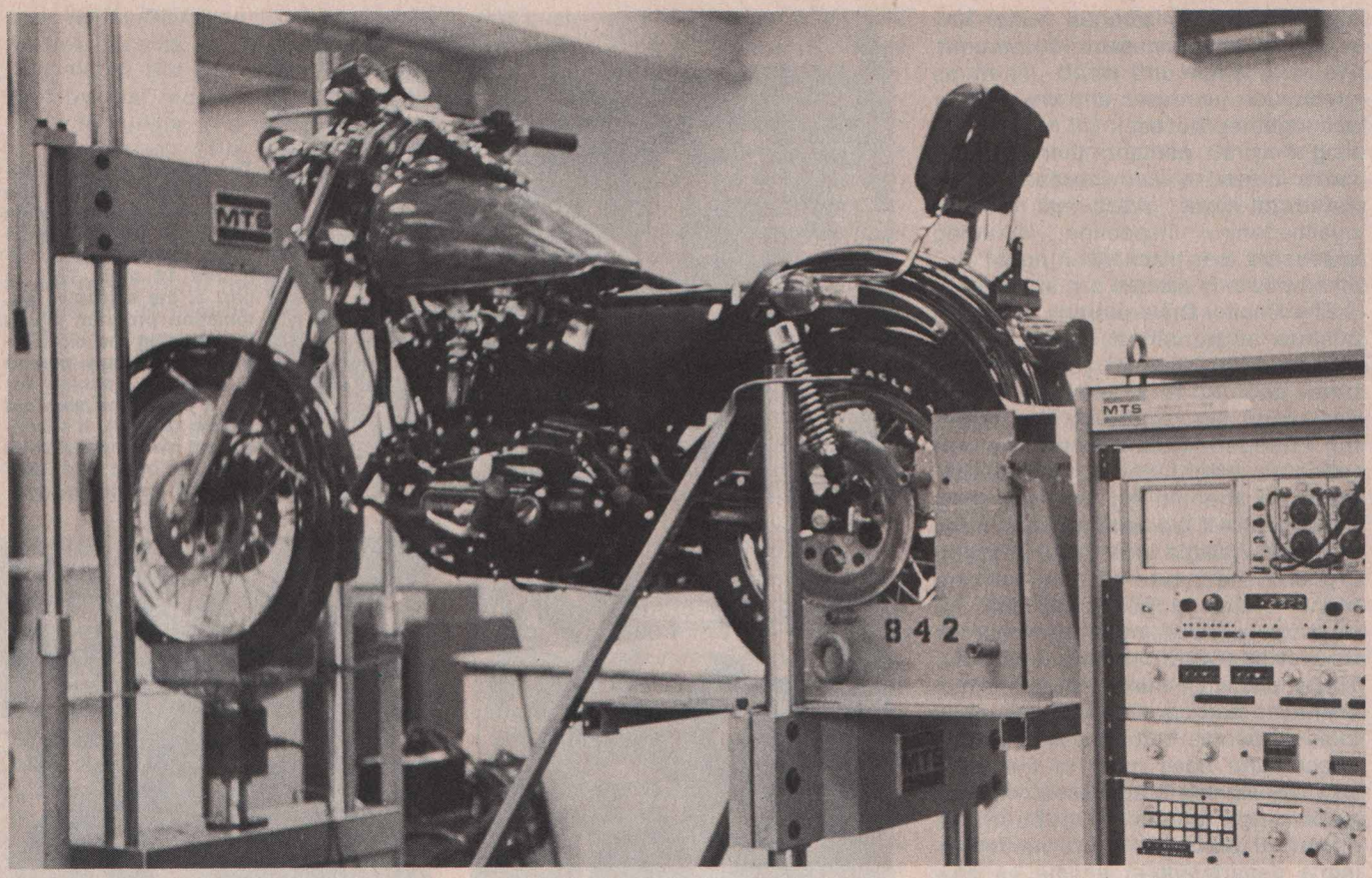


This brand new computer-controlled vibration tester can duplicate road conditions in the lab. Here a Sportster is being bounced fiercely to test for fatigue on a proposed new gas tank. The way a special paint on the tank cracks will define weaknesses.

output. When the plant went on stream some months later output capacity was quadrupled. In 1979 Harley-Davidson built 51,000 of its vee twins. But it's got dealer orders now for 80,000, and expects to generate even more demand with improvements to its current line of machines and with one or more entirely new motorcycles being developed in their mid-Eighties program, about which more later.

"In 1974-75," continued Bleustein, "AMF and Harley-Davidson realized engineering needed strengthening to meet EPA requirements and also to expand the product line with totally new motorcycle products—new transmissions, new engines."

With new designs came the opportunity to update equipment and rearrange factory layout for greater efficiency. At the Capitol Drive plant in Milwaukee, where all the vee twin engines and transmissions are made, a gradual, but none-the-less major retooling is taking place, as well as a general overhaul of the plant layout for greater efficiency and improved product quality. D.A. Wallace, Manager, Manufacturing Engineering at Capitol Drive, explained they were in the process of converting "from machining centers to machining lines to automated transfer lines. We're redesigning the plant to preclude moving the product. First we group the machines together, then we get the latest process to do the job."

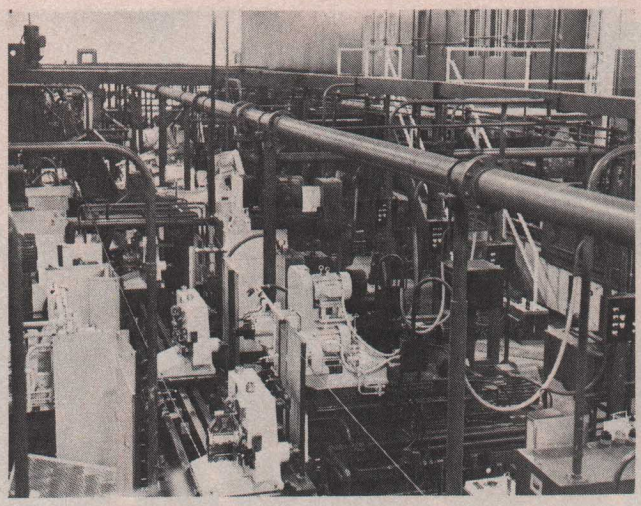
Getting the latest "process" is expensive. The new five-speed transmission in the FLT Tour Glide is built on a Cross automated transfer line, as modern and sophisticated a piece of equipment as anything this writer saw when he visited Japan to research our "Inside The Big Four" story (March, 1979 *Motorcyclist*) on the Japanese manufacturers. It cost AMF $6.7 million for the five-speed equipment, but with it Harley has the capacity to meet future demand with the cost efficiency of automated equipment—it takes 14 men to make the older four-speed trans case; one man makes the new five-speed—and with a product consistency that won't be influenced by a tiring worker on overtime. "Quality has to be built into the product," Wallace said, explaining one of the major advantages of automation besides increased capacity, and touching on one of the major themes of AMF's rejuvenation scheme for Harley. The next few years will not only see more Harleys being built, but better ones. Heat-treating is already totally automated. By next year the present cylinder-making equipment will be replaced with newer, high-speed automated equipment, as will the machinery presently producing four speed transmissions.

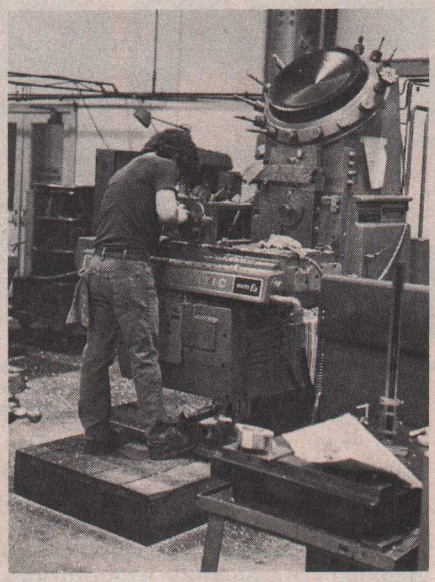
The range of equipment acquisition is international in scope, with Harley buying not only American, but also German, English and Japanese tooling, including Cross and Barnes transfer lines, and Churchill, Fuji and Suga lathes. We happened to notice a lead time listing for new machine tools that included Gleason bevel gear equipment—the same U.S.-made tooling Suzuki uses to produce its superb shaft drives. You can bet that set us to stroking our chins, but H-D personnel merely chuckled and remarked a shaft drive on their big vee would be foolish.

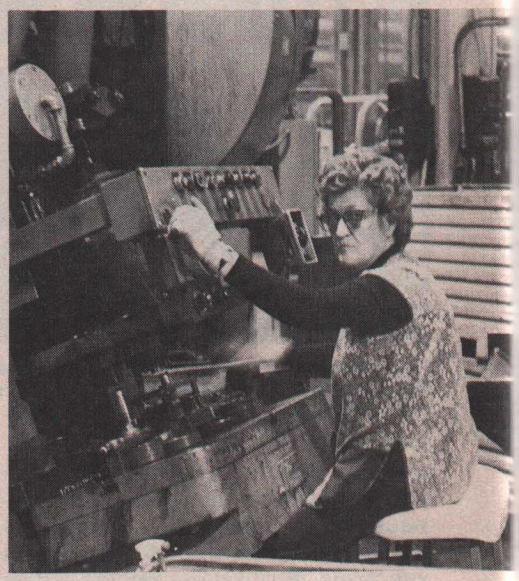
Right now Harley tries to "hold utopian tolerances," in Wallace's words, in engine manufacturing and is proud of the fact every single engine built is bench tested on a dyno and approved before it is shipped to York. No engine leaves the plant until it runs to spec. Besides the dyno run, an "assembly audit" checks torque, bolt application, casting, "anything on the product," according to one inspector, that could have been done wrong. "We take two percent of the day's production per day," said the inspector, "and pull it completely apart and measure everything to spec. We try to spot things the dealer would have to handle. We look at it as a dealer would, then see it gets fixed so he won't have to fix it. Most of the problems are minor, usually cosmetic, sometimes things

like insufficiently torqued bolts. Any new product we inspect 100 percent. We take each unit apart. Then as production increases and we get our act together we back off to dismantling only 50 percent, then 20 percent, down to two percent once we've got it pat." Additional rigorous quality-control inspection, including extensive test-track running of finished bikes, is carried out at York.

The Capitol Drive plant is clearly in a state of transition. Much of the equipment is 20 to 25 years old, but other tooling is practically brand new. Even the factory lighting is being changed, from dim fluorescent tubes to bright sodium-like units. Much of the milling and grinding equipment will be automated shortly. Manager Wallace took pride in pointing out the modernization of the plant: clutch dogs once took 14 steps to produce, now one machine does it all—with consistent quality. Today one man makes the transmission main and countershaft splines; it took six people before: a New Britain tracer lathe does most of the work now. By making crankcases with line machining, rejects have been reduced 70 percent. "We're modernizing a department at a time as new designs come on line," Wallace said. He was quick to point out that none of the 832 hourly workers at the plant is in danger of losing his job to the new machinery. The goal is to improve efficiency, quality and capacity, not to cut the work force. "AMF has been a godsend in supplying financial backing to modernize and improve quality," he adds, giving the lie to the common street badmouthing of the AMF acquisition as the worst thing that ever happened to Harley-Davidson.







The impressive $6.7 million Cross transfer line at left enables one man to build transmission cases which formerly required 14 men. This is part of the extensive automation program which is replacing the old situation of a single person at a single machine doing a single job with old tooling (below). It's ironic that so many women help to build the bike with the macho image.

WHY DOES HARLEY USE FOREIGN PARTS?

"We'd like to buy everything from American suppliers," explained a Harley executive at York, "but either they aren't interested or they haven't got the capacity. Sometimes our production is limited by our suppliers. You may be able to turn out 300 motorcycles a month, but if your supplier can only get you 100 head gaskets a month, what can you do?"

It's no secret Harley-Davidsons are built using Japanese-made forks, shocks, carburetors, electrical and other components. "We'd like to—we *want* to—use all American parts, but it's like this: we go, say, to an instrument maker and tell them we want to buy 50,000 speedometers a year. They look mildly interested. Then we tell them we need, out of that total number, so many thousand for the Sportster, so many thousand for the FLH, the FLT, the FXE . . . for this model and that one. Then on top of that we say we'll need some of them calibrated for police work. They throw us out of their office. The numbers just aren't there for them to bother tooling up to build the amounts we need. So we go to established motorcycle parts suppliers. And that means, practically, Japan."

We asked managers at the plant what they foresaw in the production future of the plant once the new tooling was in place. Various planned changes in the "evolution engine," as the gradually being redesigned vee twin motor is called in-house were noted, including the possible manufacture of all die castings by H-D—at present they are bought from outside suppliers—a switch to aluminum cylinders with cast iron liners and a change from vertical to horizontally split cases, a change which will simplify manufacture and quality control. Water cooling and shaft drive were mentioned. Innocent queries with a knowing air about H-D plans for the mid-Eighties brought responses that assumed we knew more than we did and included the fact that at least some of the equipment for the new *series* had been ordered, that four-cylinder engines would be much easier to manufacture than the vee twin, that they would be able to scrap the J-hooks that move the vee twin and go to automotive type conveyer belt assembly and that they were considering at least doubled production, perhaps 150,000 to 200,000 units within the next few years.

Since the 300,000 square feet of manufacturing, assembly, storage and office area comprising the Capitol Drive plant has a current capacity of 262 engines a day, plus or minus a bit, say around 70,000 units a year, it's clear that Harley-Davidson is heavily committed to automation to increase capacity. The York facility, (see sidebar) also limited to about 300 machines a day, will be gradually increasingly automated. In particular, York management is looking at automated frame welding equipment and queried us about the equipment Kawasaki uses at its plant in Japan. There a Kawasaki Unimate robot performs 350 separate welding operations entirely without human intervention. Currently at York much frame work appears to be done still by individual welders.

The next two or three years should

see Harley-Davidson's production facilities become as modern as any in the world. But the machines turned out by that modern equipment will have to survive in a world stalked by a remorseless EPA and an NHTSA lusting for victims to eviscerate. DOT-tie Joan Claybrook has remarked publicly she doesn't care how many companies fail because they can't meet government rules. And the Japanese are formidable foes even now moving to establish assembly and eventually manufacturing plants in Harley's Midwestern stronghold. How is H-D going to meet these challenges? *Can* it meet these challenges?

"We have no problem meeting EPA emissions standards," declared an engineer at H-D's Milwaukee emissions testing lab, where highly sophisticated testing and analysis equipment, including infrared and flame ionization analyzers, among a battery of state-of-the-art testing gear, see to it that H-D motorcycles exceed government standards. In fact, some Harley models are the cleanest machines in their class. Some Japanese engines are vastly dirtier and face difficulties meeting pollution standards. An irony is that some of the testing equipment Harley uses is Japanese-made.

What about noise level requirements? "We know how to make 78 dB motorcycles," says engineering veep Bleustein. But we want to keep the image of the motorcycle what the motorcyclist likes. It shouldn't cost the customer $300 to get down one extra dB. Our fight is against things not cost effective, not only for ourselves but for our customer. The motorcycle noise problem is not one of the manufacturer, but the aftermarket exhaust, straight pipes and the like. But the EPA only thinks of the manufacturer, probably because the manufacturer is the only one they can actually influence. The real fallacy is that the quieter they force the manufacturer to make the motorcycle, the greater the urge of the owner to replace his stock exhaust with a loud pipe."

Has Joan Claybrook's well-known anti-motorcycle stance scared Harley? Apparently not. One Harley hand remarked you could always tell a jackass by the sound it makes. "I'm more afraid of some insurance actuary pricing motorcycle theft coverage out of the reach of buyers than Joan Claybrook," commented Dr. Bleustein. "Joan Claybrook will come and go and we'll still be here."

How about potential fuel shortages? Does Harley worry that could kill the recreational role of the motorcycle? "Fuel shortages will be no problem, but we are looking into alcohol as a fuel," said Dr. Bleustein. Others at H-D pointed out the vee twin was a good, slow-revving, fuel-efficient motor. "The horsepower race is gonna end" in the 1980s said one engineer. "People will realize that's not where it's at, but as the cost of fuel goes up more and more people will turn to motorcycles for recreation, especially if they're forced to use public transportation to get to work on. Come the weekend they're gonna want to climb on a motorcycle, which can give them the most enjoyment per gallon. And we'll be there waiting with the best motorcycle for the money when that time comes."

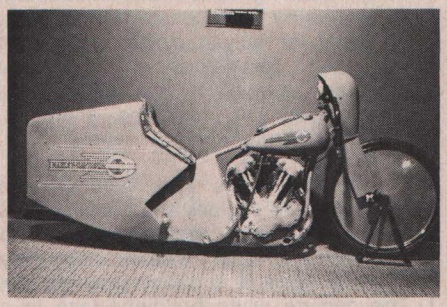
If Joan Claybrook and the sheiks of Araby don't frighten the Milwaukee mavens, what about the Eastern Barbarian, the Japanese juggernaut, the people who make practically all the motorcycles in the whole wide world. Two pearl handled Colt Peacemakers, a palomino stallion and a ten gallon white hat may make a cowboy hero and may all in spirit be incarnate in a flame-tanked Wide Glide, as one H-D marketing bigwig vehemently asserted, but an XS Eleven, a KZ1300 and a CBX all pack the performance and marketing armorment of a squadron of F-105s. Even the Lone Ranger couldn't stand up to that. And Harley has no silver bullets, let alone any RPG-7 AA missles. Or does it?

A European newspaper recently reported Harley-Davidson was working with Porsche to produce a water-cooled, fuel-injected vee four screamer. We know Harley had a parallel four before Honda did, but the management got cold feet about marketing it. We saw an 1100cc OHC 60-degree vee twin with roller cams and offset connecting rods and other goodies, which one source said had been dynoed at 86 horsepower and

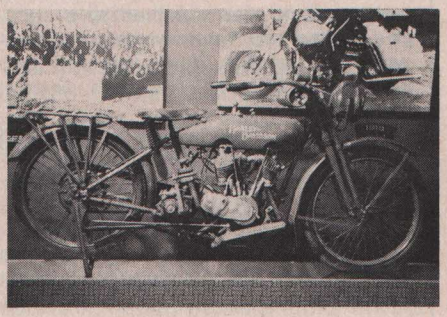
YORK'S RODNEY C. GOTT MOTORCYCLE MUSEUM

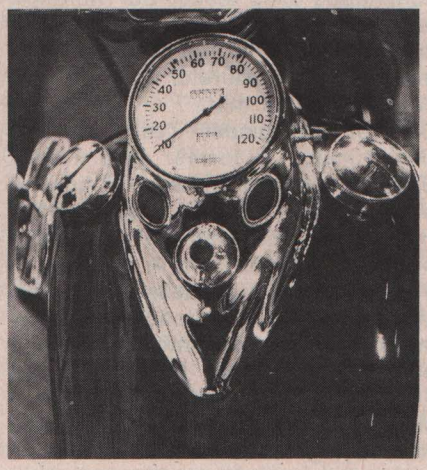
The Gott Museum, named after AMF's chairman and chief executive officer, was opened to the public three years ago with the claim it was the largest motorcycle museum in the United States. That may or may not be true, but it certainly is the best museum of Harley-Davidson history we've ever seen. The display boasts one of only three 1903 Harleys, the first production H-Ds ever built, a 30.50 single, an early land speed record bike, a brand new WLA 45 army bike from WWII and an example of the shaft-drive flat twin XA military machine of the same era. Knuckleheads, panheads, shovelheads, they're all there. The first OHV Harley, a 61 cubic incher built in 1936 is there. So is a 1961 Sprint single, a 1970 XLCH Sportster—the one with the fiberglass tail—a 50cc M-50 gadabout, a Harley motocrosser and that lovely Italian 250cc world championship two-stroke Harley road racer.

If you're into Harleys you've found heaven. If you're into motorcycles, you'll be almost as happy. Besides the bike displays, the museum has sections illustrating the operating principles of motorcycle engines, transmissions, brakes, wheels and suspension systems.



In 1936 Joe Petrali rode this dual-carb 61-incher to 136.183 mph on the Daytona sand. The record still remains unbroken. It is said that the first U.S. soldier to enter Germany in WWI rode a Harley like the 1918 J-model below.





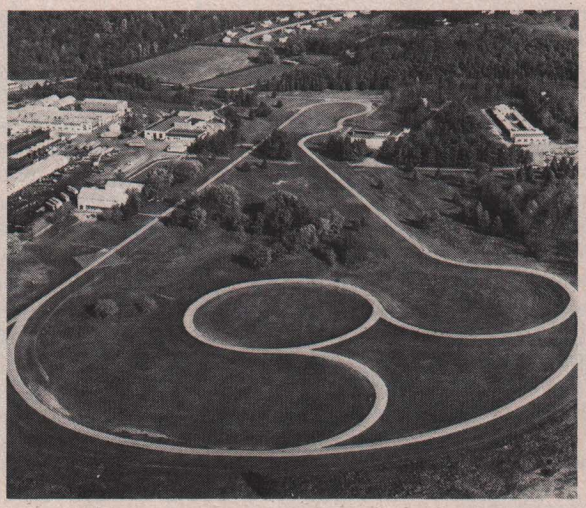
If you want to visit the museum, it's open for tours every weekday at 10 a.m and 2 p.m. The address is 1425 Eden Road, York, Pennsylvania. Take Exit 18 off the Pennsylvania Turnpike at Harrisburg onto Interstate 83 south, then drive about 20 minutes to Exit 9E in York. You can make arrangements for a group tour (10 or more) by calling (717) 848-1177, Ext. 6601. Ask for Pam. Tell 'em Soichiro sent you.

would blow a GS1000 into the weeds in a quarter-mile contest. It broke our heart to hear Harley tell us they weren't going to build it. But we dried our tears and perked up our ears when they told us they weren't going to build it because it was an old design and they had better stuff about ready to go.

"I was brought in to put some life in this division, to renovate the product line," said Dr. Bleustein. The 1100 OHC vee was begun before Bleustein and his new crew got their hands on a bunch of money and the go-ahead to prod Harley out of its hog wallow. A token of that commitment is the fact H-D's 1980 engineering budget is four times what it was in 1975. Harley-Davidson has also been head-hunting for top talent, worldwide. As one man remarked when this writer commented on the age of the buildings housing the Harley facilities, "Buildings don't make a company, people do, and we've got the best. We've got guys from Ford, Chrysler, Cummins, Holley, Rockwell- . . . guys who've designed everything from airplanes to farm machinery, guys who came to design whole new products."

Much of Harley-Davidson's testing and engineering facilities are little more than a year or two old. That means they haven't yet had a chance to have much influence on the Milwaukee product. It also means they are the most modern available—more modern than those in Japan, which have been in place for some years. "We've got state-of-the-art stuff: our continuous dyno tester, our vibration tester—all state-of-the-art; our carb flow tester . . . why, we've got a vacuum demand carburetor that . . . well, can't talk about that . . . ." said Norm Cox, Chief Engineer, Test Laboratories, himself a former heavy with England's Hawker-Siddley Group, the boys in a past era responsible for the Hurricane fighter, hero of the Battle of Britain. At one point in our tour of the new Harley-Davidson, our mind staggering under the load of information being fork-lifted into it, we came across a new dyno facility with an FLH roaring along the rollers at a simulated 80 miles an hour. They were trying to break it. Over in the corner was a sulking CBX that had lost its match with the dyno. "The CBX suffered a continuous loss of power . . . valve seating problems," said Cox. If we understood what he was trying to tell us over the bellow of the Electra Glide, they'd had a 100-horsepower Harley design on the dyno that ran right up to the dyno's 130-mph simulation limit; that beat the dyno. Maybe we got that all wrong, but we hope not.

The testing facility itself is largely



The York test track adjacent to the factory on the left is rather narrow and has rough paving in places, just like many of the backroads which meander through nearby Pennsylvania Dutch Country. The track's infield is a great picnic spot for plant workers to enjoy on their lunch breaks.

HOW DOES HARLEY'S YORK PLANT COMPARE WITH JAPAN?

Japan is a country with the population density of a roof in a flash flood. Torrents of humanity surge and eddy everywhere, giving the whole country the crazy vitality of a mass marathon white-water raft race over Niagara Falls. Factories in the country, including those that produce motorcycles, are ram-rodded into packed population centers hugging the coast of the mountainous island nation. Space is jealously hoarded and little attention is paid to such niceties as a bit of strolling and breathing room. Most of the motorcycle factories look like minimum-security prisons. One looks like Stalag 17.

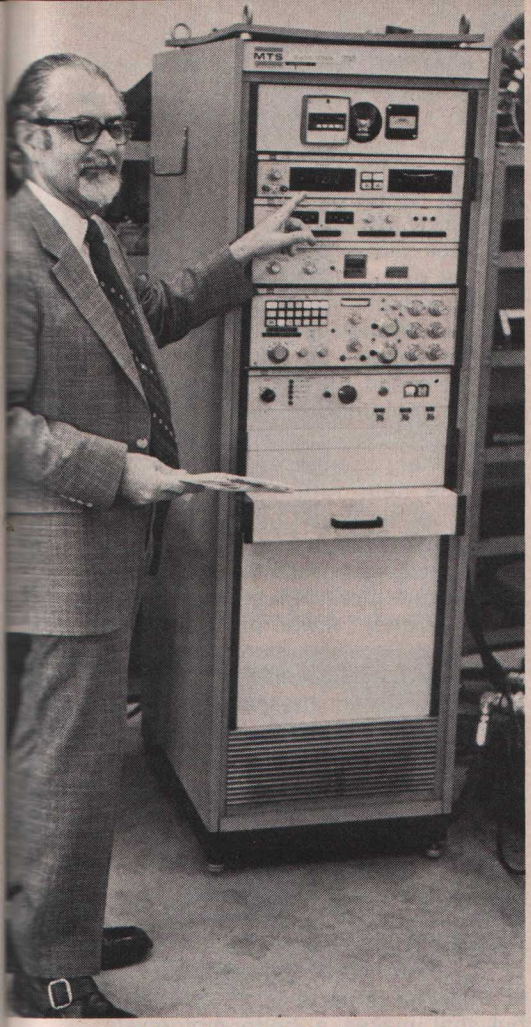
But inside those austere and ominous buildings hum and clatter some of the most advanced manufacturing facilities in the world. Automatic borers, grinders, drill presses and welders operate with never faltering speed and efficiency, controlled by sophisticated computers, the need for human monitoring all but eliminated. The efforts of the human brain are reserved for designing, engineering, planning, marketing, analyzing. Dull work, brute work, is done by dull, brute machinery.

Harley-Davidson's York, Pennsylvania factory, where engines and transmissions shipped in from Milwaukee are mated to frame and fenders to birth a complete motorcycle, is a contrast catching up. The demure white buildings laze in a 232-acre pasture in Pennsylvania's tranquil Dutch country that looks like—and is—a great place for company picnics and lunch hour frisbee tossing. Try playing frisbee on your lunch hour in Hamamatsu and you'll be hit by a speeding cement truck, then trampled by a stampede of berserk housewives . . . housewives are always going berserk and stampeding in Japan. A custom, or so it would seem.

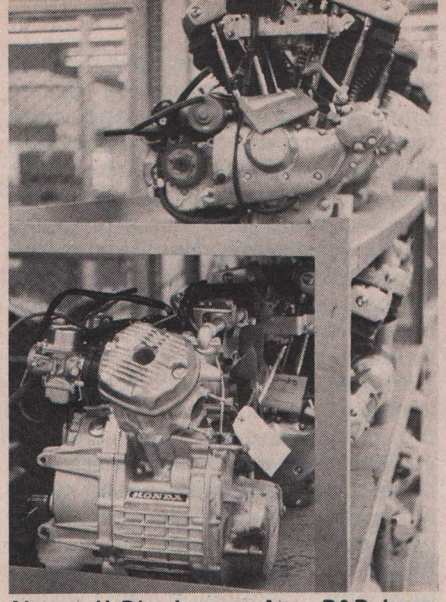
Inside, the York factory is light and airy, has an atmosphere of organized efficiency about it, but the 300,000 square feet of plant and warehouse space are obviously old and it is no trick to imagine the place as a WWII Naval munitions plant, which it was before AMF bought it and used it to turn out leisure products. Only in 1972 was it decided to build motorcycles there. Today a three-mile long monorail conveyor moves a maximum of about 300 Harley-Davidsons a day—about one every 90 seconds—past 270 line workers, 68 inspectors, five foremen and four managers. At the end of the line each completed bike is rolled into a test booth, fired up, and taken through a simulated run while the rider checks EPA compliance, engine and transmission performance, brakes, electrics, suspension: just like they do in Japan, only the series of 28 tests seem a little more thorough at York than in Japan. Maybe it's just at York they work slower. One out of 20 machines is pulled from the line and taken out on the test track for a 25-mile run to see how that hour's production does in the real world. It's a spot check some manufacturers aren't as thorough about.

While the blue-collar force seems well-regulated and appears to work with pride and contentment, and the factory is tidy, surely all good signs, compared with a Japanese facility the same size, there appear to be too many people, too much hand work, too many machines doing only one thing, and requiring a human to operate them. Women are present working right along with the men, and, aside from the occasional wolf whistle, seem not to disturb their male counterparts. It would be perfectly natural to meet a woman foreman or manager at York. In Japan it would be unthinkable.

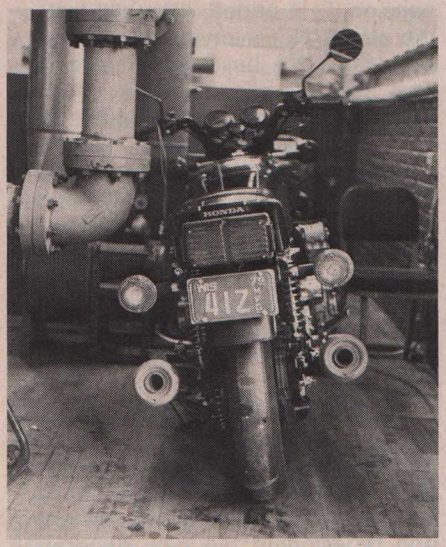
All this is different from the factories where motorcycles are made in Japan. Some of it is better, a lot worse, much merely *different*. We'd rather work at York than any of the Japanese plants we visited, if for no other reason than the chance to grab some fresh air on a lunch break, but we'd rather work with the more advanced, automated equipment the Japanese use. So would the people at York. There are plans afoot to bring York tooling up to world standard. When those are realized the company will be able to produce a more quality-consistent, cost-efficient motorcycle. But for now York stands convicted of being a nice old senile lady serving tea in the ruins of a vanished American dream of industrial superiority. Let's hope that imagery changes soon.

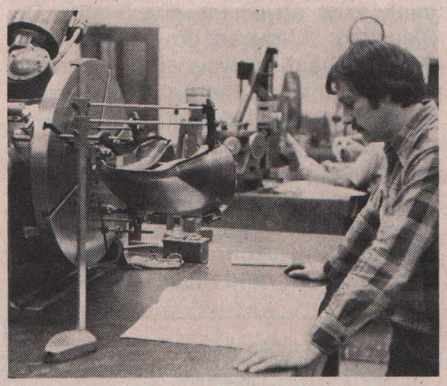


Dr. Norm Cox, an Englishman, is H-D's Chief Engineer, Test Laboratories.



Above—H-D's Juneau Ave. R&D boys carefully examined this CX500 engine. Below—The "evolution engine" has run continuously since November 9th.





Above—Harley's dyno can simulate a 130-mph road speed. This CBX finally broke trying, but failing, to go 130. Below—A new Sportster prototype tank.

new. It employs close to 100 people in two eight-hour shifts. They're looking "for anything to improve performance and reliability" according to Cox. At one point we noticed a Honda CX500 motor. "We're studying the valve design, combustion chamber and cylinder casting," explained Chief Engineer Cox. "It's very good." At another place we noticed a program board with a listing for Code 4, Code 5, Code 6. Nobody seemed to know what those enigmatic glyphs meant. A bit farther along we saw new design brakes being tested on spanking new equipment. They were running the brakes through 100,000 cycles at max loading and max braking. The test would be over in two or three days, the equivalent of months . . . years on the street.

Elsewhere we saw the company's new vibration tester stress-testing a new gas tank. A Sportster was getting the gee-whiz shaken out of it by an enraged machine while white-coated attendants stood around with clipboards waiting to see what would break first. The white coats weren't zombies by any means. They were able, articulate engineers, enthusiastic about what they were doing, excited about the work they were doing. And the equipment they had at their disposal. "We can simulate potholes, railroad ties—anything. We can run tests that would take years on the street, tests that, practically, we just couldn't do before," said one.

Around the corner a machine was trying to bust the guts out of Harley's new belt drive. Harley-Davidson mulled over putting a shaft on its twins a few years ago when shafts began to be the in thing for big bikes, but decided there were two better ways to go, at least with the vee twin motor. The simplest, yet highly efficient, is merely a chain running in an enclosed oil bath. After an initial adjustment it is practically maintenance free. The new FLT Tour Glide has such a chain. The other is the toothed belt, which is so superior to both the chain and shaft that it may well be the wave of the future. You can buy one on a Harley today and Kawasaki has also got a version on the market. But Harley used its new brains and equipment to come up with a vastly superior design. "We've uncovered and solved problems with belt drive the others haven't even begun to think about," said one Harley engineer. Harley's biggest innovation may be the compensator sprocket, which eases shocks on the belt and ensures long, trouble-free life. And here at Juneau Ave., Harley engineers had a belt running on a test machine fighting 2000 pounds of stress—without the compensator sprocket. "We'll run it for 200,000 cycles or until it breaks. It hasn't broken yet." The white coat cracked a grin. Down in the continuous-testing dyno rooms we saw a step ahead in the vee twin "evolution engine," a device with funny-looking heads, that somehow looked as if they might harbor four valves per cylinder. Three shifts of eight-hour men had been continuously monitoring the running motor since November 9 when we wandered by in mid-February. "Still haven't been able to break it," remarked one tester.

As we moved on to take a look at H-D's computer center Cox told me Harley has almost doubled the number of engineers it employs, from 130 in 1976 to 250 now. The company expects to acquire a few more slide-rule boys in the next few years. What are all these new faces working on? "There are many programs," said Cox. "We're working on a ride improvement program for the 80, a head design change to increase power, reduce noise and emissions, cut costs. We're also working on new designs for frames, brakes and sus-

pension." He added, "We still test on the street. Not everything is done by simulator. We have test riders running 200-250 miles a day in continuous shifts here in the Milwaukee area, in Texas and in Ohio. Last year we ran some 40 machines over 870,000 test miles. One machine registered 35,000 miles. We're looking for failures, of course, and try to make them happen. Our job is to make failures happen. Once we find a failure engineers analyze it and recommend redesign or remanufacture."

Up in the gleaming new computer center Americans, Britons, subcontinental Indians, all work together with the most advanced computer graphics equipment in the world, designing and redesigning the new generation of Harley-Davidsons.

The graphics terminal is only a year old. "We have tools here I don't think exist anywhere else," said Dr. Bleustein. "We can do dynamic and finite element analysis all at the same time. We may be the only commercial outfit that can do that. We have a multi-user system for our Digital PDP 11 so people in other parts of the plant can use the computer." Using the computer, engineers can design a part, run its parameters through the computer and have it create a graphic display to see how it would perform—and fail—in real life. Failure points can be predicted and redesigned, again and again if necessary, till the part performs just as it should. Only then is a prototype built. Parts can be tested far more thoroughly than ever before. Not only is the quality and performance of the actual design superior, thanks to the computer, the whole testing procedure is made much less costly.

Why all this emphasis on new automated manufacturing equipment in the plants and computer testing equipment at engineering HQ? "We have to use automation and technology to compensate for our smaller number of engineers," explained Bleustein. "We have to be in the forefront of technology and we intend to be. We'll be using the best technology available to take us into the next century. We've just begun."

What's ahead in Harley-Davidson's future? At lunch and in a discussion continuing after, Dr. Bleustein, Chief Engineer Cox and public relations director Bill Dutcher tossed around a few ideas with us. Everyone seemed to agree there would be less muscle-oriented bikes in the future. A more sophisticated customer was no longer as dazzled as he once was by sheer horsepower. Suzuki had shown that frame and suspension superiority was just as important to the knowledgeable motorcyclist as the ability to smoke the rear tire. Is Harley really serious about making a motorcycle that really handles? Take a look at the box section swingarm on the FLT. Look at that frame, the fork steering geometry. Changes are being made and they are in the right direction. But nothing in haste, nothing to upset the traditionalist. As a Harley man commented, "When I was in Daytona a year or two ago, when we introduced the updated Sportster with the XR750 rear frame, one of our dealers came up to me, really steamed, and said 'If I want a Jap bike I'll buy one!' I couldn't figure out what he was talking about. I was completely baffled. What he was talking about was the triangular side panels. We thought they looked nice, but the dealer—and the traditional Harley customer—wouldn't have them. Nor the seat. Nor the way the rear suspension was set up. They wanted that sitting *in* the bike feeling. So we changed the bike the way they wanted it."

Added Bleustein, "The dealer is our front-line soldier. We treat him as part of the factory. He gives us a lot of good input."

"But," injected Cox, "On the Sportster we were able to give it the look the dealers like and still make the suspension perform as well as it originally did. We can do things like that now."

The FLT is right in line with Harley plans for evolving the vee twin motorcycle package into a first-class modern motorcycle. At first glance it looks like just another Harley. Then you look closer and you see things like the exotic placement of the battery, the frame-mounted fairing, the vibration-isolated engine, the new instrument panel, the dual headlights, the five-speed transmission, the new frame and steering geometry, the new disc brakes, the enclosed chain. Evolutionary change.

In the near future the vee twin seems certain to get new heads, perhaps four-valve per cylinder types, and a redesigned combustion chamber. Result: more horsepower, better fuel efficiency, fewer pollutants. Already the Sportster motor has a reengineered cam profile that gives it more torque over the entire range of the engine up to 4800 rpm than earlier 1000cc engines. The new Magnavox solid state ignition system, which has no mechanical advance to wear or break, available on 1980 machines, is the most advanced ignition system for motorcycles in the world. Better than that in Hondas, better than that on Yamahas or Kawasakis or Suzukis. Again an evolutionary change that won't upset traditionalists but that makes a better motorcycle.

Eventually the inside of the vee twin will be entirely new. Outside it will look substantially the same, but internally you'll find things like pistons and wrist pins made of carbon-fiber composite that will reduce reciprocating weight and increase efficiency as well.

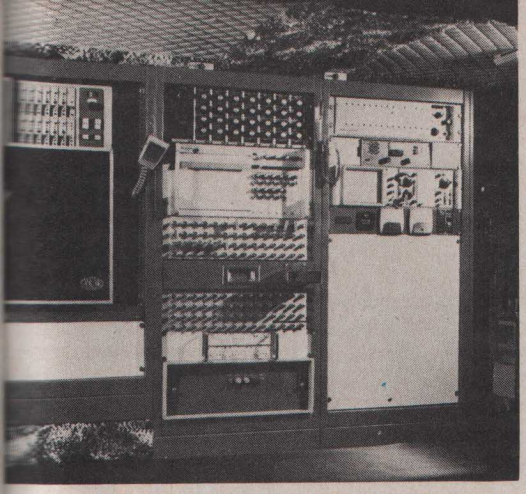
And the mid-Eighties project? "There's a whole new engine coming up," explained Bleustein. That Porsche vee four? "We're working on things different from the classic product line. We sell motorcycles around the world. Engineering can be done in many different places. Our relatively small group of engineers can use foreign stimulus. We've used Ricardo for a number of years. Porsche . . . we've talked to a number of people. The vee twin will be produced forever. Any new design would supplement and be an extension of that. We're not necessarily committed to the exact same vee. But the vee twin is a good design for a motorcycle engine . . . a 60-degree vee twin has a lot to be said for it."

What about an XR750 version for the street? With a voice seeming to express sincere regret, head slide-ruler Cox told us they had almost marketed such a machine but EPA regs killed it. "That motor was never designed with street requirements in mind. We had a viable version, but it

AMF: THE COMPANY BEHIND THE COMPANY

AMF, American Machine & Foundry is a leisure products company that makes, among a variety of products, Head skis, rackets and sportswear, Ben Hogan golf equipment, Voit balls, Hatteras yachts and Roadmaster bicycles. The company invented the automatic bowling Pinspotter. In the industrial field AMF manufactures such things as electrical components, timers, filters and automated equipment for the baking, clothing, tobacco and tire industries. It manufactures the Tuboscope, a device which electronically inspects oil pipelines for flaws. The company is international in scope, with 74 plants scattered about the globe, everywhere from Olney, Illinois to Singapore. In 1978 AMF pulled down more than $1.3 billion in revenues.

In 1968 Harley-Davidson, until then a family-owned company, and one that was ailing badly, put stock on the open market. Not long after, AMF acquired H-D and began heavy capital investment in engineering, research and development, and production facilities. The results of that investment are just beginning to show, but so far it has been good for AMF. In 1978, a decade after buying into H-D, Harley turned revenues of $227.8 million for AMF, 17 percent of all AMF sales. Right now AMF is pouring more money into Harley-Davidson than any other of its divisions. They know a good thing when they see it—and also how to make it better.



This mobile instrument van can measure up to 14 channels of data transmitted from an operating motorcycle via radio telemetry signal. Computers or oscilloscopes then help analyze input from high-speed handling, braking tests, etc.

produced only about 55 horsepower on the dyno once we met emissions standards and we decided finally not to make it."

Probably a reasonable decision, since the strangled machine was dropping something like 40 horsepower over the racing version, but still, Kawasaki's 750cc DOHC twin claims only 55 hp and probably dynos considerably less. Even with 55 horses, the light, lithe XR-based machine would have been a mountain scratcher's dream.

Can we expect genuine enthusiast sporting hardware from the reawakening Milwaukee giant in the future? If we show them there is indeed a market for such machinery, they seem receptive. They intend to be cock of the walk in the next few years and talk about a 60 percent market share of the over-900cc class soon. This at a time when Honda, for example, is reeling under the blows of competition from the other Japanese makers in this class. Harley's got a 39 percent share right now and intends to challenge other big bike makers for customers, something it has shied away from doing in the past. Anybody thinking about buying a BMW or Moto Guzzi, for example, would be well-advised to look at a Tour Glide before making a final decision. We'll be giving you a comparison test of the machine soon, running head-to-head with a BeeEm and a Gold Wing. Whatever the outcome of that test, rest assured the 1980 Tour Glide is just the beginning of what we can expect from what appears to be essentially an all-new company.

The men in charge of engineering Harley-Davidson's future are an optimistic, almost cocky lot. They know what they want to do, appear to have top brass backing, have the tools to do the job and are buckling down to the task of designing the best damned motorcycles in the world. Their attitude is best summed up by Dr. Bleustein. "You can't worry about what the other guy is doing, you've got to make him have to worry about what you're doing."

If Harley-Davidson follows through on that philosophy the company is going to have to build a lot more than 250,000 motorcycles a year by 1989. There are 20 million American motorcyclists out there just waiting for Harley to build a machine they can buy. This writer is one of them. The new Harley crew appears to be just about ready to start kicking fenders and taking down license numbers. Come on, Harley. Do it. Make me force my money on you. Build me a good American motorcycle. You can do it. Sure you can. *M*