

fmf: the engine builders

If you want your witch to work, you bring her to a witchdoctor, right? So, if you want your machine to fly, you bring it to the Flying Machine Factory.

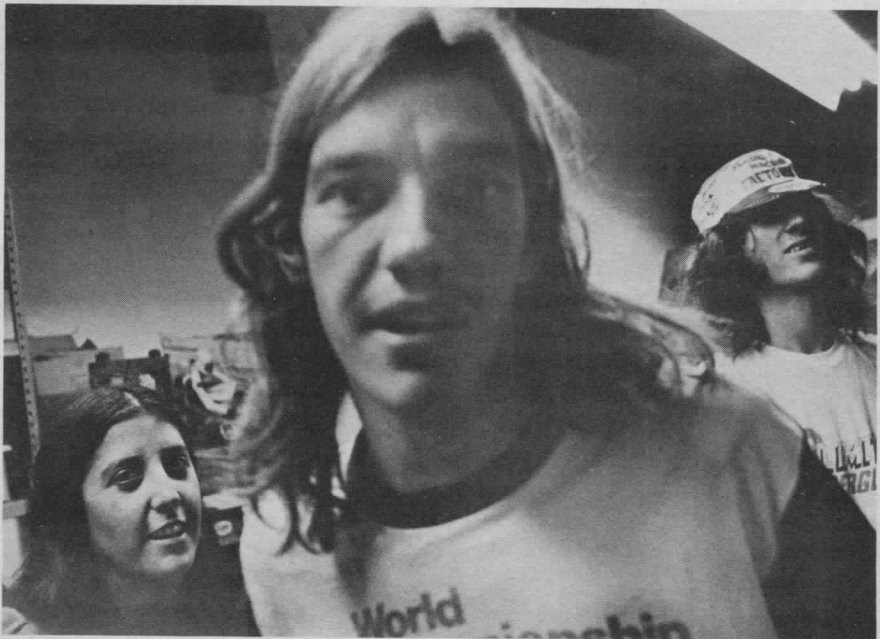
By PAUL BOUDREAU

A couple of months ago we talked about hopping up your 125 for serious motocross competition. We said you could either buy a kit like the Noguchi Stage II for the Yamaha 125MX which didn't work so hot, or you could go to an engine tuning specialist and have the work done on the existing components of your motor.

This month, in our never ending quest for 125 grunt, we visited the den of one Donnie Emler and his merry band of spaced elves, busy at work building incredibly trick 125 motocross bikes, at their Southern California workshop known as the Flying Machine Factory. Simply stated, work at FMF represents state of the art. Don Emler's engine work and pipe building has attracted the attention of different factory racing efforts such as Yamaha and American Honda and most notably, National Champion Marty Smith.

FMF's specialty is building Honda 125s so we tossed them a curve by dragging in Paulette's notorious Motocross Action Project Suzuki to be done. "No problem," says Uncle Donnie. "All the Japanese 125s are about the same. We'll use the same cones as the Honda for building the pipe and dial in the ports according to our secret formula. And I'd suggest a bigger carb so that baby can breathe, 'cause when we get through with it, it's going to need to breathe."

With that preamble, Flying



Machine Factory started to work on our precious mount. (No, not Paulette, the *Suzuki*.) A lot of an engine's low-end and mid-range performance comes from the design of the transfer ports. FMF opens the case end of the transfers as much as the casting will allow and then takes a deep cut into the cylinder wall all the way up to the bottom of the piston stroke. They leave the cylinder end of the port alone.

"Yeah, they come pretty radical stock," says Uncle Donnie. "We don't mess with them too much. But now they'll take a big charge so we've got to get more gas into the cases. We have to increase the intake duration."

This is done by either cutting the piston skirt on the intake side or lowering the intake port. So

doing, they next went to work on the exhaust port.

"This gets tricky here. You can get a big boost in horsepower by raising the exhaust port just a little, but it gets too pipey for motocross. In your case we're just going to widen them at the brows a little. On some bikes we'll raise the exhaust a millimeter or so and then mill the head .020 to make up for the compression loss."

While this work was being done, Donnie explained to us how changes in porting affect engine performance. Increasing intake duration (making the port bigger, lower or wider) will help to fill the crankcase better (up to a point, that point being about 150-degrees open duration) so that more gas/air can be transferred. The trick with

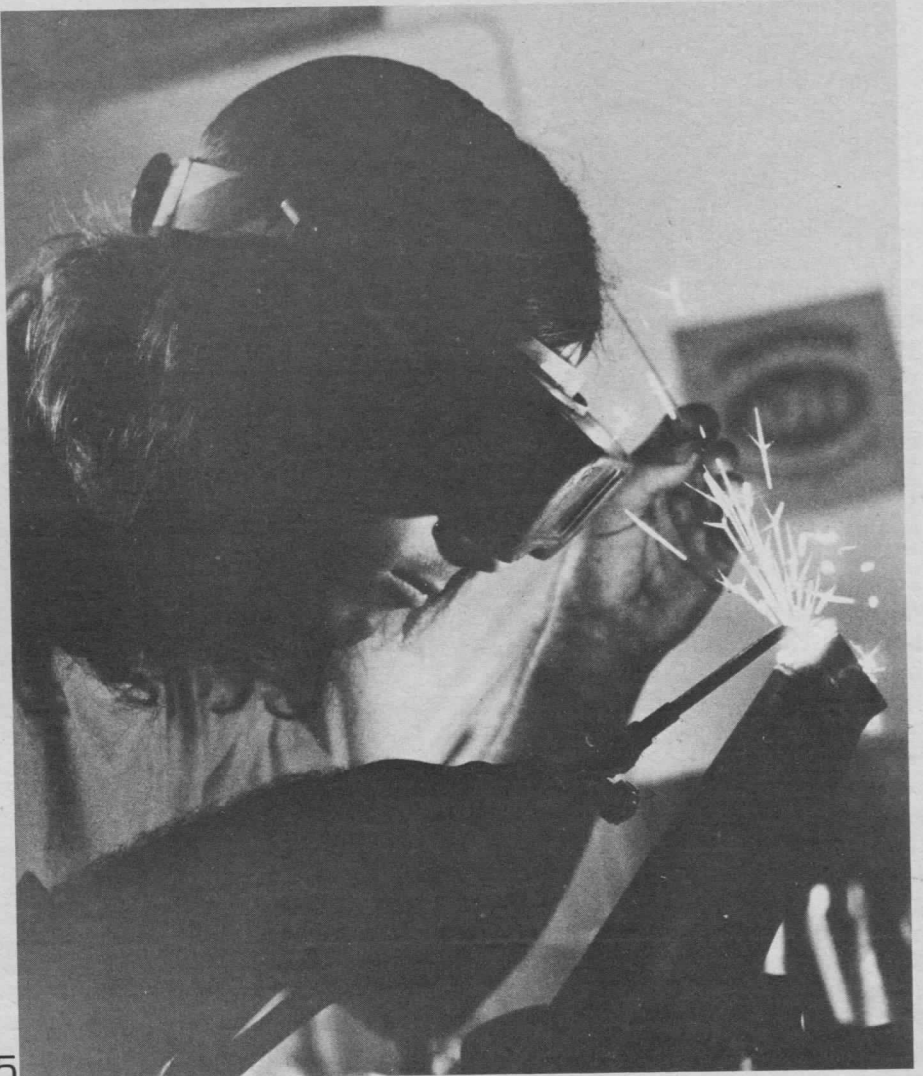
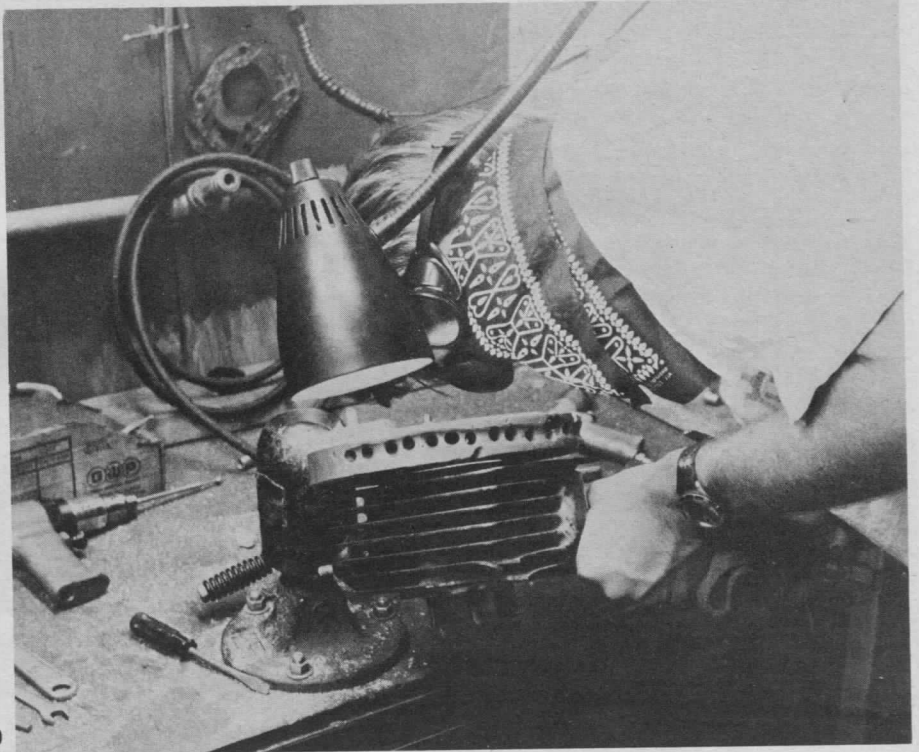
1 Machine man Don Emler flanked by customer Paulette and racer/pipe builder Dave Miller. Dr. Pepper, pinball, ports and pipes make the FMF happen.

2 Port grinder Steve Haag goes to work. A proper porting job takes up to four hours. When it's over, the barrel is ready to go but the guy who did it is exhausted.

3 The transfers are opened to the limit and cut into the cylinder. Their surface is left rough to encourage a more turbulent gas flow to the top.

4 The exhaust port is widened slightly and polished to a mirror finish so carbon won't build up.

5 A pipe is born.

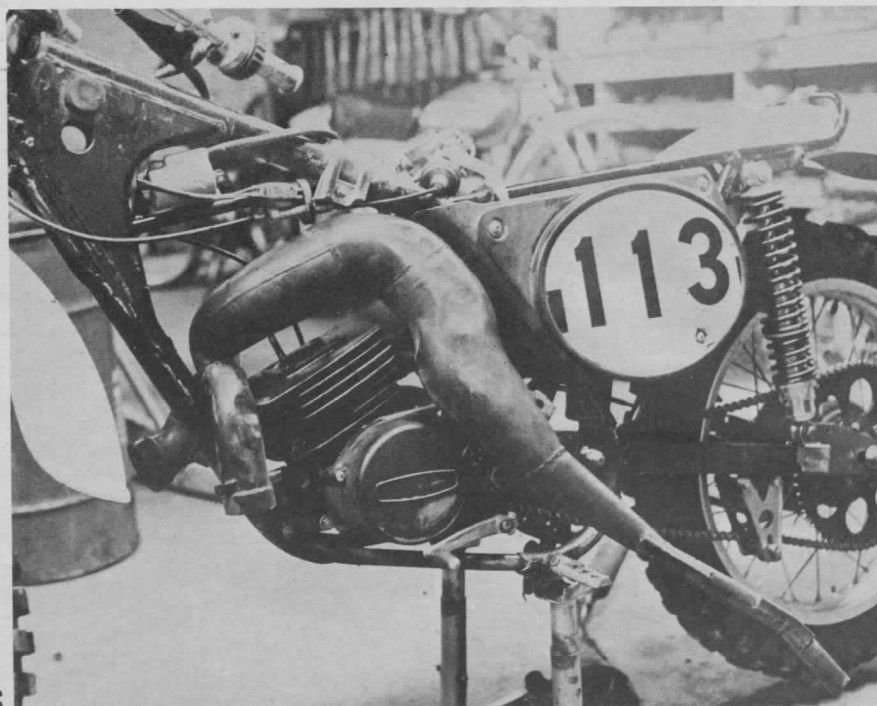


transfers is to get as big a charge as possible into the combustion chamber. Size, number, symmetry and angle of entry are all critical when designing transfer ports. Exhaust port open duration determines the rpm at which peak power will be realized and what that peak power will be. Too wide an exhaust or transfer port will break rings. Too narrow a bridge on a bridged exhaust port will cause the piston to seize. Boost porting (digging a cave in the rear of the cylinder wall and feeding it through a hole in the piston) improves power output but cuts piston life. FMF is just starting to experiment with combustion chamber shapes and cylinder head designs. "They make a big difference," says Donnie.

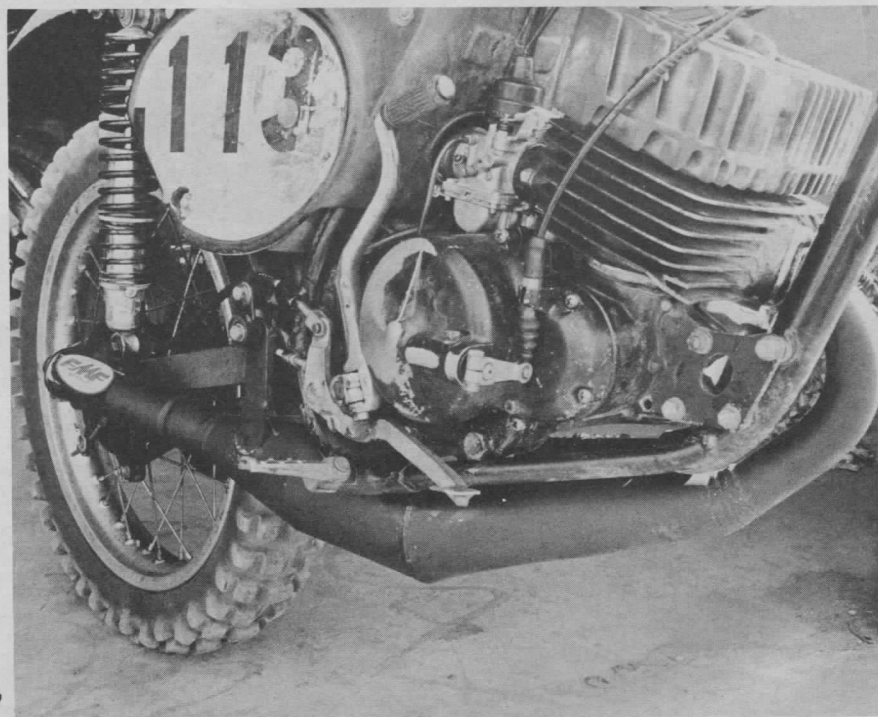
"But the pipe makes the biggest difference," he goes on. "The porting sets you up, but the pipe makes it happen. You can get the biggest charge in history to your combustion chamber, but if your pipe doesn't send that compression wave back just at the right time, all your power just drains out the exhaust port."

FMF likes to keep their 125 pipes short and fat for a broader powerband. They developed the 34-inch tuned length for the 56 x 50 Japanese 125s from a go-cart pipe. Working with a go-cart is easier because the pipe is straight and pure without all the bends needed to fit a bike. Working out the final tune required weeks of cutting, welding, testing, changing, testing again until the design was right for motocross. "We sure blew up a lot of engines before we got it all together," says Uncle Donnie.

Our pipe only required about 15 minutes of welding up the formulated cones and fabricating a mount. The results of the four hour operation (it takes at least three hours to properly port a cylinder; there's a lot of work involved) was an extremely strong power output that came on very early and lasted all the way up to the ignition limit, which is around 10,000 rpm on the TM125. "FMF pipes don't dyno out to a very high peak horsepower reading. In fact, our pipe shows two horsepower less on the Honda than with the stock pipe. But see? That's where the other pipe



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builders are blowing it. They're going for those high readings that look good in the magazine ads but don't do shit on the track. Our pipes put out more power over a wider range and that's what counts on the motocross track. Ask Marty Smith."

We did, and the National 125 Champion said he wouldn't use any other pipe except FMF's. We agree. The factory Honda 125s had bad cases of the slows before Uncle Donnie got hold of them.

The advantage of bringing (or mailing) your engine to a tuning

6 *Early designs failed.*

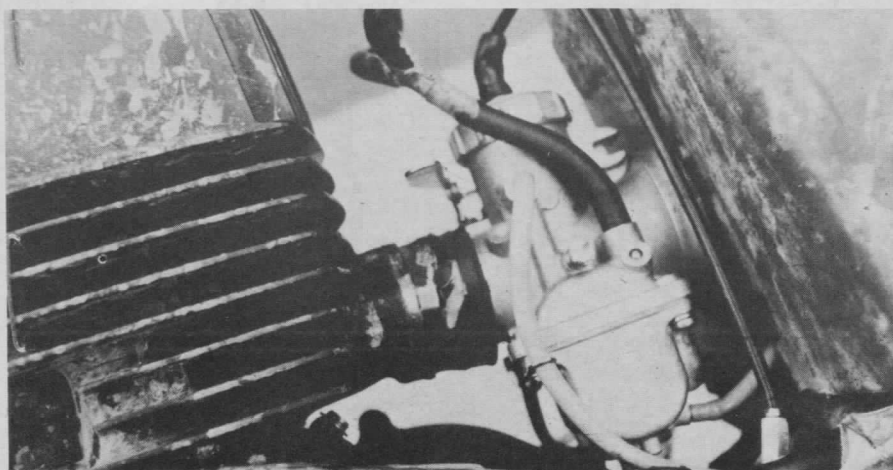
7 *The finished product: Strong and fast for only \$115.*

8 *A highly successful machine running the Southern California racing circuit has been the FMF designed Penda, a Honda engine in a Penton chassis.*

9 *Although everything worked well with the stock carb, this 30mm Mikuni conversion kit from Cycle Products West made the longer intake duration really pay off. Price: \$49.95.*



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specialist, rather than buying a kit, is this: A tuning specialist can dial in your motor right where you want it. He can go as radical or as mild as you ask him. You're the boss. Plus, it's a matter of economics: A hop-up kit runs around \$300, while FMF will port your barrel, mill your head and build you a pipe for \$115. Just think what you can do with the \$185 left over.

Besides, if you go to FMF, you can drink Dr. Pepper and play a little pinball while you're waiting. It's a hot shop. *