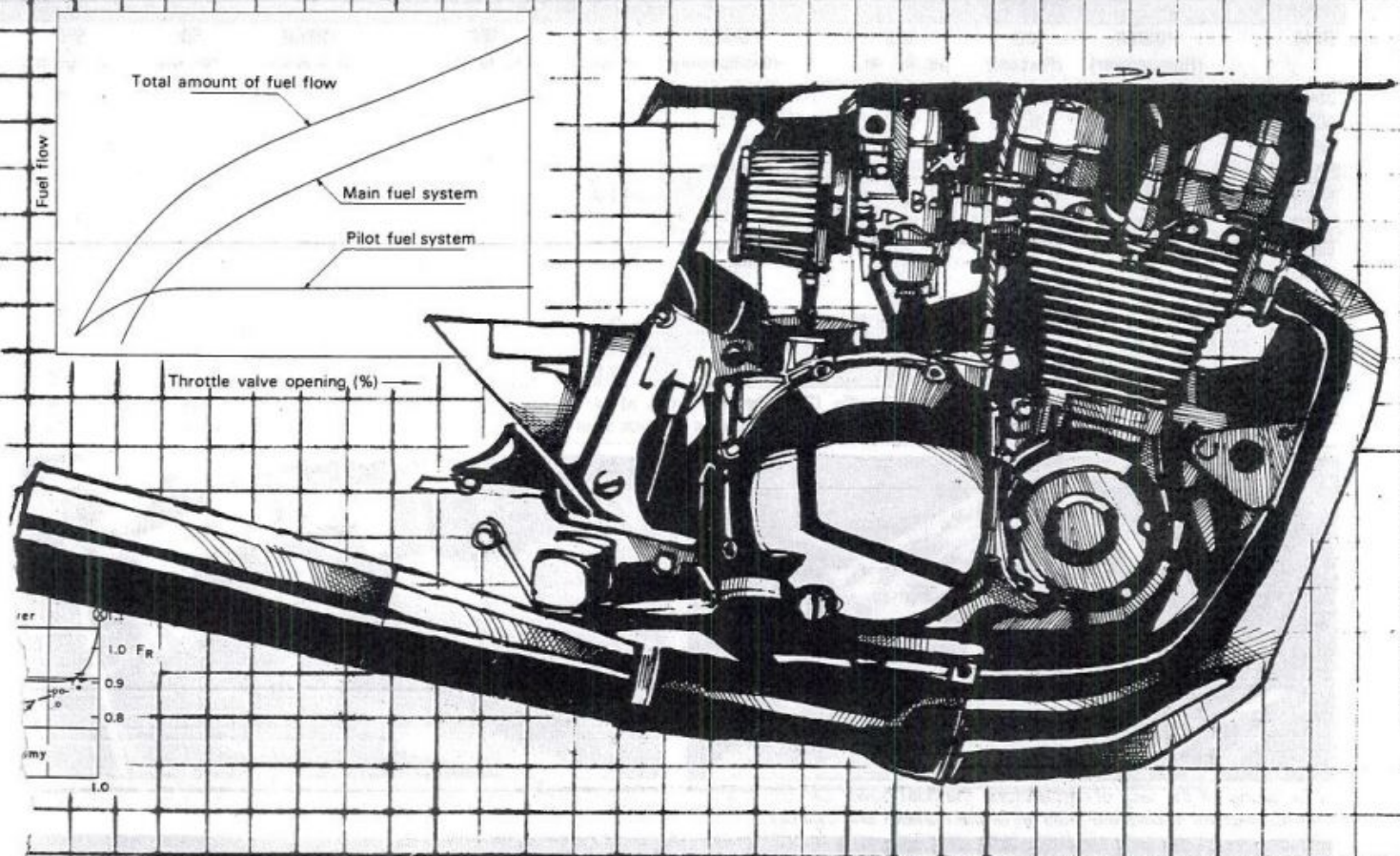




## Intake and Exhaust Modifications: How They Work Together and Why Improvements Come Harder Than You Think.

by Steve Anderson

amount of fuel an engine requires to produce a unit of power for a given length of time, and is usually given in units of lb. of fuel per horsepower-hour, or lb./hp. x hr.). The usefulness of SFC information comes from the direct relationship between SFC and air-fuel ratio. Specific fuel consumption generally reaches a peak value with an air-fuel mixture slightly leaner than that for best power. A well carbureted engine with a flat torque curve should have a smooth specific fuel consumption curve over the engine speed range, and any carburetion fault will show up in an increase in SFC.

The motorcycle companies are claimed to emphasize SFC information for setting up carburetion, but the Kerker dyno staff still feels more comfortable monitoring CO output, perhaps because the fuel flow meters are such recent additions. In any case, they record SFC for reference information.

For a baseline, the stock, well used GS1100 was run through a test cycle on the dyno and produced the results shown in fig. 1. Peak power was lower than expected, perhaps due to less than perfect valve seating. The CO level is high at most engine speeds as a result of rich jet-

ting. How could this be in this era of lean mixtures for environmental satisfaction? There are two explanations. First, the EPA requires meeting the emission standards over a standard driving cycle, with speeds and accelerations as specified. 1100cc motorcycles loaf through this test, barely using more than the idle circuits of the carburetors. There is no legal requirement for low emissions outside the standard driving cycle, so big motorcycles come with low load jetting that satisfies the EPA, and main jets and needles that satisfy performance and reliability requirements. Second, air density can vary dramatically, and these dyno runs were conducted on an extremely hot day. Air density was 95.5 percent of standard when the first run was made in the morning, and fell as low as 91.5 percent when the temperature in the dyno room crept up to 109° in the afternoon. Low density air tends to richen carburetion. This is true whether or not the density change comes from temperature, barometric pressure, or altitude changes. The lower air density and higher temperatures also reduce power output, which is why horsepower is corrected to sea level standard conditions using a for-

mula that takes the test conditions into account. Unfortunately this formula assumes a constant air-fuel ratio and constant combustion speed, and these assumptions don't reflect the real world. The Kerker technicians tell us that engines always make more power when run in cool, dense conditions, even after the correction factor has been applied. So this round of tests, because it started on a hot morning and ran into a hotter afternoon, imposed slightly more adverse conditions for the later runs than the baseline.

A Kerker KR series 4-into-1 pipe was installed for the second run. This pipe requires removal of the center stand, and the baffle that comes with it is one stage noisier than the baffle that comes in the strictly street Kerker systems. The power output was essentially the same as for the stock exhaust system: The pipe showed one two horsepower dip at 4500, and countered with a two horsepower increase at 9000 rpm. The CO readings indicated a very slight richening of the mixture at all rpm settings. The pipe reduced the motorcycle's weight, gave it more ground clearance, made it noisier, and had no significant effect on power. >