

From: egorr@interaccess.com (Eric Gorr)
TWO-STROKE TUNING WITH COMPUTERS
BY ERIC GORR

The design evolution of two-stroke engines was greatly accelerated by the proliferation of computers. Tom Turner is one of the most experienced two-stroke tuners in America. He markets his own line of design software. Some of the programs are based on Dr. Blair's work (but "Improved Greatly") but most are TSR original designs. Turner receives feedback from other tuners who use his programs for applications ranging from mx, road racing, watercraft, ATVs, and snowmobile racing. He uses this feedback to continually fine tune the programming code for better engine performance. I use Turner's Programs everyday in my tuning business. Here is a case study of how I used computer design software to improve the performance of a Suzuki RM250 (1992-95)

ANALYZING THE STOCK ENGINE

The design of the cylinder head, port timing, and pipe must be coordinated to peak simultaneously in the RPM band. There is a proper order to the design process. First I start by measuring the engine specifications and inputting the dimensions into the TSR Computer Programs, to look for shortcomings in design. The cylinder's exhaust port time area peaks at a relatively low 7,200 rpm. The transfer port time area is just the opposite. The ports are very wide and have high time area and a high rpm peak. However they don't start to flow properly until about 5,000 rpm. The problem with the RM250 is that the exhaust port is too small and the transfers are too big. That is why the stock engine hits hard in the mid-range, because the exhaust and transfer ports come into sync right when the exhaust valves open. However the transfers are too large to flow adequately at low rpm to give the engine tractable power and the exhaust port is too small to give the engine any over rev. This is an easy problem to fix.

REDESIGNING FROM THE INSIDE OUT

This is the proper order for redesigning the engine specs; exhaust port time-area, blow down time-area, transfer port time-area, cylinder head, reed valve, and pipe.

EXHAUST PORT

The chordal widths of the exhaust and transfer ports, and the port opening timing were input into Turner's PORT2000 program to determine the rpm band width of the stock ports. Time-area is a calculation based on the width of the exhaust port, the point when the port opens, and the total port open duration in relation to RPM. It is a very difficult calculation to do on a hand-held calculator but the computer performs it fast, accurate, and easy. The program enables the tuner to adjust the exhaust time-area for the power band we are tuning for. On the RM250 the exhaust port's timearea was too low and the exhaust opening timing and width had to be increased to allow the engine to peak at 8,800 rpm.