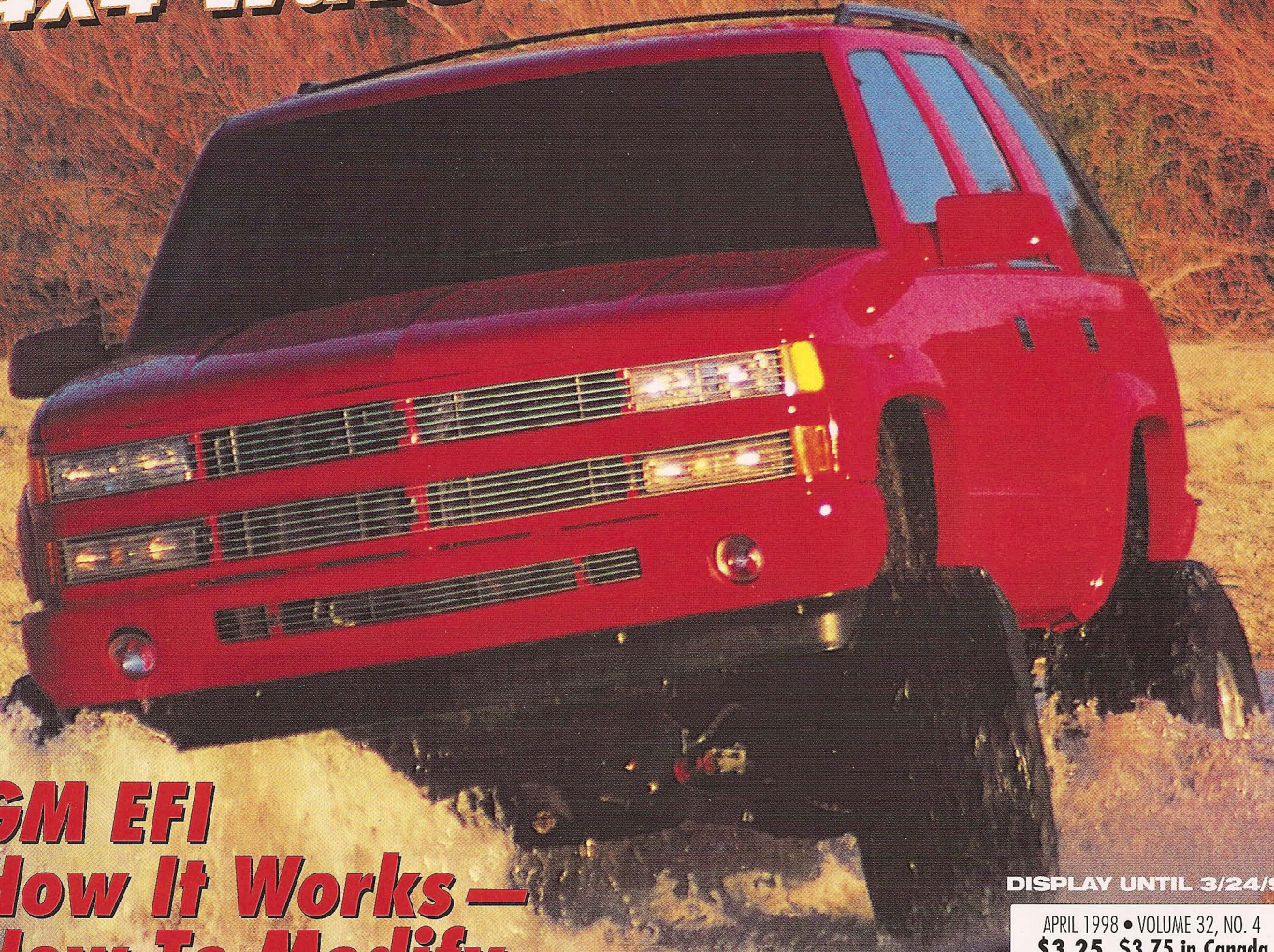


FIRST LOOK: 1999 FORD SUPER DUTY 4x4s

OFF-ROAD

OFF-ROAD

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RECURVING FOR POWER

Squeezing Performance From Your Ignition

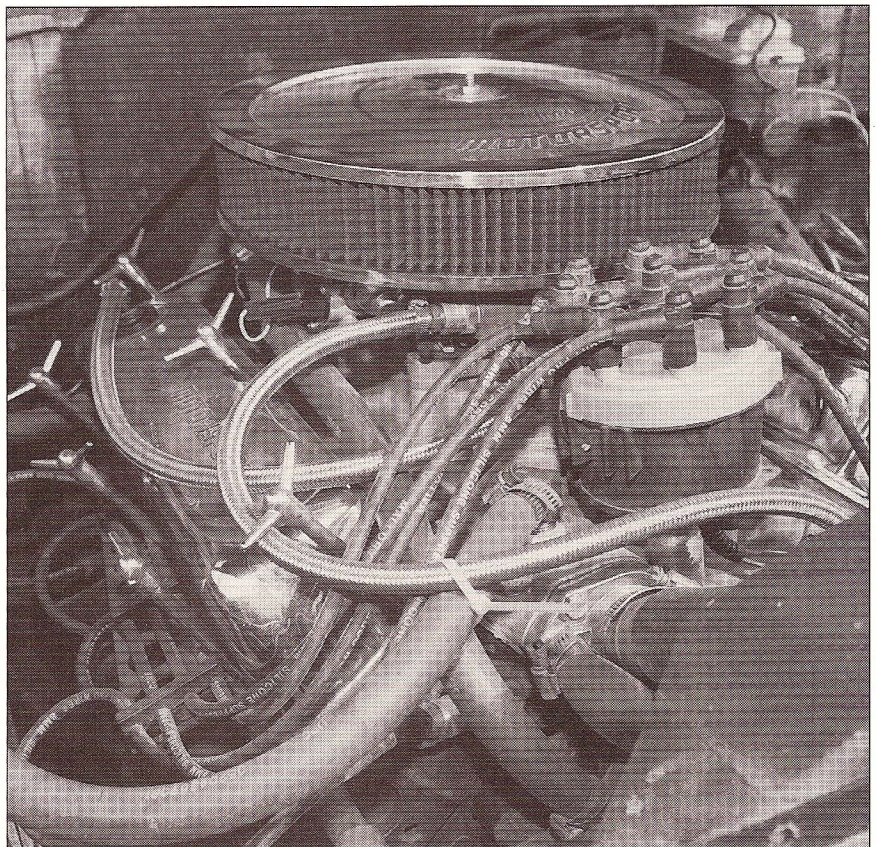
By Rick Shandley

PHOTOGRAPHY: RICK SHANDLEY

You likely have more performance hibernating in your ignition system right now than in any other aspect of your engine. The untapped potential that can "wake up" your engine can be realized by recurving your mechanical-advance distributor. Recurving the distributor involves adjusting spring tension on the centrifugal advance mechanism to obtain the desired ignition advance curve. Additional changes can be made to the stop pins that limit the amount of total advance possible. A recurved distributor is usually made to advance more quickly, improving power.

The advantage to increasing ignition advance is that the spark plugs will fire earlier in the combustion chamber relative to the crankshaft angle on the compression stroke. This allows for more burn time, and therefore a more efficient burn. You get quicker throttle response, more low-speed torque and increased fuel economy, though generally most of the gains will be experienced at higher rpm. Furthermore, by increasing the amount of total advance, you gain top-end horsepower.

We spoke with Sean Murphy of Jones Performance Fuel Systems in Huntington Beach, California, to learn how to recurve a distributor. This is an operation that can be done on your workbench, but make sure you can check the results or engine damage could occur. Typically, a stock engine will pick up 10-15 horsepower, with similar increases in torque, Murphy said. Stock powerplants come from the manufacturer with mild ignition timing to meet emissions requirements and reduce the possibility of pinging from running on poor fuel, and also to kill a dollop of power

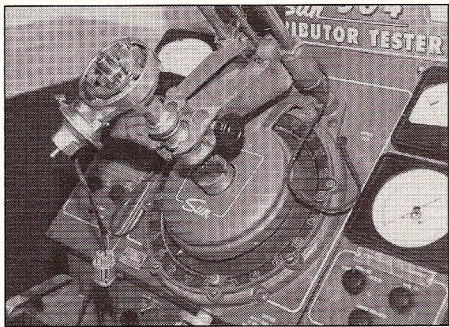


You can economically increase engine performance, whether stock or modified, by changing the advance curve of your distributor. Even a stock engine can produce better throttle response, more low-end torque and better gas mileage.

to limit warranty claims.

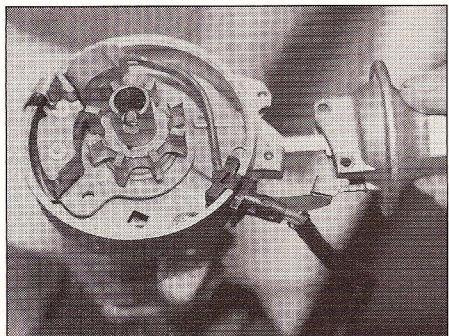
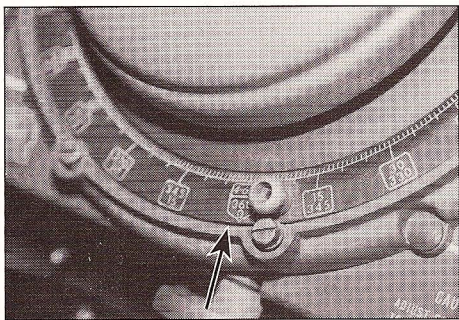
On a modified engine, you stand to see more dramatic increases in horsepower and torque because a high-profile cam is less efficient at lower rpm and needs more timing advance. By recurving the distributor, the greater-duration cam gains efficiency because the cylinder pressure lost due to valve overlap is offset by the increased

timing advance. Since the valves stay open longer, the upstroke of the piston has less time to build cylinder pressure. By initiating the spark advance earlier, the ignition spark is fired sooner, thereby allowing more time to efficiently burn the fuel in the cylinders. At TDC, the burning mixture is at maximum pressure to drive down the piston on the power stroke.

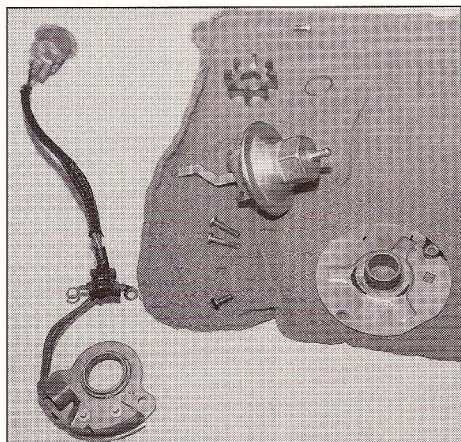


We determined the stock timing advance by testing the distributor on the Sun 504 distributor machine. The stock distributor was spun at 500-rpm increments for comparison with the new, recurved figures.

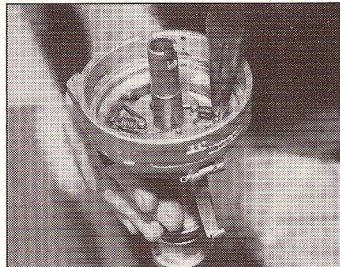
The mechanical gauge on the distributor tester was marked in 15-degree increments from the starting point at zero (see arrow). As the distributor speed was increased 500 rpm at a time, the timing arrow appeared to the left of zero above the ruled markings at whatever degrees advance the distributor put out at a given rpm.



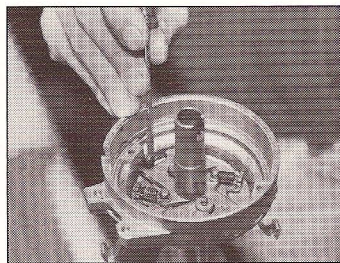
With the stock timing advance figures plotted, Murphy disassembled the distributor for recurving by removing the vacuum advance (each distributor type comes apart and reassembles differently).



The distributor's stator wheel and pickup coil sender were also removed to gain access to the advance springs and weights below.

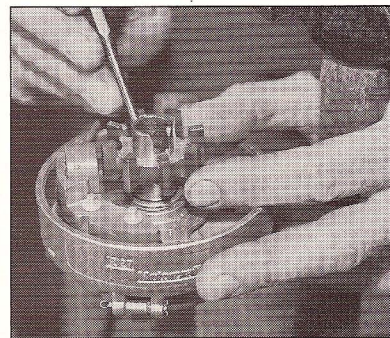


The spring tabs were bent inward to reduce spring tension, allowing the weights to move out with less centrifugal force (lower rpm) and resulting in increased timing advance.

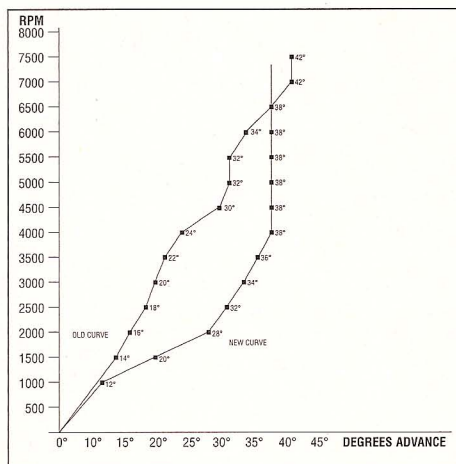


The center-plate slots and the outer ends of the center plate control maximum advance. The stop pins were moved forward to restrict the amount of travel on the center plate. This limits the amount of total advance at the upper rpm range. Too much advance can also be a bad thing.

The distributor was reassembled and put back on the tester to determine the results. On the first try, the distributor was about four degrees shy of our target curve of 38 degrees at 4,000-5,000 rpm (the stock timing advance was 30 degrees at 5,000 rpm). The distributor was disassembled once more, and the spring tension was reduced a tad more. On the second try, Murphy achieved the target curve.



A look at the chart shows the stock timing curve on the left and the modified curve on the right. At 500 rpm, neither curve shows advance because the springs still have enough tension to keep the weights from moving outward. As rpm increases, centrifugal force takes over and the weights move outward,



rotating the plate and advancing the timing. Each distributor is recurved according to the specific engine application. By looking at the graph, you can see that the curve of the modified distributor comes in quicker at lower rpm and gradually increases at higher rpm.

For demonstration purposes, we used a stock, out-of-the-box Ford distributor. The distributor was tested on a Sun 504 distributor machine, building an advance-curve chart in 500-rpm increments to learn the OEM timing curve. To get accurate results, the distributor was spun to much higher rpm than most engines would ever be (see the distributor curve

chart). Next the distributor was modified, and the tests were performed again for a visual comparison.

Heavy-load applications such as towing should use a milder advance curve than the one shown here, in order to resist pinging. Follow along to learn how you get power from your mechanical-advance distributor. **OR**

SOURCE:
JONES PERFORMANCE
FUEL SYSTEMS
 Dept. OR
 17491 Apex Circle
 Huntington Beach, CA 92647
 714/848-5500