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IH: Engine Control - Sub-01E

Why Timing Advance Changed From 45°- 40° BTDC in 1972

Article by Dr Dick of the XLFORUM [1)]

- 1972 marked the introduction of the 1000cc engine.
- Timing advance changed for two reasons:
    - The head volume is the same between 900 and 1000 and so is the compression ratio (supposedly).
    - That means the piston dome is 'smaller' on 1000 pistons than on 900 which means there is more TDC chamber volume in a 1000 than in a 900. And, with a smaller dome, you have less “cold surface” area. These two things mean that, in a 1000, the small burn at the plug gap will “snowball' into a full burn quicker. There is less cold surface stealing the precious heat so less spark lead is needed.
    - If you think about this the second reason may become apparent. Increasing displacement but leaving the head chamber alone gets rid of the cursed 'orange peel' shape of the chamber. Actually, the chamber gets real good if you go big enough. Heard that before right?
    - Go the other way. With a smaller displacement, the orange peel gets worse. The chamber size gets filled with a bigger dome and more surface sucks up more heat. The amount of burning mixture is less because the displacement is less. More heat goes into raising motor temp than gets used as pressure to push on the piston. Sounds like a recipe for over heating.
    - I'd bet if you took a 900 and de-stroked it to 750, it wouldn't be good for much more than a 1/4 mile. It seems it would just get so hot that it would toast all the fuel energy to heat motor parts instead of pushing on the piston. Heard that before right?
    - Spark lead got less in 1972 because it was 1972. Starting in 1970 the government forced emmision restriction on the big 3. Smog in California.Smog was caused by nitrogen combining with oxygen in the cubustion chambers of every vehicle. This byproduct grows as heat and the pressure increases. But, heat and the pressure it creates is the only thing that pushes on the piston. The only thing that makes power is piston push. So, to get rid of nitrous emmisions combustion temps needed to drop. Read as pressure. Read that as power.
    - This worked to drop nitrous emissions. Stomp on it: no pressure or power = no fun and no smog.
    - But, the low compression motors were so crappy at burning the fuel, because of the government mandated artificially low partial throttle cylinder pressures, that a new problem showed up. Hydrocarbon emissions (which is a fancy name for gasoline). The

un-burnt mixture was getting emitted now.
    - Solve that by putting a self heating chamber in the exhaust that self heats by catalytic reactions. This heat forces the unused fuel and oxygen to burn in the exhaust (where it does no good). They call it a catalytic converter.
    - Now, you've got water vapor and co2. Lately, I've been hearing rumblings that co2 isn't good for the planet either.
    - Anyhow, lead from the gas would coat the catalyzing surfs in the converters and render them useless. They couldn't have that, especially now that your new car is at a 8:1 compression ratio and you don't need that octane anyhow.
- What's that you say? What about your grandmother and her 11:1 alum head straight 6 Tempest? Collateral damage, just like every 11:1 XLCH your grampa rode.

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https://www.xlforum.net/forum/sportster-motorcycle-forum/sportster-motorcycle-era-specific-and-model-specific/ironhead-sportster-motorcycle-talk-1957-1985/142788-timing-question/page3?t=1547480&page=3