Determining Effects of Head Milling on Camshaft Timing

When you mill the head or block, the distance between the centerline of the crankshaft and the centerline of the camshaft(s) is reduced by the amount removed from the head or block. What effect does this have on the camshaft timing? What you have read on the internet is probably incorrect.

In order for the camshaft to be in time with the crankshaft, with zero degrees advance or retard, it must remain in the same position, relative to the crankshaft, with the milled head as it was with the stock head. If you are going to maintain this relationship, you will need an adjustable timing gear.

In order to determine the effects of the milling, you need to understand what is actually happening. The length of the timing belt between the crankshaft gear and the camshaft gear is a fixed distance, due to the belt having teeth which meshes with the gears. When you mill the head or the block, the distance between the crankshaft and camshafts is obviously reduced, but the belt length and number of teeth between the crank and cam gears remains constant. This means that in order for the belt to remain tight, without slack on the front side of the engine and remain meshed with the gears, the outside ring of the adjustable camshaft gear has to rotate clockwise, while at the same time keeping the camshaft in the same position relative to the crank. The distance the outside of the gear rotates is equal to the amount milled. The next question is "How much in degrees does it move?"

In order to calculate what this means in camshaft degrees, we use a simple math formula for the Properties of a Circle, where:

Angle A (in degrees) is = 180a/pi(r)

with "a" being the length of the arc or distance that gear rotates (equal to amount milled) and "r" being the radius from the center of the cam gear to the belt.

On <u>SOHC</u> <u>D-series</u> Honda cam gears, there are 38 teeth on the cam gear and the pitch of the teeth is 9.5mm. This means that the circumference around the gear at the belt is 38 x 9.5 = 361mm. Since the radius is equal to the circumference divided by 2 x pi, the radius from the center of the gear to the belt is approx. 57.5mm or 2.2638". Plugging the numbers into the above formula you will get:

Angle A = 180a/pi (2.2638) = 25.3096a

Substituting into the formula, for instance with a head milled 0.010" the camshaft will rotate 25.3096 x 0.010 = 0.253 degrees clockwise.

On <u>B-series</u> & <u>DOHC ZC</u> Honda cam gears, there are 34 teeth on the cam gear and the pitch of the teeth is also 9.5mm. This means that the circumference around the gear at the belt is 34 x 9.5 = 323mm. The radius therefore is approx. 51.5mm or 2.0276". Plugging the numbers into the above formula you will get:

Angle = 28.2579a

Substituting into the formula, for instance with a head milled 0.010" the camshaft will rotate 28.2579 x 0.010 = 0.283 degrees clockwise.