Note 54

Combustion Chamber Shape and Efficiency

There are a number of examples of how Combustion Chamber Shape can affect Combustion Efficiency (EC).
(1). H.N. Charles in 1939 (294) described how, in the MG NE-type IL6 1.3L NA with bath-tub head having 2 vertical valves and R = 9.8, the combustion on 50/50 Petrol/Benzole was not complete until the piston crown opposite to the side-mounted sparking plug was raised "*so that...the gas....can see the flame*" as his foreman tester suggested.
(2). D. Munro of BSA (398) warned in 1949 of the chamber shape effect, writing:- "*....if the adoption of a high*" [compression) " *ratio involves the use of a piston with a very steep dome, there may be a loss of power due to the inefficient space thus formed*".
(3). Tony Rudd was advised similarly by Shell's Dr Harrow to cut off the top of the piston crown in the 1962 BRM V8 1.5L NA at the 14^0 angle of the plug so as to "....*show the charge to the spark*". Despite a drop of R from 12.2 to 11.2 this added 4% to Peak Power (40). The chamber was no longer "cut in two" by the high crown,
(4). Yoshio Nakamura (75) detailed how an increase in a basically-high-compression ratio could spoil the combustion chamber shape in a racing engine and produce a lower cylinder pressure (i.e. reducing the Combustion Efficiency more than the gain in Cycle Efficiency). His test results were obtained from a 25 cc 4-valve cylinder of the Honda 1963 RC113 50 cc twin, B/S = 33/29.2 = 1.14, VIA = 72^0 using high Octane Petrol. They showed that R = 9.3 with a smooth moderately-humped piston was more powerful than R = 10 when the latter needed 4 pockets in the crown to clear the valves with high-speed timing all open at exhaust TDC (note: (R x VIA) = 670^0 and 720^0 in these cases respectively). See Fig. N54.

Fig. N54
November 1963 Honda RC113
IL2 a/c 33/29.2 = 1.138 49.95 cc
Tested at 16,000 RPM:- MPS = 15.6 m/s.
DASO 75
Pictures approx. full size

	Piston A	Piston B
Compression Ratio	10	9.3
	Humped with deep valve-clearance pockets	Lower hump without pockets.

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