

Note 69



Oil scavenging

Vee-configuration engines with DOHC per bank have presented oil-scavenging problems at least since 1938 when the Mercedes M154 V12 had this trouble. In the 1939 M163 V12, with three pumps *supplying* oil to the crank and valve gear, six *scavenging* pumps were found necessary to return oil not only from front and rear of the sump but also from valve gear, superchargers, rear crank seal and the crankcase breather (30). The 120V6 Ferrari of 1961, as described by its designer Carlo Chiti (22), also suffered from oil-scavenging problems (which were described as 'barbotage' = splashing; the oldest engine lubrication system by splash was called in French 'graissage par barbotage', hence re-adoption of the term on the Continent for the new phenomenon). These problems were also met by increasing the number of scavenge pumps. Chiti (in the cited reference, published in 1980) credited Duckworth's DFV arrangements with the general solution to 'barbotage'.

An interesting numerical example of the power and lap speed losses due to oil churning with inadequate scavenging was the mid-1971 third redesign of the Matra 60V12 3L, B/S = $79.7/50 = 1.59$. When first raced in the German GP at the Nurburgring, Amon's Matra with the new engine was 4.0% slower than pole (Stewart/Tyrrell-DFV) and 3.9% below the grid 2nd (Ickx/Ferrari 312B). Matra skipped the next race to investigate the poor power and found the cause as mentioned above (124), the peak being only 395 HP (981). When rectified the power rose to 460 HP (981). Amon then took pole for the Italian GP at Monza, 0.5% faster than Ickx, who was 2nd, both benefiting from slip streaming, and 1.2% faster than Stewart (who did not get a tow). Thus a reported 16.5% power rise translated into a 4.4% lap speed gain over the Ferrari (about a 4th root effect).

'Oil hiding', which is the same thing, ie oil not returning 'properly' above certain RPM, is known to have affected certain aero gas turbines in the '70s. It was thought to be associated with exceeding a critical Reynold's Number. It was noted that this effect, with great aeration, led to very high temperatures since the oil 'made many laps' before eventually reaching the reservoir. In these cases shrouding of certain gears effected a cure (880).