

ALUMINIUM DIE CASTINGS IN AUTOMOBILES (*)

R.K. Srivastava,
Indian Standards Institution,
New Delhi.

The most important factor in favour of aluminium and aluminium alloys is their low specific gravity. This coupled with the desirable mechanical properties of aluminium alloys is responsible for the low average weight achieved.

Small parts are being followed by large structural parts such as transmission cases, torque converter housings and clutch housings. Oil pumper bodies, rocker arms, rocker arm brackets, water pumps, timing chain cover, valve covers, crank cases, carburetors and many other parts in die cast aluminium are available in passenger cars and trucks. The die casting process in aluminium has been able to combine several parts into one casting thereby achieving production economies.

Clutch and torque converter housings made of die casting aluminium have been introduced in advanced countries as early as 1950. This has increased the amount of aluminium used per car to 12 kg (in 1953) and in 1963 the average reached to about 30 kg of which 18 kg or nearly 60 percent was in the form of die castings. These die castings were specified for the mechanical or structural parts. The remainder of the aluminium was used for pistons, brake drums, mouldings and other ornamental parts.

Recent Trends for Bigger Automotive Castings:

The attention of the automotive industry has for considerable time been focussed on developments in the advanced countries for large pressure die castings.

(*) Paper for presentation at the Symposium on "Recent Developments in Non-Ferrous Metals' Technology"
- 4th to 7th December, 1968, Jamshedpur.

While advantages of aluminium for engine blocks have long been recognised by automotive engineers, the cost of a block produced in sand or a semi-permanent mould could not compete with that of a cast iron block. Although to begin with, the size and the quality of aluminium casting was limited by the lack of technical knowledge, production experience and size of die casting machines, further improvements in the die casting techniques made the production of cylinder blocks a reality in 1955.

Subsequently die cast aluminium engine blocks were also made by American Motors and Chrysler Corporation. The General Motors used this method to produce aluminium V-S engine for Buick and Oldsmobile. There were many problems and prejudices to overcome in the design of a die cast block with dry sleeves. Corrosion was viewed as a serious problem in a water cooled engine. The higher coefficient of expansion of aluminium compared to iron was expected to create problems specially in bearing clearance. Aluminium was considered neither strong nor rigid enough to withstand the pulsating stresses of the powerful engine and high compression ratios. Aluminium would not have the dampening effect of grey iron resulting in a moisy engine. Porosity was another problem and it was thought not possible to produce a leakproof engine block. The die casting industry might not be capable of producing engine blocks of acceptable quality in large quantities. All these fears had already been disproved by the high performance of relatively small engines but still these prejudices persisted.

Answers to these questions and many others were found. Prototypes were made, and tested. New casting machines were designed and built to handle engine block dies and the production of die casting engine blocks was started by American Motors for their passenger cars in 1961.