

# CADILLAC'S V-8, V-12 AND V-16 ENGINE EVOLUTION

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Cadillac was founded in 1902 by Henry Leland who had a passion for precision craftsmanship and standardized parts. Beginning in 1915 Cadillac offered a pioneering flat (L) head V-8 engine that set new standards for smoothness, power and reliability as its name became increasingly recognized as a luxury-make leader.

In 1930 Cadillac ventured further into the ultra-luxury market by offering the industry's first V-16 engine. Their "452" CID engine was a 45 degree, overhead valve (OHV), push-rod design with five main bearings that delivered 165 horsepower. Sixteen cylinders were chosen principally because of the inherent smoothness of this design.

The V-16 engine was essentially two straight-eight engines sharing a single crankcase and crankshaft. In a V-16 engine layout there are only two vee angles that give equal firing intervals, 45 deg. and 135 deg. Cars of the early 1930s were still relatively tall and narrow so the logical choice was the narrower 45 deg. design. With the narrower vee a flathead design would not allow both intake and exhaust manifolds to fit between the vee whereas an OHV layout would allow the intake manifolds to be placed on the outside of the engine and the exhaust manifold on top in the vee. The inherent problem with the OHV design was more frequent valve adjustment and more valve noise, which Cadillac dealt with by incorporating a hydraulic valve adjustment mechanism.

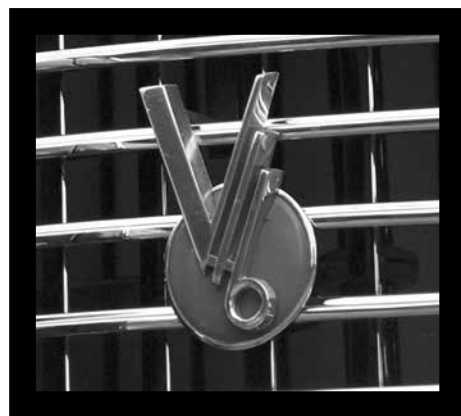
The first generation V-16 was one of the finest appearing production automotive power-plants ever built. When this engine was introduced,

automobile engines were very visible due to ventilation doors in the hood sides that opened with the hoods, so that an aesthetically pleasing engine was very desirable. Cadillac certainly achieved that. All of the manifolding was coated in black porcelain enamel, the rocker covers were black and polished aluminum, the black valley cover which also hid the ignition wiring was held down by knobs with cloisonné emblems and all exposed hardware was chrome plated.

The sixteen was only nine months old when Cadillac introduced another multi-cylinder engine, a 352 CID V-12. This engine was essentially their new V-16 with four fewer cylinders. The cars in which it was offered weren't quite as large, using the Cadillac Eight's 140" chassis versus the enormous 148" chassis only used for the Sixteen. Predictably, the Twelves weren't quite as fast as the Sixteen but every bit as smooth and quite ample for most drivers. And, the Twelve was priced much cheaper than the Sixteen, severely impacting future sales thereof.

Despite their refined performance and majestic proportions, the first generation Cadillac Twelves and Sixteens were anachronisms in the devastated Depression market and none sold in significant numbers. The peak was 1930-31 when 3,250 Sixteens and 5,725 Twelves were produced. The total volume of Twelves and Sixteens produced had dropped by more than 75% for 1932 and continued sharply declining after that until production of both those engines was terminated in 1937.

Over the seven years that 1st Series V-12 and V-16 Cadillacs were sold they



made a total of just under 14,700 cars of which less than 3,900 were V-16s.

There has been only one other American manufacturer ever to offer a production V-16 automobile to the public - "Marmon." Developing 200hp from 491 CID this amazing giant was guaranteed to do 100 mph. The Marmon engine employed state-of-the-art all-aluminum monoblock construction weighing in at 370 pounds less than Cadillac's slightly smaller V-16. The Marmon "Sixteen" debuted in 1931 advertised as "The World's Most Advanced Car," however, the Cadillac V-16 had already established a market foothold having been on the market for a year and outsold Marmon by a margin of 10-to-1. Marmon ceased automobile production altogether in 1932 after selling only 390 of their magnificent "Sixteens" over a two year production run.

There were two main reasons why these grand, top-of-the line, cars fared so poorly in the marketplace. First, staggeringly expensive cars with more than eight cylinders seemed socially inappropriate to many people in the early 1930s. These models were shunned by most potential customers for cheaper, less showy cars.

Second, when Marmon left the scene, the existing Cadillac V-16 engine was rapidly being outmoded by advancing technology. In 1936, Cadillac themselves introduced a completely redesigned 346 cid

flat (L) head V-8 delivering 135hp from a mono-block that was lighter, less expensive to build and had a power to weight ratio superior to both the Twelve and Sixteen. Though the flathead design had its limits, this new engine delivered excellent performance and reasonable economy. This respected power-plant was used extensively throughout WWII to power tanks and armored vehicles. With upgrades bringing this engine up to 150hp It would remain in production until Cadillac replaced it with a new short stroke OHV engine in 1949.

In late 1937, Cadillac stopped producing its venerable 452 engine and replaced it with an all new Sixteen Cylinder redesign. These cars, designated as the 90 Series, were built from 1938 through 1940 and would be the last production sixteen-cylinder "Supercars" ever built.

The most notable feature of this last V-16 series was the engine, an L-head of almost horizontal (135 degree) (vee) design. It has long been questioned why Cadillac would switch from the beautifully appointed and finished overhead valve engine used from 1930 through 1937 (along with its 1931 through 1937 companion V-12) to the plainer, much simplified L-head design. Also, Cadillac's wisdom is often questioned as to why they would introduce a new design V-16 in 1938 when the V-12s of the other competing prestige makes were all in their last days.

As to why Cadillac switched V-16 engines in 1938, their reasoning is fairly straight forward. In the 1935-1936 time period Cadillac was struggling to turn their Division around from its money losing days of the early thirties so, reducing the cost of the first generation Sixteen/Twelve engine was a big goal. During this time the new Cadillac mono-bloc V-8 had been introduced and had quickly become a performance success, even

to the point of besting not only their old separate block and crankcase V-8 but the overhead valve V-12 as well. Using current knowledge they wanted a new V-16 to be the evolution of Cadillac V-8, V-12 and V-16 engines.

By this time car design had evolved to where the engine was much more hidden due to the body using engine compartment sides that did not open with the hood. So engine appearance wasn't nearly as important as it had been. The updraft carburetor had been obsoleted by the downdraft design and the engine had evolved to a mono-block style wherein the cylinder blocks and crankcase are cast in one piece. The L-head design was chosen and 135 degrees between the cylinder banks was used to accommodate both the lower hood lines and enabled all the manifolding and downdraft carburetion to be positioned on top of the engine. Since high octane fuel was still some years in the future, use of the OHV configuration to allow higher compression ratios was deemed not necessary. Keep in mind that the main reason the original V-16 was designed with OHV's was to accommodate a side manifold layout required for updraft carburetors.

The results of this V-16 redesign program certainly achieved the Division's desires of reducing production cost. The resulting power-plant had a displacement of 431 cu. and developed 185 hp at 3600 RPM. This was the same hp developed by the last versions of the first generation V-16s at 3800 RPM with almost the same amount of torque. The greatest differences between the old and new engines were in the weight and number of parts. The new V-16 had less than half the parts (1627 vs 3273), was 250 pounds lighter, 6 inches shorter, 12 inches lower and 4 inches wider than the old one. This engine was much less costly to produce.

In keeping with their cost effectiveness goals Cadillac designed a completely new car for that new engine. For 1938 the largest V-8 (75 Series) and the V-16 (90 Series) used the same body and were mounted on the same 141 inch chassis (including the same mounting pads for both engines.) This was a departure from 1937 when the largest V-8 (75 Series) and the V-12 (85 series) were mounted on a 138 inch chassis and the V-16 (90 Series) was mounted on their 154 inch chassis, the longest ever used on an American production car. This common body and chassis usage was made possible because of the compactness of the new V-16 engine.

As to why Cadillac even produced the second generation V-16, their rationale is very difficult to defend. During the development period the economy was looking up and to make this commitment there must have been much optimism felt within Cadillac.

In spite of all the work and preparation that went into those new V-16s the sales were disappointing. Another economic slow-down occurred in 1938 knocking car sales down again. Only 311 V-16s were sold in 1938, 136 in 1939 and after selling only 61 cars in 1940 the V-16 series was discontinued after selling a grand total of 508 cars over the three year production run. A big deterrent to increased sales was the price. In 1940 a basic Cadillac sedan with a V-8 engine listed for \$1745, however with a V-16 the price jumped to \$5140, almost three times as much ((\$97,000 today.)

The Cadillac second generation V-16 series 90 was the end of the era, however, one could argue that by offering it Cadillac helped to solidify the company's reputation as a leader in producing fine motor cars that still claim to be "The Standard of the World."

