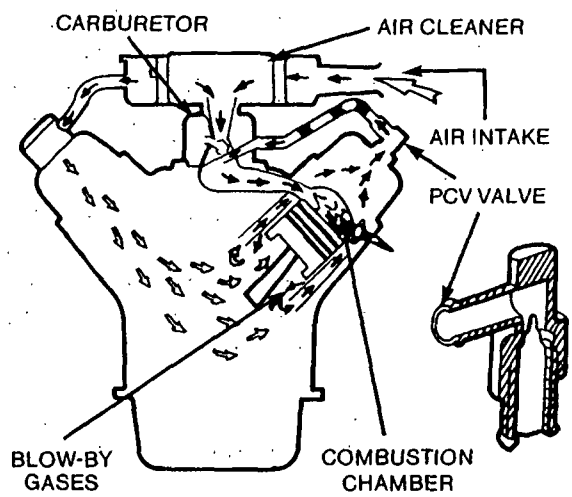
preferred method) and those which reduce or control pollutants after they have been formed ("post-combustion" systems). For a more detailed discussion of the following systems, see the Engine module.

Pre-Combustion Control Systems

Pre-combustion systems are by far the most efficient of the two types of control systems. It's better, easier and cheaper not to produce emissions in the first place than it is to control or destroy them after they've been formed. Most of the pollution control systems we use today prevent emissions from being created in the engine, either during or before the combustion cycle.

Crankcase Ventilation

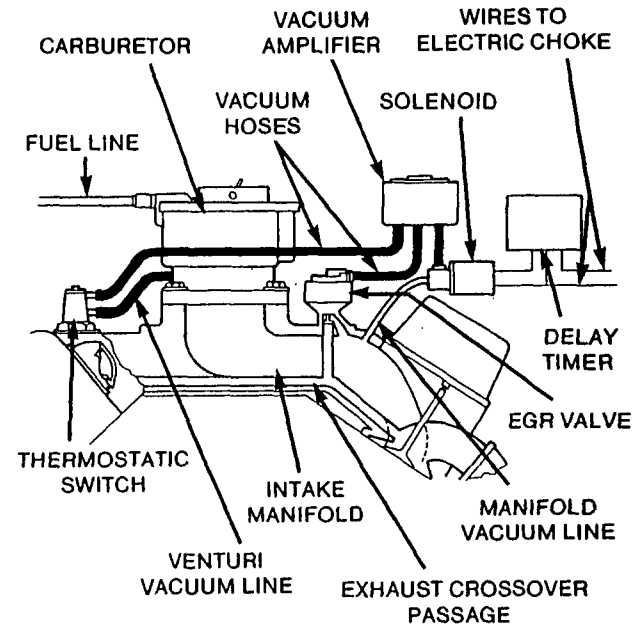


(Figure 44) Crankcase Ventilation.

The first crankcase ventilation systems were installed not to control emissions, but to remove harmful fuel vapors and combustion "blow-by" from inside the engine crankcase. Later, it was discovered that the these harmful interior elements were damaging when they were released into the atmosphere. Modern crankcase ventilation systems prevent these vapors from reaching the atmosphere by recycling them through the engine. This reduces emissions, while still allowing for ventilation.

Exhaust Gas Recirculation

One of the best methods of controlling the formation of NOx emissions is through exhaust gas recirculation (EGR). Designed to reduce the temperature of combustion in the cylinders of the engine, EGR is also the only major emissions control that is used on modern diesel engines.



(Figure 45) Exhaust Gas Recirculation.

EGR reduces combustion temperatures by introducing small amounts of inert exhaust gas into the combustion cycle. The exhaust gas dilutes the incoming air/fuel mixture, which results in less fuel in the combustion chamber. With less fuel to burn, less heat (and power) is produced.

Since it was first introduced into cars in 1971, many advancements have been made in the area of EGR control. Methods have been developed to control when EGR flow should occur and how much it can be used. But other than refinements in control, the EGR systems in use today are basically the same as the first systems of the early 1970's.

Spark Controls

There have been two phases in spark control development. The first designs were simple, usually consisting of a vacuum control valve added to the existing ignition advance system. These devices were designed to either prevent or increase spark advance under certain conditions.