



Subject: THE VARIABLE STROKE COMPRESSOR	TSB #: 22 3-09
	Date: 14/3/09
Initial Once Read:	

I know that this subject has been done to death but there are still some technicians out there that are not to sure how the variable compressor works.

Variable stroke compressors have become the "favoured compressor" for a large number of vehicle manufacturers such as GM Holden, Daewoo, VW, BMW, Mercedes Benz, Nissan. The variable stroke compressor manufacturers are Delphi, Sanden and Denso.

The main reason that vehicle manufacturers select the variable stroke compressor is that this compressor does not cycle on / off. Non cycling means less load on the engine, less engine load equals improved fuel economy.

If we look at a "normal" cycling system it requires some form of sensor / thermostatic switch / thermistor that monitors the temperature of the evaporator coil. Once the evaporator coil has reached a temperature of lets say, 3 degrees C, the compressor electrical circuit is interrupted by the sensor / thermostatic switch / thermistor. The idea of using a device that monitors the evaporator temperature is so that the evaporator can get down to a very low temperature but stay above zero degrees c as water (condensate) freezes at zero degrees c.

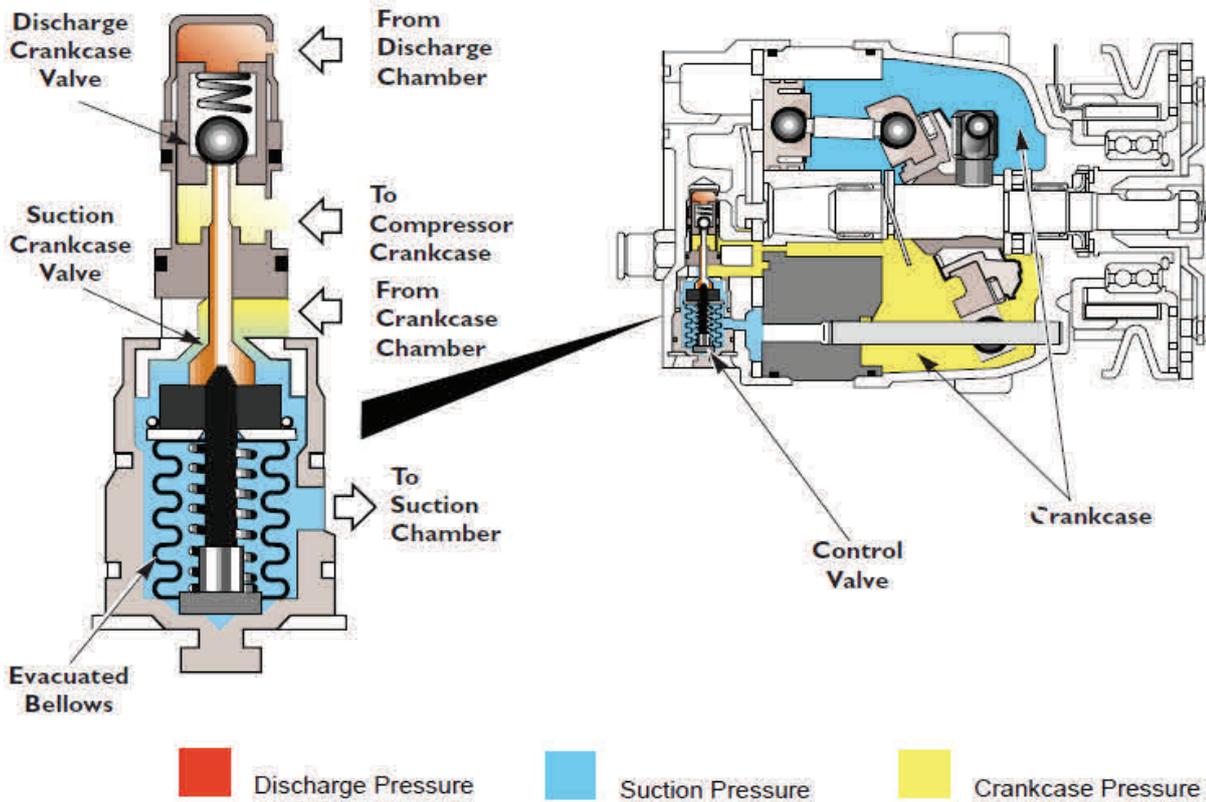
The variable stroke compressor even though it does not cycle, must still ensure that the evaporator temperature does not go below zero degrees c. The low side pressure is maintained to a preset pressure value called the "set point" which is normally in the range of 190 kPa which compares to zero degree c to approx 300 kPa which calculates to plus 9 degrees. The set point pressure is controlled by a valve located in the compressor body. This valve could be mechanical or electrical / mechanical design depending on the compressor manufacturer.

The variable stroke compressor gets it's name from the fact that it can vary the output or displacement to meet A/C system demands under all conditions and temperature loads. The actual output of the compressor can be altered from a minimum output of .06cc to a maximum output of 10ci.

The following is a description and the operation of the most recognized variable stroke compressor in Australia, the Delphi, V5 variable, 5 piston used on the Holden range of commodore vehicles VT through to VY.

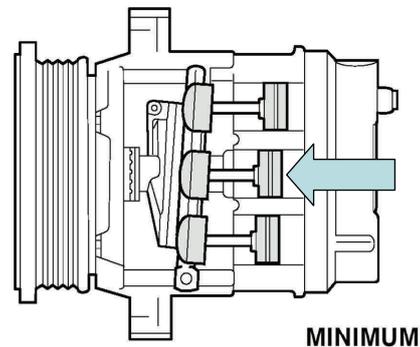
The compressor output is adjusted by means of a mechanical control valve located at the rear of the compressor body. This control valve senses and responds to the low side pressure changes which directly correspond to the A/C evaporator load. It is the changing of the "wobble" plate angle that affects the output of the compressor. The wobble plate is adjusted by "crankcase pressure" this pressure is behind the pistons and acts as an opposing force to the pistons as they move back when the input shaft is turned.

If the crankcase pressure is equal to the suction pressure, the opposing force to the rear of the pistons is equal and with the aid of an internal spring causes the wobble plate to move to the almost vertical position which then shortens the stroke of the pistons and makes the compressor output low (minimum stroke). As the low pressure increases owing to A/C load the crankcase pressure is reduced through the control valve which lowers the suction (low) pressure leaving less opposing pressure to the rear of the pistons which then causes the wobble plate to change angle thus allowing the pistons to travel to full stroke and maximum output.



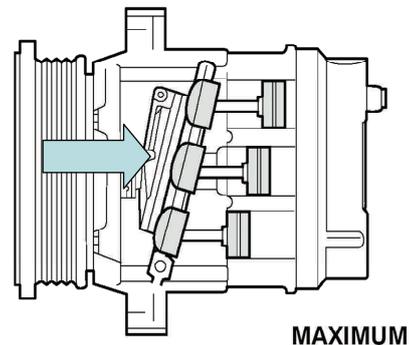
MINIMUM STROKE

A/C Demand Low – During times of low A/C demand, the suction (low) pressure will be greater than the control valve set point. During this time the control valve maintains a bleed of crankcase pressure to the suction (low) side pressure.



MAXIMUM STROKE

A/C Demand High – Suction (low) pressure will decrease to the control valve set point. The control valve maintains a crankcase pressure bleed to the discharge side (high) and prevents any pressure bleed off to the suction (low) side. At this stage the output could be varied between 5 and 100% of its output.



Later GM vehicles such as the Holden Commodore VE use a compressor that has a control valve that is electronically controlled via an ECM (electronic control module). The compressor also has no clutch magnetic coil as it is not required as the compressor does not cycle.

Always remember “A variable stroke compressor should not Cycle on and off, if it does that means the A/C system has a problem”