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# Sounds Made By Older Diesel Locomotives

**By Ken Scales MMR**

This article is about understanding how diesel locomotives work and why they make the noises we try and replicate in our models. To understand the basics of older Diesel Locomotives it is probably best to look at their history. The first known diesel locomotive in the USA was produced by GE for the Jay Street Connecting Railroad in 1918. It had a 200 horsepower V8 engine but it was not a commercial success and was returned to GE shortly after delivery. The first uccessful production locos in the USA were small box cabs built in a joint production by GE, Ingersol Rand and Alco in 1924. It was not until 1928 that Alco in a joint venture with the New York Central railroad built the first successful road diesel which remained in service almost as built up to 1946. Even after that it was rebuilt and remained in service until 1953. Other loco manufacturers such as Baldwin built large diesel locomotives as early as 1924 but none were considered a commercial success.

The real change that made diesel electric propulsion so attractive was the use of a governor which allowed the locomotive to be controlled with a single throttle lever. The Electro-Motive Corporation had plans to build doodlebugs using GE electrical components and Winton Engines. A Swiss engineer working for GE by the name of Lemp developed a governor at the request of EMC to be used in Gasoline Electric Doodlebugs. Over time Winton developed distillate and finally diesel engines until both it and EMC became the EMD division of General Motors. EMD then went on to develop the most commercially successful early diesel electric locomotives which changed the way railways operated from that time on. Most older locomotives use either Woodward or GE governors. Both of these work in a similar way and they have a bearing on the overall sound made by the loco.

While modern locomotives use electronics to control both the diesel engine and the generator they still use the same basic components. If you are really interested in adding realistic sound to your locos it helps to know how it all works. On most older US and Australian locos there is a single throttle which controls both the generator and diesel engine. It has an idle or off position and 8 running notches. The speed of the diesel engine increases as the throttle is advanced from notch 1 to 8.

The amount of electrical current produced is automatically controlled by the governor. The governor will determine this either by measuring the axle speed or the current running to the traction motors. It then changes the amount of current fed to the outside coils in the generator which controls how much current the generator will actually produce. This process is known as

exciting the field coils. This as a consequence controls the speed of the traction motors which drive the loco because it regulates the amount of electrical current they receive. There is also a reverser handle which has off, forward and reverse positions. This operates by reversing the polarity of the electrical current flowing to the traction motors.

Most locos have a traction motor for each set of wheels. The current delivered to the traction motors is also dependant on how they are connected in to the generator. Most older locomotives start in what is known as series/parallel. This means that they are connected together in each bogie in series and the sets of traction motors in each bogie are connected together to the generator in parallel. This reduces the amount of power required from the generator when starting the train. As speed increases the electrical system changes the way in which the traction motors are connected. It also changes the way electricity is fed to the field coils
in the traction motors in a process known as a field shunt. The locomotive performs a procedure known as “transition”. As part of this process the traction motors are reconnected to the generator in parallel which requires a much higher current output from the generator. On most mainline freight locos there are 3 or four stages of transition. It is this procedure which we often try to replicate with our sound decoders because it changes the load and as a consequence the
sound made by the diesel engine in the locomotive.

One of the main aims of transition is to protect the electrical system from back current produced when the traction motors act as generators. Many locomotives are fitted with dynamic brakes which use the traction motors to help slow the train. When these are applied the traction motors act as generators and the current is fed into resistance grids. This further protects the electrical system from back current and reduces the load on the brakes during long descents. Most of the grids are cooled by fans which produce a distinctive noise. This is another feature which we try and replicate with the sound units in our models.

The diesel engines used in older locomotive are generally fa2supercharged two strokes. On these engines air is forced into the cylinders through ports in the side by a mechanically driven supercharger. These ports in the side of the cylinders act as valves when the piston moves up and down. When fuel is injected and the engine fires the burnt gas is then forced out as the piston moves up and pushes it through exhaust valves in the top of the head. There are two strokes of the piston and one revolution of the crankshaft to complete a working cycle. Most early EMD units are supercharged two strokes. Around 1959 EMD began using turbochargers as well as superchargers. Eventually most EMD engines became turbo-supercharged two strokes.

The second are turbocharged four strokes. On these engines air is forced into the cylinders through inlet valves in the top of the head. Fuel is injected and the engine fires forcing the piston down. As the piston moves up it pushes the burnt gas through exhaust valves in the top of the head. The burnt gas drives the blades of the turbocharger as it exits through the exhaust. There are four strokes of the piston and two revolutions of the crankshaft to complete a working

cycle.  Most Alco and GE units are turbocharged four strokes.

Normally aspirated four stroke engines work in a similar way except that the air is sucked into the
engine by the effect of the piston moving down instead of being forced in by the turbocharger. Most Caterpillar engines are naturally aspirated four strokes.

Most of this information is very general and related to older US and Australian locomotives. Newer locomotives use electronic controls and alternating current and they are built to comply with stringent noise regulations.  Many do not have transition.  Consequently they sound very different.

Many early EMD diesel engines were supercharged two strokes and their exhausts were more difficult to silence because did not tolerate high backpressure from mufflers.  Alcos which were turbocharged four strokes were also noisy but not for the same reasons.  Two stroke and four stroke engines usually sound very different.  The noise made by the superchargers and turbochargers adds even more distinctive sounds to different locos.  Combined with noisy exhausts and lack of sound proofing material in the loco bodies, older locos often have a far more distinctive sound that their more modern counterparts.  The sound decoders made for early EMD and ALCO locomotives make far more distinctive noises than the newer locomotives because their 12 inch to the foot cousins did the same.