Miniatronics Electrak II

Review of Miniatronics Electrak Clean II Track Cleaning Car (Patent Pending), by Larry Maier (12-04-04).

Miniatronics has just released an electronic track-cleaning car housed in an Athearn diesel B unit. It comes equipped with McHenry style couples and is ready to run right out of the box. It is compatible with both DC and DCC layouts. Since it does not rely on mechanical interaction with the rail, it moves smoothly with minimum resistance.

The Electrak uses an internal 9V battery (included) to generate a high voltage, high frequency track cleaning signal. (Another release is planned that also uses track power.)

I measured a voltage of 216V across the rails with the unit sitting on a 1-meter section of flex-track with no other loads. The operating frequency is in the range of 100KHz, and the output pulses on and off at approximately a 20 Hz rate. At first look, that output voltage is quite an eyebrow raiser. However, the total output current is limited to approximately 2 mA, which prevents the Electrak from being a hazard to people or to your layout. I placed my finger across the track on which I measured the 216 volts, and could not feel any sensation of a shock. With my finger in place, I measured a track voltage in the range of 30 volts, which is well within the limits of human safety.

DCC Compatibility

To verify that the Electrak is not a DCC hazard, I connected a DCC decoder directly to the rails of a test length of flex-track with the Electrak operating. There where no other loads on the rails, so this is a worst-case condition. I measured less than 8 volts on the input filter capacitor of the DCC decoder. This voltage would be at least 9 volts even with low voltage N scale operation and is well within the voltage withstanding limits recommended by the NMRA. The reason the voltage is so low is that the high frequency of the Electrak sees the decoder input capacitor as a short circuit, so very little voltage is developed across the capacitor and the decoder input circuitry. As I will discuss later, this effect of shorting the rails together at the Electrak operating frequency is necessary for the unit to operate properly. As a further verification of DCC compatibility, I ran the Electrak cleaner on my layout. I have multiple BLI (Broadway Limited) engines, multiple units equipped with Soundtraxx decoders, and I use stationary decoders and Tortoise switch machines for all of my switches. Short answer: all the layout functions, including sound, operated correctly with the Electrak in operation on the layout. In fact, in my cleaning evaluation, I ran the unit with a Soundtraxx equipped engine with no problems. I also inserted it into a consist of multiple sound-equipped engines without difficulty.

Theory of Operation

The Electrak works by generating a high voltage, high frequency signal that is current limited to about 2 mA. Due to the current limit, almost anything that is attached to the rails (e.g. a motor in DC or a decoder in DCC) will act as a short circuit to the Electrak. Thus, loads on the rails normally short the generated signal. Current flows from the generator, out one wheel set, across the rail load, into the other wheel set, and back to the generator. Due to the low impedances involved, there is very little voltage in this loop (hence its safety and compatibility with DC and DCC). When the Electrak encounters a spot in the track that does not provide a good connection to the Electrak wheels (i.e. a dirty spot), the full 216 volts of the generator appears across this high impedance. This high voltage acts to break up the contamination, and thus clean the track.

The Electrak is particularly good at destroying oxide films. Any exposed metal will form a surface oxide coat. Some of these metal oxides are insulators (such as brass) while some oxides do have conductive properties (such as “nickel silver” rails). Most metal oxides, however, do not conduct as well as the base metal. This is why abrasive pads work well. The abrasive action destroys the oxide coating allowing metal contact to the engine wheels. The dielectric withstanding voltage of thin oxide layers is on the order of 10-50 volts depending on the oxide and the oxide thickness. The Electrak has sufficient voltage to “punch through” the oxide (called defritting), destroying the oxide and exposing the base metal. The ability of the Electrak to remove track oxides is particularly handy if you have an outside layout or one exposed to high humidity.

In addition to oxides, the voltage action of the Electrak will help breakdown thin layers of complex organic molecules (grease, oil, and plastic residue) back to simple carbon. As a result of this action, the Electrak will tend to leave an ash residue where contaminants were broken down. This residue needs to be cleaned from the track. For this reason, a chemical track cleaner, such as the CMX Clean Machine should follow the Electrak cleaner for optimum rail cleaning. The Electrak will breakdown the metal oxides and some of the contaminants, while the Clean Machine will clean the Electrak residue and any contaminants that the Electrak cannot break down. The result is chemically and electrically cleaned rails.

Layout Testing

I ran the Electrak (by itself without the chemical follower) around my layout to see if it made any difference in operation. I had previously noted a section in which the headlight of through trains would vary in intensity, indicating the need for some cleaning. As I ran the Electrak around positioned midway in the engine consist, the flashing of the lead engine headlight became less and less and then stopped.

I had one switch to a hidden yard that was giving me serious grief (it normally does not see much traffic), often causing engines to stop in mid-frog. I manually ran the Electrak through the switch several times. Trains started to navigate the switch with just a short headlight flash. A definite improvement! I believe this is a case in which low utilization of the track resulted in oxide build-up and then poor operation.

My layout certainly seemed to benefit from the use of the Electrak Cleaner II.

Conclusion

Based on layout testing, the Electrak Cleaner II is an effective method of improving model railroad performance by cleaning the track and allowing good contact between the engine pickup and the rails. To achieve the best possible rail cleaning, I recommend cleaning your rail with a combination of Electrak and CMX cleaning systems to get the best of both approaches. If you use this approach, remember to run the CMX after the Electrak in the consist so it can collect the debris from the electronic cleaning operation.