



# Locomotive Overhauls & Emission Reduction

## PROJECT FACTS

01/21/2013

### Project Scope

Alaska Railroad (ARRC) locomotive overhauls include emission control measures that bring older locomotives into compliance with new Environmental Protection Agency (EPA) tiered standards.

### Overhaul Benefits

- Overhauls extend the useful life of a locomotive by 13 to 15 years.
- Additional emission control kits bring railroad locomotive equipment into regulatory compliance with EPA standards.
- Since investing in newer locomotives and locomotive maintenance and overhauls, ARRC receives far fewer complaints from nearby neighborhoods. Fewer emissions simply make the Alaska Railroad a better neighbor.
- Well-maintained and upgraded engines significantly reduce emissions of carbon monoxide (CO), hydrocarbons (HC), nitrogen oxides (NOx) and particulate matter (PM, also referred to as soot). Ultimately, the 12 GP40s without idle reduction systems will have one installed. GP40s emission systems will be upgraded to Tier 0+. The SD70MACS purchased in 1999 already meet Tier 0 standards and will be upgraded to Tier 0+. SD70MACs purchased in 2004 meet Tier 1 standards and will be upgraded to Tier 1+ standards.

### Emission Reduction Efforts

ARRC has 51 locomotives: 28 SD70MACs, 15 GP40-2 and eight GP38-2. Efforts to reduce emissions from locomotive operations include:

#### 1. Invest in newer, more efficient equipment

Purchased 28 SD70MAC locomotives in the past 10 years. With 4000 HP engines, one SD70MAC can pull as much as two of the older GP40 models, resulting in significant fuel and emissions savings.

Compared to the GP40 and GP38 locomotives, newer SD70MAC technology produces markedly less particulate matter (soot), hydrocarbons, carbon monoxide and nitrogen oxide.

#### 2. Idle Reduction Systems & Infrastructure

Three-fourths of the locomotive fleet have an idle reduction system onboard. Such systems turn off the engine when the locomotive is not in use or if it is sufficiently warmed up. This avoids unnecessary idling, which reduces emissions. Major passenger depot facilities include track-side power plug-ins for trains to provide electricity to onboard food and beverage systems, thus eliminating the need to run a locomotive engine to provide power. The newest location to receive track-side power is in Seward, where plug-ins were installed in 2010.

#### 3. Train Operating Policies & Best Practices

Engineers follow fuel conservation and train operating best practices to boost locomotive efficiency. Brake-and-throttle techniques use gravity and track resistance to conserve fuel. Locomotives not needed to pull an empty train are turned off to avoid using fuel. A shutdown policy governs the locomotives not equipped with automatic idle reduction systems. **Purchase of a new Locomotive Simulator, to be installed in 2013, will enhance train crew training to include fuel conservation efforts.**

#### 4. Comprehensive Maintenance Programs

Locomotives are kept in top working order through a program of preventive and repair maintenance policies and procedures. Daily monitoring and inspections and regular maintenance ensure more efficient performance and fewer emissions.

#### 5. Ultra Low Sulfur Diesel Fuel

The EPA mandated that locomotives switch to low sulfur diesel (LSD) by June 2007 and to ultra low sulfur diesel (ULSD) by 2012. ARRC switched to ULSD in 2007, five years ahead of EPA deadline. LSD has 500 parts per million (ppm), while ULSD has just 15 ppm, making a significant difference in lowering emissions.

## 6. Overhaul + Emission Improvements

ARRC's evolving 10-year locomotive overhaul plan includes part replacements that increase engine efficiency and better control emissions to meet new more stringent EPA tiered standards. A methodical schedule is underway to upgrade one or two GP40 engines each year during planned overhauls.

Within the next few years, the 12 GP40s without idle reduction systems will have one installed. GP40s emission systems will be upgraded to Tier 0+. The SD70MACS purchased in 1999 already meet Tier 0 standards and will be upgraded to Tier 0+. SD-70MACs purchased in 2004 meet Tier 1 standards and will be upgraded to Tier 1+ standards.

# What's Involved with Locomotive Overhaul Emission Reduction Enhancements

### After-cooler



New after-cooler equipment circulates coolant water twice as many times as older after-coolers. The result is cooler air moving through the engine turbochargers and root blowers, which reduces emissions.

### Fuel Injection



New fuel injection systems improve engine fuel burning efficiency, which lowers emissions.



## GP40-2 Locomotive

### Power Assembly



New power assembly design reduces engine oil consumption (blow-by) thus lowering corresponding emissions.

### Idle Reduction



Automatic Engine Start-Stop (AESS) installed to provide idle reduction. Pictured is the ZTR SmartStart AESS model.