# Auxiliary Power Unit Cuts Emissions, Fuel Use in Railroad Locomotives

## Background

U.S. Environmental Protection Agency (EPA) regulations are forcing locomotive manufacturers and railroads to reduce pollutant emissions from locomotive operation. All new locomotives, and those overhauled after January 1, 2002, are required to meet strict standards for oxides of nitrogen (NOx) emissions. These emissions can be reduced either by adjusting combustion parameters, which imposes a fuel penalty, or by turning the diesel engine off when the train is not moving and would otherwise be idling. Like heavy-duty trucks, railroad locomotives are often idled to avoid long startup periods.

The impacts of locomotive idling are significant in terms of energy use and emissions as well as dollars. For a switcher locomotive (2,300 horsepower and below) that idles 75% of the time, 27% of its fuel is consumed, and 25% of its NOx emissions are produced at idle. Unregulated locomotives have been estimated to contribute almost 5% of the total nationwide emissions of NOx, making them one of the largest remaining unregulated sources.

In order to meet the challenge of reducing fuel use and NOx emissions,

*K9® APU installed on a locomotive*

EcoTrans Technologies, Inc., has introduced a revolutionary new locomotive idle reduction system, the K9® auxiliary power unit (APU). It automatically shuts down the main locomotive engine idle while maintaining all vital main engine systems at greatly reduced fuel consumption. Argonne National Laboratory provided independent confirmation of the validity of the original APU idea. In addition, Southwest Research Institute performed a year-long verification testing to quantify emission reductions and fuel savings from the APU.

## The Technology

The K9® APU consists of a compact unit that includes an EPA-emissions-certified 48-hp, 4-cylinder turbo-charged diesel engine. The engine is coupled to a generator with an automatic main engine shutdown timer circuit. Upon locomotive shutdown, electric immersion heaters maintain the main engine's coolant water and lubrication oil temperatures, making it easier to restart the locomotive. A battery charger maintains the locomotive's 74-Vdc system. The K9® APU also generates 120/240 Vac, making it possible to operate air-conditioning or space heaters without running the locomotive engine. The K9® APU been shown to reduce fuel consumption at idle by as much as 83% and emissions of NOx by 91%, hydrocarbons by 94%, carbon monoxide by 96%, and particulate matter by 84%. An added benefit is a substantial reduction in noise levels in neighborhoods located near freight terminals and large railroad yards.

## Commercialization

EcoTrans Technologies has deployed over 3,600 APU kits to various railroad customers in North America including installations with most Class 1 railroads and several short-line railroads. EcoTrans Technologies, Inc., expects to complete their first overseas transaction of several hundred APUs in 2006. In 2003, EcoTrans Technologies was awarded the EPA Clean Air Excellence Award as well as the Texas Environmental Excellence Award for its contribution toward reducing emissions from idling locomotives.

## Benefits

- Offers estimated total savings to the railroad industry of 230 million gallons of diesel fuel per year
- Reduces locomotive fuel consumption at idle by more than 80%
- Cuts NOx emissions at idle by 91%
- Available as part of a certified EPA Tier Zero package that meets air quality standards for NOx, hydrocarbons, carbon monoxide, and particulate matter
- Substantially reduces railroad yard noise levels
- Facilitates the ability of the owners of APU-equipped locomotives to earn emissions reductions credits when in operation in certain jurisdictions, resulting in operating cost savings.

## Contacts

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