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## **RTD a Leader in Alternative Fuels and Emissions Standards Testing**

RTD remains on the leading edge of the transit industry with respect to our work with alternative fuels and pollution reduction technology. The RTD fleet operates exclusively on ultra low sulfur diesel fuel which contains 95 percent less sulfur. Sulfur produces particulate emissions during the engine combustion process. The use of ultra low sulfur diesel fuel alone results in noticeable Particulate Matter (PM) emissions reductions. To further take advantage of the ultra low sulfur diesel fuel, RTD has taken delivery of new buses which are equipped with many advanced emission devices compatible with ultra low sulfur diesel fuel. In addition, RTD has recently started the use of biodiesel blends in the RTD-operated fleet of over 600 buses. Biodiesel is a clean burning alternative fuel produced by renewable domestic resources. The use of biodiesel helps lower exhaust emissions and decrease our dependence on foreign oil.

Over 15 years ago RTD began to experiment with various alternative fuels including methanol, propane and Compressed Natural Gas (CNG) in the daily operation of our standard passenger buses and support vehicles. In 2000, RTD introduced a fleet of 36 new mall buses that operate on CNG in electric-hybrid configuration. To support RTD's CNG buses, RTD has a CNG fueling station at its District Shops facility.

RTD is one of the pioneers in the use of true electric-hybrid buses in transit service with our 16th Street Mall Shuttle hybrid buses fueled by Compressed Natural Gas (CNG). These mall shuttle buses take advantage of the latest advanced technology series electric-hybrid propulsion systems. They use a combination of conventional internal combustion engines powered by CNG and electric motors. A small Ford 2.5 liter engine drives a generator which in turn charges a set of batteries. These batteries provide electrical power to propel two electric motors that drive the rear wheels. Each bus can carry up to 116 passengers under the horsepower produced by an engine that is as small as the engine in the popular Toyota Prius hybrid passenger car. The mall buses are quiet and have very low exhaust emission. This fleet of electric-hybrid buses is one of the most successful fleets of hybrid buses in the country. For our hard work with electric-hybrid buses, we received the prestigious award from the Department of Energy's National Renewable Energy Laboratories for leadership in promoting renewable energy and energy efficiency. To further enhance the use of hybrid technology, RTD now operates in regular city transit service nine hybrid buses equipped with the highly advanced parallel hybrid system designed and produced by General Motors. These buses are driven by both a small diesel engine typically found in a pickup truck and electric motors integrated in a transmission like component. The hybrid buses are showing about 15 to 30 percent improvements in fuel consumption as compared to the conventional diesel buses.

RTD has recently concluded a successful fleet study on biodiesel in partnership with the National Renewable Energy Lab (NREL). Five regular transit buses were operating from our Boulder facility on a mixture of 20 percent biodiesel made from agricultural products and 80 percent regular diesel. This study was published in an award-winning Society of Automotive Engineers (SAE) paper. The study found reduced emissions of all regulated pollutants with the use of biodiesel. As a follow-up to this study, RTD has worked with its fuel supplier, Suncor of Commerce City, to implement the use of biodiesel. This summer, RTD started blending biodiesel to its diesel fuel supply for use in the RTD-operated fleet of over 600 buses.

RTD has worked with the bus transmission manufacturer to implement an intelligent transmission shifting program into several hundred of its transit buses. Taking advantage of the increased computer power of the transmission electronic controllers, RTD has programmed the transmissions to select the shifting points based on the terrain (flat or steep roads), bus load, acceleration power available from the engine, and road surface resistance. The intelligent program automatically selects the most fuel efficient shift pattern according to the road conditions to achieve a fuel savings of between 5 to 10 percent as seen in RTD operating conditions. RTD is in the process of implementing this intelligent shift feature into additional buses to further reduce fleet energy consumption, greenhouse and other gaseous emissions.

In other efforts to minimize vehicle emissions, RTD continues to phase out the use of old high emission buses. Since 2000, RTD has procured almost 1,000 new buses to replace the old buses. All of the new buses are powered by clean diesel engines, which are equipped with the latest emission reduction devices and certified to meet the most stringent EPA emission regulations at the time of manufacture. These buses reduce exhaust emissions as much as 90 percent when compared to some of the old high emission buses which they replaced. RTD District Shops has housed one of the premier engine and fuel research labs in the nation, the Renewable Fuels and Lubricants (ReFUEL) Research Laboratory. The Lab is being operated by the Department of Energy's National Renewable Energy Laboratories. Many of RTD's alternative fueled test buses were thoroughly tested by the lab for exhaust emission reduction as compared to regular diesel buses. RTD maintains high exhaust emissions standards of two times more stringent than the requirements by the state of Colorado. If a bus fails an emissions test, it is taken off the streets immediately to remedy the problem. To make sure RTD buses are the cleanest in the state, RTD maintains one of the largest diesel fleet self certification stations in the state.