BLACKSMITH INSTITUTE

Project Completion Report:
Senegal Lead Gas Vendor Testing

- **Project Details:**
- **Short title: Senegal Lead Gasoline Phase-Out**
- **Short problem: In the 21st century, leaded gasoline still harming children**
- **Short solution: Enable & verify the phase-out of leaded gasoline**
- **Quote: Gas lead levels drop by a factor of 8 million**

Location:	Dakar, Kaolack, Thiès, Touba, Senegal
Contaminant:	Lead
Project Duration:	2006—2007
Project Cost:	$16,400
Implementing Partners	AfricaClean, Direction of the Environment and the Listed establishments (DEEC), and the University of Dakar

- **Problem:**

In 1998, an international framework was established to improve air quality in Sub-Saharan Africa. The first regional conference was organized by the World Bank on June 26th, 2001 in Dakar, Senegal, to discuss the issue of leaded gasoline as a major source of emissions in traffic-heavy towns and cities in developing countries. The harmful health effects of lead exposure in children, such as brain and nervous system damage, prompted the "Dakar Declaration." This was a joint effort by the World Health Organization and 25 sub-Saharan countries, the oil industry, civil companies, and other international agencies to eliminate leaded gasoline by December 31, 2005.

In July 2005, the African Refining Company reported a voluntary phase-out of leaded gasoline. However, it was important to coordinate efforts among various stakeholders to implement a comprehensive phase-out program, because one last refinery-- Société Africaine de Raffinage (SAR)--was to continue producing leaded gasoline for the rest of that year.

- **Solution:**

  The project primarily focused on the control of lead contents in gasoline all over in Senegal with a particular emphasis on traffic-heavy cities. Gasoline samples were collected in different time periods (September 2006, December 2006, and March 2007) in four Senegalese cities (Dakar, Kaolack, Thiès, and Touba). The samples were analyzed by the complementary methods of ICP/MS and CPG/MS—the first one has a high sensibility and the second one allows identifying the molecular form of lead in gasoline. In addition, the ambient air quality was also monitored in different cities of Senegal to indicate the progress of the phase-out program..

- **Results:**

  Gasoline sampling results showed that lead was still present in Senegalese gasoline after the ban, but that levels varied across different times and areas. Most importantly, lead content in gasoline in the capital, Dakar, was much lower--and 75% of all cars in Senegal are located here. Overall, lead levels in gasoline decreased between September 2006 and March 2007.

  BEFORE THE LEADED GAS PHASE-OUT

Collection	Average gas lead levels
Pre-2002	800 mg/l
2002	400 mg/l
2003	200 mg/l

  AFTER THE LEADED GAS PHASE-OUT

Collection	Average gas lead levels
September 2006	0.0105 mg/l
December 2006	0.0005 mg/l
March 2007	0.0001 mg/l

  Additionally, atmospheric lead levels decreased in all towns observed, to the point that all are now significantly lower than the WHO recommended safe level (0.5 ug/m^3). These results demonstrate that lead emissions from vehicle gasoline combustion dropped significantly, and that the lead phase-out program in Senegal has been successful overall.

- **Follow-up:**

  Trace amounts of lead are still present in stains on gas tanks that were not properly cleaned after the phase-out. A technical committee should determine the viability of using catalytic converters to reduce the emissions output of cars that violate air quality standards (such converters do not function when the vehicle runs on leaded gas, and so they would have been completely useless before the 2005 phase-out).

This air pollution project should be an introduction to more far-reaching initiatives that will seek to transition the diesel buses in Dakar to compressed natural gas or liquefied natural gas fuel. Natural gas bus conversion programs such as those in Mexico City, Bangkok, Cairo, and Beijing will be used as models..