Saskatchewan Air Monitoring Lab (SAML)

What is the SAML?

The Saskatchewan Air Monitoring Lab (SAML) is a vehicle designed to measure air quality and is equipped to continuously monitor a variety of air pollutants simultaneously. The convenience of a mobile lab allows the Ministry of Environment to monitor ambient air quality anywhere in the province that is accessible by road.

Data is collected by a computer based acquisition system with a customized program designed to store air sampling data from each analyzer. The SAML is also equipped with a cellular modem so that data can be collected remotely at near real-time while the SAML is in the field. The instrumentation used in the SAML is federally-approved, which means that the data being measured is scientifically comparable across the country.

What do you use the SAML for?

Even though Saskatchewan generally has good air quality based on results obtained by the Provincial Monitoring Network's permanent air quality monitoring stations, the SAML is able to supplement that data by travelling and monitoring in almost any location within Saskatchewan. The purpose of the SAML is:

- To enhance the collection of air quality data by sampling a broader range of sites.
- To better locate sites for permanent air quality monitoring stations.
- To conduct special surveys at locations where air quality is a concern.
- To supplement some emergency situations where air quality is a concern.

How does the SAML work?

Air is drawn using a Teflon line through the roof into a glass chamber inside the SAML. Each type of air analyzer draws enough air from the manifold to conduct a thorough analysis of its particular parameter(s). This process is continuous so data is always being collected. The SAML is also equipped with sampling equipment, which can be used to collect grab samples to be sent to a laboratory where a detailed analysis can be performed.

Can the SAML monitor while moving?

Data is more accurately obtained while stationary, but it is possible to monitor while moving slowly and over very short distances.

How many of these vehicles does the government own?

There is only one SAML at this time.

How many people does it take to operate?

One person is required to operate; however, the SAML is equipped to accommodate up to two operators if necessary.

What does the SAML monitor?

In addition to being able to measure wind direction and speed, temperature, solar radiation and relative humidity, the SAML is equipped to measure sulphur dioxide, carbon monoxide, ozone, nitrogen oxides, fine and course particulates, hydrogen sulphide, ammonia, total hydrocarbons, and volatile organic compounds. The characteristics and impacts of these parameters include:

Sulphur Dioxide (SO_2)

Sulphur Dioxide (SO_2) - a colourless gas with a strong pungent odor. The burning of sulphur containing fuels and the processing of sulphur containing ores, result in the formation of SO_2. This gas irritates the respiratory system, causes vegetation damage and corrodes many minerals. Sulphur dioxide may react in the atmosphere to form other pollutants that contribute to acid rain.

Carbon Monoxide (CO)

Carbon Monoxide (CO) - a colourless, odourless, tasteless gas which is produced from the incomplete combustion of fossil fuels. Carbon monoxide is produced from motor vehicles, fossil fuel combustion for residential space heating and commercial/industrial operations. This compound binds chemically to hemoglobin in the blood stream. Hemoglobin carries oxygen to the heart, brain and other body tissues. Exposure to carbon monoxide can cause dizziness, headaches, slowed reflexes and reduces the ability to perform physical exercise.

Ozone (O_3)

Ozone (O_3) - a colourless gas with a pungent odour. It is a major component of a photochemical oxidant compound formed as the result of chemical reactions between nitrogen oxides (NO_x) and reactive hydrocarbons in the presence of sunlight. Ozone is produced by the sun's photochemical action with hydrocarbons and nitrogen oxides. Formation of ground level ozone depends on warm temperatures and strong sunlight and usually occurs in greater concentrations from late spring to early fall.

Nitrogen Oxides (NO_x)

Nitrogen Oxides (NO_x) - consists of the total oxides of nitrogen and is the sum of nitrogen dioxide (NO_2) and nitric oxide (NO) concentrations in the atmosphere. Nitrogen dioxide (NO_2) is a reddish brown gas with a strong irritating odour. Fuel consumption is the major source of nitrogen oxides. Automobiles, power plants, incinerators and several chemical processes that have high temperature conditions during combustion result in the formation of nitrogen oxides as a byproduct. The primary concern with NO_x emissions is their contribution to the formation of ozone and acid rain. To a lesser extent, some NO_x compounds contribute to stratospheric ozone layer depletion and global warming.

Particulate Matter ($PM_{2.5}$)

Particulate Matter ($PM_{2.5}$, PM_{10}) - The fraction of particulates less than 2.5 micron in diameter is called $PM_{2.5}$ and the fraction of particulates smaller than 10 micron is known as PM_{10}. Particulate matter can originate from agricultural operations, industrial operations, fuel combustion, and natural sources such as the action of wind on soils, forest fires and plant pollen. Because of their very small size, these particulates may be inhaled and can penetrate the lungs causing pulmonary irritation.

Hydrogen Sulphide (H_2S)

Hydrogen Sulphide (H_2S) - a colourless gas with a pungent, “rotten egg” odour. H_2S occurs naturally in swamps, bogs and marshes and are created by human activities such as pulp and paper mills, wastewater treatment, refineries and other oil and gas facilities.

Ammonia (NH_3)

Ammonia (NH_3) - a colourless gas with a pungent odour. NH_3 occurs naturally in the deteriation process of plant and animal matter and man-made sources include fertilizer industries and intensive livestock operations.

Volatile Organic Compounds (VOCs)

Volatile Organic Compounds (VOCs) – the term used to describe a class of compounds that have a high vapor pressure at regular atmospheric conditions. The high vapor pressure allows these compounds to evaporate at low temperatures and combine with the surrounding air. VOCs are numerous, varied, and ubiquitous. They include both man-made and naturally occurring chemical compounds. One of the most abundant VOCs found in ambient air is naturally occurring methane gas, which is a known greenhouse gas. The processing and burning of hydrocarbons is also a major source of VOCs. Man-made sources include various solvents, paints and other chemicals.

For further information, contact the Ministry of Environment Client Service Office at 1-800-567-4224 (toll free in North America), or 306-787-2584 in Regina.