

# ENVIRONMENTAL EXPRESS CELEBRATES EARTH DAY

## Earth Day Revived

By: Tracy Dotolo Sanders, Army Corps of Engineers Biologist

The environmental movement of the 1970's gave birth to many landmark environmental laws, such as the National Environmental Policy Act, the Clean Water Act and the Endangered Species Act. The establishment of Earth Day was also part of this environmental movement. First celebrated on April 22, 1970, Earth Day is now recognized and celebrated worldwide by more than one billion people each year. Earth Day was established to inspire environmental awareness and appreciation and, forty one years later, the environment is once again receiving national attention. Terms such as "green energy," "climate change," "hybrid cars" and "carbon footprint" are being used in mainstream vocabulary, much like the popular slogan "reduce, reuse, recycle." Just last year, President Barack Obama established the America's Great Outdoors (AGO) initiative to reinvigorate the federal government's approach to conservation and reconnect Americans with the lands and waters that are used for farming, ranching, hunting, fishing and recreation.

To celebrate Earth Day this year Environmental Express Technical Specialist Joe Boyd visited the second grade class at Laurel Hill Primary School in Mt. Pleasant to talk about conservation and recycling. Here are some of the posters the second graders created in support of Earth Day.



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# EXPRESS NEWS

June 2011

## Smokey Treats

By: Julie Higgins, Technical Sales Representative, Environmental Express

We all know that smoking is potentially harmful to our health, but do you know why?

Among other risks, the tobacco plant is able to absorb trace elements, such as arsenic, barium, beryllium, cadmium, cobalt, copper, manganese, molybdenum, nickel, lead, antimony, selenium, thallium, vanadium, and zinc, from the soil. These accumulate in the leaves of the plant. Setting the tobacco plant apart from other plants, is the rate at which it accumulates these trace elements in its leaves, depending on soil composition and pH, pesticide application, genetic make-up of the plant, and how the stalk is positioned. Low pH has been known to increase the amount of some trace elements found in the plants' leaves by as much as 5 times. To avoid such accumulation of lead and cadmium in particular, major cigarette manufacturers are required to use tobacco grown in less-acidic soils. This doesn't mean that farmers stopped growing in these acidic soils. Their products go to counterfeit cigarette producers. A study recently completed by Dr. Kamal Swami and others at the Wadsworth Center, New York State Department of Health used ICP-MS to show that smokers of counterfeit cigarettes have higher exposure levels to several potentially hazardous trace elements than smokers of their legal counterparts.

Beryllium (a group 1 carcinogen), cadmium (also a known carcinogen) and thallium (formerly used in rat and ant poisons, but has since been outlawed) were all found in higher amounts than in legal cigarettes. Arsenic (known to be responsible for elevated risk for several types of cancer, such as skin, bladder, liver, kidney and lung), molybdenum (a well-known irritant), and antimony (also a known irritant and potential carcinogen) were found to be present at concentrations 2-3 times higher in counterfeit cigarettes. Mercury and lead, both notorious for their cumulative properties and well documented for causing neurological harm, also were present at higher concentrations in counterfeit cigarettes. In fact lead was seen in concentrations as much as 10 times higher than those seen in legal cigarettes. Smoking legal cigarettes? Don't get too comfortable, all of these trace elements are present in these brands as well, and nickel (another assumed carcinogen) was even found to be present in higher amounts in legal cigarettes. By far the best advice is DON'T smoke 'em if you got 'em!

For more in-depth information and data, please see the following article:

Swami, Kamal, Judd, Christopher D., and Orsini, John (2009) "Trace metals Analysis of Legal and Counterfeit Cigarette Tobacco Samples Using Inductively Coupled Plasma Mass Spectrometry and cold Vapor Atomic Absorption Spectrometry", *Spectroscopy Letters*, 42: 8, 479-490.



## Come See Us On The Road!

Our technical sales staff will be traveling to shows and events in the next few months. Scheduled events are listed on our web site at: [envexp.com/conferences](http://envexp.com/conferences)

**AWWA Annual Conference**  
June 12-16 Washington, DC  
[www.awwa.org](http://www.awwa.org)

**OWEA Annual Conference**  
June 21-23 Sandusky, OH  
[www.ohiowea.org](http://www.ohiowea.org)

**Texas Water Quality Association Annual Convention**  
July 13-16  
San Marcos, TX  
[www.twqa.org](http://www.twqa.org)

**PaAAEL/NYAAEL Conference**  
July 24-26  
Lake Canandaigua, NY  
[www.paael.org](http://www.paael.org)  
[www.nyaael.org](http://www.nyaael.org)

**KY/TN WPC Conference**  
July 24-27  
Covington, KY  
[www.kytwnwea.org](http://www.kytwnwea.org)



## Here we GROW again!

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June 2011 Issue

# Cyanide: The Molecule and its Analysis A Simple Compound with Complex Problems

By Edward F. Askew PhD, Askew Scientific Consulting

## Part 3: Cyanide Sample Distillation

In the first two parts of this series, the requirements for pretreatment and preservation of a cyanide sample were covered. This included the pretreatment and preservation of the sample by utilizing chemical/physical processes that removed/neutralized interactions that may bias the cyanide final concentration or prevent loss of the initial cyanide concentration. This third part of the cyanide series will focus on the distillation of the sample to collect the cyanide within a basic solution.

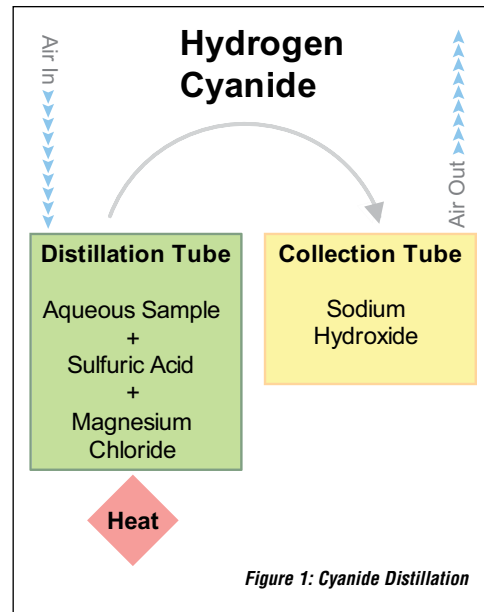


Figure 1: Cyanide Distillation

The cyanide distillation process relies on the volatility of hydrogen cyanide gas in a refluxing acidic aqueous solution that is then transported with a stream of air and collected in a sodium hydroxide solution as the sodium cyanide salt.

The distillation process insures that all simple cyanides, such as sodium cyanide, release the hydrogen cyanide and that most of the complex cyanides such as potassium ferricyanide (III), (K<sub>3</sub>FeCN<sub>6</sub>) release some if not all of the cyanide ligands. (See first part of series for detailed explanation of the simple and complex cyanide compounds) But, due to the low pH of the sample in the distillation tube, other competing reactions can occur to produce either low or high recovery of cyanide. In *Standard Methods 4500 CN- B and C*, the following chemical or physical reactions can produce sample analysis bias:

**Ascorbic Acid:** Though listed in the EPA Drinking Water Laboratory Certification Manual (EPA 2005) as the approved dechlorination agent, ascorbic acid is suspected to react with nitrate and nitrite salts in the samples to produce cyanide (Nonsolar 1988; Carr, Baird et al. 1997) But, the addition of sulfamic acid to the distillation tube along with the magnesium chloride and sulfuric acid has shown to limit this reaction (Nonsolar 1989).

**Nitrates and Nitrites:** Nitrates/nitrites along with organic compounds containing carbonyl groups (CO) are suspected to react to produce cyanide (Nonsolar 1988; Carr, Baird et al. 1997) But, the addition of sulfamic acid to the distillation tube along with the magnesium chloride and sulfuric acid has shown to limit this reaction (Nonsolar 1989).

**Aldehydes:** Aldehydes present in the sample can irreversibly react to produce cyanohydrins

R1HC(OH)(CN). The presence of reactive aldehydes can be tested for with a simple colorimetric qualitative test with 3-methyl Benzothiazoline hydrazone hydrochloride (MBYTE). If the test is positive, then the addition of an ethylenediamine solution can inhibit the reactions.

**Glucose and Other Sugars:** The reaction mechanism is the same as that for aldehydes. The MBYTE test is inconclusive, but addition of the ethylene diamine solution will prevent the cyanohydrins formation.

**Sulfides:** Sulfides will distill over mechanically (i.e. in water vapor) with cyanide. Pretreatment and removal of sulfides in the collected sample was covered in the second part of this series. Before sulfide removal is attempted, determine if there is any oxidizer present in the sample. Sulfide will react irreversibly with oxidizers to produce sulfates and will not react with the distilled cyanide. If sulfide is suspected to be present in the sample and has not been removed by pretreatment, then the addition of lead carbonate to the collection tube will trap the sulfide. *Standard Methods* recommends filtering the hydroxide solution after completion of the distillation step. Gravity filtration is not recommended, but filtration through a 0.24 μm PYOTE syringe filter can produce acceptable filtrate. Care should be taken to check the filtrate for cyanide loss with replicate matrix spikes of the aqueous sample.

**Sulfur Compounds:** Many other sulfur compounds will distill over mechanically (i.e. in water vapor) with cyanide. If other sulfur compounds are suspected to be present in the sample, then the addition of lead carbonate to the collection tube will trap the sulfide. *Standard Methods* recommends filtering the hydroxide solution after completion of the distillation step. Gravity filtration is not recommended, but filtration through a 0.24 μm PYOTE syringe filter can produce acceptable filtrate. Care should be taken to check the filtrate for cyanide loss with replicate matrix spikes of the aqueous sample. The step-wise sample preparation prior to distillation are summarized in the chart on the right.

Dr. Askew has more than 25 years experience in the environmental chemistry and regulatory fields including FIORA regulations and analytical analyses, REAR and CEREAL regulations and analyses, CWM regulations and analyses and SEDA regulations and analyses.

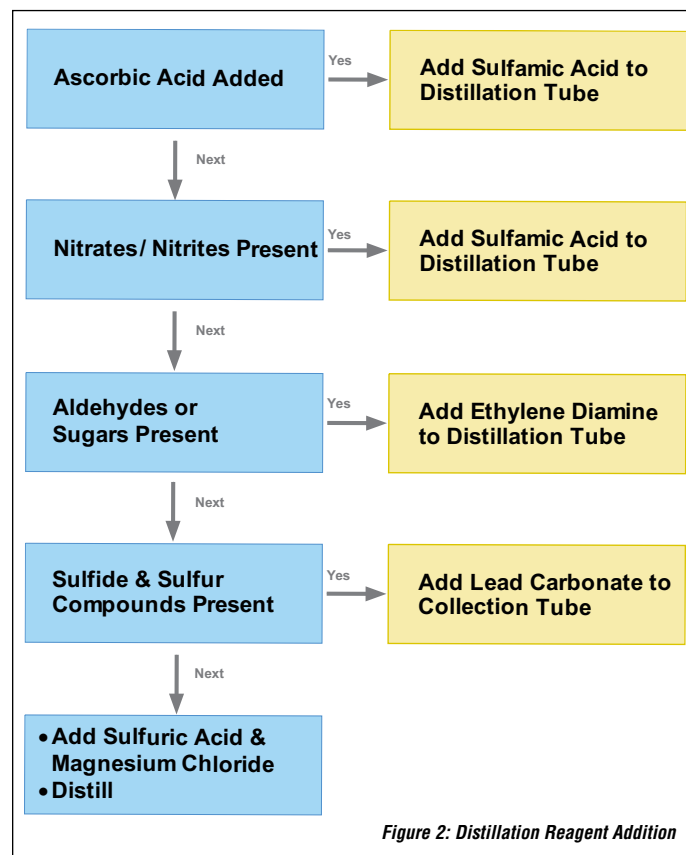


Figure 2: Distillation Reagent Addition

## Water For Africa

By Joe Boyd, Technical Specialist, Environmental Express

### Lake Victoria Communities in Africa, Transformed by Safe Water

One of our neighbors in Charleston, SC is working to provide safe water to over one million people in Africa. Water Missions International is an engineering relief and development Christian nonprofit. Its engineers, staff and volunteers design and provide sustainable, safe water solutions to disaster victims worldwide and people in 49 developing countries.

Water Missions International has partnered with California-based Water for Life International to provide sustainable safe water for more than one million people in sub-Saharan African communities. The project, called "Water for Africa (WFA)," will include a Health Impact Study and will serve safe water and community development needs for people living within one kilometer of the shore of Lake Victoria, beginning in Uganda and proceeding east into Kenya. This region is one of the most densely populated rural areas in the world, and the availability of safe water is nearly non-existent. As a result, people drink water from contaminated sources and are highly vulnerable to water-related illnesses.

The Health Impact Study provides sound scientific data on the impact of access to safe water on public health. This study is currently underway and will document the transformation that takes place in the community through the use of safe water and health and hygiene training. The health study is being conducted in six communities, all of which have either already received or will be receiving Living Water™ Treatment Systems. Water Missions International has designed a new water distribution system for Water for Africa utilizing this system. Water from various sources is pumped through a Living Water™ Treatment System to a storage tank that is at an elevated point in the community. Water from the tank flows by gravity through buried PVC lines to tap stand distribution points located throughout the community.

In the first phase of the project, 25 community water systems are planned for installation serving 62,500 people with safe water. Each village will undergo community development training that will help empower people as they benefit from safe water and improved overall health. By the end of May, the following communities will have installed Living Water™ Treatment Systems and are receiving the gift of life-saving water: Walumbe, Busuyi, Busana, Namoni, Malindi, Bukagabo A, Kyanja, and Musoli.

Since 2001, Water Missions International has responded to the world's largest natural disasters and daily tackles the world's single biggest cause of illness - lack of safe water and adequate sanitation (U.N. Report, 2005) by providing safe water to more than 2 million people. We at Environmental Express applaud their efforts. If you're interested in getting involved with Water for Africa, Water Missions International is looking for funding partners. For more information, call (843) 769-7395.



Charleston, S.C.-based Water Missions International has received Charity Navigator's top rating five years in a row. To Learn more visit WaterMissions.org.

## ELEMENT OF THE MONTH

### Hexavalent Chromium

By Les Orr, Product Marketing & Technical Support Manager, Environmental Express

Hexavalent Chromium is a heavy metal containing the element chromium in the +6 oxidation state. Hex Chrome, Hexachrome and Chrom 6 are all synonyms of the metal that is recognized as a human carcinogen, mainly from inhalation, but also ingestion of drinking water. It is used in industrial applications such as textile dyes, wood preservatives, leather tanning, anti-corrosion coatings and production of stainless steel. Welders can be exposed as they handle supplies containing chromate during the arc welding process. Hexavalent chromium inhalation may cause health effects which include lung cancer, irritation or damage to the nose, throat, eyes and lungs. Long term exposure has been linked to conjunctivitis kidney failure, liver failure, peritonitis, gingivitis, conjunctivitis and lung cancer.

Currently few regulations exist for hexavalent chromium as the limits are lumped in with total chromium. The national drinking water standard for total chromium (all forms of chromium, not just hexavalent) is 100 ppb. OSHA has set a limit of 5 micrograms per cubic meter of air in an eight-hour time-weighted average for people working in an environment with potential hexavalent chromium in the atmosphere.

Gaining notoriety from the movie "Erin Brockovich", hexavalent chromium is now on the front line of studies and research for both industry and government organizations. One of the first publicly available national surveys recently came out from Environmental Working Group showing that in 31 of the 35 cities studied, the drinking water tested positive for the appearance of hexavalent chromium. California has proposed a "Public Health Goal" of 0.06 ppb in drinking water. If this amount was enforced, 25 of the 35 cities would be above those limits. This goal may be lowered to 0.02 ppb as new information and studies of health risks continue to arise.

Hinkley, CA, the site of the *Erin Brockovich* saga, is in the news again with more contamination showing up beyond the original boundaries thought back in 1993. Studies and potential lawsuits are being reported. With hexavalent chromium being all the buzz lately there is sure to be additional legislation, limits, goals and studies as it is under review from the US EPA.

