

Data Source: Soil and Groundwater Pollution Remediation Web of Taiwan

<http://sgw.epa.gov.tw/public/En/index.htm>

Remediation Sites→7.1 Introduction of Various Pollution in Taiwan→2

## Gas Station Pollution

Two pollutions found in the gas station are air pollution and ground soil pollution. Air pollution is caused by volatile chemical vaporized out during the gas filling process. Ground soil pollution is caused by underground pipeline rusting or leaking and oil is slowly leaked out to contaminate the surrounding soil and groundwater.

Gas station pollution is not obvious to the public. Because gas station constructs underground storage tanks to store the fuel oil, and it is susceptible to the frequent earthquakes and is rust-eaten, oils easily flow out to the surrounding soil. If the leaking spot has groundwater nearby, groundwater may be contaminated and oil is transferred downstream. If the local resident drinks the contaminated groundwater, the health impact would be profound as well as the environment damage.

The gas station that opened more than 10 years and whose storage tank was built many years ago may have a leak problem due to aged pipeline or tank without proper maintenance, stratum level change, and improper operation. Broken tank and pipeline will be undermined and cause stored chemicals to leak into the soil and groundwater, therefore gas stations and underground storage tanks are potential pollution sources. To ensure the gas station underground storage tank operation is properly running and prevents the occurrence of soil and groundwater pollution, the EPA carried out the Gas Station and Underground Storage Tank Pollution Potential Survey from the years 2001 to 2003. The survey data including existing condition and pollution potential assessment are completed and hopefully this will help us to discover the problem and prevent the groundwater pollution by oil and other pollutants.

To understand the existing condition for the gas station that opened more than 10 years ago and storage tanks built a long time ago, EPA carried out Soil and Groundwater Pollution Potential Surveys in the years 2002 and 2003 to gather the information and transfer the data into a specific database. EPA also investigates site reported by the public as pollution sites in accordance of Article 11, paragraph 1 of the Remediation Act. If the pollutant concentration is exceeding the control standard, then the site is listed as a control site and necessary control measures are taken to avoid

the expansion of the pollution scope.

### Pollution condition in the gas station



### Gas Station Survey

According to the April 2003 statistic data, the total gas stations needed for a survey are 2,285 stations. The highest number are located in Taoyuan County, there are 248 stations. The next regions that deserve attention are Taipei County and Tainan county. The EPA carried out the Ten-Years Aged Gas Station Pollution Potential Survey Project in 2002 and 2003. In the year 2002, there were 191 gas stations surveyed and 2003 there were 400 gas stations surveyed. Totally there were 591 gas stations surveyed.

Surveying is classified into 4 stages:

First stage: Test the leaking spot in the pipeline.

Second stage: Test the leaking gas and take soil gas sample.

Third stage: Test the sample taken from gas station soil and groundwater.

Fourth stage: Investigate the soil and groundwater pollution at the target station.

The surveyed items classified by the soil and groundwater are:

Soil surveyed item:

Survey the 21 organic compounds listed in the soil pollution control standard, including Benzene, Carbon tetrachloride, Chloroform, 1,2-Dichloroethane, cis-1,2-Dichloroethylene, trans-1,2-Dichloroethylene, 1,2-Dichloropropane,

1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 3,3'-Dichlorobenzidine, Ethylbenzene, Hexachlorobenzene, Pentachlorophenol, Tetrachloroethylene, Toluene, Total petroleum hydrocarbons (TPH), Trichloroethylene, 2,4,5-Trichlorophenol, 2,4,6-Trichlorophenol, Vinyl chloride, and Xylenes.

Groundwater surveyed item:

Survey the 17 one-and-multiple ring aromatic hydrocarbon compounds and chlorine-carbon-hydrogen organic compounds listed in the soil pollution control standard, including Benzene, Toluene, Naphthalene, Carbon tetrachloride, Chlorobenzene, Chloroform, Chloromethane, 1,4-Dichlorobenzene, 1,1-Dichloroethane, 1,2-Dichloroethane, 1,1-Dichloroethylene, cis-1,2-Dichloroethylene, trans-1,2-Dichloroethylene, phenols, Tetrachloroethylene, Trichloroethylene, Vinyl chloride, methyl tertiary-butyl ether (MTBE), and oxygen reduction potential (ORP).

The high potential polluted gas station is selected from the survey. The local competent authority will list the site as a control site if the pollution source is defined and/or the pollutant concentration is reaching the soil or groundwater pollution control standard. All the enlisting is done in accordance with Article 11, Paragraph 2 of the Remediation Act. The most pollutant type found in soil is Total petroleum hydrocarbons (TPH), and Benzene, Toluene, Ethylbenzene concentration are less found in soil. The most found pollutant in groundwater is Benzene.

Gas Station Pollution Survey



Remove the Floating Oil in the Soil



### **Gas Station Emergency Responses and Improvements**

Pollution Control Proposal will be drafted by the enlisted gas station personnel, and submitted to the local government special team for review. After the proposal is approved, the remediation will be taken and executive condition proposed by the

proposal will be supervised by the local government.

When the pollution is observed, emergency responses have to be taken like surveys if the local residents drink the groundwater, notify them the water is polluted and offer them the substitute water source like bottled water. The tap water supplier shall supply tap water to these affected residents. The polluted gas station pipeline shall be closed and tested to ensure the leaking spot. If leaking is found on the tank or pipeline, the damaged parts must be repaired until there is no concern needed. After the repairing, remediation shall be taken by the followings:

- I. Tank and pipeline shall be closed and tested to see where is the leaking spot and repair the leak part.
- II. Adopt soil gas pumping and AS to remove volatile organic pollutants.
- III. Adopt float oil recycling, pump & treat, air injection, natural attenuation, and ORC oxygen releasing agent injection.
- IV. Continue environmental monitoring.

SVE Recycling Equipment



Oil Tank Improving Leaking



Oil Stopping Tank



Oil Absorbent



Simple Oil-Water Separator



Photo Sources: Taiwan EPA and Each Local Environmental Protection Bureau