Safe Drinking Water Project

Background

Global Health and Education Foundation (GHEF) and **Chinese Academy of Sciences** (CAS) initiated Safe Drinking Water Project in rural areas of China in year 2006, to address the fluoride and arsenic contamination problem in drinking water sources.

Since 2008, CAS has developed new technologies for arsenic and fluoride removal, and the two parties agree to extend the cooperation, to prevent waterborne disease, and improve the health and well-being of individuals globally with the new technologies available.

Water Treatment Technology

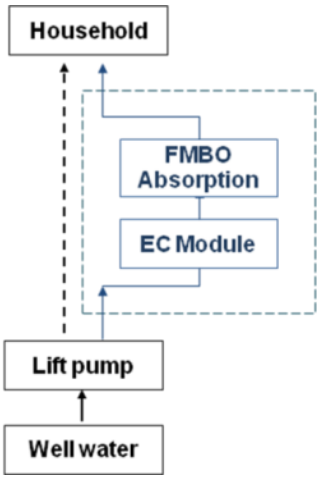
Technologies. The project will apply the two innovated technologies patented by CAS to remove the arsenic and fluoride from underground water.

They are:

- Metal Oxide Composite Adsorption Method (FMBO Absorption)
- Electro – Coagulation Method (EC Module)

Advantages. Compared to various technologies such as Reverse Osmosis and Ultra-Filtration, both of the two technologies are:

- Much lowered electricity consumption and maintenance cost;
- Able to remove arsenic while retain ions that are good for human-being.



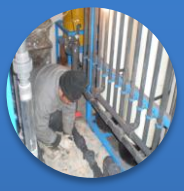
Operation Illustration Diagram

"The two technologies are most beneficial to rural areas and mountainous areas", recommended by Dr. Qu, Leader of the technology development of CAS.

Project Implementation


Site Investigation


System design and manufacture


System onsite installation, testing and training


Water station operation and public health education

Completed Water Stations in China

Yangzhuang Village Purified Water Station Shanxi (coal mine area), 2007

- Impact: 830 people immediately
- Technology: Reverse Osmosis
- Source water: Underground brackish water
- Product water: Purified water
- System operational cost: 5 RMB/m3

Youyi Village Water Station Inner Mongolia, 2009

- Impact: 260 people immediately
- Technology: FMBO Absorption for Arsenic + EC Module
- Source water: Underground water (**Arsenic: 120ppb**)
- Product water: **Arsenic: 20 ppb** (National standard: 50ppb)
- System annual operational cost: 10 RMB for each household

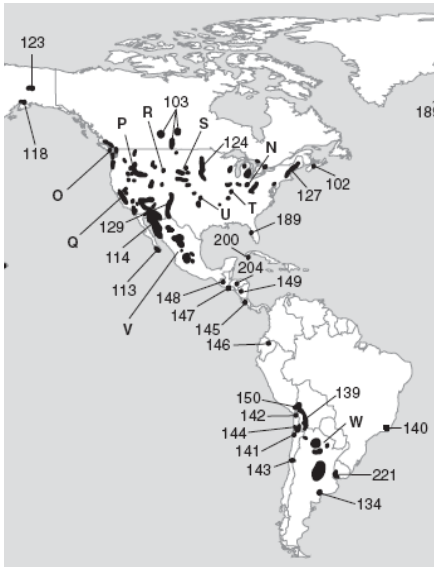
Huangtudang Village Water Station Inner Mongolia, 2009

- Impact: 400 people immediately
- Technology: FMBO Absorption for Fluoride+ EC Module
- Source water: Underground water (**Fluoride: 1300 ppb**)
- Product water: **Fluoride: 500 ppb**(National standard: 1000ppb)
- System annual operational cost: 10 RMB for each household

Arsenic contamination in Northern, Central and Southern America

Arsenic contamination of groundwater is a natural occurring high concentration of arsenic in deeper levels of groundwater, which became a high-profile problem in recent years due to the use of deep tubewells for water supply, causing serious arsenic poisoning to large numbers of people. Study found that natural arsenic poisoning is a global threat, 140 million people affected in 70 countries on all continents.

According to reference papers and data provided by CAS, 12 countries in America continents are affected by water with arsenic contamination, for detailed information please see next page: *Occurrences of arsenic contamination in Northern, Central and Southern America* (exclusive data of Canada and USA).



Location of arsenic contamination

[Table] Occurrences of arsenic contamination in Northern, Central and Southern America

Country/Region	Region name	Arsenic(ppb)† (mean/ range/Max.)	Geology, hydrology, climate	Water chemistry	Affected population /significance*
Northern Mexico	Sonora Baja California	9% > 10; Max. 305 Max. 410	Alluvium?; semi-arid semi-arid	AD SO	
Central Mexico	Rio Verde Región Lagunera Zimapán Valley	Max. 54 50% > 50; Max. 624 50% > 50;Max.1100	Alluvium over limestone, volcanics; semi-arid Volcanic; semi-arid Alluvium over limestone; semi-arid	SO	400,000(E50)2,000,000(R)
Nicaragua	Sebaco-Matagalpa Valley	37%> 10; Max. 1320	Hydrothermally altered, bedrock	Geothermal,$CaHCO_3$	1200 (E10)
El Salvador	Ilopanga lake catchment	Max.770	Geothermal	GT	
Argentina, Chaco-Pampean plains	Cordoba La Pampa Santiago del Estero Tucuman Buenos Aires	82% > 50 96%> 10; 73% > 50 98%> 10; 53%> 50 100%>10; 87% > 50 84% >10; 56% > 50	Loess-rich alluvial deposits; semi-arid	AD; pH>8, high Na:Ca; high F,V and Mo	811,000 (E50)
Bolivia	Altiplano	Max.> 1000	Geothermal; arid tosemi-arid.	GT	
Peru		Max. *c*. 500	Geothermal	GT	
Ecuador	North-central region	Max. 5080	Geothermal	GT	
Chile, Region II	Rio Loa Rio Elqui R. Camarones	2000 220 1252	Geothermal hot-springs discharging into rivers; arid to semi-arid.	GT	400,000 (E50)
Brazil	Iron Quadrangle	Max. 350	Precambrian basement, ironstone and sulphide mineralization	SO	

AD, alkali desorption; RD, reductive dissolution; SO, sulphide oxidation; GT, geothermal arsenic.

*E10 refers to the number of people drinking water with >10 ppb As, and E50 to drinking more than 50 ppb As. R indicates at risk.

†Concentrations normally refer to untreated water sources, either wells, streams or lakes, but not piezometers.

■ **Reference from: Peter Ravenscroft, Hugh Brammer, Keith Richards, *"Arsenic Pollution: A Global Synthesis".* Wiley-Blackwell, 2009.**