

"Water for People"

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In a contest sponsored by the US National Academy of Engineering (NAE) and the Grainger Foundation the 2007 Grainger Challenge Prize for sustainability sought innovative solutions for removing arsenic from drinking water. Of the 70 teams that submitted entries; only three won prizes. The first prize was netted by professor Abul Hussam of Centerville who came to USA in 1978 from Kustia of Bangladesh, arrived at a fine solution for arsenic removal from tube well waters and his innovative filter system was judged as the best of all presentations and was awarded the Grainger Challenge Gold Award of 1 million US\$ for devising an efficient and inexpensive arsenic filter system that has proved popular and effective in Bangladesh. The Award was presented on Feb 20, 2007 at Washington DC.

A panel of experts decided two years ago that the first contest would be focused on the Arsenic problem that is wrecking havoc in Bangladesh, Eastern India and at other places. The rules of the prize for this year were to look for affordable, reliable, socially acceptable and environment friendly solution to the Arsenic problem that does not require electricity. Prize rules also required that the Arsenic filtration system be proven in field conditions, not just in a lab.

After many trials with many modifications, Hussam's creation consisted of an easy to make, maintenance free, two- tired system that uses sand, charcoal, bits of brick and shards of a widely available kind of cast iron, removes virtually every traces of Arsenic from tube-well water. Each filter contains about 20 pounds of porous iron, which forms a strong chemical bond with arsenic and is the key to the system's success. Even if the resulting coffee- ground like substance is eventually dumped on the ground the arsenic will not be released, as long as there is oxygen around. The filtration systems are assembled at the rate of about 200 a week in Kustia for 35 to 40 US\$ each. More than 30,000 have been distributed. Hussam will use 70% of his prize money to distribute his SONO (the name given) filters to nearby communities, 25% will go for further R & D and 5% to his George Mason University.

The Silver Award of 200,000 US\$ (nearly Rs 1 crore) went to a team of engineers led by Arup Sengupta. Mr Sengupta, P C Rossin Professor of Civil and Environmental Engineering of Lehigh University was asked in 1995 by the non-profit organization "Water for People", with whom also connected was Arun K Deb an alumnus of BE College, Shibpur. Lehigh's winning team also included Owen E. Boyed, Prasun Chatterjee (a Ph D student), Lee Bleney, Johan Greenleaf and Sudipta Sarkar, a post-Doc in Sengupta's Lab. Sengupta's lab is credited with developing and commercializing the first polymer based arsenic selective adsorbent. They learned to impregnate columns of tiny, polymeric ion-exchange beads with ferric hydroxide nano-particles. The iron transmits its affinity for arsenic to the beads. The beads provide sturdy mechanism for fine iron powder, which would otherwise clump and clog the column, making arsenic removal inefficient or impossible. The result is a hybrid sorbent that removes arsenic from water. Such systems are used in India and at 200 places in USA. This filtration system is now being built in India and incorporated in what has now come to be known as 'Amal Filters', whose making costs range from 1,200 to 1,500 US\$ (around Rs

60,000). About 150 of such Amal Filters have been installed in various arsenic affected areas of West Bengal. The Bengal Engineering and Science University's young professor Anirban Gupta and his senior able associate Debabroto Ghosh are installing this Amal Filters with zeal to provide arsenic free safe-water to the people of arsenic affected areas of West Bengal. The installation costs and other helps are partly provided by "Water for People" through Arun K Deb and by some NRIs who are also alumni of BE College.

The 100,000 US\$ Bronze Award went to Proctor & Gamble Co's Children's Safe Drinking Water Program for a coagulation and a flocculation water treatment system. These arsenic filter systems are no doubt advances in providing some relief to arsenic victims around the world, but these are neither perfect nor final solutions, since (1) arsenic laced irrigation water continues to affect man and environment through accumulation and transmission in the food chains, (2) waste arsenic disposal problems remains, and (3) some high costs will still remain.

Besides surface water harvesting there can be other and better solutions. One of such solutions with high potential is geo-chemical which has come to be known as In-Situ or Sub-terranean Arsenic Remediation Technology in which the arsenic poison can be left behind adsorbed on the underground aquifers and arsenic free wholesome water can be pumped out and used for drinking and irrigation. The technique in principle is quite simple. Since chemical reduction processes of iron (III) and arsenic (V) and/or microbiological activities in the underground aquifers mobilize arsenic, so reversing the aquifer conditions and/ or inhibiting microbiological activities by some suitable technique, would prevent arsenic mobilization. This can be done in many ways, for example, by injecting aerated or oxygenated water for some time and then pumping out arsenic free water for longer periods. Injections of permanganate or ferric chloride solutions into the aquifer can also prevent arsenic mobilization in some cases. Stuttgart University of Germany has made respectable contribution to the development of such techniques and arsenic free water is supplied through public distribution systems at some places. Such techniques are being used at some places in Germany, Netherlands, USA etc. Even Bangladesh with its PHED and DANIDA have made some progress in these directions and the World Bank is reported to have granted some US\$ 200,000 for such R&D works to an WB NGO who are supposed to work in collaboration with Stuttgart University. With Government support and funding and GSI participation this technology may be perfected in India and successful scientists would surely receive bigger awards and prestige, bringing lasting benefits to man and environment. □□□