

## Arsenic remediation in Bangladesh

*Scarab Development AB has together with the Royal Institute of Technology, Stockholm, Sweden, (KTH) developed systems for polygeneration.*

*The commercial product is a system that combines generation of electricity and purification of water. The fuels will be Biomass, Biogas and Solar. Water will be purified in a low temperature distillation process driven by the waste heat from electricity generation. This way, arsenic and all other contaminants will be completely removed in an affordable way.*

In 1995, Scarab was asked if our new technology could separate arsenic from water. We tested water spiked with arsenic at Karolinska Institute in Stockholm. The arsenic was removed completely. After that we sent test equipment to Dhaka and researchers at Bangladesh University of Engineering and technology (BUET) tested actual well water containing arsenic with the same successful result. These results were documented in a Master Thesis from Chalmers Technical University in Goteborg, Sweden, *Membrane Distillation Process for Pure Water and Removal of Arsenic* by Ashiq Moinul Islam, 2004.

The next step was to conceive an ecologically sustainable and technically well designed system. These developments are documented in a Master of Science Thesis by Ershad Ullah Khan in 2007, *Biogas driven Stirling engine micropower generation and integrated membrane distillation process for arsenic removal*.

Work in improving the design of the equipment continued in co-operation with KTH. Successful results were obtained in removing salt from sea water, treatment of desalination brine (concentrate), purifying power plant effluents and removal of pharmaceutical residues and nanoparticles.

Finally a grant from the Swedish international development cooperation agency (Sida) enabled KTH to execute a field study to model the social and financial conditions for making the system culturally and economically viable. This study resulted in a report to Sida, *Biogas based polygeneration for rural development in Bangladesh*, February 2015.

At the same time Sida ordered a study performed by Swedish Institute of Public Administration (SIPU International) in consortium with Orgut and Adam Smith International with the title: *Influencing results in four target areas of Sweden's development co-operation with Bangladesh: Opportunities for private sector collaboration*. This study strongly advocates our solution.

Based on these results, a subsidiary of Scarab, HVR Water Purification AB, has proposed a plan for demonstration of four biogas polygeneration systems in the field: *Demonstration phase for biogas based polygeneration for rural development in Bangladesh*, October 2015. The proposed budget for the three year demonstration program is 3.5 M€.

Scarab has presented the demonstration proposal to the Swedish Embassy in Dhaka and to Sida headquarters. The Embassy has approved the project. However, Sida does not have a suitable call for the project at the moment. So, it will be on hold.

Aapo 2015-11-13

Scarab's ambition is to enable supply of electricity, healthy drinking water and food to people who are lacking in these essential commodities. This will be done by designing affordable polygeneration facilities. The design and development work is financed by Scarab's other activities in commercial industrial projects. The polygeneration facilities themselves must however be designed in such a way that they can be financed by the beneficiaries themselves and not depend on charity.