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Leveraging mathematics for global filtration challenges

Tuesday, 15 May 2018 14:00 (25 minutes)

The Ganges–Brahmaputra Delta is a global hotspot for arsenic groundwater contamination. Naturally occurring arsenic concentrates in water drawn from deep wells, creating a major public health issue in West Bengal and Bangladesh that has been described as the largest mass poisoning of a population in history.

A novel technology has recently been discovered that uses naturally abundant laterite soil to filter arsenic. This technology has the potential to provide a global breakthrough, supplying clean water to the world. However, to achieve this, a sound quantitative understanding of its behaviour is essential, which can only be obtained through the development of mathematical models.

In this talk we present a mathematical framework that uses homogenization theory to distil the complex process to a simple model. The resulting framework predicts how frequently filters must be replaced and how the filters may be upscaled to serve, for example, a school or community. The filter has been piloted in three communities in India, serving more than 5000 people, and the tools that we have developed will provide the essential guidance needed for engineers to maintain current filters and deploy these new filters in a cost-effective manner.

We will also outline how the framework is applicable to the wider filtration context of porosity-graded filters that offer superior filtration properties and improved blocking resistance.

References

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