Modelling contaminant accumulation

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Summary of presentation/poster

Modelling contaminant accumulation is needed to evaluate the potential impact of CBRN contamination caused by a terrorist attack. Three specific objectives are defined:

(1) Experimental determination of kinetic coefficients for sorption (penetration/release) of contaminants in biofilms/deposits for different cases, to provide data for (2)

(2) Simulation of the transport and accumulation/release of contaminants both in water and on surfaces (deposits/biofilms and pipe walls), which depends on the design of the network, the surface properties and the properties of water (pH, temperature, chemical composition...)

(3) Development of software tools to simulate the effects of contamination events (based on the data obtained in the last two items) and to identify the location of the probable source (s) of contamination.

It is known that deposits can be havens for contaminants. Pathogens, for example, may still thrive in deposits/biofilms even if they are not able to survive for a long time in the bulk water. Later on, even after the water phase has been successfully decontaminated, gradual release of pathogens, chemicals and radionuclides to the liquid environment can/will occur.

Therefore, once a deliberate contamination event is detected, fast computer methods are needed to estimate the probable location of the attack and the concentration of the contaminating agent in the source point and other places in the network, including the prediction of the slow release of contaminants from deposits and pipe walls. This is mostly an "inverse problem" solution which can only be applied after: (i) obtaining data concerning the interaction (sorption/release) of contaminants with the deposits/biofilms on the pipe walls; (ii) calculating the transport, penetration, reaction and release of contaminants by using "forward" simulation software (hydraulic models such as the ones by EPA/USA improved by incorporating surface interaction models).