Coupon Monitoring Devices for Monitoring of Surface Deposits in Drinking Water Systems

M. Strathmann | D. Pütz | D. Moschnitschka | H.-C. Flemming

Aim

In a contaminated system, not only the water phase is of importance but also the deposits at the inner surfaces.

Therefore, it was the aim to develop coupon monitoring devices which can be used to sample representative pipe segments or coupons to

(1) analyse the present deposit,
(2) to analyse the possibly absorbed contaminants and
(3) to validate the effect of cleaning and or decontamination procedures.

Conclusions

- Several coupon monitoring devices have been developed within SecurEau project.
- Monitoring devices vary in complexity and ability to simulate hydrodynamics in a drinking water pipe.
- Pilot scale experiments revealed good agreement in biofilm formation on pipe surfaces and coupons.
- Sampling of coupons from monitoring devices is suitable to analyse surface deposits in drinking water systems.

Material and Methods, Results

Coupon monitoring devices

Based on a laboratory coupon reactor system several improved flow-through devices and in-line pipe monitoring devices have been developed.

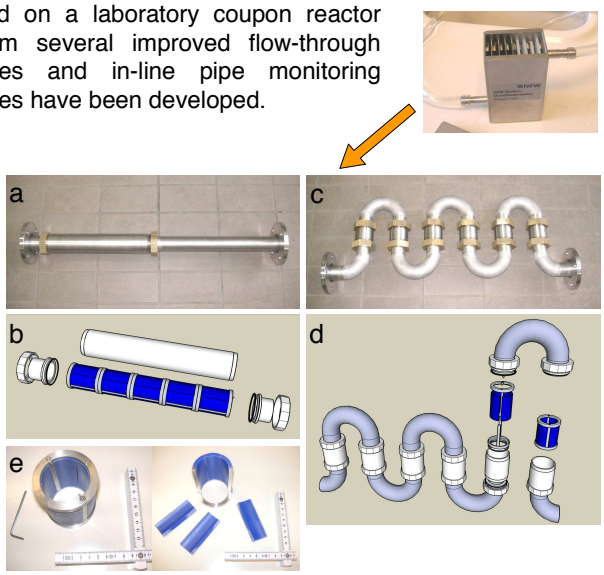

Fig. 1: Coupon monitoring devices; a & b: in-line pipe monitoring device; c & d: serpentine in-line pipe monitoring device; e: coupon holder with PE-HD 100 coupons

Pilot test system

Drinking water biofilms were grown on pipe and coupon surfaces in a pilot scale test system.

Fig. 2: Pilot test system used for the generation of drinking water biofilms on pipes and test coupons

- Natural drinking water flora used as inocculum
- PE-HD 100 drinking water pipe material used as growth surface
- 4 – 5 weeks recirculating operation
- Continuous dosing of nutrient medium to accelerate biofilm growth

Biofilm growth and quantification

Biofilms on surfaces (coupons + pipes) were quantified by fluorescence microscopic determination of the total cell number after detachment of the bacteria.
Similar biofilm development was observed on coupons and pipes.

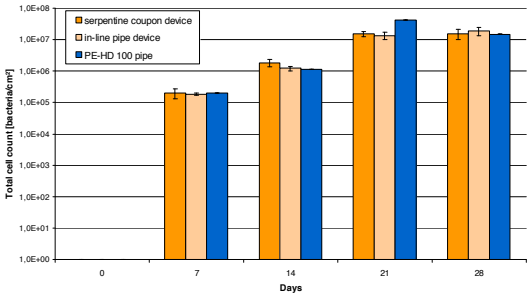

Fig. 3: Biofilm development on PE-HD 100 pipes and coupons taken from coupon monitoring devices (Fig.1, a & c)

Comparison of devices

On one hand, the developed systems should reflect the conditions and the hydraulic regime of real drinking water systems. On the other hand, the systems should be relatively simple, easy to handle, easy to install and not too expensive. Unfortunately, these two groups of requirements are contrary.
How the systems fulfill the requirements is depicted in figure 4.

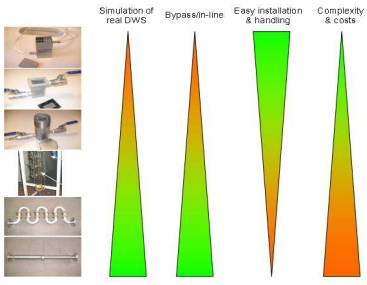

Fig. 4: Schematic comparison of coupon monitoring devices

Acknowledgement

The research leading to these results was part of the European joint research project "SecurEau" and has received funding from the European Community's Seventh Framework Programme (FP7/2007-2011) under grant agreement n°217976.

Contact

IWW Rheinisch-Westfälisches Institut für Wasserforschung gemeinnützige GmbH
Moritzstrasse 26 • D-45476 Mülheim an der Ruhr • Germany
Dr. Martin Strathmann • Tel.: +49-(0)208-40303-361 • m.strathmann@iww-online.de