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CHARACTERIZATION OF BIOFILMS that develop during the installation phase of new drinking water pipes in Aarhus, Denmark

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BACKGROUND

Biofilm is considered beneficial in the non-chlorinated Danish drinking water distribution systems, as it increases the microbiological stability of the water.

When introducing new pipe sections in the distribution network, the biofilm which develops on the new pipe wall is influenced by water quality, pipe material, the existing biofilm upstream the new pipe section, flow velocity, etc.

The influence of biofilms on the water quality in the short-term during the commissioning of new pipe sections remains poorly understood.

This project aimed to analyse the short-term effect of the developing biofilm in newly installed drinking water PE pipes on the water quality to be able to optimize the commissioning procedure for installing new pipe sections in an existing pipe network.

RESULTS

- Detection of increased HPC levels (the bloom) after commissioning of new PE pipes was verified with five different methods.
- The “Early settlement theory of biofilms” was confirmed in this study. A few specialized species will occupy a new clean surface with a competitive advantage that is beneficial in a short period of time. Hereafter, the diversity gradually increases to higher complexity.
- No coliforms and E. coli were measured during the flushing period.
- Only non-pathogenic surface-living microorganisms caused the bloom observed with the HPC methods.
- The family Comamonadaceae accounted up to 60% of the diversity in the downstream water after 10 days of flushing. It only accounted for 15% of the diversity in the upstream water.
- An increase in microbial numbers (the bloom) is expected to take place everywhere in the system where new PE material is installed.
- The mobile version of the bacterial monitor GRUNDFOS BACMON was tested in the field and was found to provide valuable information on total bacterial counts during commissioning of new drinking water pipe installations.

PERSPECTIVES

- On average Aarhus Vand replaces 15 km PE pipes annually (about 1% of their total network).
- The new commissioning strategy of installing new pipe sections should focus on rapid establishment of an intact and well-functioning biofilm for increased microbiological stability of the water.