



Introduction

During the Techneau project, Eawag has worked on the development and optimisation of several microbiological methods for drinking water analysis, and specifically the testing and application of these technologies in several full-scale treatment and distribution systems in Europe. The methods focussed on the assessment of total/active bacterial numbers and growth supporting organic carbon compounds. This report summarises the data and knowledge gained from these studies.

Importance

General microbial parameters are often not considered in drinking water analysis, and when so, most water utilities still use conventional heterotrophic plate counts (HPC) as a routine parameter. This method is time consuming and inaccurate (or limited) for the detection of the entire bacterial community in drinking water. There is, therefore, a clear need for the development of rapid, accurate and sensitive methods that can be used for monitoring and optimisation of treatment processes and distribution networks.

Approach

Full-scale treatment plants and distribution networks in Zurich (CH), Riga (LV) and Amsterdam (NL) were sampled and analysed with flow cytometry (total and intact cell counts), ATP analysis, assimilable organic carbon (AOC) analysis, pathogen growth potential (PGP), as well as conventional parameters such as dissolved organic carbon and heterotrophic plate counts. The data from these systems are compared with one another.

Results

The data show that the alternative methods (FCM and ATP) are better descriptors of the major bacterial processes (growth and disinfection) occurring during treatment in comparison to conventional plating methods. Moreover, these methods sufficed for analysing biological stability and bacterial growth in distribution networks.

More information

Full details on this deliverable can be found under D3.6.5.2. Further information can be requested from:

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TECHNEAU Knowledge Integrator (TKI) categorisation

Categorisation of Knowledge Packages

Categorisation (i.e. classification, contains and constraints) of knowledge packages (KPs) can be carried out by 'checking' the appropriate boxes in the attached tables. For example, for a KP investigating point-of-use treatment suitable for a developing world country, the following might be checked:

Classification: Process chain – Tap (Customer) – Point-of-use (POU).

Contains: Report; Literature review.

Constraints: Low cost; Simple technology; No/low skill requirement; No/low energy requirement; No/low chemical requirement; No/low sludge production; Developing world location.

Note that only the lowest level classification needs to be checked, e.g. Point-of-use (POU) in the above example.

Meta data can be included under the 'More Information' section of the Executive Summary Report, i.e. Author(s), Organisation(s), Contact details (name and email), Quality controller (name and organisation) and Date prepared. (The TKI administrator can enter Source (= TECHNEAU), Date submitted (TKI) and Date revised (TKI)).

TKI Categorisation

Classification							
Supply Chain		Process Chain		Process Chain (cont'd)		Water Quality	Water Quantity (cont'd)
Source		Raw water storage		Sludge treatment		Legislation/regulation	- Leakage
- Catchment	X	- Supply reservoir	X	- Settlement		- Raw water (source)	X - Recycle
- Groundwater	X	- Bankside storage	X	- Thickening		- Treated water	X
- Surface water	X	Pretreatment		- Dewatering		Chemical	
- Spring water	X	- Screening		- Disposal		- Organic compounds	X
- Storm water	X	- Microstraining		Chemical dosing		- Inorganic compounds	
- Brackish/seawater	X	Primary treatment		- pH adjustment		- Disinfection by-products	X
- Wastewater	X	- Sedimentation	X	- Coagulant		- Corrosion	
Raw water storage		- Rapid filtration	X	- Polyelectrolyte		- Scaling	
- Supply reservoir	X	- Slow sand filtration	X	- Disinfectant		- Chlorine decay	
- Bankside storage	X	- Bank filtration	X	- Lead/plumbosolvency		Microbiological	
Water treatment		- Dune infiltration	X	Control/instrumentation		- Viruses	Consumers / Risk
- Pretreatment		Secondary treatment		- Flow		- Parasites	
- Primary treatment		- Coagulation/flocculation	X	- Pressure		- Bacteria	X Trust
- Secondary treatment		- Sedimentation	X	- pH		- Fungi	- In water safety/quality X
- Sludge treatment		- Filtration	X	- Chlorine		Aesthetic	- In security of supply
Treated water storage		- Dissolved air flotation(DAF)		- Dosing		- Hardness / alkalinity	- In suppliers X
- Service reservoir		- Ion exchange	X	- Telemetry		- pH	- In regulations and regulators X
Distribution		- Membrane treatment	X	Analysis		- Turbidity	Willingness-to-pay/acceptance X
- Pumps		- Adsorption		- Chemical	X	- Colour	- For safety
- Supply pipe / main		- Disinfection	X	- Microbiological	X	- Taste	- For improved taste/odour
Tap (Customer)		- Dechlorination	X	- Physical		- Odour	- For infrastructure
- Supply (service) pipe	X	Treated water storage					- For security of supply
- Internal plumbing	X	- Service reservoir	X			Water Quantity	Risk Communication

- Internal storage	X	Distribution					- Communication strategies
		- Disinfection	X			Source	- Potential pitfalls
		- Lead/plumbosolvency				- Source management	- Proven techniques
		- Manganese control				- Alternative source(s)	
		- Biofilm control	X			Management	
		Tap (Customer)				- Water balance	
		- Point-of-entry (POE)	X			- Demand/supply trend(s)	
		- Point-of-use (POU)	x			- Demand reduction	

TKI Categorisation (continued)

Contains		Constraints		Meta data			
Report	x	Low cost		<i>Author(s)</i>		Frederik Hammes	
Database		Simple technology		<i>Organisation(s)</i>		EAWAG	
Spreadsheet		No/low skill requirement		<i>Contact name</i>		Frederik Hammes	
Model		No/low energy requirement		<i>Contact email</i>		Frederik.hammes@eawag.ch	
Research	x	No/low chemical requirement		<i>Quality controller name</i>		Eveline Sack	
Literature review		No/low sludge production		<i>Quality controller/organisation</i>		KWR	
Trend analysis		Rural location		<i>Source</i>			
Case study / demonstration	x	Developing world location		<i>Date prepared</i>		2010-11-31	
Financial / organisational				<i>Date submitted (TKI)</i>		2010-12-23	
Methodology				<i>Date revised (TKI)</i>			
Legislation / regulation							
Benchmarking							