EFFICIENT TREATMENT OF PHARMACEUTICAL RESIDUE AT SOURCE - EPIC

WP3: Cost-effectiveness of waste water treatment solutions at different sources

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Need, WP3: Cost-effectiveness of waste water treatment solutions at different sources

1. Knowledge of costs in treatment of pharmaceutical residues in wastewater
   - Investment costs
   - Operation costs
2. Knowledge of cost-efficiency of different methods and approaches in pharmaceutical residue purification
   - What are important pharmaceuticals to be removed?
   - What are additional unit costs of different treatment methods?
   - What are benefits of treatment of pharmaceutical residues in wastewater?
   - Is it more cost-efficient to have specific treatment at the pollution source where the concentration is high?

Approach

1. Assessment of investment and operation costs
   - VVY, 2016 (Teknis-taloudellinen tarkastelu jätevesien käsittelyn tehostamisesta Suomessa)
   - THL, 2018 CONPAT-project, (Juomavesien epäpuhtauksien poistotekniikat talous-ja jätevesilaitoksilla)

2. Life Cycle Costing assessment LCC
   - SYKE, LUT, HY, 2019, EPIC-project

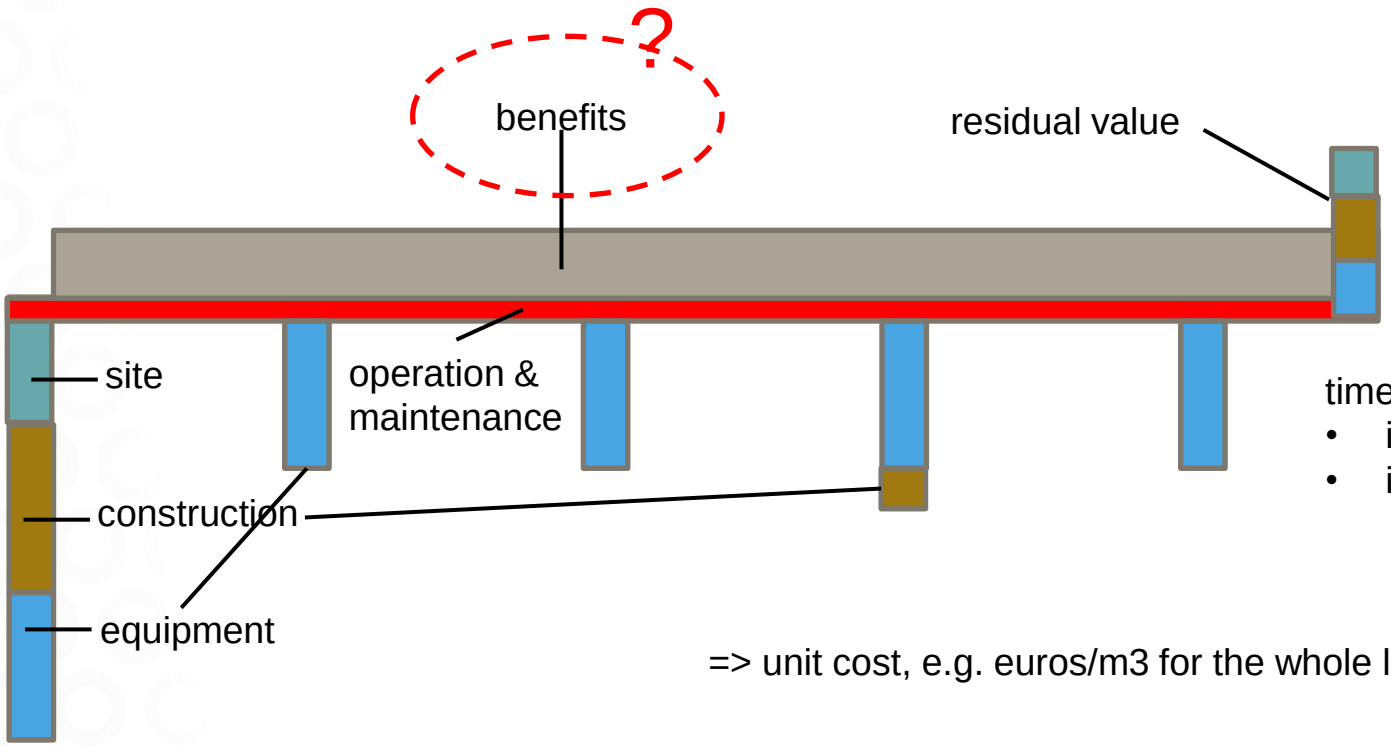
Approach

Operation cost estimates (euros/m3) vary a lot in previous studies

1. Activated carbon
   - 0,0039 – 0,5 (GAC)
   - 0,036 - 1,1 (PAC)
2. Ultrafiltration 0,08
3. Nanofiltration 0,35
4. Reverse osmosis 0,52
5. Ozonization 0,06 – 0,07
6. AOP (H2O2+UV) 0,14 – 0,32

Approach

Life cycle cost assessment LCC



time/a
- interest %?
- inflation %?

=> unit cost, e.g. euros/m3 for the whole life cycle

Approach

1. Pulsed corona discharge PCD + membrane filtration
2. Enzyme methode pCure

Costs are assessed using following assumptions:

- Electricity 0,10 €/kWh
- No personnel costs
- pCure blocks 7 €/pc

Depreciation of investments:

- Constructions 50 years
- Equipment 15 years
- Interest rate 3 %
- Inflation 0 %

Benefits

Preliminary assessments with period of 50 years, capacity of 750 m3/d

	Year		
	1-15	16-30	31-50
Building	3 887	3 887	3 887
Equipment	6 819	6 819	6 819
Pumps	0	0	0
Operation costs	31 900	35 659	39 866
Cost €/a	42 605	46 365	50 572
Cost €/m3	0,16	0,17	0,18

	Year		
	1-15	16-30	31-50
Buildings	0	0	0
Equipment	0	0	0
Pumps	0	0	0
Operation costs	379 167	417 083	458 792
Cost €/a	379 167	417 083	458 792
Cost €/m3	1,39	1,52	1,68
	0	0	

UF + PCD

- Tertiary treatment after an activated sludge process

Enzyme method pCure

- Treatment at the source; hospital

Assessment of benefits of treatment

- Removed or reduced materials and their effects
- Benefit gained from the process; site, significance to sludge reuse
- Benefits compared to possible limits
- Costs of damage if not implemented

Benefits of this study

- Understanding of long term costs and benefits of treatment of pharmaceutical residues in wastewater helps to plan treatment strategy in future
- Different treatment methods and approaches affect differently; at pollution source when concentration is high, cost-efficiency might be high
- Some methods need clear water, so they are applicable as tertiary treatment after chemical and biological treatment in wastewater treatment plants
- It is possible to assess the effect of treatment costs to water fee

Collaboration

National

- Financers (steering group)
- Healthcare operators: hospitals, pharmacies, factories
- Authorities: YM, STM, Fimea, regional authorities, municipalities
- FIWA, MWWTPs
- Technology providers, consulting companies, other related enterprises
- Scientific community: research institutes, universities
- Other stakeholders & networks

Thank you!

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