



Aalto University
School of Engineering

Adsorption and ion exchange in practice

Prof. Riku Vahala



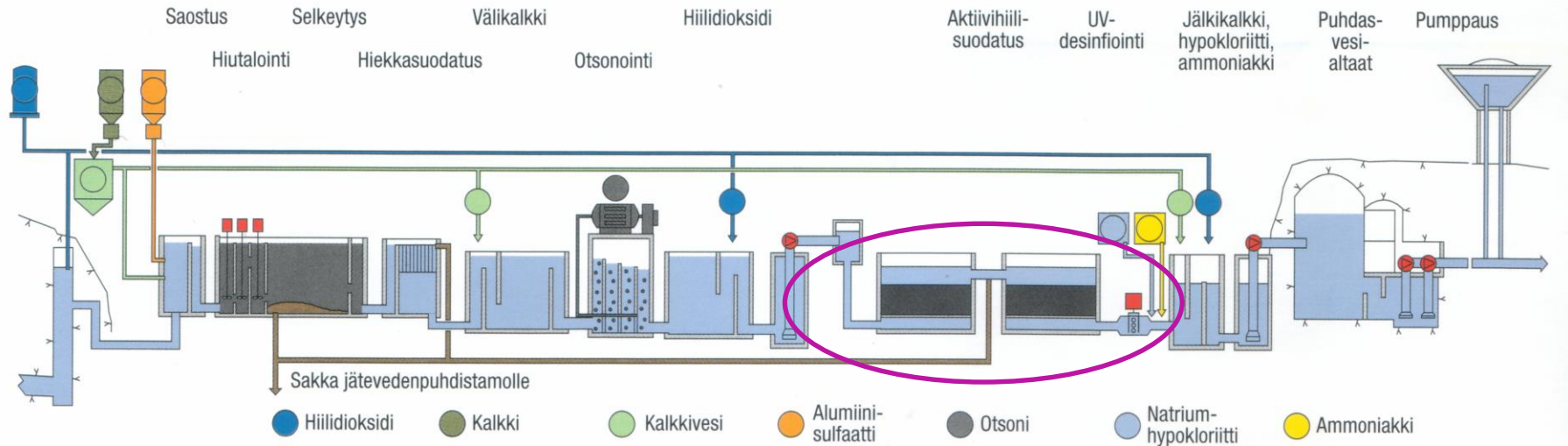
Aalto University
School of Engineering



Case 1: Removal of NOM from drinking water by granular activated carbon (GAC) filtration

Pitkäkoski and Vanhakaupunki WTP, Helsinki

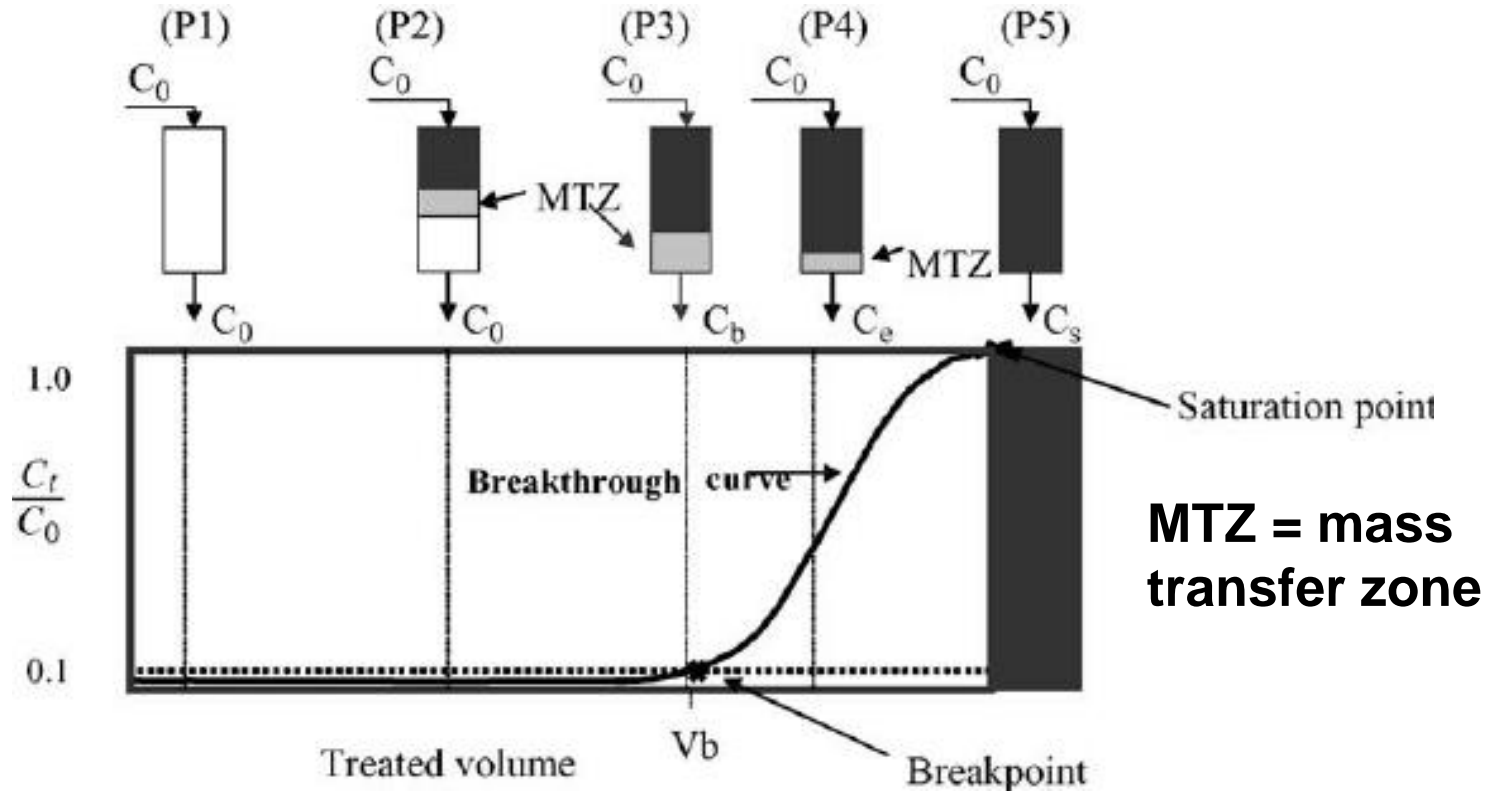
- Ozone as a last step of the process produced large amounts of biodegradable NOM, which caused extensive biological growth in the distribution system
- As a solution two-step GAC filtration was installed to remove BDOM after ozonation



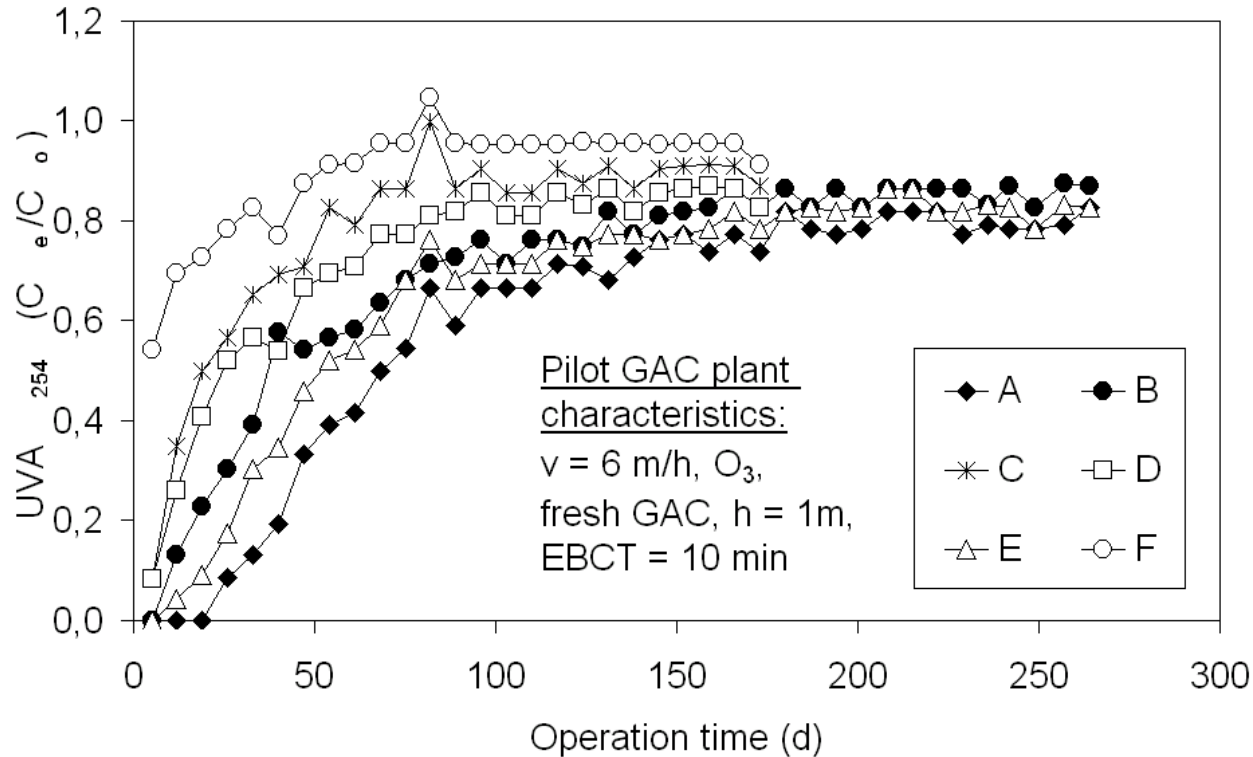
Design parameters

- Based on the literature review and pilot-scale studies
- Empty bed contact time (EBCT) of 2 x 25 minutes = volume of the filter (m³) divided by the flow rate (m/h)
- Charcoal based GAC
- Filter depth of 2 x 2,8 meters
- First filter upflow, second downflow
- Thermal off-site regeneration frequency of four years
- After two years the first filter is moved as the second by changing the flow direction, second filter is filled in with fresh GAC
- Backwash once a week with air and water
- Later on the operation mode has been changed to one-step filtration in order to increase hydraulic capacity of the plant

Ideal breakthrough curve of the filter bed



Impact of GAC quality



=> Practically most of the time the filter operation mode is biological, selection of GAC has major impact on the adsorption capacity

AOC breakthrough curve

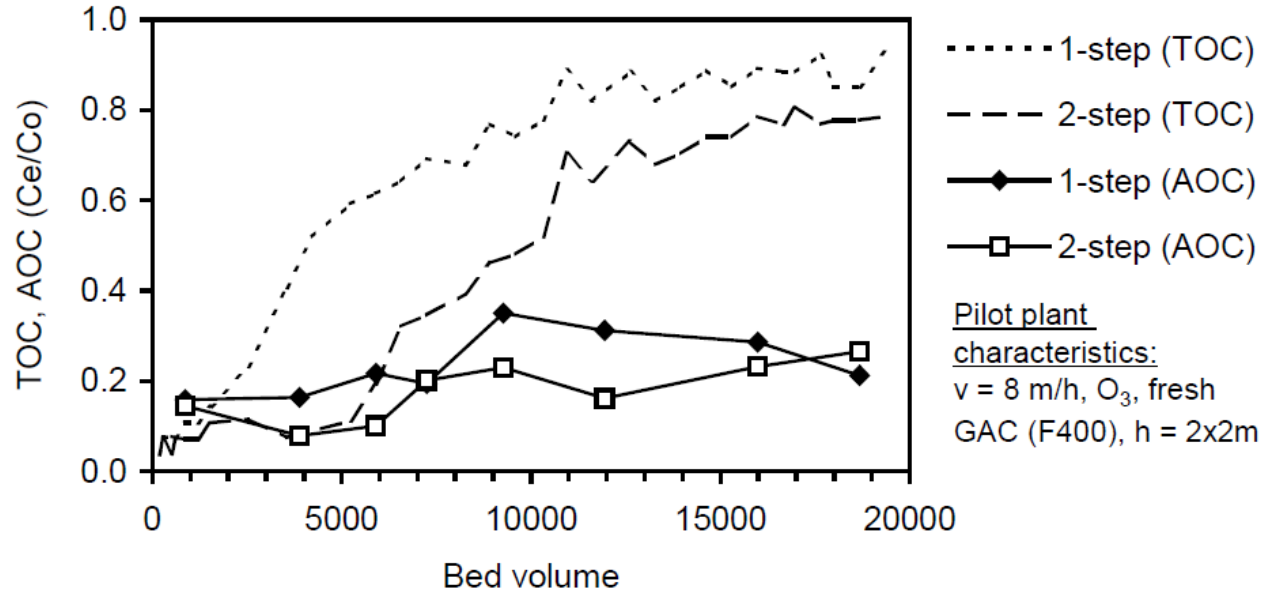


Figure 6. AOC breakthrough curves for two-step GAC filters (fresh Filtrasorb 400).



Aalto University
School of Engineering

Case 2: Removal of micropollutants from wastewater by powdered activated carbon (PAC) in Switzerland

*Pöyry's presentation in Water Association's seminar on
micropollutants, October 16th, 2016*



Aalto University
School of Engineering



Case 3: NOM removal by suspended ion exchange resins in Andijk, Netherlands

See: <https://player.vimeo.com/video/116172135>

Additional information: https://pwntechnologies.com/wp/wp-content/uploads/2016/03/artikel-Essener-Tagung-mrt-2016_pdf.pdf

Suspended ion exchange process (SIX)

