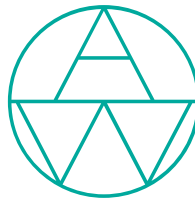


Cascading Alum Sludge

driving the circular economy

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Backgrounds

ALUMINUM BASED COAGULANTS AND RESIDUAL ALUM SLUDGE

Aluminum based coagulants are generally applied in **drinking water** treatment from surface water. Typically, the sludge goes to landfill or to waste disposal sites. Reuse or recovery is applied only at limited scale yet.

A number of **wastewater plants** use aluminum based coagulants as well, especially for phosphate removal. Also in this case, the residual sludge goes to landfill or to waste disposal sites.



Cascading alum sludge



The challenge

TURNING WASTE INTO RESOURCES, RECYCLING, 'UPCYCLING': WHAT ARE THE OPTIONS?

Present routes for beneficial use of alum sludge are still restricted. EU policy focuses on an innovative, circular approach rather than the oneway use – disposal route. What are the options?

- Feed into cement kilns: practiced in some cases, depends on the proximity of a cement plant
- Use in construction materials: a potential, only very limited use in practice
- Extraction of aluminum aiming for full recovery: numerous R&D efforts, not applied in practice
- Cascading towards a second time use: our option, further highlighted below

REFERENCE INFORMATION ABOUT ALUM SLUDGE FROM DRINKING WATER PRODUCTION

- Mainly consists of aluminum hydroxide, dry solids content 20 %-w/w or higher
- As a rule of thumb: 20 – 40 ton (dry matter), or 60 – >100 ton (as is) are generated for each million m³ of treated water
- Alum sludge volumes generated worldwide are estimated >5 Mton (as is) per annum
- Costs for disposal or treatment are increasing, typically 20 – >80 €/ton (as is)

The concept

cascading alum salts

CONVENTIONAL ROUTE

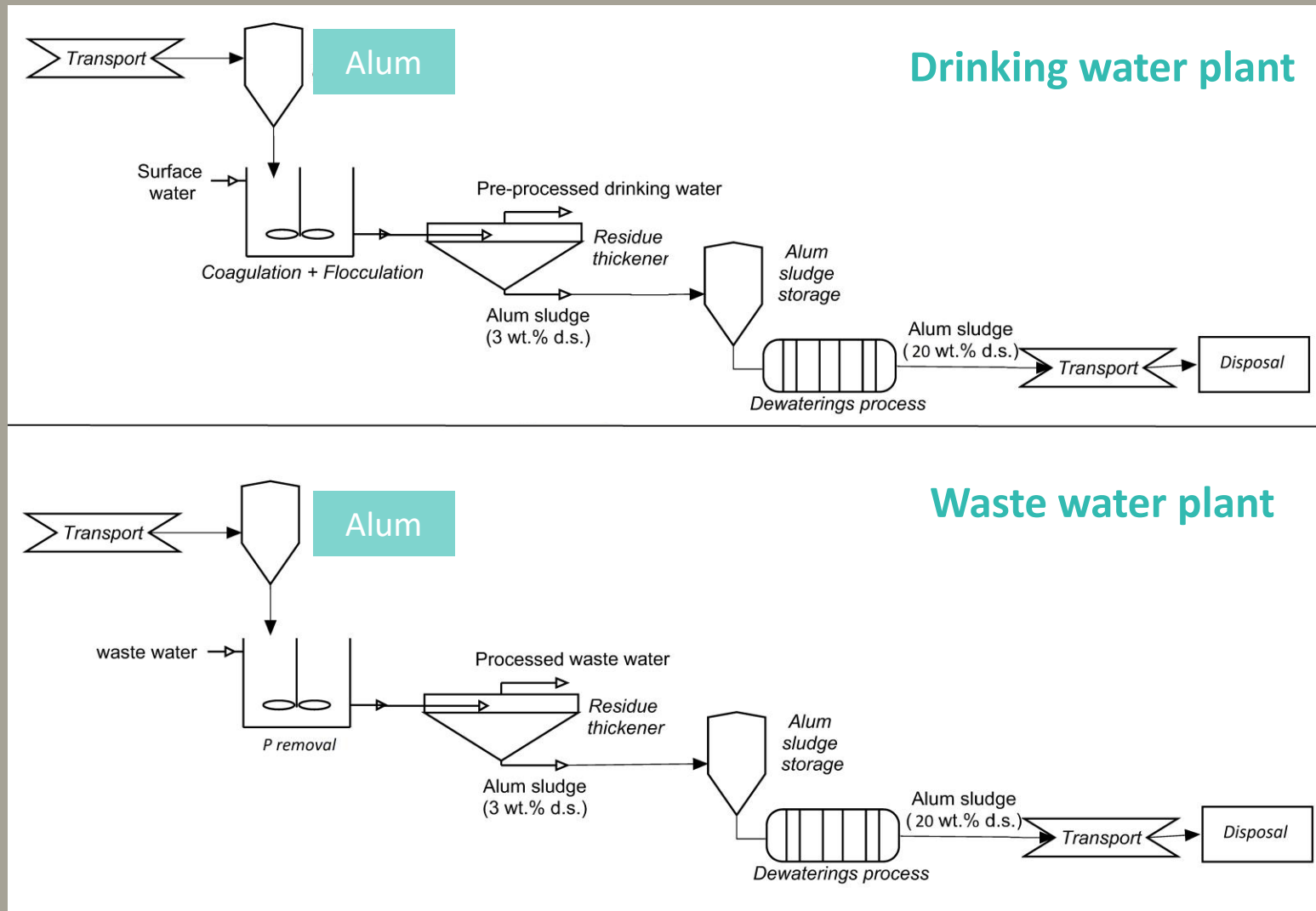
Both drinking water and wastewater treatment use fresh aluminum based coagulants in a oneway route

CASCADING OPTION

Use acidified sludge from the drinking water plant as a feed to the wastewater plant (next slide)

ADVANTAGES OF CASCADING

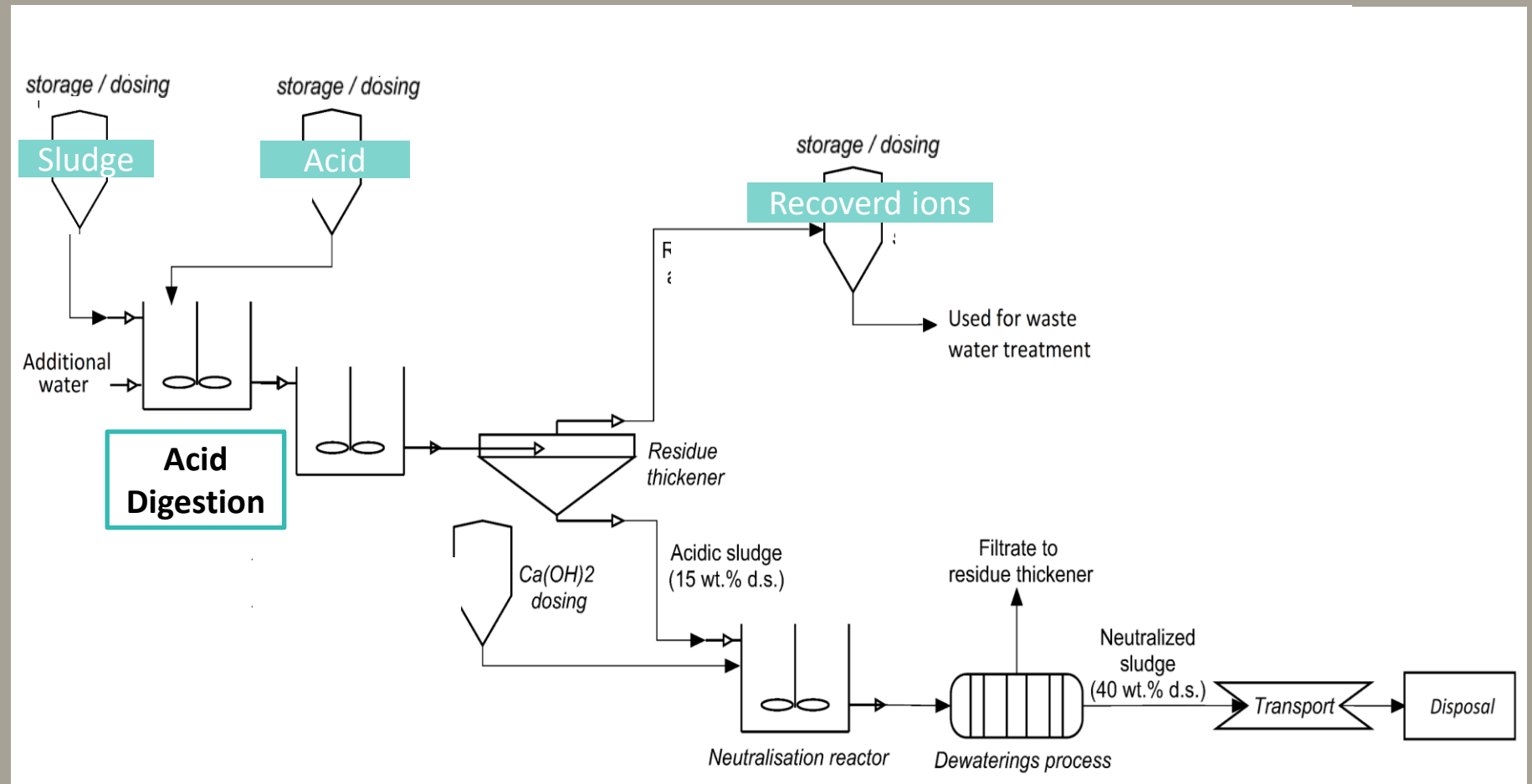
- Enhanced circularity
- Overall cost savings



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Technology

principles of acid digestion



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Cascading evaluated

how do the economics of cascading versus conventional look like?

ECONOMIC MODEL OF CASCADING

- The main costs relate to: depreciation of equipment, maintenance and operation, consumables (acid, lime, energy), management
- The main savings pertain to: sludge disposal, transports, purchase of fresh aluminum based coagulant
- Result: according to our estimates an overall 20 % cost saving is achievable while comparing cascading versus conventional

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