TRAINING MATERIAL

Title:

Technology for P recovery as phosphate salts from drinking water and waste water by the Crystalactor® water treatment process (ID:449)

Training:

What is the technology?

The patented zero-waste Crystalactor® water treatment technology is used as advanced treatment of both drinking water and (industrial) waste water for removal of a large number of heavy metals and other inorganic compounds. The crystallization process purifies water, harvesting high-purity pellets which have proven to be reusable or for commercial off-take.

Who is the vendor of the technology?

Royal HaskoningDHV is an independent international engineering and project management consultancy. They have been working with clients to successfully deliver projects which contribute to improving living circumstances around the world since 1881.

Which other technologies are provided by the vendor?

Royal HaskoningDHV has nowadays 6,000 employees with projects and services in the fields of aviation, buildings, energy, industry, infrastructure, maritime, mining, transport, urban and rural development and water in over 140 countries.

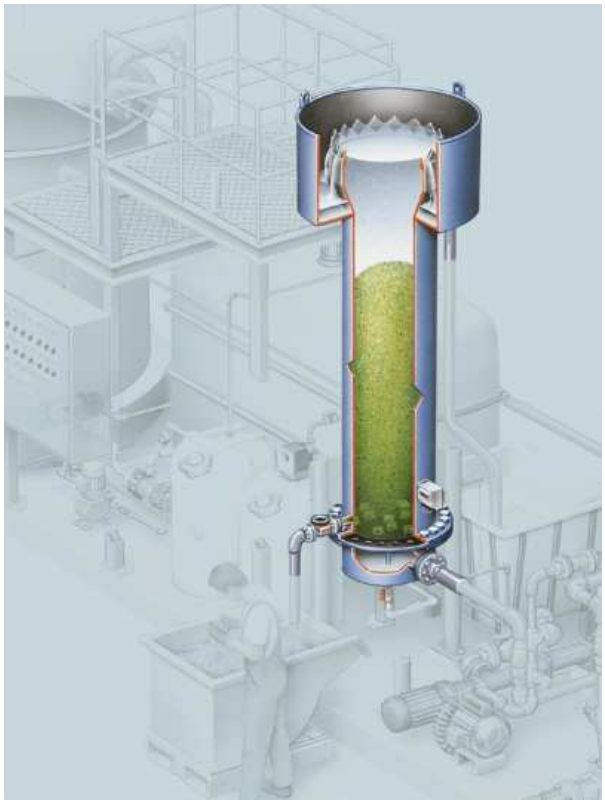
Which are the advantages of the technology and the problems addressed?

- The Crystalactor technology is a flexible technology that can be used for treatment of both large and small water flows.
- Crystalactor is sustainable and cost-effective: compared to other technologies like precipitation, ion exchange or membrane filtration, it produces a valuable resource as revenue instead of waste and associated costs.
- Suitable for reducing the concentration from over 25 mg P/L to 0.2-0.5 mg P/L at loads over 1 kg P/h.
- Recently, the Crystalactor was enhanced with a smart controller, which was developed in close collaboration with Delft University of Technology and Amsterdam Water Works (Waternet). The advanced controller reduces the chemical, operational and maintenance costs by predictive control of formed pellets.
- Wide range of application in the industry.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818470

How/where to use the technology?

Royal HaskoningDHVs' involvement with crystallization started early in the 1980's when then the company assisted Amsterdam water supply company Waternet in designing the pellet softening plants Leiduin (8,500 m^3/hr) and Weesperkarspel (3,300 ^{m3}/hr) and took over the patent of the pellet softening process.



How does the technology work?

The heart of the Crystalactor treatment plant is the pellet reactor, partially filled with suitable seed material such as sand or minerals. Feed water is pumped in an upward direction at a superficial velocity of about 40-100 m/h, which depends on the type of application. To crystallize the target component(s) on the pellet bed, a driving force is created by a reagent dosage and/or chemical for pH-adjustment. By selecting the appropriate process conditions, co-crystallization of impurities is minimized and high-purity crystals (pellets) are obtained. The pellets grow and move towards the reactor bottom by gravity.

Phosphorus is recovered in the form of calcium phosphate, magnesium phosphate or struvite by dosing lime or magnesium hydroxide, or a combination of caustic soda and magnesium chloride as reagents. Struvite formation occurs by dosing magnesium salts if the ammonium required for struvite formation is present in the water. The bulk of the phosphate is removed in the form of pellets from the reactor. Effluent filtration is usually required to remove suspended phosphate flocs that are present as carry over from the reactor. Other possible applications are softening (calcium carbonate), fluoride removal (calcium fluoride) , or for metal removal (metal carbonates or hydroxides).

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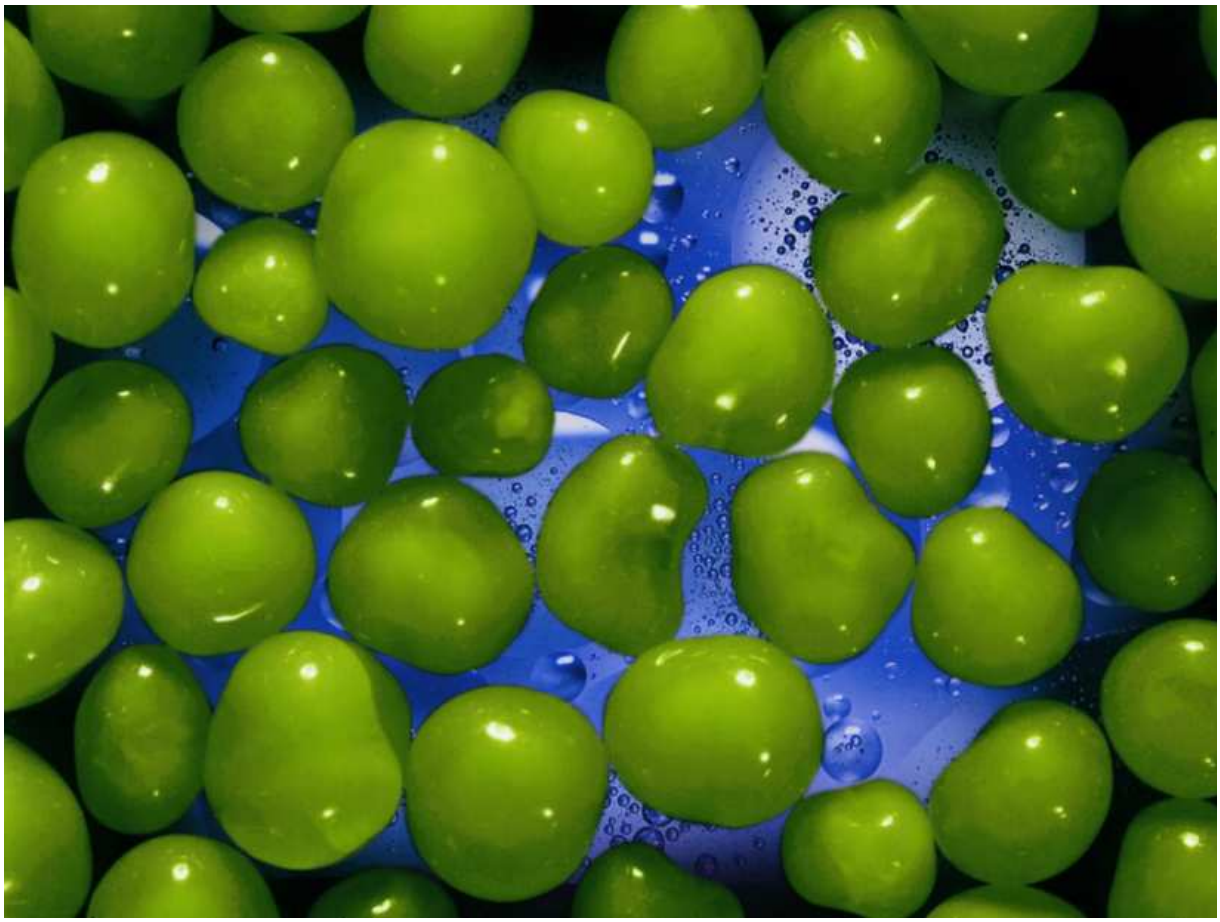

How and where to use the technology?

The technology is suitable for reducing the concentration from over 25 mg P/L to 0.2-0.5 mg P/L at loads over 1 kg P/h. The recently added advanced controller reduces the chemical, operational and maintenance costs by predictive control of formed pellets.

How much does it cost?

There are currently more than 70 Crystalactor Plants in operation or under construction on all continents. The cost of the technology depends on the project, total installation, choice of materials, requirements for the effluent, etcetera.

For more information: https://nutriman.net/farmer-platform/technology/id_449

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