Royal HaskoningDHV
Enhancing Society Together

Crystalactor® Controller®

The Aquasuite® Crystalactor® advanced process control for better performance and lower operational costs

www.aquasuite.eu

Crystalactor® technology

The heart of the Crystalactor® installation is the so-called pellet reactor, partially filled with a suitable carrier material such as sand or another mineral. The water is pumped in an upward direction, maintaining the pellet bed in a fluidized state. In order to crystallize the target component on the pellet bed, a driving force is created by dosing a reagent and pH-adjustment. By selecting the appropriate process conditions, co-crystallization of impurities is minimized and high-purity crystals are obtained. Due to growth of the pellets they will settle at the reactor bottom. At regular intervals, a quantity of the largest fluidized pellets is discharged from the reactor and new carrier material is added. After atmospheric drying, readily handled pellets are obtained and the need for sludge dewatering or hauling of sludge is eliminated. Due to their high purity, the pellets can often be recycled or reused.

Advanced Control with the Crystalactor Controller

The fluidized pellet-bed management is critical to the performance of the pellet reactor. The distribution of pellet diameters should be in such a way that there is sufficient surface area for crystallization while the settling rate of the pellets is sufficiently high. This is dependent on wastewater temperature, flow and constitution and is controlled by adjusting dosage flow, recirculation flow and pellet discharge and sand supply.

There are several measuring devises installed on the Crystalactor, however, it is not possible to directly measure the condition of the pellet bed. The Crystalactor Controller,, based on more than 10 years of (award winning) modelling of the fundamental processes and hydrodynamics within fluidized bed crystallizers[1], can determine the condition of the pellet bed through the available devises combined with a mathematic process model and takes into account all the variables mentioned before. With this so called soft sensing, Crystalactor Controller can determine the best settings for dosing and most importantly for pellet bed discharge and sand supply.

1 The controller has been developed in close collaboration with the Delft University of Technology and Amsterdam Water Works, which was also Royal HaskoningDHV's partner for development of the proprietary Crystalactor® process more than 25 years ago.

Improved process performance

The added-value of Crystalactor Controller is expressed in a:

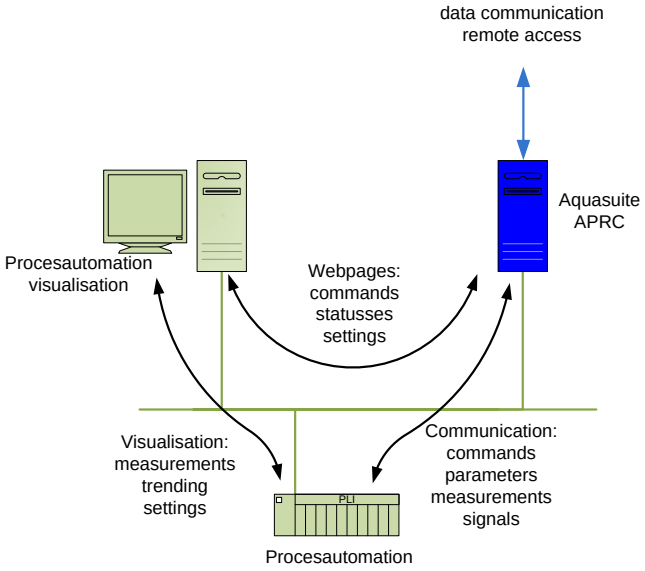
- reduced chemical consumption
- improved process robustness
- automatic adaption to changing circumstances resulting in easier operation and a reduction in the operator's work load
- better insight and understanding of the process

Crystalactor Controller strives for a maximal crystallization surface by timely removing the larger pellets from the reactor and maintaining an optimal fluid bed height. The reagent dosed can therefore be maximally effective and overdosing is prevented. This in turn reduces or even eliminates the need for reagent neutralization in the reactor effluent. Additionally, maximizing the crystallization surface and effectiveness reduces the potential for spontaneous nucleation in the water phase. As a consequence less suspended solids are present in the reactor effluent. The downstream carry-on filters are taxed less heavily, resulting in less rinsing.

Adjusting important process parameters like pH, reagent dosing, sand supply and pellet discharge in case of varying treatment capacities and water composition require a good process understanding of the operator. The Crystalactor Controller easily and automatically optimises the relevant set-points and as a result maintains best process conditions without the need for adjustments by the operator. The controller virtually enables the operator to "look into the crystallization process" and makes optimal performance reliable and easily achieveable.

Easy implementation

The Crystalactor Controller is an easily implemented add on to the standard Crystalactor process control (SCADA, PLC, DCS, etc.). The Crystalactor Controllersoftware can run on any type of computer connected to the control network. it reads signals from the process control system and sends back optimized setpoints for chemical dosing, pellet discharge and sand supply. The operator can always select whether the process control should apply the Crystalactor Controller set points or not. Normal control functions are still and always available in the plants process control.
Additionally, the Crystalactor Controller is monitored using a Watchdog signal between the plant control and itself. In case of a hardware malfunction, the local plant control will take over.



Crystalactor Controller generates operator friendly webpages for visualization of status, settings, measurements, calculations and trends. These pages can be easily accessed on any computer on the network and/or integrated into the standard visualization system.

In addition, the Crystalactor Controller collects relevant data for thorough analysis and can be used for remote process operational support by Royal HaskoningDHV.

Application

The Crystalactor® Controller is available for industrial and municipal Crystalactor® treatment plants targeting water softening, fluoride, phosphate or metal removal/recovery. It is part of Aquasuite®, a Royal HaskoningDHV software suite of advanced process controllers for various water treatment and water distribution processes.

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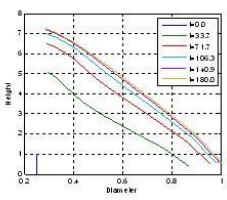

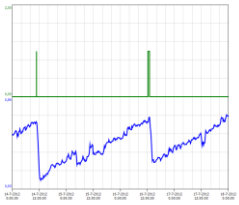

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