



Nutrient Recovery Technology Customized To Meet Your Needs

Converting wastewater treatment plants into resource recovery facilities, Ostar's proprietary Pearl® technology provides cost effective nutrient recovery for reuse.



Pearl® Fluidized Bed Reactor Design

Ostar offers three standard reactor sizes designed for a range of wastewater treatment plants (WWTPs): Pearl® 500, Pearl® 2K, and Pearl® 10K.

Each Pearl reactor is designed based on phosphate mass removal requirements. The Pearl 2K provides nominal orthophosphate (PO₄-P) removal capacity of 550 lbs/day (250 kg/day), which would typically make it suitable for WWTPs ranging in size between 10 to 30 MGD (average dry weather flow). Modular design enables multiple reactors to be installed.

The Pearl reactor has no moving parts and requires minimal maintenance. All other components are industry standard, providing easy access to spares and support.

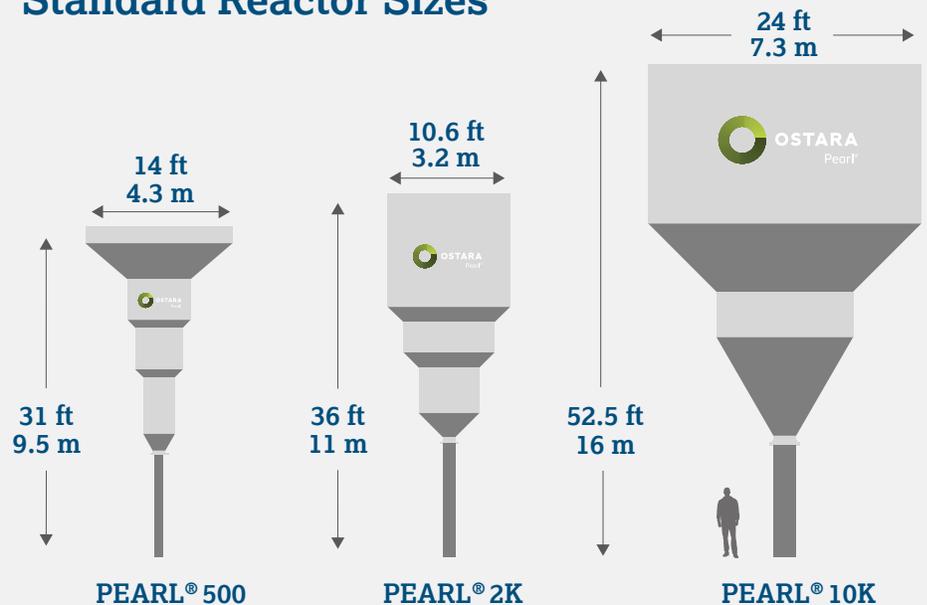
The Pearl® Process

The Pearl process recovers phosphorus from pre- and post-digestion thickening and dewatering liquors through the controlled precipitation of struvite (magnesium ammonium phosphate).

The liquors are fed to the reactor together with magnesium, which is added to maximize struvite precipitation. At the right nutrient concentrations, the crystallization process occurs rapidly.

Like a pearl, the struvite granules grow in diameter resulting in an extremely pure fertilizer marketed and sold as Crystal Green®. Treated effluent is discharged from the top of the reactor and returned to the plant.

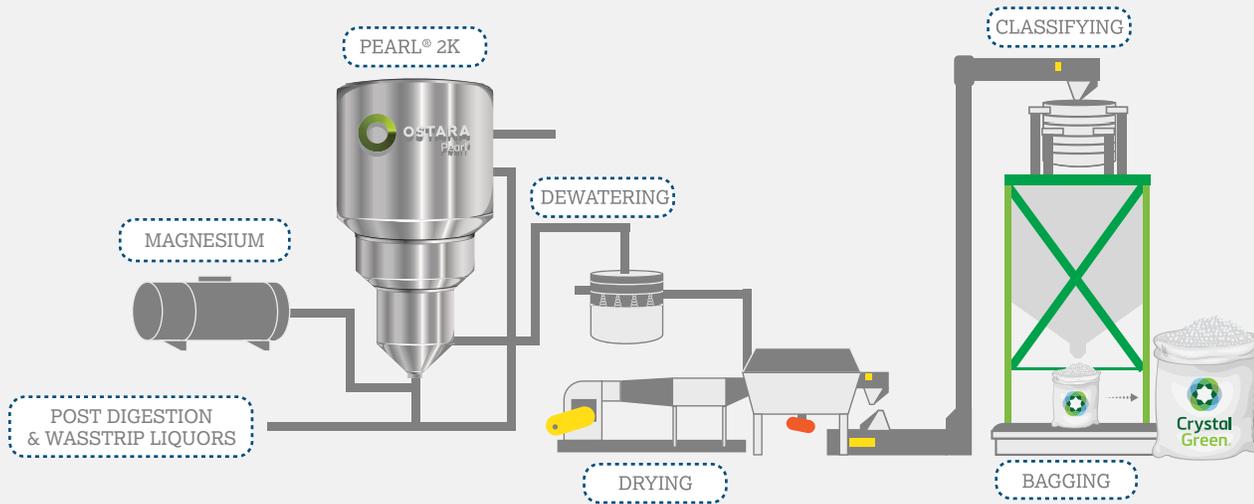
Standard Reactor Sizes



	Pearl® 500	Pearl® 2K	Pearl® 10K
Load Capacity (lbs/kg PO ₄ -P per day)	145/65	550/250	2,750/1,250
Average Production Capacity (lbs/kg Crystal Green fertilizer per day)	700/325	2,750/1,250	14,000/6,350
Installed Base (2018)	9	17	4

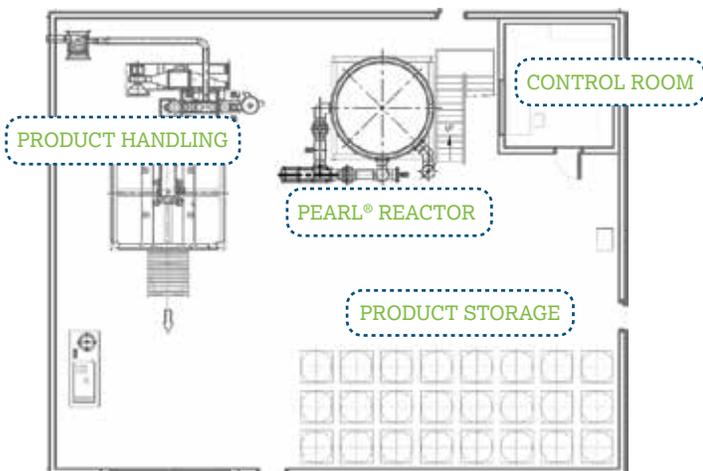
Crystal Green Processing – Simple and Fully Automated

Once granules have reached the desired size, they are removed from the reactor. Finishing occurs automatically in batch-mode, without interrupting the process. Granules are washed as they are conveyed to a dewatering sieve, dried using hot air (which can be recovered from combined heat and power engines or other waste heat sources), then delivered to a classifying screen, before being deposited in silos. The finished product is then ready for bagging in one-ton bulk bags and loading onto trucks for transport to fertilizer customers. As a registered commercial fertilizer, Crystal Green is the only recovered phosphorus ready for reuse as a premium fertilizer directly from WWTPs, with revenue to the plant guaranteed in a long-term offtake agreement.



Flexible, Efficient System Construction

Pearl reactors are provided in standard sizes, utilizing a modular design approach to deliver the required treatment capacity and operational flexibility. System layout is highly flexible, allowing installation into existing buildings where available. System tie-ins include process influent, effluent drainage, power, and non-potable water (e.g. WWTP effluent).



Pearl System Footprint

Reactor Count	Pearl® 500	Pearl® 2K	Pearl® 10K
1	1,500 ft ² 140 m ²	3,500 ft ² 325 m ²	6,500 ft ² 600 m ²
2	-	5,000 ft ² 465 m ²	8,000 ft ² 745 m ²
3	-	-	10,000 ft ² 930 m ²
4	-	-	12,000 ft ² 1,115 m ²



Ostara Nutrient Recovery Technologies Inc. helps protect precious water resources by changing the way cities around the world manage nutrients in wastewater streams. The company's Pearl® and WASSTRIP® technologies sustainably transform phosphorus and nitrogen recovered from municipal and industrial water treatment facilities into a high-value, eco-friendly fertilizer, sold and marketed by Ostara as Crystal Green®. Crystal Green's unique Root-Activated™ mode-of-action minimizes phosphorus tie-up in the soil, thus enhancing crop yield and performance, and significantly reducing nutrient leaching and runoff. For more information, visit www.ostara.com and www.crystalgreen.com

