

Struvite as fertilizer: the Oregon story

By: Dan M. Sullivan, Soil Scientist, Oregon State University. Based on presentations made at the NBMA meeting held Nov. 25 at the OSU North Willamette Research and Extension Center (Aurora, OR). Presenters were Rob Baur, Clean Water Services (Durham) and Jim Owen (OSU).

What is struvite? Struvite is a mineral, magnesium ammonium phosphate hexahydrate.

Where does struvite come from? Struvite accumulation is a problem in most wastewater treatment facilities. Struvite “naturally” forms on pipes, in anaerobic digesters, and on other surfaces within wastewater treatment plants when nutrient concentrations and water pH reach threshold values.

What is Crystal Green? Crystal Green is a struvite-based fertilizer product that contains nitrogen (5%), phosphorus (27% P₂O₅) and magnesium (10%). Crystal Green is the propriety trade name for product produced by the Ostara process. The typical fertilizer analysis is 5-27-10.

What is new about the facility to produce Crystal Green at Clean Water Services (CWS) Durham treatment plant? Clean Water Services will use the Ostara process to produce fertilizer grade struvite. The patented Ostara process (a fluidized bed reactor) controls the struvite formation process so that small, hard, rounded fertilizer prills are formed. Struvite produced “naturally” is not useable as a fertilizer product because it is in larger, more angular chunks or sheets that can’t be handled and spread easily as fertilizer. At Durham, the reactor is fed a magnesium chloride solution as the “seed” for struvite precipitation (formation of fertilizer prills).

What research is underway (OSU)? Ostara, CWS and Oregon State University (Dr. Jim Owen, North Willamette Experiment Station, Aurora) are partnering to evaluate Crystal Green as a fertilizer for container-grown nursery plants.

Dr. Owen’s research in 2008 demonstrated that the initial dissolution rate of Crystal Green fertilizer prills (first weeks after application) released sufficient phosphorus to meet needs of most nursery crops. Summer growth trials with a range of nursery crops (hydrangea, azalea, juniper) were also conducted in 2008. These plant growth trials showed that the phosphorus from Crystal Green was more slowly available than that provided by the “industry standard” fertilizer program. Additional trials will be conducted in 2009 (as funds become available) to evaluate Crystal Green as a slow-release phosphorus (P) fertilizer for production of containerized nursery crops.

Why has containerized plant production been targeted as a market for Crystal Green in Oregon?

Crystal Green is primarily valued for its phosphorus content. In most agricultural systems, a slow release P fertilizer is not desired. But in containerized nursery crops grown in soil-less P deficient media (bark, peat, pumice etc) with considerable leaching of irrigation water through the pots, a slow or controlled-release P fertilizer source is desirable.

What are the economics of Crystal Green fertilizer production for the CWS Durham treatment plant?

According to Rob Baur, CWS representative, the initial installation (3 Ostara reactors) at Durham will

cost approximately \$2.5 million, and is projected to payback in about 5 years. Annual Crystal Green production is projected at 525 tons per year. The CWS agreement with Ostara is an ongoing partnership.

What is Ostara? Ostara, based in Vancouver, BC holds the patent for reactors that produce Crystal Green (prilled, fertilizer grade struvite).

How are struvite fertilizers regulated? In Oregon, Crystal Green is regulated as a fertilizer product. It must meet fertilizer registration requirements of the Oregon Dept of Agriculture. Crystal Green is not a biosolids product, and is not subject to biosolids regulations.

When will the CWS Durham facility start up? Construction is underway. Completion is scheduled for spring 2009. The new facility is based on production data collected during earlier pilot-scale reactor operation.