CEEP Centre européen d'Etudes des Polyphosphates
a Sector Group of cefic

CEEP is the European phosphate industry's joint research association (detergent and industrial phosphate applications) and sector group of CEFIC – the European Chemical Industry Council – avenue E. van Nieuwenhuyse 4 bât 2, B1160 Bruxelles, Belgium.

Phosphates, the only recyclable detergent ingredient 7/2007

In the past, societies used to make great efforts to recover phosphorus values from wastes. Medieval contracts between land owners and farmers stipulated that the meat and crops produced from land could be taken off, but that animal manures must be returned to the soil : society knew that if this was not ensured, land fertility was slowly lost. The reason for this was only identified centuries later, when Phosphorus was discovered.

Phosphorus is essential for all life, included in DNA, nerve cells and the brain, bones, teeth and in the biochemical cycles which manage energy in plants and animals. With the developments of big cities, intensive agriculture, and modern sewerage, phosphorus from both detergents (less than a third of total P in domestic sewage) and from human and food wastes (the remainder) is concentrated in waste streams and recycling to land becomes difficult. Increasing tendencies to move away from agricultural re-use of sewage sludges accentuate this situation. For the moment, this "lost" phosphorus is replaced by the use of mined phosphate rock in mineral fertilisers, but this is not a sustainable solution. Phosphate rock is a limited, non-renewable, and non-substitutable resource, even if at current use-rates economically viable reserves are expected to last another century.

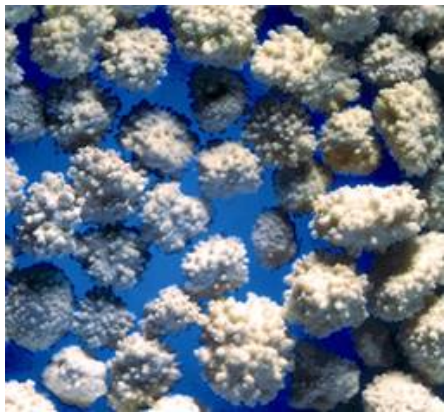
Phosphorus recycling

Today, over half of the phosphates in sewage biosolids in Europe (phosphates from human wastes, foods and other sources, including detergents) are already effectively recycled as fertiliser values to agriculture (53% of sewage sludges are reused in agriculture EU COM (98)775).

Both Germany and Sweden have recently (2003) announced national objectives for phosphorus recovery for recycling from sewage. Sweden's action plan centres on recycling P to land through sewage sludge use in farming, whereas the German Federal Environment Office (UBA) suggests recovery for recycling in sewage works. Phosphate recovery is now also officially included in UK Environment Agency strategy. See SCOPE Newsletter n°50

This places phosphates in a unique position as a sustainable detergent component.

Industrial phosphorus recycling



Phosphate recovery for recycling consists of extracting phosphates from the sewage works in a form which can be used either industrially (as a raw material in the phosphate industry) or as a fertiliser (either directly as recovered, or after further processing or mixing by the fertiliser industry).

A number of full scale or pilot recovery installations are already operational in sewage works in several countries and the industrial use of recovered phosphates has been successfully tested. Since 1999, sewage phosphates recovered at Geestmerambacht sewage works (near Edam, Holland) are recycled into industrial products by Thermphos International. Full scale commercial phosphate recycling, as struvite fertiliser, is also operational at Slough sewage works UK (Thames Water), in Edmonton Canada (commissioned 2007), and at several sewage works in Japan. The recycled phosphate is sold as a « green » ecological fertiliser.

Stephen Smith (Imperial College London) estimates that current world reserves of exploitable phosphate rock will last around 250 years at current rates of consumption. However, he considers that contaminants in fertilisers produced from rock may be a more important driver for phosphorus recovery. “Recycling phosphorus in biosolids is therefore a key prerogative for long-term sustainability. Phosphorus recovery during wastewater treatment is highly efficient and the sludge is an effective phosphorus fertiliser source that closes the nutrient loop through the food chain, provided it is carefully managed. Under these circumstances, it may not be necessary to control inputs of phosphorus to the wastewater collection system. In any case, the largest input of phosphorus originates from dietary sources, which emphasises the important link apparent between recycling in sludge and the food chain.”

In Green Alliance “The nutrient cycle: closing the loop”, 2007: http://www.green-alliance.org.uk/uploadedFiles/Publications/reports/TheNutrientCycle.pdf

Closing the loop

Phosphate recycling is essential for the sustainable future of our society as it is inconceivable to continue to simply throw away a non-renewable resource which is essential for life. Whilst this is a long term objective, increasing economic pressure on sewage sludge disposal and on water industry environmental life-cycle responsibility are likely to bring phosphate recycling into the short-term future.

The best way to recycle phosphorus is agricultural re-use of sewage solids, but problems with logistics (lack of farmland around big cities), contamination with pollutants and consumer resistance mean that this route is fast disappearing in many countries. In situations where agricultural re-use is not possible, industrial recycling of phosphates offers a sustainable solution. Phosphates from sewage (of human, food waste, detergent or industrial origin, recovered together) or from animal manures can be industrially recycled into either fertilisers or into industrial phosphate applications (flame retardants, detergents, electronics …).

Further information on phosphate recovery dedicated web site maintained by Darmstadt technical University Germany http://www.phosphorus-recovery.tu-darmstadt.de