



Phosphorus recycling  
Phosphorus as a critical element  
Recovery from sewage sludge ash

# Innovative comprehensive solutions for environmentally compatible phosphorus recovery

With the use of phosphorus-containing materials in fertilizers, we face two problems: increasing pollution and low supplies. For anyone focused on environmental issues to ensure a sustainable future, this is cause for concern. This white paper addresses the problem of diminishing phosphorus resources and identifies ways in which the recovery of phosphorus from sewage sludge can function.

## Why do we need phosphorus?

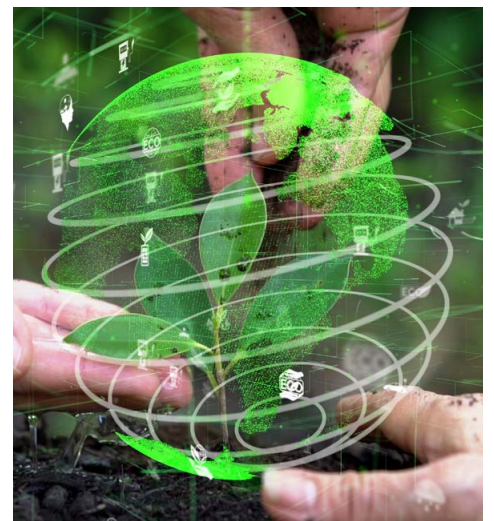
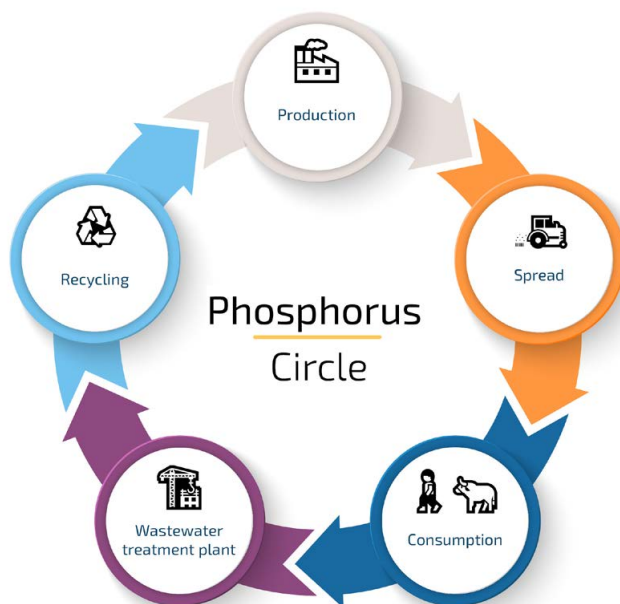
Phosphorus is an important nutrient for humans, animals and plants. We need phosphorus for the development, structure and function of body parts such as bones, muscles, DNA and teeth. Currently, a lot of phosphorus is lost because it is disposed of in landfills after sewage sludge incineration and has not yet been recycled.

The following cycle shows what this cycle looks optimally so that there is no longer such a high loss of phosphorus and can be recycled instead. Unfortunately, phosphorus cannot be produced synthetically and there are no comparable substitutes. Therefore, it is important to actively recover phosphorus and bring it back into the cycle.

## Issue

At the same time, the recovery of phosphorus, in turn, contributes to environmental pollution. Common practices such as the direct use of sewage sludge or sewage sludge products such as fertilizer also have the risk of pollution. AIK Technik AG is familiar with different processes and can provide you with active support. As a process specialist with over 13 years of in-house experience, we will find the right solution for you.

In the following, two different processes are shown in more detail, in which we are very well versed and were involved in the implementation of.



# Leachphos (AIK patented process)

A very proven process is Leachphos which was developed and patented by AIK Technik AG. In a demonstration plant (EWB Bern), the wet chemical phosphorus recovery (in an urban mining process) from sewage sludge ash following the FLUWA process (acid fly ash washing) was verified in cooperation with ZAR and AWEL.

### The Leachphos process consists of:

A wet chemical phosphorus recycling process of municipal sewage sludge ash from mono- incineration.

- Wet chemical extraction of ash with diluted mineral acid
- Targeted precipitation of the phosphorus product at ideal pH values
- Possible utilization of the washed-out sewage sludge ash filter cake.

In the demonstration plant in which 45 tons of sewage sludge ash were purified, about 6 tons of phosphorus fertilizer could be produced, the fertilizer effectiveness of which was confirmed with field tests.

The end product is thus a finished product. A fine, whitish fertilizer powder which can be distributed directly on the fields. This product can be produced in the sewage treatment plants and does not require any further export or import of phosphorus semisolids.

### Advantages of AIK Technik AG

#### Application areas

- ARAs

#### AIK Know-how

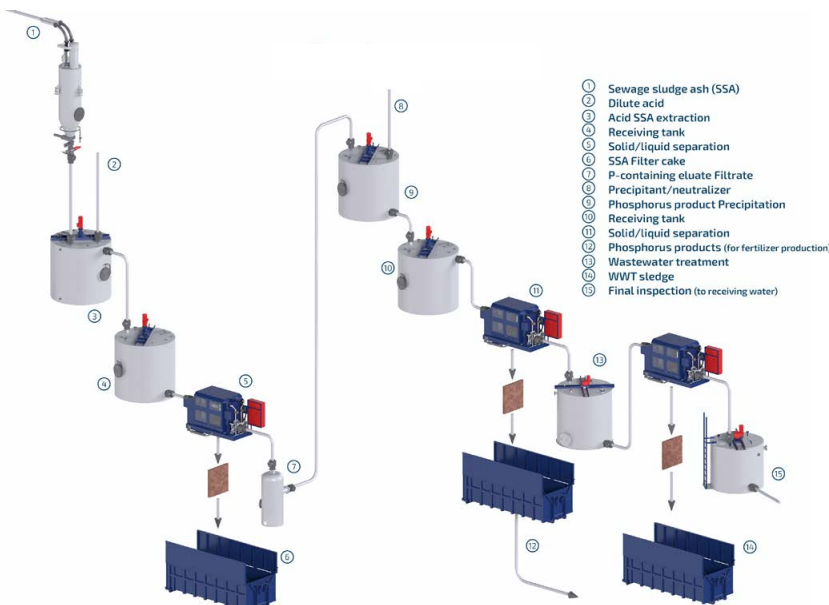
The market demands more and more complex disposal systems including solutions. AIK knows the legislation and has the knowledge in process engineering to completely fulfill the legal environmental requirements. The experience of AIK - sewage technology is complemented by the expertise of our employees.

#### Proven environmental technology

- Optimized wastewater treatment
- Efficient and monitored drainage
- Economical use of polymers
- Stationary and mobile structures
- Professional process control
- Sustainable service and spare parts services

#### Complex solutions

- Chemical engineering
- Laboratory and analytical technology
- Contamination reduction
- Treatment of complex polluted sludges



# Phosphorus recovery by means of REALphos

REAL already developed its own process for phosphorus recovery in 2018 and had it patented in 2019. In this process, an acid is obtained from the sewage sludge ash as a semi-finished product, which can then be reused for the production of phosphorus fertilizer.

However, it still needs to be further processed to produce a finished product.

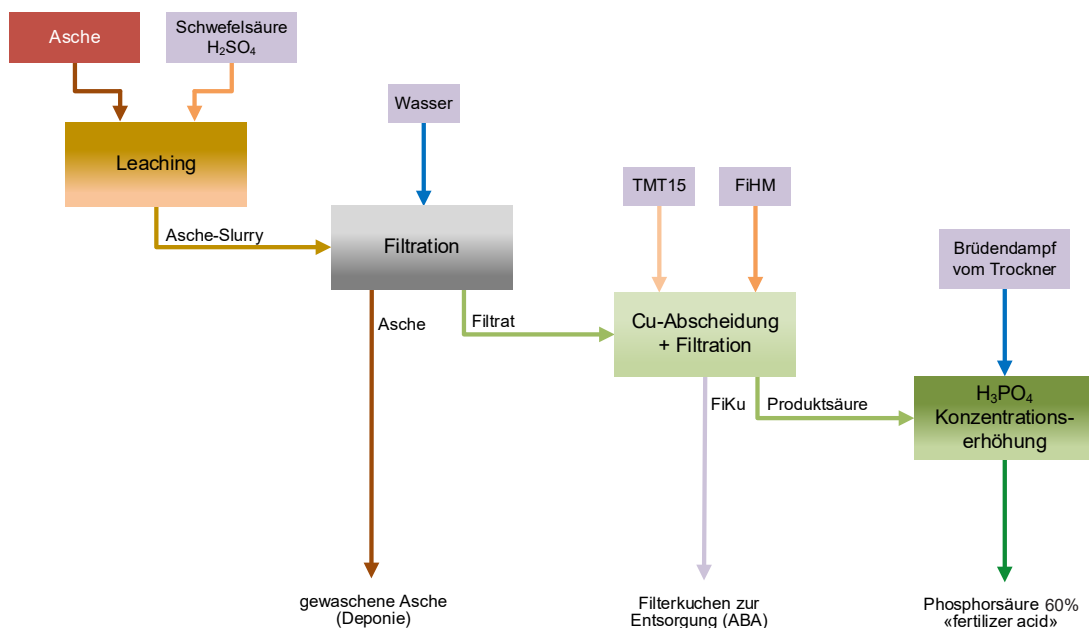
At that time, AIK Technik AG, with its comprehensive knowledge, had the opportunity to provide consulting services for the REALphos process. Therefore, we can also support you in the implementation of phosphorus recovery.

**The phosphorus recovery process (REALphos) includes the following process steps:**

- Extraction with diluted sulfuric acid
- Purification (heavy metals) of the phosphorus-containing extract and also of the ash - enriched with phosphorus.
- Concentration of the acid produced

When the ash is leached with suitable concentrated sulfuric acid, the phosphorus dissolves quickly. On the other hand, many heavy metals do not dissolve or dissolve only slightly. After filtration in the REALphos process, almost all phosphate salts remain in solution.

In the end, you have a semifinished product. An acid that can be resold to produce fertilizer.



# Legal requirements from 2026

In 2006, Switzerland already legally banned the direct fertilization of fields with sewage sludge from wastewater treatment plants. Because in addition to phosphate, heavy metals and other pollutants such as pharmaceuticals, pathogens, flame retardants and nanomaterials are contained in the sewage sludge, which would accumulate in the fields.

Since 2016, the largest waste incineration plants in Switzerland have therefore been required to incinerate sewage sludge as a mono-combustion process. What remains is a reddish ash from which phosphorus can be dissolved. In 2018, a total of 46,000 tons of sewage sludge were thermally utilized in Switzerland and the remaining ash was absorbed into cement. As a result, the phosphorus is bound in the structure and can no longer be used as a nutrient.

The Ordinance on the Prevention and Disposal of Waste in Switzerland (Waste Ordinance, VVEA) stipulates that phosphorus must be recovered from phosphorus-rich waste such as sewage sludge by 2026 at the latest. The aim is to evaluate the most promising processes that allow the use of the existing wastewater disposal infrastructure in Switzerland. Currently, 100 percent of phosphorus fertilizer in Switzerland is imported. Whereas with the phosphorus volume which should be recycled, the entire demand could be met.

Another problem is that the imported phosphorus fertilizer often does not comply with the legal limits. The heavy metals contained remain in the soil and thus have possible consequences for the environment and health.

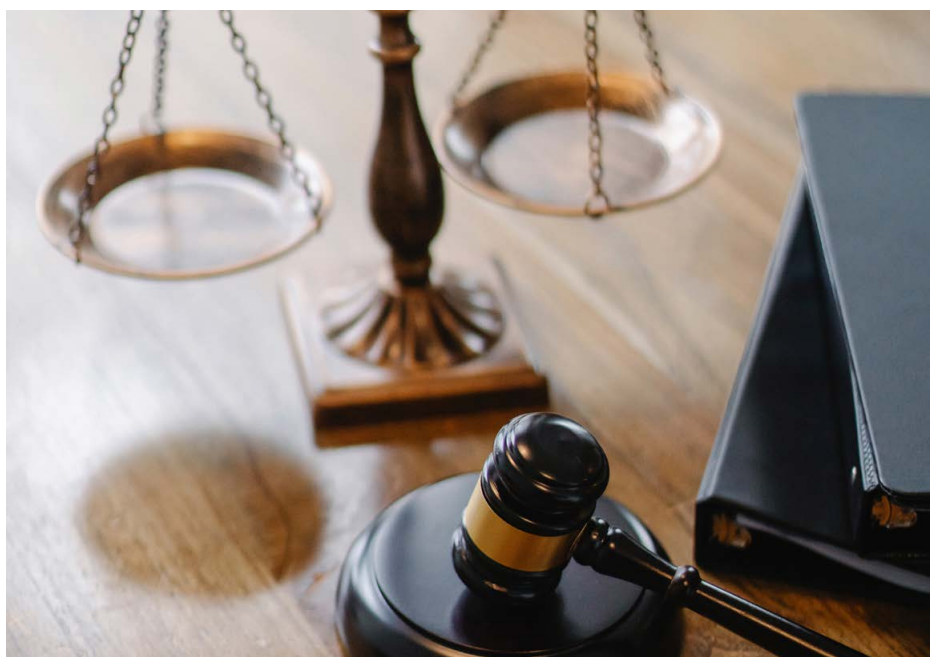
**Phosphorus recycling is thus worthwhile from an ecological and economic point of view.**

**It is a big step towards the sustainable use of raw materials.**

**Phosphorus recycling from sewage sludge has three advantages:**

- The phosphorus reserves are conserved
- Since imports will no longer be necessary, no harmful heavy metals such as uranium and cadmium will continue to be used in Switzerland
- Swiss farmers are no longer exposed to an uncertain price development of the phosphorus raw material

This is also an important issue throughout Europe, which is why phosphorus will probably have to be recycled by law by 2030.





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