

Phosphorus recycling

Recovery from sewage sludge ash



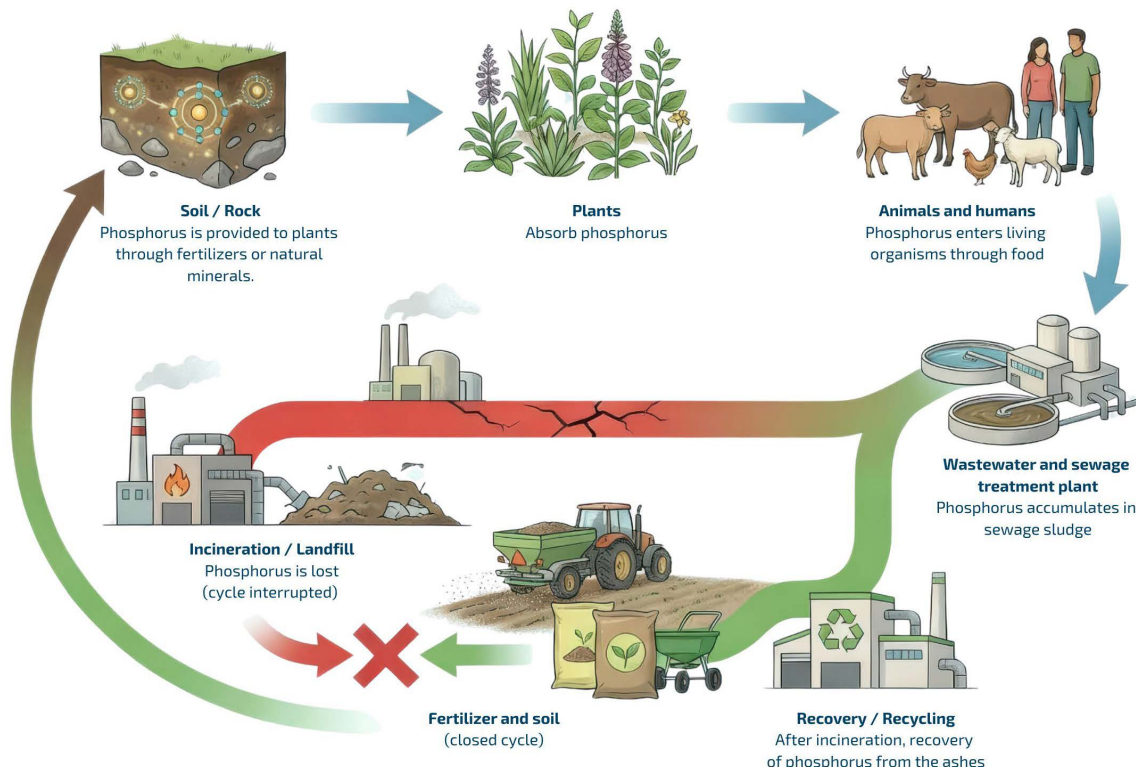
LeachPhos – Our Efficient and Economical Phosphorus Recovery from Sewage Sludge Ash

Phosphorus is a critical raw material for agriculture and industry. At the same time, legislation increasingly requires the recovery of this element from waste streams. The LeachPhos process developed and patented by AIK Technik AG offers a technically reliable, economical and future-proof solution for recovering phosphorus from sewage sludge ash (SSA) in mono-incineration plants.

base due to its typical phosphorus content of 8% P. Within the scope of our wet-chemical leaching process, the ash is treated with diluted mineral/sulfuric acid, selectively dissolving the phosphorus bound in the ash. Under stable, moderate conditions and depending on the mineralogy of the ash, extraction rates of over 80% can be achieved. Our process takes into account that metal ions such as iron, aluminum or heavy metals are simultaneously dissolved with the phosphorous, specifically dealing with this in subsequent steps. As early as 2013, we built, operated and extensively tested a pilot plant in Bern/ Switzerland. It operated very successfully over an extended period, convincingly demonstrating

With our patented LeachPhos process, we provide a technically robust, economical and easily integrable solution for phosphorus recovery from sewage sludge ash. LeachPhos thus proves that urban mining and a functioning circular economy are possible. Phosphorus is a limited and strategically

important raw material and, with regulatory requirements continuously increasing, LeachPhos is designed as a process that operates both safely and sustainably while offering high potential for recovery. Our process starts with sewage sludge ash from mono-incineration, which represents an ideal starting



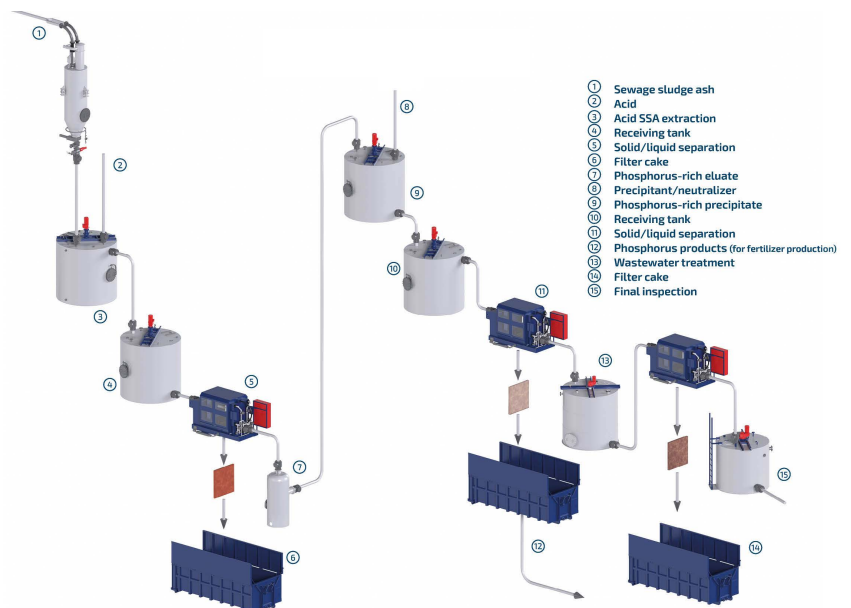
phosphorus recycling LeachPhos

the technical maturity, stability and economic viability of the LeachPhos process under real operating conditions. Up to 300 kg of sewage sludge ash was treated in one hour. The insights gained were incorporated directly into the further development of the LeachPhos process. After acid leaching, the solids are separated using conventional solid-liquid separation. The resulting solution, which contains phosphorous, is then further treated. A key step is the targeted removal of co-dissolved heavy metals and other impurities from the phosphorus solution, for example by means of controlled precipitation, reduction or other established separation methods. These purification steps ensure a sufficiently high purity of the phosphorus product. The filter cake that is formed during the process is largely inert and can be easily disposed of or further utilized, depending on its composition. In the next step, the phosphoric solution that has been obtained is further purified by pH adjustment and simple chemical conditioning. Dissolved metals and unwanted by-products are efficiently removed, allowing the quality of the subsequent phosphate precipitation to be precisely controlled while avoiding energy-intensive or complex additional technologies. In the final recovery stage, phosphorus is precipitated from the purified solution. The result is a fine, light-colored phosphate product with high purity and excellent plant availability. This product can be used directly as fertilizer or as an intermediate for further industrial processing, for example in the production of technical-grade phosphoric acid. The recovered quantity is impressive: depending on the ash quality, approximately 50–70 kg of phosphorus can be obtained from one metric ton (2,200 lbs) of sewage sludge ash.

A major advantage of the LeachPhos process is its technical simplicity. We deliberately avoid

high-temperature processes, complex reduction steps or specialized equipment. Instead, we rely on robust, proven industrial components such as stirred tanks, dosing systems, standard separation technologies, and conventional chemical process stages. This significantly reduces energy consumption as well as investment and operating costs. LeachPhos is therefore more cost-effective, easier to operate and less susceptible to operational disruptions than thermochemical alternatives. Furthermore, modular, flexible integration of the process into existing plant infrastructures is possible. In most cases, existing

utilities, ash logistics systems and spatial conditions can continue to be used. This ensures short implementation times, high operational reliability and sustainable use of existing infrastructure. With LeachPhos, we transform a previously cost-intensive waste material into a valuable raw material. We reduce dependency on imported phosphorus, lower landfill volumes and create tangible benefits for the environment, plant operators and future resource security. For us, LeachPhos is more than just a process – it is our contribution to a functioning circular economy and a sustainable, economically viable future for phosphorus recovery.



Phosphorus – An Indispensable Raw Material with Global Challenges

Phosphorus is a fundamental building block of all life. Plants require it for growth, their energy metabolism and cell formation, making phosphorus a key component of modern fertilizers. Around 95% of global phosphorus production is used in agriculture – and since there is no artificial substitute, phosphorus is essential for global food security.

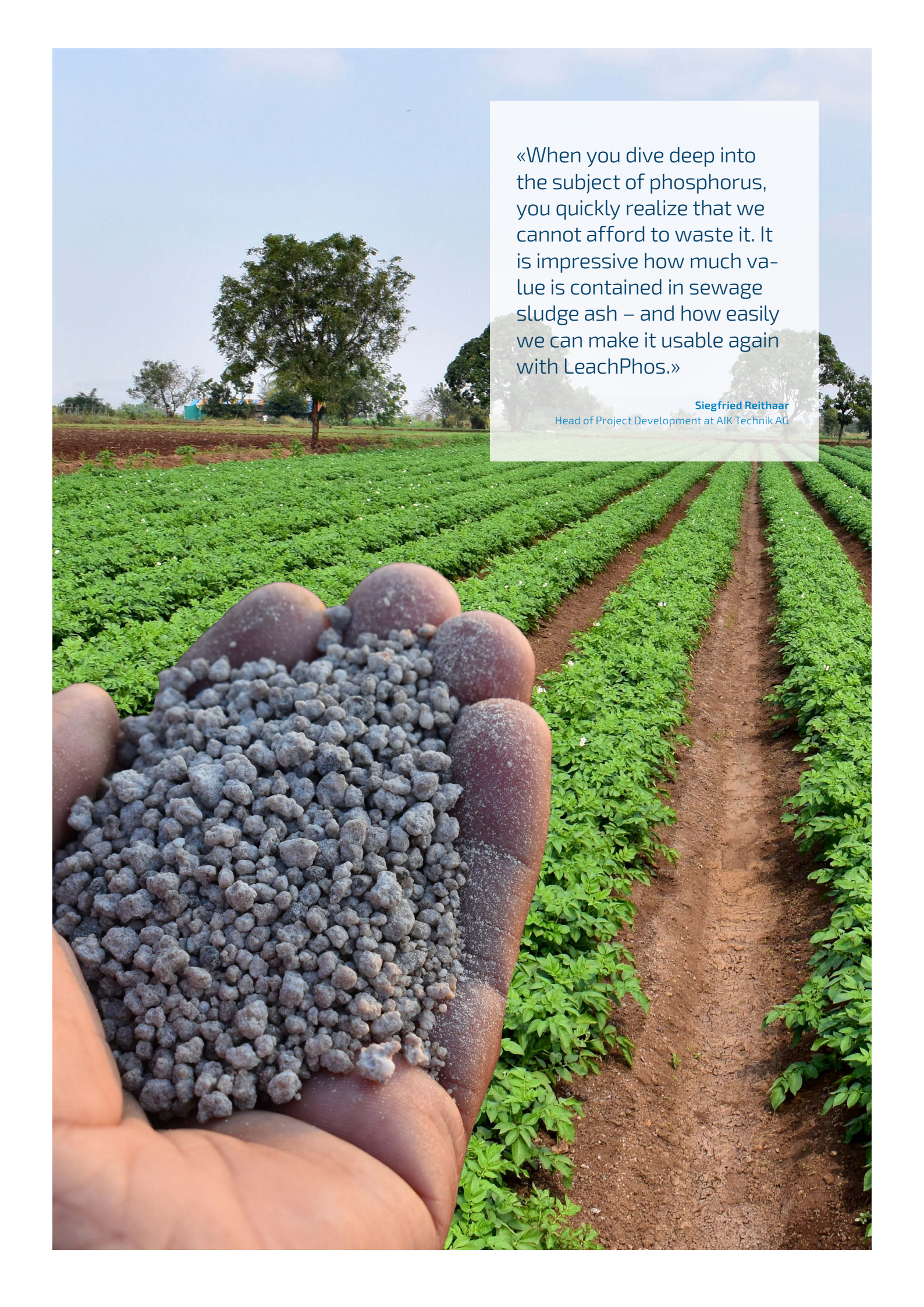
However, global natural phosphate reserves are limited and very unevenly distributed. Most economically exploitable deposits are located in only a few countries outside Europe. Europe as a whole – including Switzerland, Germany and Austria – has virtually no domestic mineable reserves and is therefore almost entirely dependent on imports. This dependency makes the continent increasingly vulnerable to geopolitical uncertainties, price fluctuations and quality issues regarding internationally traded phosphates, which are often contaminated with heavy metals such as cadmium or uranium.

Against this background, phosphorus has been classified as a critical raw material in Europe. Consequently, several European countries have introduced regulatory measures to secure long-term supply. In German-speaking countries in particular, a clear focus is emerging: the recovery of phosphorus from sewage sludge ash should become a central pillar of future raw material strategies. Germany has amended its Sewage Sludge Ordinance to make recovery mandatory, and this obligation will

apply to large wastewater treatment plants from 2029 at the latest. In Switzerland, legal obligations to recover phosphorus from sewage sludge or sewage sludge ash and return it to the material cycle have been planned for several years and are expected to come into force from 2030. Austria is following the same principle within the scope of its waste and fertilizer regulations, starting in 2033.

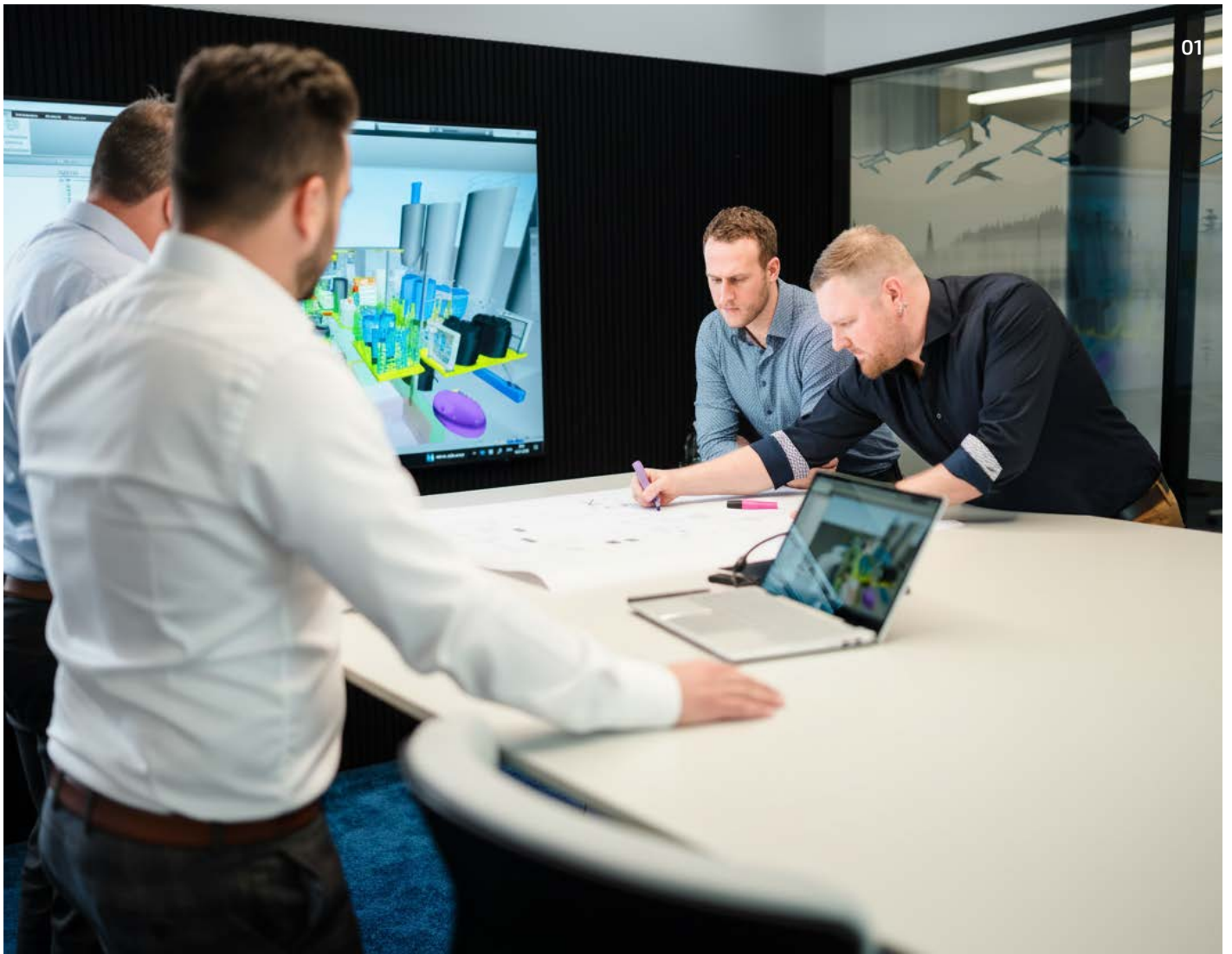
These political decisions reflect the growing realization that Europe must reduce its dependency on imports and develop its own sustainable resource sources. Phosphorus from sewage sludge ash represents a valuable domestic secondary raw material that offers not only ecological benefits but also long-term security of supply. Processes such as LeachPhos are making a decisive contribution by recovering phosphorus from existing material streams and effectively closing the loop.



A close-up photograph of a hand holding a large quantity of grey, granular fertilizer pellets. The hand is positioned in the foreground, and the pellets are piled high. In the background, there is a field of young green plants in rows, with a dirt path running through them. The sky is clear and blue.

«When you dive deep into the subject of phosphorus, you quickly realize that we cannot afford to waste it. It is impressive how much value is contained in sewage sludge ash – and how easily we can make it usable again with LeachPhos.»

Siegfried Reithaar
Head of Project Development at AIK Technik AG



Our Service Portfolio

We are an engineering company specializing in integrated technical solutions for municipal and industrial plants. We combine in-depth technical expertise with practical planning and modern digital modeling. Our experts support projects across all phases – from the concept to successful commissioning.

01 Engineering and Planning System Supplier for Plant Engineering

Our services cover a wide range of engineering and planning activities, enabling us to support projects holistically, efficiently and on a solid technical basis. On the engineering side, we can handle the entire technical project process – from the initial analysis to the final implementation. This includes project management and coordination of all technical disciplines, structural and strength calculations, and detailed on-site surveys. We develop precise P&ID diagrams, manage technical procurement and handle full plant engineering including construction. Our services are complemented by instrumentation and control engineering, detailed functional descriptions and comprehensive operational and plant documentation to ensure smooth commissioning and long-term reliable operation.

On the digital planning and modeling (CAD/CAX) side, we use modern 2D and 3D planning systems to create accurate technical models and high-quality planning documents. We develop process flow diagrams, detailed 3D models for plants, components and piping systems, as well as layout and installation concepts. We also prepare foundation and support plans to enable precise implementation on site. This ensures that all technical details are clearly defined and projects can be realized efficiently, safely and economically.

02 Commissioning and After-Sales-Service

Our after-sales service ensures that your plants operate reliably, efficiently and economically in the long term. Our qualified service technicians carry out maintenance, fault analysis and professional servicing of pumps, filter presses, candle filters and other plant components. We also support you with targeted interface analysis, maintenance planning and short- and long-term strategies to reduce operating costs.

Whether retrofitting, modernization, spare parts service, or preventive maintenance, we provide holistic support and ensure the economic efficiency and service life of your plants.

03 In-House Laboratory Analytical Services

Our in-house laboratory combines technical expertise with chemical-analytical precision. Thanks to the close integration of laboratory, engineering and process technology, we can quickly analyze disruptions, stabilize processes and make well-informed technical decisions.

Whether troubleshooting, process optimization or practical pilot testing, our laboratory findings flow directly into the planning, development and optimization of your plants. This results in solutions that are technically sound, economically viable and sustainable in the long term.



AIK Technik AG
Allmendstrasse 4 | CH-6210 Sursee | +41 41 510 65 00
info@aiktechnik.ch | aiktechnik.ch | **Residue today, commodity tomorrow**

