Wider scope for a smaller footprint

Richard Spaargaren, ESI Eurosilo, reveals the rise of large scale vertical storage in different industries as a result of expansion within narrowing boundaries.

Economic growth has always been a driver for the expansion of basic industries around the world. Over the past decades, experience has shown that a more sophisticated lifestyle, for a growing number of people in any region, leads to higher production rates in the agro, power, and chemical industries. This, in turn, has implications for global supply chains and logistic solutions, simply because the production and consumption of virtually all products are spread across many countries and continents.

However, the expansion of production and the higher volumes in the supply chains are hitting new boundaries: increasing scarcity of space and stricter environmental regulations. Optimising the new equation causes producers to look in a different direction for bulk storage: vertical instead of the conventional horizontal solutions.

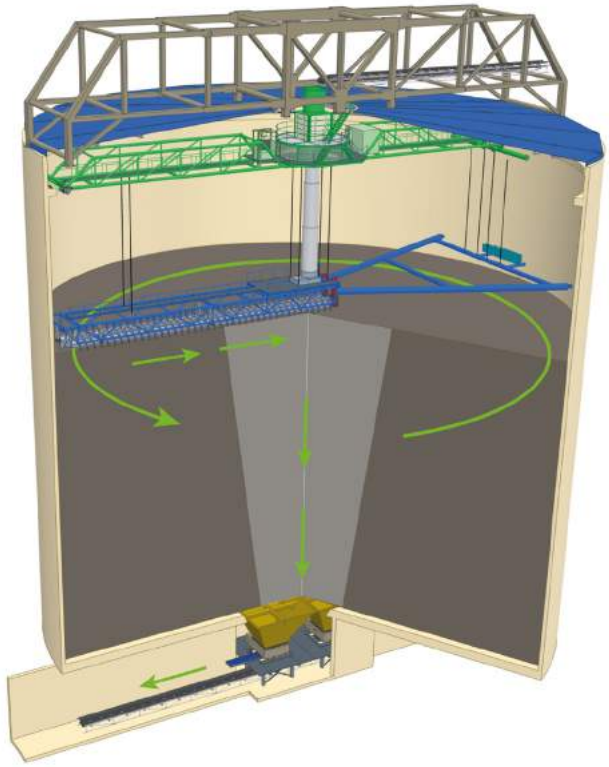

Figure 1. Mass Flow System reclaim process.

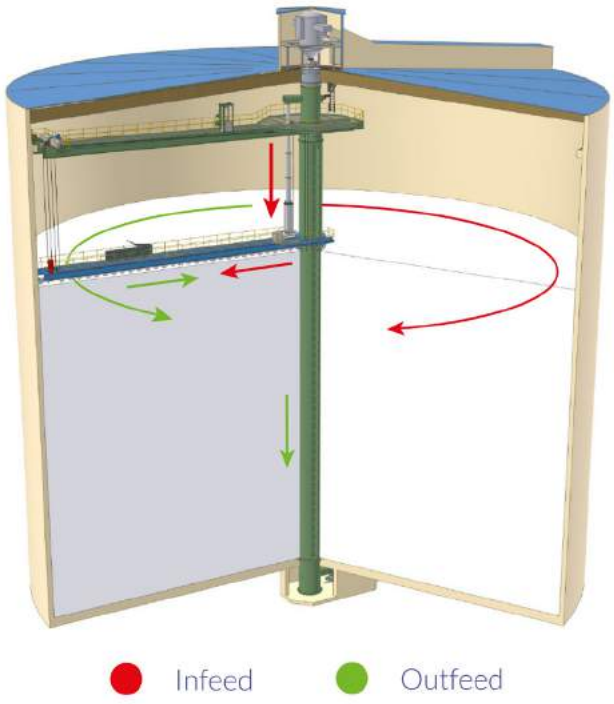

Figure 2. Shutter Column System infeed and outfeed.

New applications of vertical storage

The need for a solution to cope with limited space in ports, terminals and plant sites has drawn the attention of various industries to the Eurosilo system. The enclosed storage system was designed in the late 1960s for potato starch producers in the Netherlands, but quickly became a renowned system for the power industry after the concept was redesigned and optimised for the storage of coal. Moving away from space-consuming open stockyards, the industry is now adopting enclosed, vertical storage for state-of-the-art power plants. In recent years, there has been a quest for space-efficient alternatives in other industries. Obviously, space is no longer an infinite resource.

On top of that, the bullwhip effect, caused by the pandemic, drives the need for more buffers in global supply chains. As a result, ESI Eurosilo is now researching large scale storage of soybean in ports and terminals, as well as material handling systems for the mining industry. From a long-term perspective, large scale vertical storage has only just begun.

Three different bulk handling systems

The Eurosilo system operates with three different bulk handling systems to meet the characteristics of products such as potato starch, fertilizer, FGD gypsum, fly ash, coal, or soybean. These material-handling systems are suitable for a wide range of materials, whether they are cohesive, flammable, hygroscopic or have very fine particles. Infeed from the top, storage in uniform layers and discharge underneath the silo are handled by highly automated systems that reduce manpower requirements and ensure continuous system availability.

Mass flow system for coal and petcoke

The Eurosilo system offers storage capacities of up to 100 000 m^3. The coal is fed from the top of the silo into a telescopic chute, through which it reaches a suspended frame on the coal surface. As the frame rotates, it distributes the coal evenly over the entire surface of the silo using screw conveyors. After each layer, the distribution frame moves upwards. Reclaiming is done by extracting coal from the hoppers and initiating a core flow. The frame then feeds the coal into the formed core flow. The Eurosilo system helps to meet today's requirements and protects the environment with fully enclosed storage. The system uses a quarter of the ground space compared to open storage and is suitable for expansion in case of limited space at plant sites.

Shutter column for starch, EAFD and fly ash

Bulk materials with a very small particle size, such as potato starch, fly ash or electric arc furnace dust (EAFD), fluidise when put into motion. This is the process whereby the granular material passes from a solid into a liquid state, making effective bulk handling almost impossible. Enclosed storage and the specially

designed shutter column system enable producers to handle these materials in a controlled way. During filling, the rotating frame spreads the material across the surface in the silo. By only opening the hatches in the shutter column at the surface of the stored mass, the material can be conveyed by the distribution frame by means of a ring conveyor. As reclaiming progresses, the height of the distribution frame determines the exact opening and closing of the shutters in the column. Since its introduction in the 1960s, the shutter column system has performed successfully in food processing plants in the agribulk industry, and more recently in recycling plants in the metal industry.

Slotted column for fertilizer and FGD gypsum

In order to deal with the hygroscopic characteristic of some base materials, the Eurosilo system provides a controlled environment inside and a well-protected environment outside. The use of non-corrosive materials protects the storage facility from damage or leakage due to the corrosive content. The filling and reclaiming of non-free flowing materials, such as ammonium sulfate, common salt or FGD gypsum, is handled by the slotted column system that effectively prevents blockages. The screw conveyors mounted in a rotating distribution frame, transport the bulk material toward and through the slots, formed by the horizontal flat rings, so that it can freely descend through the open central column. For FGD gypsum, the Eurosilo system combines three functions with dewatering on top, storage in the middle and load out into trucks underneath. Because the systems are integrated in production workflows, they are designed and built to be compact, robust, and reliable.

Case studies

The Eurosilo is gaining ground in various sectors all over the world, from food-related industries to energy generation and industrial production.

Denmark

In order to be assured of sufficient buffers of potato starch in the coming years, KMC in Denmark has chosen to work with multiple Eurosilos. The company has successfully commissioned its fourth potato starch silo in production, the latest silo at the Karup site as of 2022.

Poland

At the new Pulawy Power Station in Poland, ESI Eurosilo recently delivered a FGD gypsum silo for Mitsubishi Power Systems, who plans to commission the new power plant in 2022.

Turkey

In Hunutlu, Turkey, the company is finishing the last of three 100 000 m^3 coal storage silos in an environmentally sensitive area.

Asia

In Korea and China, several coal silos were commissioned at the end of 2021.

The reasons for all of these projects are, of course, economic viability, which is increasingly determined by the limits of a sustainable future.

Conclusion

Systems, such as the Eurosilo system, can be proven to add new value to the equation. It combines logistic reliability, safety, and environmental protection with a large storage capacity at the smallest possible footprint. With a view to a sustainable future, it becomes evident that the total cost of ownership over the full lifecycle, including costs and savings related to environmental regulations, need to be analysed on a case to case basis. DB

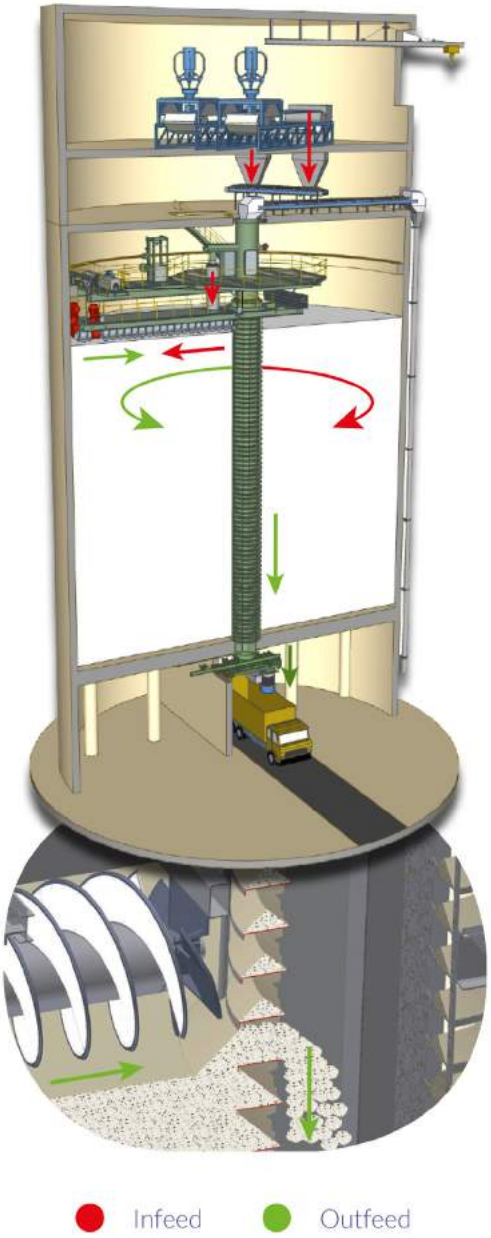

Figure 3. Slotted Column System infeed and outfeed.