PRESS RELEASE

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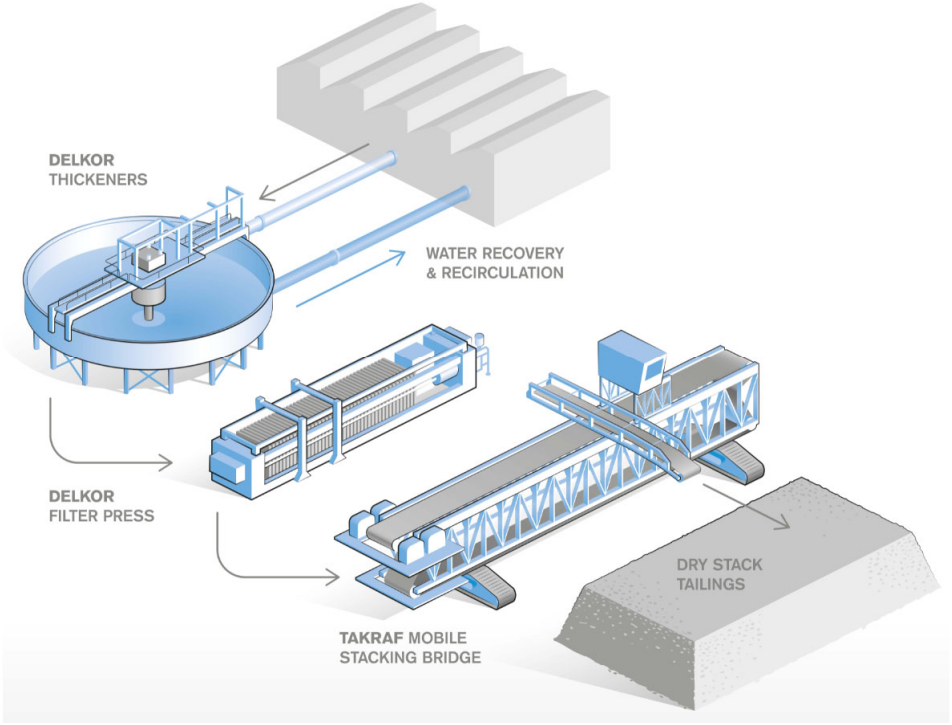
Managing and disposing of processing waste safely and effectively

Implementing a Dry Stack Tailings (DST) solution provides a safe and sustainable alternative to the storage of tailings in impoundments.



A "typical" flowsheet showing an example of TAKRAF's complete DST solution.

Leipzig (Germany), Belo Horizonte (Brasil) March, 2022: The recent commissioning of a Dry Stack Tailings (DST) system supplied by TAKRAF to a Brazilian mine highlights the advanced expertise and unique positioning of the company to offer a complete end-to-end solution for safe and environmentally friendly mine waste management.

While the dry stacking concept is not new, with references as early as 1909 in Australia, technological advances have made DST an increasingly important alternative to conventional methods for handling mine waste, enabling mining companies to significantly decrease their risk profile.

Currently, the most widely utilized method of disposing tailings (waste material from the mineral extraction process) is to pump the tailings slurry to a dedicated impoundment area (pond or dam) to allow sedimentation to occur and solids to settle out. Part of the water is then recovered and re-used in the process.

However, the risks and challenges associated with this method, combined with evolving mining conditions, mean that the safe and effective handling and deposit of tailings, whilst also considering

the environment, is of ever-greater importance. Challenges include the considerable space requirement when storing tailings in impoundments, while the catastrophic tailings dam failures, which have occurred, resulting in significant loss of life and environmental damage, are a stark reminder of the risks.

Exacerbating the situation are current mining conditions, which utilize advanced mineral processing technologies to allow lower grade ores to be processed. This results in a much larger quantity of tailings that need to be safely stored. This ever-increasing tonnage of generated tailings makes conventional deposit in dams an increasingly significant burden in the expansion and development of mine operations and further highlights the potential of DST as a viable and beneficial alternative.

Advantages of DST

With DST, the moisture content in the tailings is reduced by a mechanized and controlled process to the point that it can be safely transported, deposited and stacked as solid cake-form tailings. This yields a number of advantages over other surface tailings storage options, including:

- Significant safety improvement with the risk of catastrophic dam failure and tailings run-out being eliminated.
- Transformation into a stable landform, and easing of rehabilitation and eventual closure.
- Smaller tailings footprint and can be used in undulating or steep terrain.
- Suitability to areas of high seismic activity and areas where there is limited construction material to develop a conventional retention impoundment.
- Reduced make-up water requirements in plants, principally achieved by recycling process water, and near elimination of water losses through seepage and/or evaporation.

DST system under construction for the safe and effective handling of iron ore process tailings recently supplied by TAKRAF Brazil to Mineração Usiminas.

As tailings processing is complex, a detailed understanding of and expertise in the different steps specific to the commodity and project location are required. All equipment needs to be designed and/or adapted to specific project requirements and to be integrated seamlessly into the overall system. As a result, TAKRAF adopts a comprehensive and holistic approach to the design of its DST systems, combining its proven expertise in dewatering (DELKOR) and materials handling (TAKRAF)

with a dedicated team of mining, materials handling and processing specialists. This two-fold approach - *bottom up*, equipment supply and *top down*, planning a long-term sustainable system – enables TAKRAF to develop solutions that best suit a client's specific requirements, as well providing the client with a single point of responsibility during implementation. This approach has resulted in clients not only procuring equipment for tailings treatment, but also in contracting TAKRAF to carry out conceptual studies and economic trade-offs for DST systems. All this culminated in a recent DST system order being placed in January 2019.

DST system designed for Brazilian Mining company

The order, placed by Mineração Usiminas, one of the Usiminas companies, and one of the largest steel producers in the Americas, comprised basic and detailed engineering, manufacturing, supply, transportation and site assembly supervision of equipment to process iron ore tailings.

The system is designed as a fully integrated dewatering process via thickening and filtration and includes the following main equipment:

- 1 x flocculant plant
- 1 x coagulant plant
- 1 x DELKOR high-rate thickener: 35 m-diameter, 680 t/h (nominal); 748 t/h (design)
- 1 x 300 m^2 slurry tank with agitator
- 4 x double stages centrifugal slurry pumps
- 4 x DELKOR filter press overhead beam (FP OH): 2 m x 2 m plates, each 170 t/h (nominal) and 187 t/h (design), capacity for 215 chambers
- 4 x compressors with tanks (process and instrument air)
- 4 x TAKRAF belt feeders: 2.0 m width, 31 m length with transfer chutes

Mineração Usiminas implemented the DST system to enable the filtering and stacking of tailings as the deposit area of the existing tailings dam reached full capacity. The process dewaters the tailings slurry in a single stream – two-stage process using a DELKOR high-rate thickener followed by the filtration of thickener underflow using DELKOR overhead filter presses. The next process step allows further water recovery through the filter press, designed to achieve a moisture content level of about 14% (dry basis). Particular attention has been given to the redressing of the slurry using reagents to improve maximum recovery. The result is a dry filter cake that can be effectively handled and deposited.

In line with TAKRAF's approach to supply site-specific solutions, the tailings material was extensively tested prior to the selection of the equipment. For example, the DELKOR filter presses, designed with a collaboration partner as an overhead beam type, are best suited for the operational conditions. A design to process large volumes of material, yet robust and maintenance friendly with easy access to the filter plates and filter cloths.

"Sustainable water management, together with safety, are increasingly important topics for mining operations and all stakeholders around the world; especially in areas where water conservation is critical and/or tailings failure risks are significant as has unfortunately been the case in Brazil. The Mineração Usiminas project is testimony that implementing a full DST solution, in line with the overall mine development plan, is the most environmentally-friendly and beneficial approach for all stakeholders," noted Thiago Machado, Head of DELKOR products at TAKRAF Brazil.

About TAKRAF

TAKRAF Group, through its established and well-known brands, TAKRAF and DELKOR, provides innovative technological solutions to the mining and associated industries. The Group leverages its experience, acquired over more than a century, to provide equipment, systems and services that best satisfy our clients' mining, comminution, material handling, liquid/solid separation and beneficiation requirements. Owners and operators around the world trust TAKRAF Group's engineered solutions to lower the total cost of ownership and reduce environmental impact by improving efficiency with safe and reliable equipment. For sustainable solutions backed by expert service you can rely on TAKRAF Group. Visit us at www.takraf.com.