



The power of crystallization: how an Australian lake produces fertilizers

In Western Australia, the power of the sun will soon be used to extract the essential fertilizer sulphate of potassium (SOP) from the heavily mineralized Lake Way. Salt Lake Potash Limited, known as SO4, is currently commissioning the technology to produce SOP in what is a first for Australia.

In Western Australia, Veolia has been integral to enabling the production of sulphate of potassium (SOP) fertilizer by providing essential crystallization technology. Because of its chemical characteristics, Lake Way is perfectly suited to the production of high-value SOP – a premium potash fertilizer, with potassium one of the three essential nutrients required by most plants. “The main benefit of SOP is

that there is no chloride,” says SO4 Chief Executive and Managing Director Tony Swiericzuk. “When you hear about potash, it is typically KCL (potassium chloride) and chloride is not friendly with arid soils such as those found in Australia, the Mediterranean, Africa and Middle East. All of these locations with quite poor soils cannot tolerate chloride put into them. What SOP does is that it introduces a chloride-free source of

potassium. There are particular cash crops such as fruits, berries, nuts and citrus that cannot tolerate chloride at all. It affects the taste and colour.”

A lake rich in potassium
Lake Way has a dry salt surface under which is a quite shallow salt brine aquifer. This brine contains minerals that are taken from the lake’s catchment area that flow into the

ISSUE AT STAKE
Expertise and technology required to crystallize sulphate of potassium.

OBJECTIVE
Crystallize solution into a commercial product.

VEOLIA SOLUTION
Be the technology provider that produces the finished fertilizer.





KEY FIGURES

- **245,000 tonnes** of SOP fertiliser produced per year
- **92%** of production will be exported
- Customers in **60 countries**
- Veolia HPD crystallisation technology used in **30 countries**

crystallizer to grow and purify potassium sulfate crystals, and a second crystallizer to produce secondary Schoenite salts recovered from the recycled SOP mother liquor. These salts are then recycled and combined with Primary Schoenite salts and fed to the SOP crystallizer to maximise potassium yield," indicates Jim Brown, Executive Vice President of Veolia Water Technologies Americas. "Veolia had the expert understanding of the solubility characteristics, dissolution of the salts and all those areas where it has made a name for itself in crystallization," says Tony Swiericzuk. "They outperformed competitors with solubility tests in Chicago and determined the process conditions to maximize the product recovery. Veolia did a great job understanding the process flows and really nailed it. HPD is the crystallizer. It is at the heart of the process and is essential to overall production quality. Not getting this right and getting the recoveries right, and the solution management right, we would be in trouble. HPD produces our end product." SO4 is working hard towards being ready for production of SOP by the end of May 2021, with sales of the fertilizer due to begin as soon as possible after. It expects to deliver 245,000 metric tonnes of SOP per annum when in steady state production. SOP is generally considered a higher quality source of potassium, compared to the lower quality KCL – the latter being the largest source of potassium around the world.

Global sales of SOP
Through six distribution partners, it aims to

supply 92% of its product to 60 countries around the globe with the remaining 8% being used for spot and Australian trade. Currently, most seaborne traded SOP comes from Belgium and Germany, but this will provide more supply on the market, with use of SOP growing each year by 3-4%. In particular, South East Asian and Australian customers will have a closer source of SOP than previously. While all of the focus at the moment is on completing the Lake Way project, Tony Swiericzuk has ambitions to introduce the technology to other SO4 lakes in the region. He says: "We've got nine lakes in the Goldfields region. I see Goldfields as a multi-lake SOP province. I can see Goldfields in Western Australia being known globally as a provider of high-quality SOP." But in a matter of weeks, SO4 will be producing its high-quality SOP fertilizer from Lake Way, and it is being produced thanks to the assistance of Veolia's technology. As a result, before long, you could be eating tasty fresh citrus fruit, berries or nuts that have been nourished with Lake Way-produced SOP fertilizer. ■

FRESH WATER FROM THE SEA

A shortage of freshwater sources on land means that the Spanish region of Almería relies on desalination plants to provide fresh water to inhabitants and agriculture. The Campo de Dalías facility supplies 250,000 people with drinking water as well as 4,600 hectares of irrigation. Built by Veolia, it began operation in November 2015 and is one of the largest desalination plants in Europe.

The project was promoted by the Spanish Ministry of Agriculture, Food and Environment through the public company Acuedam, specialized in water management. Its Project Manager Santiago Lacambra says: "The main objective of the Campo Dalías desalination plant is the

generation of new quality water resources in an area with great scarcity." With a 15-year operation and maintenance contract in place, Veolia extracts seawater and using filtration and reverse osmosis processes produces 97,200 m³ of fresh water per day – this is the equivalent of 1.6 Olympic-sized swimming pools every hour. The process is designed to remove salt and other chemicals from the seawater and produce high-quality drinking water. After treatment, the clean water is distributed by gravity through a 5-km pipeline from the plant and then through a 38-km long network to supply the cities, towns and agricultural needs of western Almería. Effluent created during the process is returned

to the sea, with the 20 diffusers of the underwater outfall carefully positioned to avoid any impact on marine flora and fauna.

Santiago Lacambra adds: "The action also seeks to improve the ecological status of the underground water bodies, eliminating a large part of the deficit of available resources in the area. It is important to mention that during the construction phase and now the plant's operation, all the environmental requirements and conditions in the Environmental Impact Statement have been verified in addition to complying with the requirements stipulated in the Water Framework Directive for all new projects."

basin over millions of years – for Lake Way this has meant that it is especially rich in potassium that is ripe for extraction. "The technological process used here involves paleochannel bores that are shallow in the lake and extract brine," adds Tony Swiericzuk. "It flows into a trench network that is currently 65km long and will be extended to 95km eventually. The surface layer of the aquifer soaks into those trenches, which are seepage collection channels and also a transportation pathway for bore brine. The water from the lake basically works its way to sumps around the solar evaporation ponds. Those sumps then pump the aquifer brine into the ponds. Over several months after you transport the brine around the ponds and transfer it into downstream cells, under the hot sun, the concentration of brine gets

higher and higher as the water evaporates off." Eventually, a vast majority of the contaminant salts, sodium chloride (NaCl), are removed and this is the plant feedstock. From there, it goes through various phases to remove other contaminant minerals and to benefitiate it, before reaching the crystallization phase. It is at this point that Veolia comes in.

Veolia's crystallization technology
Following a competitive tender process, Veolia was selected by SO4 to provide the crystallization plant. Using Veolia's proprietary HPD crystallisation technology, the SOP solution will be turned into a water-soluble crystal product that is ready for bagging and sale. "To convert the harvest salts to premium grade SOP, Veolia designed an HPD® SOP

ISLAND WATER RECYCLING

Hawaii is a tropical paradise with a diverse and beautiful ecology. But being an archipelago of 137 islands means that water supply is limited. With a growing population, the US state has had to look at water recycling to provide essential water supply.

"Water is limited, obviously, on an island. It's not like we can put in an aqueduct, or pull up an iceberg from the Arctic," says Barry Usagawa, a program administrator at the Honolulu Board of Water Supply. "Recycled water provides that resilience for

us to diversify and extend those limited freshwater supplies even further into the future." In 1998, the City and County of Honolulu entered into a US\$140 million, 20-year agreement for Veolia to design, build and operate Honolulu Water Reclamation Facility. The Honolulu Board of Water Supply purchased the facility from Veolia in 2003, but kept the company on under an operations and maintenance contract. Each day, the plant treats almost 50 million liters of secondary effluent from the city and county to produce almost 45

million litres of recovered water. The water undergoes two different types of treatment depending on its end-use: highly pure water treated using reverse osmosis (RO) is used for industrial purposes, while R1 filtered water is used for irrigation. With eight golf courses within a five mile radius of the facility, in a tropical climate with heavy water demand to keep the greens and fairways lush, this R1 water has limited the need for freshwater supplies for this type of irrigation. Each day, the recycled RO water diverts around eight million liters of fresh

drinking water from industrial use freeing it up for to domestic consumption. The RO water covers around 75% of power generation facility requirements on the island of Oahu.

The contract has now been extended to 2038, and in 2019 new technology was installed to improve energy efficiency for the R1 process by 65%. Hawaii has some of the highest electricity costs in the US, but this process has led to significant cost savings for the Honolulu Board of Water Supply.

