

FINDS

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FINDS SERVES THE WORLD'S FERTILIZER INDUSTRY AND INDUSTRIES USING RELATED TECHNOLOGIES.

Fertilizer Markets

Corn

The corn price stood at about \$6.40 per bushel in the First Quarter (Figure I, page 4). In February, the USDA, citing weak export demand for U.S. corn, estimated that stockpiles will total 632 million bushels before this year's harvest, a five percent increase over its January forecast. However, the market remains tight because supplies are still the lowest in many years.

(continued on page 4)

New Mexican Polyhalite: The Key to Producing High-Performance, Low-Cost Sulfate of Potash Fertilizer Products

By Sidney Himmel

Sulfate of Potash, or SOP, is the world's most common non-chloride potash fertilizer. It can be sold as a powder, as granules, or as a soluble product. SOP is priced at a premium to Muriate of Potash (MOP) and is used on sensitive, high-value crops, including fruits, vegetables, nuts, and tobacco.

(continued on page 14)

LNG

By 2016, Cheniere Energy should be shipping LNG from its Sabine Pass Terminal in Louisiana. The shipments will be the first LNG exports from the continental U.S. Cheniere received its export license from the Department of Energy (DOE) late last year – the only such license to be awarded to date.

Bechtel is building four LNG trains for Cheniere of 4.5 million tonnes per year each. Cheniere has secured 20-year offtake agreements for 16 million tonnes per year and plans to make the residual two million tonnes available for spot sales.

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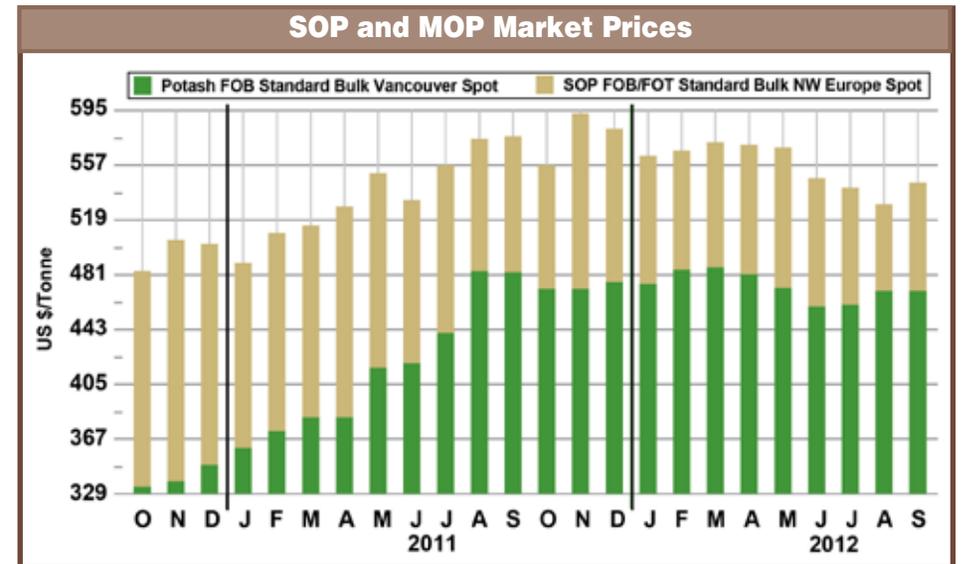
Cheniere Energy's Sabine Pass Terminal



Over the last 30 years, global SOP consumption has increased 181 percent to reach its current level of about six million tonnes per year. Fertecon, the market specialist firm, expects world demand to reach 9.3 million tonnes by 2016 and 10.3 million tonnes by 2020 and predicts that the SOP supply/demand balance will remain tight.

PROJECT PLAN							
STAGE	ACTIVITY	2011	2012	2013	2014	2015	2016
Exploration Drilling	Phase II-Metallurgy Sample	█					
	Development Drilling		█				
Engineering Studies	Pre-Feasibility	█					
	Feasibility		█	█			
Permitting	Project Permitting		█	█	█		
Project Development	Mine Design			█			
	Mine Construction				█	█	
	Shaft Sinking				█	█	
	Mine Development					█	█
Process Development	Process Design		█	█			
	Process Plant Construction				█	█	
	Process Commissioning						█
	Production						█

Unlike MOP, which occurs naturally as sylvite or is extracted from the mineral sylvinite, SOP is not a naturally occurring mineral. However, it can be manufactured in several different ways. The Mannheim Process makes approximately 60 percent of the 5.1 million tonnes per year of current global SOP production. In the Mannheim Process, 0.85 tonnes of MOP combines with 0.35 tonnes of sulfuric acid to produce a tonne of SOP at a present cost of over \$500 per tonne. Consequently, given that it takes MOP to make SOP, SOP has consistently commanded a 30 to 50 percent premium over the prevailing MOP market price, as illustrated in the chart.

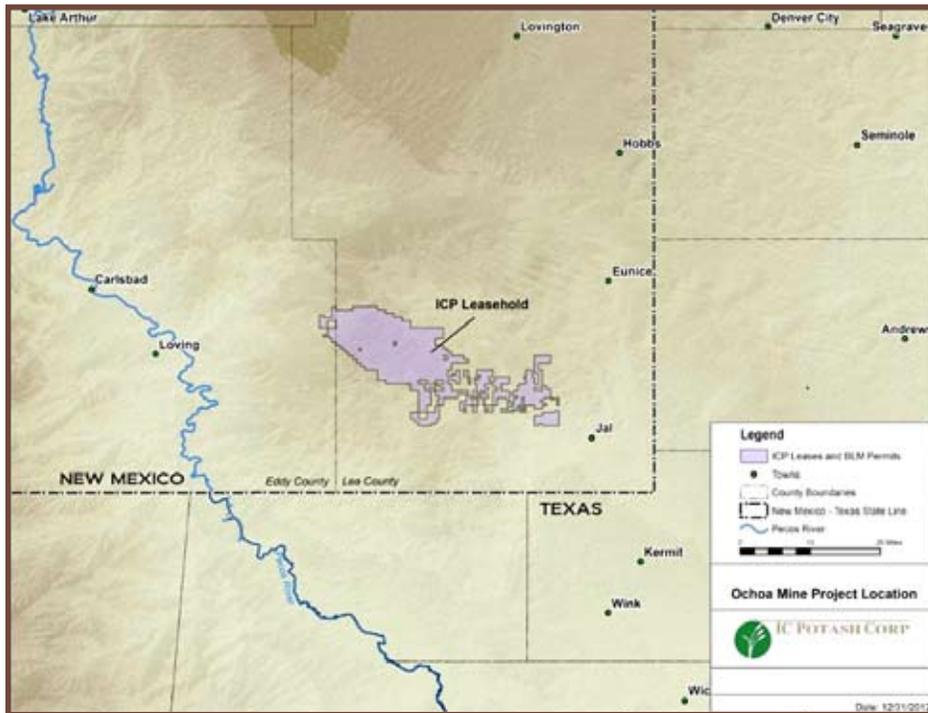


K+S Kali, in Germany, uses an ion-exchange process to produce 20 to 25 percent of the global SOP supply. In this process, MOP reacts with magnesium sulfate (kieserite) to produce SOP for at least \$400 per tonne.

Three companies — GSL Minerals (Great Salt Lake, Utah), SQM (Salar de Atacama, northern Chile), and Luobupo Potash (Lop Nur, northwest China) — use the “Salt Lake Method” to produce SOP from natural brines. The sulfate in salt lakes is typically in the form of the double-salt kainite, which is converted to Schoenite by leaching with sulfate brine. Halite (rock salt) is first removed because sodium chloride hampers the leaching process. Hot water is added to decompose the Schoenite; the magnesium sulfate enters the solution; and SOP crystals form. This process is currently the least expensive way to make SOP. Since lakes with suitable brine-mineral levels are indeed rare, this method only accounts for 15 to 20 percent of global supply and costs approximately \$200 per tonne of SOP.

At its wholly-owned Ochoa Project site in southeastern New Mexico, IC Potash Corp. (ICP) intends to develop and produce SOP using the mineral polyhalite as feedstock. The polyhalite will provide the potassium as well as the sulfate needed to produce SOP. Unlike other potash mining operations, polyhalite can be mined inexpensively by using conventional continuous and hybrid long-wall mining techniques. A granular product is produced by crushing the ore, wet grinding, removing halite scale, calcining, leaching, evaporative crystallization, and drying.

(continued on page 15)



Extracting potash from Texan-New Mexican Polyhalite ($K_2SO_4 \cdot MgSO_4 \cdot 2CaSO_4 \cdot 2H_2O$) dates back to the early 20th century. In response to reducing American dependence on foreign potash imports after Germany stopped shipping potash to the U.S. during World War I, the U.S. Bureau of Mines (USBM) began an extensive research and development program to examine viable processing routes for the production of SOP from polyhalite mineral deposits. Processing polyhalite into SOP was originally pilot-tested by the USBM from 1924 to 1944 and, then again, by Potash Corporation of America (PCA) in the 1950s.

ICP has reconfirmed the process in recent pilot testing and estimates that it can produce SOP for about \$160 per tonne, which will position ICP to emerge as one of only two SOP producers in the U.S. and as the world's lowest-cost SOP producer.

Based on ICP's prefeasibility study results, which were published in January 2012, and the anticipated validation of its findings by its Feasibility Study, which should be completed by the end of August, ICP's Ochoa scheme appears to meet all the requirements for a successful project, including:

- 400+ million short tons of proven and probable reserves (100+ years of mine life)
- After-tax NPV of \$1.3 billion and a 26 percent IRR
- Low operating costs (bottom quartile estimated at \$162 per tonne of SOP)
- Low projected capital cost for expected 568,000 tonnes SOP and 275,000 tonnes SOPM of annual production, which equates to the approximately \$1,000-per-annual-tonne benchmark targeted by the better greenfield MOP projects
- Historically safe mining region that is close to well-established infrastructure



One of two wells that will supply water for mine operation



Crew installing liner

What's more, with the average MOP price maintaining a reasonably anticipated floor of \$400 to \$450 per tonne and factoring a minimum 30 percent premium price for SOP, ICP can expect a worst-case profit of over \$250 per tonne of SOP once it moves into full commercial production. ■



Sidney Himmel

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