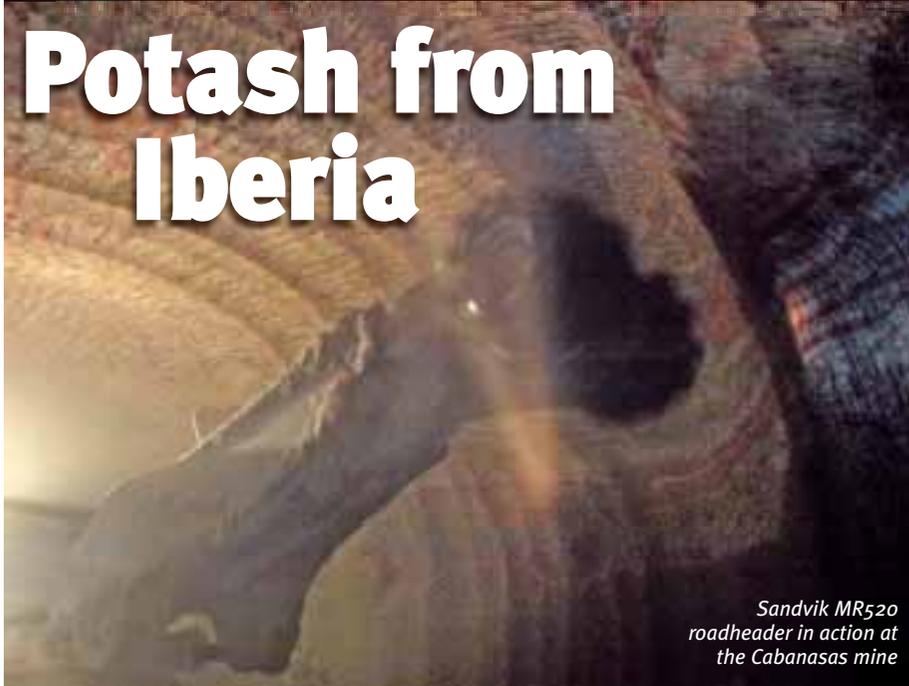




Potash from Iberia



Sandvik MR520 roadheader in action at the Cabanasas mine

Paul Moore visited the Iberpotash Cabanasas operation in Catalonia, northeast Spain, to see the company's continuous mining process for sylvinite production, as well as to get the latest on planned expansion at the mine

Mining area history and future

The potash ore (sylvinite) deposit was discovered close to Iberpotash's current facilities in 1912 by Rene Macary and Emili Viader, who were looking for potash following its discovery in Germany and knew this part of Spain was prospective. They drilled a series of holes and discovered first salt and then potash. Since then, a series of different companies have exploited the potash ore in this areas of the Catalan basin, which is found close to the towns of Suria and Sallent, some 60 km from Barcelona and close to the town of Manresa. In 1918, the first granted mining concessions were granted and in 1925 the Suria potash mine started operations, followed by the Sallent potash mine, operated by Iberian Potasas, in 1929. The current Cabanasas mine began operations in 1960 under the ownership of MPS. In 1972, Potasas del Llobregat then began operation of the Vilafruns mine.

The major change came in 1982 when MPS was nationalised and from then on known as Suria K. Then in 1992, Suria K merged with Potasas del Llobregat to become Grupo Potasas Group and from this date, the Catalan potash mines, after many decades of history under separate owners, were finally organised under one managerial unit.

Finally, in 1998, Grupo Potasas was acquired by Iberpotash SA, a division of ICL Fertilisers, an Israeli multinational company and one of the major global fertiliser producers, that also owns the Cleveland Potash Boulby operation in

northern England along with phosphate producer Rotem and a number of fertiliser production plants. In August 2006, one of the two Suria mines was closed commercially but there are plans to develop it for use in earth sciences academia and the tourism industry – it will be part of a UNESCO Geopark. As a result, Iberpotash now has two production areas – one at Suria consisting of the Cabanasas mine and Suria processing plant; and other in Sallent composed of the Vilafruns mine and Sallent processing plant. The long term importance of the operations to the area has been considerable, with almost 1,200 employees, of which 350 are contractors.

Iberpotash is now the only potash producing company in Spain and the largest mining company in Catalonia. The mines also represent one of the most important resources of potash in Europe.

One of the principal projects for Iberpotash's future is the further increase of production using a selective extraction method with continuous miners, as well as making ongoing and continuous investment in all the Cabanasas mine facilities and machine maintenance capabilities.

In the medium term, the company wants to grow production to 1.1 Mt/y KCl and 3 Mt/y of salt. A recent 3D seismic geological campaign to confirm the size of regional potash occurrence as the basis of a major reserves increase covered an area of 40 km² and cost more than €8 million. Of the new KCl capacity, 630,000 t/y will be granular potash and 50,000 t/y technical potash, with the fine material forming the remainder. About half of the 3 Mt/y salt figure will be higher priced vacuum salt. Ultimately the phasing in of increased mine production at Cabanasas and plant production at Suria will lead to the phasing out and eventual closure of operations at Vilafruns and Sallent.

In order to achieve these production levels, Iberpotash has embarked on an investment plan, known as the Phoenix project, that consists of a series of different phases. This includes the building of a new ramp for the Cabanasas mine, and the building of a new vacuum salt plant at Suria to increase the profitability of the salt business. A first phase was approved in 2011 by ICL, based on an investment of €160 million, and is now being implemented.

The system of management for achieving a sustainable mining industry that is in use in Iberpotash is supported by the international



Underground trucks of 30 t capacity with ejector bodies are used



certificate ISO 9001 and according to the group it is the only mining company of Spain that can extend this certification to all of its mining and processing facilities. The company also obtained in 2008 the additional ISO 14001 certification for environmental performance and at the end of 2009 obtained the international certificate in prevention and safety, OHSAS 18001.

Mining method

Both mines exploit sylvinite ore (a mix of sylvite: KCl and halite: NaCl) from the same orebody, with Vilafruns extracting potash ore via a 2,400 m 12° grade decline, with a production of some 10,000 t/d of sylvinite. Cabanasas exploits a part of the deposit north of the El Tordell fault and Vilafruns to the south of it. A major aspect of mine development is to initially remove about a third of the ore tonnage that is richest in salt (halite) which is used to backfill the empty potash ore galleries.

Cabanasas has a vertical shaft with a 30 t skip, running at up to 16 m/sec, allowing a potential production rate of 10,000 t/d. Actual Cabanasas extraction



Sylvinite ore entering feeder breaker before being conveyed to the hoist level

averages 6-6,500 t/d of sylvinite but new development underground, together with an advanced continuous mining system, will allow this figure to increase to over 7,000 t/d. The Vilafruns sylvinite averages 22% KCl, versus Cabanasas at more than 27% KCl.

The fleet at Cabanasas is formed of 30 t trucks that include eight Atlas Copco Minetruck MT436Bs as well as additional six GHH Fahrzeuge trucks, both of which are loaded by a fleet of seven Sandvik electric roadheaders – four newer machines delivered as MR520s and three older machines with the previous AM85 model name. Both the truck models have ejector bodies for more efficient unloading.

A significant investment programme in recent years has allowed Cabanasas to develop its current continuous mining process, based on the electric roadheaders, which allows the maximum amount of sylvinite selectivity to be achieved versus conventional drill and blast. The very exact profiles as a result of this style of extraction,

also increases gallery and pillar stability.

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The Iberpotash Cabanasas mining operations will form the basis of future expansion, along with the nearby Suria plant

The mine also has a fleet of Atlas Copco ST1030 LHDs, used for development work; and Liebherr road maintenance vehicles. No shotcreting is required in the mine, but bolting using Sandvik Robolt models is conducted, mainly with Minova Lokset resin cartridges.

The main hoist level is at 680 m from surface with the main production level at 800 m and the main workshop at 834 m, with the main development level at 900 m. In addition to the main production shaft, a second shaft is used for worker access to the mine. The production areas are located just above the main ramps in the potash rich zones; with the development area in the salt below.

The underground 30 t trucks empty potash ore into vertical ore passes that feed temporary stockpiles known as under which are located chain conveyors similar to those used in the coal industry. The ore is conveyed a short distance to a feeder breaker that feeds a suspended conveyor positioned perpendicular to it. There are two main conveyors that go directly to the hoist and skip via two main ramps connecting the production and hoisting levels. One of these carries intake air and the other return air and the two ramp areas separated by ventilation doors. The air is circulated using a network of Zitron fans.

The Cabanasas ROM production is about 6,500 t/d. Currently the company uses road haulage trucks to take ROM ore from the mine to the nearby Suria plant but is planning an underground tunnel connection to link the mining operations and processing facilities, thereby removing a significant amount of road traffic from the local area.

Local company Codina has the contract for service and maintenance of the mine fleet both within the mine and at a local service facility. Codina recently completed the rebuild of an older Robolt H530 rig, originally delivered in 1996. The machine has been converted to a



diesel machine from an electrohydraulic machine and adds a new bolter to the rock support fleet at Cabanasas. Other improvements include the construction of a completely new enclosed operator cabin with improved controls and display.

Processing and marketing

The main objective of the downstream process is to separate by physically the salt and potash, which as stated occur together in the mine in the form of sylvinites. The processing plant at Sallent (ore from Vilafruns) has a capacity of 450,000 t/y of KCl, while Suria (ore from Cabanasas) has a capacity of 580,000 t/y of KCl. Both plants use conventional grinding followed by flotation and achieve an average recovery of 89.5% and a concentrate grade of 95.5%. The plants together are now producing some 800,000 t/y of potash but as stated, as Suria undergoes a major planned expansion, Sallent will be phased out.

At both plants, the sylvinites are primarily crushed to -150 mm and transported to large sylvinites covered storage areas. Before flotation it undergoes secondary crushing to -10 mm and

then ground to -1.5 mm and treated to remove waste clays.

Then, using conventional flotation and constant oversaturation of the water with the mineral salts, the potash is separated from the salt. Achieving the potash buoyancy does not require xanthate as it is not a sulphide, and is instead achieved by adding pine oil or guar gum, which makes the potash hydrophobic; and the particles adhere to the air bubbles. The foam is dried using natural gas fuelled fluid bed dryers. The final product is 95.5% KCl. After drying, the flotation concentrate is divided into a standard or further processed into a granular type. The standard potash has a grain size of 0-1.5 mm and granular potash 2-4 mm. Final potash transport is by truck or train. Iberpotash relies on four rail terminals for bulk salt and potash transport, and has its own terminus in the Port of Barcelona.

The impure sodium salt from the flotation rejects is sold to the chlor-alkali industry as well as for road de-icing. The principal use of potash is as a fertiliser as a component in NPK and other fertilisers, with some 95% of KCl production from Iberpotash used in this market, with the remainder used in a variety of chemical, pharmaceutical and other industrial markets such as crystal manufacture. The company exports over 70% of its potash production to fertiliser operations in Asia, North Africa, Europe and South America. This includes fertiliser production by ICL Fertilisers itself but also by other companies, particularly in China and India.

Despite potash being the main economic product, salt production is actually higher in tonnage terms, reflecting the fact that the proportion of halite in sylvinites is higher than sylvinites – generally over twice as much. Salt production is over 1 Mt/y. **IM**

Sandvik units delivered to Iberpotash (1995 to 2012)

Model	Units	Year delivered
Pluton (Axera) D6 jumbo	1	1999
Robolt 5 (126XL) bolter	1	2006
MR520 roadheader	3	2008
MR520 roadheader	3	2009
MR520 roadheader	1	2010
MR520 roadheader	1	2011
MR520 roadheader*	1	2012

*Formerly the AM85