

# Nevada Clean Magnesium builds bench-scale pilot furnace

by Ellsworth Dickson

While some metals have seen a decline in demand in recent years, the opposite is true for the lightweight metal magnesium and for good reasons. The silvery metal is one-third the weight of steel yet it provides the same structural strength; it is a necessary element to alloy with aluminum to strengthen that metal and it is increasingly used to reduce weight in vehicles and aircraft. Weight reduction results in increased fuel efficiency and decreased greenhouse gas emissions. In addition, by adding magnesium during steel making, the steel is 'purified' by eliminating sulphur and it is strengthened. Magnesium is increasingly used in cameras, computers and cell phones as the metal is the structural skeleton of these devices.

Noting global magnesium demand has grown from 389,000 tonnes/year in 1998 to 910,000 tonnes/year in 2013, **Nevada Clean Magnesium Inc.** [NVM-TSXV; MLYFF-OTC; M1V-FSE] is positioning itself to become a major US producer and distributor of primary, high-grade, low cost magnesium metal extracted from its 100%-owned, road-accessible, Tami-Mosi property near Ely, north-central Nevada.

An independent NI 43-101 compliant Preliminary Economic Assessment has been completed by Wardrop Engineering. Inferred resources stand at 412 million tonnes averaging 12.3% magnesium for a contained metal content totaling 111 billion lbs of magnesium using a 12% cut-off grade within high-purity dolomite, the host rock of magnesium.

The PEA demonstrated a conservative business model with a NPV (6% discount rate) of US \$547 million, an IRR of 16.1%, and a payback time of 5.9 years with an initial capital cost of US \$424 million. This is based on one cycle per day for 30 years of mining producing 30,000 tonnes of

99.9% magnesium per year. Cash cost/lb of magnesium is projected to be US \$1.28/lb. Nevada Clean would be selling magnesium in the range of US \$1.65-\$1.90/lb.

The company has engaged Lindon Acres Enterprises to build a bench-scale pilot furnace in Fort St. John, British Columbia. To be completed shortly, the furnace is designed to hold about 10 lbs of dolime-ferro-silicon and is expected to yield a magnesium 'crown' of 1 lb. Bench-scale testing will identify and correct any potential design flaws before construction of the commercial-scale pilot furnace in Norway. The testing program will commence early in the New Year.

Meanwhile, these efforts are coinciding with the completion of the materials testing program under way at the Mo Riana Laboratory in Norway under the supervision of ScanMag AS. The ore testing program is using a Thermo Gravimetric Analyzer and will include confirmation testing of dolomite from the ScanMag orebody as well as the assessment of potential reductants. Ore from the Tami Mosi deposit will also be tested. Success of these tests will lead to designing and development of the pilot program using multiple pilot furnaces to operate at a small production level. The pilot-scale facility will be capable of incrementally bringing additional equipment on line. This will allow the plant to ramp up to full-scale production as the market utilizes the metal.

The technology that will be utilized to recover magnesium – the thermal reduction process – was originally developed in Italy in the 1930s (the Bolzano process) that became well known as the magnesium alloy was used to make the very successful air-cooled Volkswagen and early Porsche engines. This technology has been used for the past 38 years in Brazil utilizing two

cycles per day and is noted as being both competitive and environmentally sound, providing magnesium metal for its domestic demand.

Ed Lee, CEO for NCM explains, "We are obviously pleased the development work has started and is definitely a positive for the shareholders of Nevada Clean Magnesium. The process and the equipment that are being developed and installed at ScanMag will be directly utilized at the Tami Mosi Project. By having the comfortable and stable relationship with ScanMag, it offers us the chance to address and eliminate the technical process risks typically inherent with new operating projects.

"We are concurrently raising monies for the Tami Mosi Project because the timing is right for magnesium metal production, especially if it can happen within the US. The metal has a bright future with more opportunities than ever before. In the energy sector there is a drive to replace the \$10 billion lithium battery market with magnesium as a more efficient and environmentally friendly alternative for batteries for electric cars and dry cell applications."

Magnesium is more readily available than lithium and, for the same size battery; there is twice the current capacity.

Magnesium demand is strong with the auto sector needing seven times annual production. A North American source will benefit domestic buyers; however, there would be other benefits from magnesium production, including the production of three forms of energy: electricity, syngas (coal gas) and high pressure steam. As well, most waste can be converted to potential products and CO<sub>2</sub> waste can be captured.

Jim Sever, President/COO, said, "There are two types of markets: push and pull. In



Building the bench-scale pilot furnace for testing magnesium ore. Photo courtesy Nevada Clean Magnesium Inc.

a push market (the auto industry is a good example) the automakers create demand in the minds of people and push the product. A pull market is where the customer recognizes the value and the need for the product and pulls it toward them. Food is an example of a pull market as people know they need food."

He continued, "Magnesium has the ability to displace other materials. People are willing to do that because of the benefits incurred. The only problem is that the industry is limited in its capacity. When a new application comes on stream, there has to be sufficient capacity to fill it to absorb the new demand. Our approach is to come on the market at a price point that allows new innovation or utilization of the material and, as the market grows, it will pull our product from us.

Sever noted that the magnesium industry is small compared to other industrial metals with magnesium prices negotiated a year in advance. "We would sell our products to foundries and die casters such as Alcoa and Kaiser and anyone that uses raw magnesium to make alloys such as aluminum alloys. Ford Motor Company, for example, could then buy their products."

The magnesium market has tripled since

2000 due to the inception of many new magnesium applications and China having the production capacity available to fill the demand. "Right now, there are new applications and not enough magnesium," explained Sever. "That's where we come in. We want to fill the North American need first and then expand to the world."

"We are not relying on a protective North American tariff for our economic model," said Sever. "The 2025 CAFÉ standard for gas mileage means that vehicles will have to weigh 300 to 500 lbs less than present. Department of Energy calculated that this weight reduction can be met using magnesium in six proven applications. Unfortunately at this time, it would take 10 times current world magnesium production to satisfy the automotive demand. The approval by the FAA of the use on magnesium in the cabin and cockpit will also result in big demand for magnesium alloys in aircraft that will result in huge fuel savings."

"In the use of magnesium for alloying with aluminum for food containers, (beverage cans) the purity of the magnesium deposit is probably the most important factor," said Sever. "Our Tami Mosi deposit meets the world standard for purity." ■