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Talga's Swedish mine of the future
[Richard Roberts](#) 16 Nov 2016

Few sites around the world embody the concepts of a 'mine of the future' like the one described by Talga Resources managing director Mark Thompson at this week's Low Emission and Technology Minerals Conference.



Trial mining at Vittangi in Sweden's north

At Vittangi in north Sweden, where Talga has pulled about 5,000 tonnes of material out of a trial pit, the company won't be drilling, blasting or digging with big, traditional mining machines. Nor will the ore "carved" out of the deposit be crushed, ground or processed via the industry's conventional energy-intensive comminution and flotation circuits.

Instead it will be electrochemically exfoliated in water, mostly, becoming graphene and micro-graphite products – in particle form that then needs to be concentrated – without so much as an agitator to stir the pot.

"We can reduce 7t blocks of rock down to individual atoms, with no crushing or grinding," Thompson said at the conference in Perth, Western Australia, where it has its head office.

In an update on the ASX-listed small-cap's efforts to convert high-grade graphite into "advanced materials" for multi-billion-dollar coatings, construction, conductive ink, and battery and membrane markets, Thompson said Talga had reached its extraction limit for the permit used to produce trial 'electrode' parcels for testwork and some product marketing.

But in future he envisaged a "herd of ... machines" roaming over exposed graphite at Vittangi, and possibly other of the company's 25 current deposits at five project sites in Sweden, supplying cut rock directly to its unique product centres.

"We have run a trial mining test pit over last two years where we've scaled up the cutting technology," Thompson said. "No-one was actually sure how this would work. Can you cut at commercial speeds? Do you generate heat, or use the blades up faster than you should otherwise?"

The 3m-diameter, dual-wheel cutting machines shown in Thompson's conference presentation had demonstrated their effectiveness.

"We've calculated that 15 machines can pull 250,000 tonnes per annum over about seven months [presumably that's what is available for surface extraction in the country's climatically harsh north]. We can just pull the ore out as whole blocks because that is an electrode – we can use that the way it [comes out of the ground]."

Talga is storing material extracted to date in a nearby, large shed. Thompson lauded Sweden as a mining jurisdiction with low taxes and royalties, and excellent infrastructure. But a “shed with a railway track going through it”? That’s nice.

The Vittangi/Nunasvaara deposit’s predominantly microcrystalline-flake JORC resource of 9.8Mt grading 25.3% graphite is claimed by Talga to be the highest resource grade of any JORC/NI 43-101 graphite deposit in the world. Thompson said his work as a “guest professor in mineral exploration technology” at China’s Chengdu University of Technology, and Southwest University of Science and Technology, had given him a view of samples from other graphite deposits around the world “including everywhere you’ve heard about in the earlier presentations [at this conference]”.



Talga’s proposed low-cost, electrochemical conversion of cut graphite into various solutions that can be concentrated for transport to various markets “only works if you’ve got the right type of ore”.

“We know what works and what doesn’t ... [and] would have gone somewhere else and done something else [if alternative sources were available],” Thompson said.

“We’re very happy with what we’ve got here. It works very, very well.”

Talga, Australian-listed but seemingly destined for European equity markets (with its major shareholder in Norway), has a market capitalisation of only about A\$50 million. It has \$10 million in the bank and about 20 employees in Europe. As well as its exploration and development activities on the ground in Sweden the company has established R&D facilities in Germany – where it has a pilot plant and 15 people working on product development – and the UK.

“Our business model to make money is not just raw material supply,” Thompson said. “It is to add value and develop graphene-enhanced products; build a prototype and then patent it – or choose not to – and we then send that to companies for testing. On the basis of getting a deal with them we look for licensing revenue and they would produce something under licence for us and drive the raw material sales as well.

“Three factors give us a distinct advantage.

“The first one is the source itself – the highest grade graphite resource in the world under JORC or NI-43 conditions, and a unique sort of ore that forms these natural electrodes. The ore itself does not need drilling and blasting, which reduces dust and environmental impacts, and allows you to get hold of the ore in a very clean way.

“It’s in Sweden, a jurisdiction with fantastically low taxes and mineral royalties, super-low power costs, and is directly connected by rail into Europe, including Germany.

“And then we’re able to make some really high value-added products out of it, [and] that’s what we’re currently doing in the UK.

“Some of these application areas and markets are far, far bigger than global graphite market, which we’ve heard here is about [natural graphite] 100,000tpa. The global paint and coatings industry alone consumes over 40Mtpa

of materials. So this is what we're actually going after with our material. Our material can play in the current graphite market, but we're really excited about developing products for much larger industrial product markets of the world."

Thompson said Talga had entered into a range of technical and commercial partnerships with groups in Germany, India and the UK.

"What is worth keeping an eye out for is not necessarily who our partners are, but who their partners are," he said.

"These guys might represent the front-end for the product development of a much larger company, behind them or as a shareholder.

"We're a bit underrated in that we own 25 different deposits in Sweden. We've got a full range of [deposit types] going from plus-600 micron jumbo flake deposits all the way to the micro-graphite deposits that do some of these crazy electro-chemical things that suit graphene.

"We've specially chosen the ones we think we'll commercialise the most rapidly for the biggest bang for the buck.

"Where we step in with graphene is ... a lot of these things [applications] have only been worked out over the last 10 years. But no-one could supply the stuff in any volume. So that's where we come in. We lower the price, lower the volume, and like carbon-fibre, like plastic, and going back even further, like aluminium, when you lower the price of production the volumes come up because the applications increase.

"We already have material that's been made into battery anodes and that's now scaling up at the energy innovation centre in the UK and the results so far been very good considering this material not optimised.

"But the nice thing about graphene is it's the material behind most of the evolving battery technologies. So if any of you are worried about anodes one day converting to a different type of technology – if you're worried that one day a battery technology comes along that doesn't use spherical graphite in an anode, one of the ways to hedge against that is to have some graphene, because graphene is behind the lithium-sulphur, lithium-aluminium, lithium-air [options] and also you can do printable batteries and flow batteries out of it.

"So you've got exposure across the full group of battery technologies that are underway.

"The electric vehicle story is also not only an electrification story, it is light-weighting story. Materials are needed to make cars lighter. Graphene can effectively save one passenger's weight in a car, which affects its range.

"The number one thing with EV take-up is range anxiety [where the concern is] about weight, and there are a number of areas where graphene fits in.

"So we're targeting markets that are worth far more than batteries, with higher margins."