Developing the World's First Industrial Graphene Supply: An Interview with Mark Thompson

Interview conducted by Alexander Chilton

Mark Thompson, Managing Director of Talga Resources Limited, talks to AZoNano.com about their unique, simple and cost effective process to liberate graphene directly from its large high quality graphite ore deposits.

AC: Could you provide our readers with an overview of Talga Resources Limited and explain how the company has changed since it floated on the Australian Securities Exchange (ASX) back in 2010?

MT: We started off as a gold focused company and we recognised the graphite space becoming of more and more economic importance in 2011.

We secured our graphite projects in Sweden in 2012 and it was during the development of our flagship project at Vittangi that we discovered that both graphite and graphene could be liberated from the ore in a rather special way in early 2014.

That leads us nicely to where we are today in 2015. We celebrated our 5th year anniversary last month, with the company having a market value of approximately 7 times of when it started.

AC: Mark, you personally entered the graphene processing industry from a geological background, having spent more than 20 years working on mineral exploration and mining management. How has your previous experience influenced the way in which Talga views the graphene processing market and the way it operates within it?

MT: Certainly as graphene is a material that has been largely difficult to manufacture and is still developing in its market, it means that it is an industry which is weighted towards more scientific knowledge when it comes to the management and development of graphene companies. I think my experience in a geology and mineral career has allowed me to have a more complete view of the material process from the mine to the market.

I find that many people in the graphene sector from the academic side did not understand where the graphite precursors came from depending on how they were making their graphene. If they were making it from a natural graphite source I found that they did not understand the quantity of steps, the expense and the environmental footprint of their graphite supply before they'd even begun to commence a graphene production process.

Coming from the other side of it, it allows you to develop an objective view of natural advantages through the whole process from the first cost and the natural abundance of materials through to the way that feeds into the economic side of graphene production. I have found this an advantage to date.

AC: Why is it very important to carefully consider the source material you use when producing and processing graphene? What are the advantages of doing so in terms of the cost of the production process and the quality of the end material?

MT: There are fundamentals such as crystallinity and grain size that can feed into any resulting graphene process but I find mostly that if you consider carefully the source material, then that sets up the economic conditions for the graphene production process.

For example, if you look at what has happened in the lithium production market. For many years the way we produced lithium was from hard rock sources and there has been in more recent years a greater focus on saline sources of lithium. This is much more economic as a source of lithium than hard rock, so the source supply of that material changes your economic costs and your margins when producing it.

If you can source a graphitic precursor that has got as big a benefit as, say liquid versus hard rock, or in our case things like crush and grind versus another method which liberates the graphene, you see that an economic condition that is more advantageous than other pathways. That is why the source of the material is really the start of solving the problems that there has been in graphene production.

AC: What do you believe sets Talga Resources apart from pure play graphene companies and gives you a true competitive advantage within the graphene market?

MT: The main advantage is probably volume – as we make graphene almost as a by-product of our graphite mining, we can produce graphene on a scale than is more akin to graphite mining. By comparison to pure play start-ups, it is the sheer volume because we mine our source material, we are developing our source material and processing it in a way to suit another market – the graphene as I mentioned is almost like a by-product.

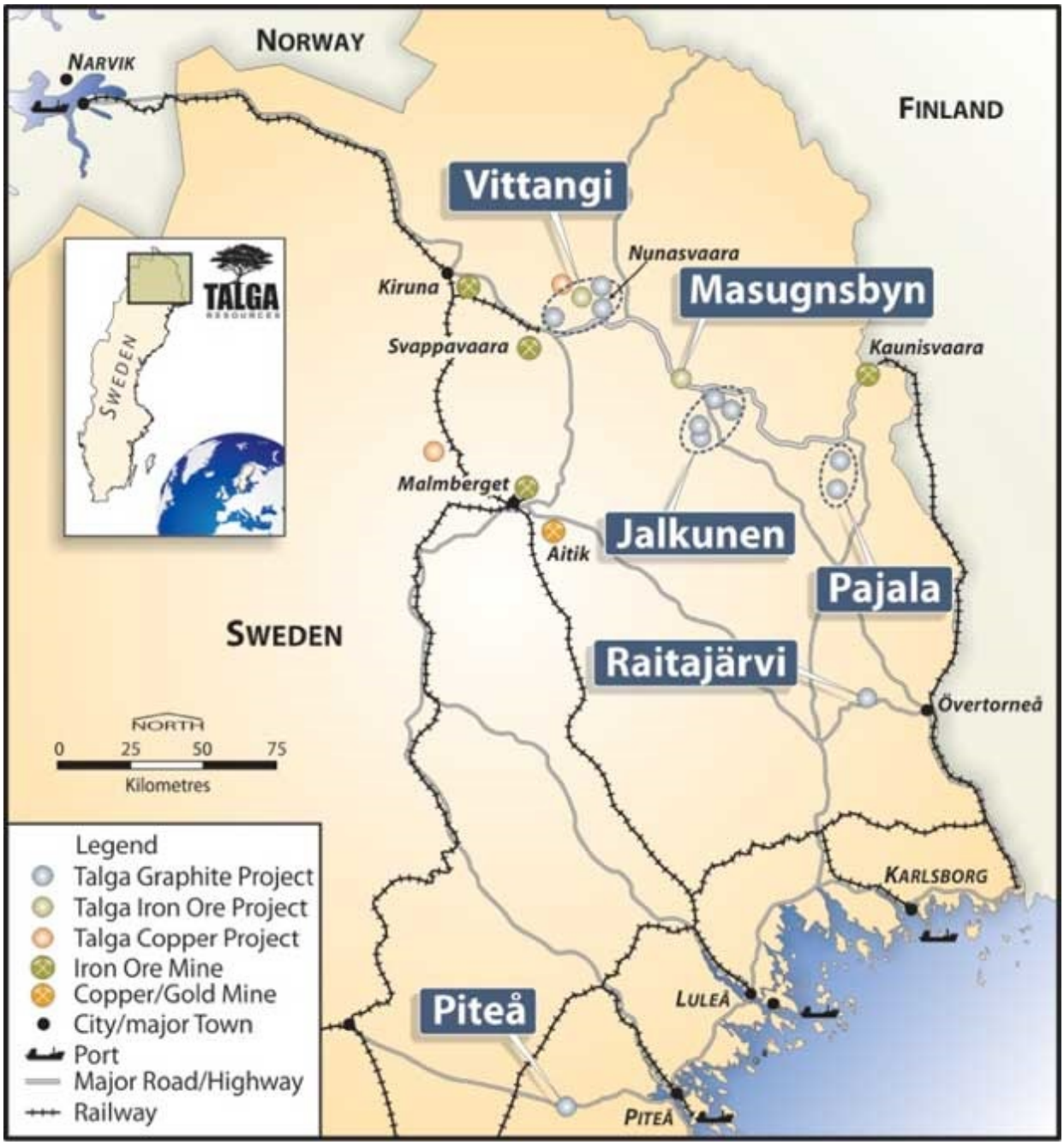
This allows us to produce massive volumes compared to what other companies can produce so it's scalable and also means the cost basis is much lower than other routes. Also, fundamentally as a business model, the company can make money from its graphite assets as well as its gold, cobalt and other assets so Talga does not live or die by whether the graphene market commercialises or

not at the speed which we hope it will.

The business model of the company runs very profitably on the standard industrial commodity supply of graphite and therefore we are not actually reliant on the commercialisation of the graphene market to make money, it just means that we will make more money if the market grows in the way in which we believe it will.

AC: Talga Resources now has five 100% owned graphite projects in Sweden. Could you explain to our readers where these projects are geographically within Sweden and how the deposits vary by location?

MT: All the deposits are in the north of Sweden, mainly in the Norrbotten district, which is one of the largest mining producing areas of the country. It has been the home of some of Europe's largest iron ore, copper and gold mines for nearly one thousand years so it is clearly an area of Sweden with an active mining district.



The deposits range from the highest grade technical resource in the world at nearly 25% at the Vittangi project to deposits which have resources down to 7% graphitic carbon grade ranges. The deposits at the five projects cover a complete range of sizes from less than 75 microns to 80% of them being bigger than 300 microns in size.

Probably more importantly, the particular process we use in an advantageous way to get the graphene and the graphite supply from the rock only covers two of the five projects. We have standard slate-graphite projects which can be developed into materials that would suit the full range of graphite specifications. Two particular projects are exceptionally high grade and they have been proven to liberate graphene as well as graphite in a unique, low cost and scalable way.

AC: Last month (26th June 2015) Talga Resources announced the commencement of site works in relation to its trial mining program at the Vittangi graphite project. Could you summarise the latest developments on this project to our readers?

MT: We made a decision around 6 months ago, as part of the development towards a full scale mine in Sweden which would take between 2 and 3 years, that in the meantime we would undertake some trial mining at the Vittangi project to prove the methodology we propose and that we can therefore treat larger amounts of material through this process. This will allow us to not only prove what is a world first in the mining to processing method but allows us to confirm that this method can be scaled up to full scale production.

It has also provided the opportunity to gain large channels of graphene to supply to the market where companies and products which we have identified with large volumes need quite large sample sizes to accelerate the development of the product. That is why we are undertaking trial mining as well as pilot plant processing in Germany so that we can advance the market faster.

AC: Talga Resources recently secured a site in central Germany for a demonstration plant to process your high-grade graphite ore from your deposits in Sweden. Why did you decide to construct a pilot plant there rather than in Sweden? What are the advantages of choosing this location?

MT: There are many advantages to being based in both countries. We chose the deposits in Sweden because they are exceptional deposits and quite unique in the world in the way they work and their exceptionally high grade. Sweden has also got very advantageous tax and mining laws. The infrastructure and low cost power in Sweden is really second to none anywhere in the world.

It really is a great place to be developing and producing our precursor graphite material but we also recognise that north Sweden is quite far away from end users who may be in Europe and the analytics which are required in order to work with quite high precision graphene.

We have several research programs running on the graphene production process and utilising graphene in products in central Germany. There was a real speed benefit as there were government buildings available to lease which we could turn into a pilot plant. There are also quite generous research and development concessions from the local government.

It was faster and cheaper to build the pilot processing plant in Germany and transport the material down from Sweden than to construct all of those facilities in north Sweden in the time frame we wanted. The time frame we are talking about here was 4 months – we have got to the stage we are at now in 4 months from the decision to do it so it needed to be very rapid by going to the Thuringia area of Germany.

An additional benefit is that the research programs give us access to world class analytical facilities for the characterisation of the material and the integration of the graphene into customer's products, which means that it can happen a lot faster. It also provides a facility where end users can see what we are doing and get some comfort from the fact that we have a consistent high-quality process and a real industrial example of graphene production rather than something theoretical.

AC: When do you believe the pilot plant in Germany will be operating at full scale? Will this remain your main processing plant or do you have plans to move to an alternative location in the long term?

MT: The German pilot plant will be scaling itself up through several phases until it is at full scale in 2016. It will be our primary processing plant for approximately two years until our site in Sweden is ready to go into full scale production and then everything will shift to Sweden.

The German plant is expected to continue to operate in some sort of R&D or even small retail type way but the bulk of production will shift to Sweden and the material will be processed on site. In the meantime, it is certainly cheaper and faster to do it in this way.

AC: What are the main markets and application areas which you are targeting with the graphene you produce?

MT: Because of our potential for volume, we are focusing on graphene as an additive. Within that sphere are things like composites, 3D printing inks, conductive inks, paints, anti-corrosion coatings, galvanic applications on to steel, plastics and polymers such PET material or packaging material.

We are focussing mainly on the additive applications which have not only large volume but also good margins and are current products. We do not require new products to be created which do not exist yet, we just looking at making current products better.

We see this as the fastest pathway for graphene to commercialise and its one that we feel is a lot better developed behind the scenes than the media has been picking up on because there is a focus on well-hyped futuristic applications of graphene rather than the fundamentals of how it can affect every day materials.

AC: What do you believe is the biggest challenge which the graphene industry has to overcome before this 'wonder material' can be fully commercialised in the near future?

MT: I differ from a lot of people in industry at this point who keep seeking a killer application. I actually think that to just focus on one single graphene only application is a little furphy. I have seen many trial products that have not been able to continue onto production because of the lack of volume in the supply of graphene and the associated high costs of the material.

I see volume and costs as the chicken to graphene's egg. Most people have been waiting for graphene but they have not solved the volume or the cost problem. When you solve these problems then you can enable all sorts of graphene applications to occur and a couple of those might turn out to be killer applications. I see the production side as being the main hold-up.

When you have a material like graphene with extraordinary properties such as strength, conductivity, transparency in some applications amongst others, and it seems that there is quite an abundance of evidence in how it can affect everyday materials then you do not need a killer application, you just need to solve the supply problem.

AC: Where can our readers find out more information about Talga Resources?

MT: We are listed in the Australian stock exchange which is a good place to start: http://www.asx.com.au/asx/research/company.do#!/TLG

Our website also has details of our company including presentations and the latest news: http://www.talgaresources.com/IRM/content/default.aspx

You can also meet us at the graphene and technology conferences where you should review who else is talking about solving the main problem of graphene supply.

Look at what the other companies are not yet solving and are not yet producing for some information about where Talga is going in the future.

About Mark Thompson

Mark Thompson has more than 20 years industry experience in mineral exploration and mining management, working extensively on major resource projects throughout Australia, Africa and South America.

He is a member of the Australian Institute of Geoscientists and the Society of Economic Geologists, and holds the position of Guest Professor in Mineral Exploration Technology at both the Chengdu University of Technology and the Southwest University of Science and Technology in China. Mark Thompson founded and served on the Board of ASX listed Catalyst Metals Ltd and is a Non-Executive Director of Phosphate Australia Ltd.

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Company Background

In a global resources environment where the choice of mineral commodity, project location, operational factors and the right management skill sets is increasingly borderless, Australian exploration and development company, Talga Resources Ltd (ASX: TLG) has emerged as a prime mover in one of Europe's leading mineral destinations – Sweden.

Underpinning Talga's growth strategy is Sweden's reputation as a top tier mining jurisdiction, with well-established bulk commodity infrastructure, low cost power, favourable tax regime, highly skilled workforce and very low sovereign risk.

Perth-based, Talga's current Swedish portfolio includes the world's highest grade graphite resource, significant iron ore resources and highly prospective copper-gold exploration projects. The Company also has gold exploration assets in its home state of Western Australia.

Talga's flagship Swedish assets are the 7.6Mt at 24.4% graphite JORC resource at Nunasvaara, and combined total JORC iron ore resources of 235.6Mt @ 30.7% iron at the Masugnsbyn and Vittangi skarn magnetite iron projects.

Talga first joined the Australian Stock Exchange in July, 2010.