

Global First as Talga Graphene Coating Begins Commercial-scale Trial on Ocean-going Cargo Vessel

Advanced battery anode materials and graphene additives provider Talga Resources Ltd (“**Talga**” or “**the Company**”)(ASX:TLG) is pleased to announce the commencement of a commercial-scale trial of a Talga graphene-enhanced coating applied to a 33,000t container ship.

Believed to be the world’s largest single application of graphene, the 700m² coating of the cargo vessel’s hull is part of advanced testing of Talga’s functionalised graphene (Talphene®) additive as a performance booster for existing commercial marine coatings (part of the global 54 million tonne per annum paint and coating market¹).

The commercial-scale application follows completion of in-house development and patent pending technology that successfully translates graphene’s exceptional mechanical properties into paint and coatings. The result is expected to be a range of environmental and economic benefits, which for marine applications such as shipping and offshore infrastructure includes improved corrosion resistance, decreased metallic paint loss into oceanic ecosystems and increased efficiency through lowering dry docking cycles.

The freshly coated ship is now at sea and over the coming 12-18 months the Talphene-coated area will be evaluated in the harsh real life conditions of global cargo shipping.

Talga Managing Director, Mr Mark Thompson: *“The maritime coating sector is a very large market and well suited to use of our Talphene® graphene additives for improved environmental and economic outcomes. Additionally, by successfully taking this new product from the laboratory to commercial-scale application on a 33,000 tonne ship, being tested across global marine environments, we are showcasing our graphene’s real-world potential as a bulk industrial product.”*

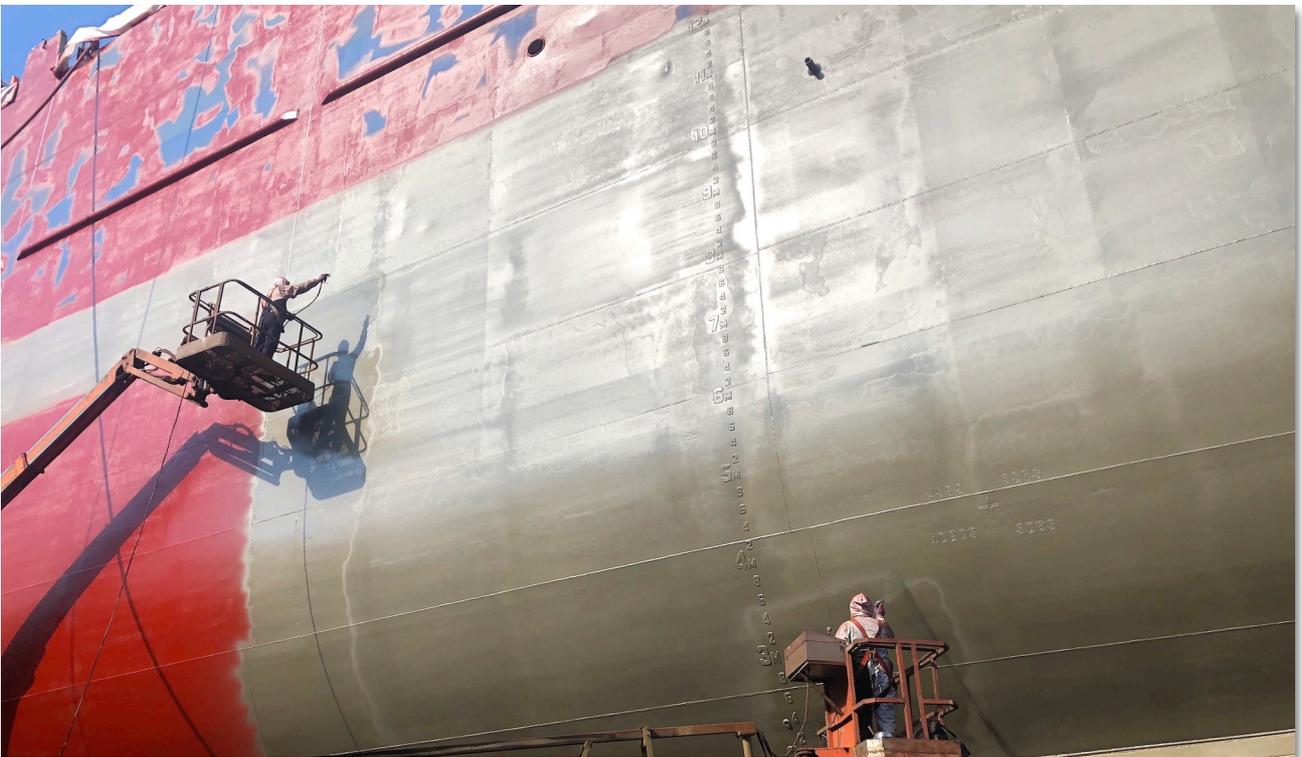
Figure 1 The 33,000 tonne 225m long cargo ship “Algarrobo” leaves dry dock after re-painting including 700m² section of Talphene®-enhanced primer coating along the starboard side.



Figure 2 Vessel in dry dock during removal of existing paints.



Figure 3 Talphene®-enhanced primer (left) being spray coated onto starboard hull of vessel, alongside the test reference coating (right).



Marine Coatings Market

Within the global ~54 million tonne per annum paint and coatings market¹, the marine coatings segment is projected to grow to USD\$12 Billion by 2024. Drivers for new coating technologies include environmental and regulatory demands, fuel efficiency, construction costs (pre-fabrication) and maintenance costs. Growth in emerging economies such as China, India and Brazil are large volume drivers while in terms of value, the Asia Pacific marine coatings market is projected to grow at the highest CAGR during the forecast period².

Key players operating in the marine coatings market include Hempel (Denmark), Jotun (Norway), AkzoNobel (Netherlands), PPG Industries (US), Sherwin-Williams (US), Chugoku Marine Paints (Japan), Nippon Paint (Japan), Kansai Paint (Japan), Axalta (US), and BASF Coatings (Germany).

Talphen® Coating Product Development

Coatings are one of Talga's key target products due to the large volume market and graphene's potential to provide substantial new levels of performance and environmental sustainability³.

For maritime applications, Talga's additive development has included multi-stage testing to optimise graphene loadings (i.e. quantities) and Talga's unique patent-pending dispersion technology for epoxy based commercial primer coating systems.

Testing by Talga included industry accepted ASTM prescribed Salt Fog Test (ASTM B117) where steel panels coated with epoxy primer containing Talphen additive showed improved corrosion protection performance compared to 'state of the art' commercial systems currently used world-wide in large volumes.

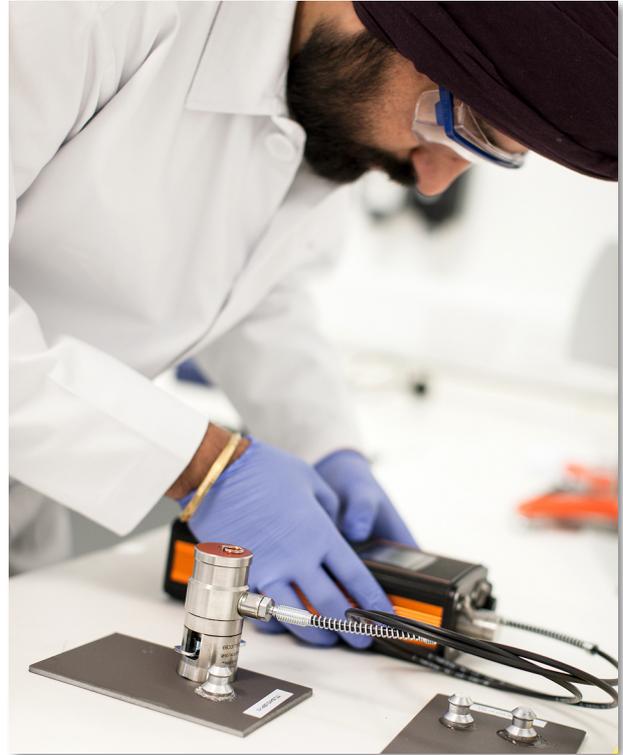
Further evaluation included mechanical performance tests, carried out to ASTM standard by the highly recognised research organisation The Welding Institute (TWI), as the coated surfaces of ships and maritime infrastructure are exposed to considerable abrasion and mechanical damage during service.

The results showed a significant improvement in primer performance, including greater adhesion to the substrate (by ~7%), greater interlayer adhesion to the subsequent (antifouling) coating systems (by ~14%) and consistent improvement in abrasion resistance. These improvements in performance were a notable outcome for this highly optimised industry, indicating that graphene's exceptional mechanical properties translated into the coating system and warranted commercial-scale trials.

Figure 4 Talga technician performing in-house ASTM salt spray testing on coating samples.



Figure 5 Coating adhesion tests by Talga scientist



Commercial Ship Application & Trial Details

Based on the successful lab results, plans were drawn up for a major commercial scale application and sea trial. A 2-part epoxy based commercial coating system was purchased (Akzo Nobel Intershield 300) and mixed with the Talphene additive before dispatch to the ship management company for application during vessel dry docking (carried out every ~5 years for ships this size).

The test areas along the ship's starboard side, both below the water line and above in contact-wear sites, were blast cleaned to remove prior paint systems before the Talphene-enhanced primer coating was applied (next to a test reference coating without Talphene) in two coats, using manual spray systems.

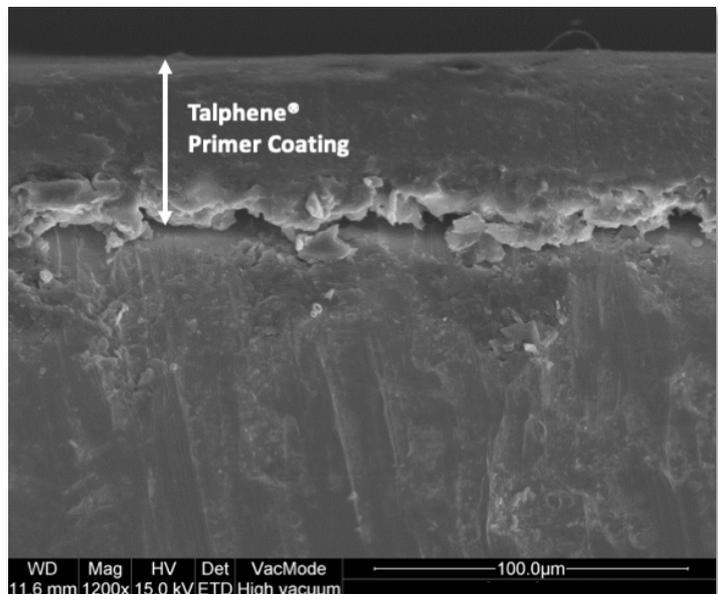
A major challenge of the product development was to translate the positive lab-scale tests into practical, large-volume use by on-site commercial applicators. The successful application of the Talphene-enhanced coating without any adverse effect in terms of stability in resin, application, curing and surface features is a highly positive step forward in the commercialisation process.

The test areas have been over-coated with the standard topcoats used on the rest of the vessel and marked to ensure identification during service. Periodic inspection will be carried out over the next 12-18 months to determine real world performance.

Figure 6 *Mixing of epoxy coating system.*



Figure 7 *SEM image of coating development on steel.*



Next Steps

Talga intends to continue development of this Talphene additive for marine coatings under its range of paint and coating additives now trademarked as Talcoat™. The next steps include a trial of the additive as an after-market product, to be mixed into the coatings on-site by the commercial applicators, as opposed to being dispersed by Talga prior to despatch.

Talga has also identified a range of potential commercial partners and commenced discussions, under NDA, regarding the incorporation of Talcoat products into their existing and new coating product lines. The Company notes that these negotiations are preliminary, and further updates will be released as and when any definitive commercial agreements are reached.

For further information please contact:

Mark Thompson
Managing Director
[Talga Resources Ltd](#)
T: +61 (0) 8 9481 6667

Nikki Löf
Marketing & Investor Relations Coordinator
[Talga Resources Ltd](#)
T: +61 (0) 8 9481 6667



About Talga

Talga Resources Ltd (ASX:TLG) is building a European source of advanced battery anode materials and graphene additives, to offer graphitic products critical to its customers' innovation and the shift towards a more sustainable world. Vertical integration, including ownership of several high-grade Swedish graphite projects, provides security of supply and creates long-lasting value for stakeholders. Joint development programs are underway with a range of international corporations. Company website: www.talgaresources.com

References

1. "World Paint & Coatings-Demand & Sales Forecasts, Market Share, Market Size, Market Leaders" Freedonia Group, Jun 2016
2. "Marine Coatings Market, Industry Analysis Report & Forecast" Global Market Insights, Aug 2019
3. "Graphene based anticorrosive coatings for Cr (VI) replacement" K. S. Aneja et al, Nanoscale, 2015

