

Green Gum



Green Gum Overview

Introduction

Green Gum technology processes scrap rubber to manufacture rubber granules to be used in the rubber, paints and plastics industries

Green Gum technologies are an investment with significant potential. The *Green Gum* process uses scrap rubber to manufacture rubber granules of flour-like consistency. This technology uses a low energy consumption and environmentally friendly recycling process, and makes it possible to greatly increase the clean utilisation of scrapped rubber tyres. The resulting granule products are used as expensive industrial base materials, and may be applied, in addition to other industries, for the substitution of a part of pure rubber in the rubber industry, as filler in the paint industry and for the substitution of plasticisers in the plastic industry.

At present it is a single milling plant with associated patented process that is able to produce in quantities fine rubber granules (180–150 microns) for the efficient recycling of rubber for a range of industrial and commercial applications. The patented process uses less energy than traditional methods and as such, has a much smaller carbon footprint. The existing *Green Gum* manufacturing plant is located in Western Hungary, approximately 150km from Budapest and approximately 130km from Vienna.

Astra Resources acquired a 76% stake in *Green Gum Technologies* through its subsidiary, *Astra Innovations Pty Ltd*, in August 2011 through a deed of assignment with *Sino Bay (BVI) Ltd* to acquire all of its right, title, and interest in *Green Gum Technologies*. Full production is planned to commence mid 2015. *Green Gum* plans to produce over 15,000 tonnes per year once machinery testing at the plant is complete. The need for rubber granules in road building and road maintenance alone is expected to be in excess of 35,000 tonnes per year over the next five years with considerable use of the product throughout Europe.

Mission Statement

Green Gum's mission is to utilise its low energy consumption and environmentally friendly recycling process to be the preeminent supplier of rubber granules in Europe and globally.

History and Current Status

The technology has been developed over a number of years with patents awarded in early 2010. Whilst in the pre-commercialisation stage, Astra acquired the intellectual property, plant and operations from its existing Austrian owners and established Green Gum Technologies Kft (Hungarian Liability Limited Company), located in Devecser, Western Hungary, a 76% owned subsidiary of Astra Innovations Pty Ltd (Australia). The inventors of the technology and advisers have retained a 24% share in order to continue scale testing, fulfil small orders, and pursue continued commercialisation of the technology.

Objectives

The commercialisation of Green Gum Technologies aims to deliver a first mover advantage to Astra within the synthetic rubber (vs. natural rubber) market amid continued and growing global demand for rubber and related products via the availability of a much finer granule size compared to other manufacturing methods, which can be efficiently produced and is more advantageous to customers due to its better bonding properties when making plastics, recycled/synthetic rubber based products and other similar materials.

Green Gum is one of Astra's green technologies and is the first of its kind in producing finer granule size

The investment in Green Gum's rubber granule technology is in-line with Astra's broader strategic objective of pursuing diversification of operations, green and advantageous technology/knowledge based assets. The intention of the diversified portfolio, best-in-class assets is also that they be complementary to core focus with low costs and shorter lead-time to revenues.

Green Gum is aiming to scale the technology and manufacturing processes at the existing mill so as to be able to meet known demand and supply industrial quantities to already interested parties such as European road builders who wish to use the fine rubber granules within their bitumen blends due to its flexibility properties. Once existing plant capacity is reached (estimated at 15,000 tonnes p.a.) further production capacity can be developed locally to meet the expressed demand as well as an exploration of other geographical markets and end-uses of the product.

Products

Features

Green Gum's patented technology pursues devulcanisation of scrap or waste rubber (e.g. automotive tyres) by converting rubber base material (rough grind 8-10mm) via a grinding technique into high quality and consistent sized end products of fine and super fine rubber granules 200 to 300 and 150 to 180 microns in size respectively. The resulting rubber granules are of a flour-like consistency and will be available in industrial quantities.

This material is suitable for the substitution of expensive industrial base materials and it may be applied for the substitution of a part of caoutchouc in the rubber industry, as a filler in the paint industry or for the substitution of plasticisers in the plastic industry.

Benefits

One of the main advantages of the Green Gum technology is that the process uses substantially less energy for the production of these fine granules than the traditional methods that utilise nitrogen freezing or high-pressure water. Other competitive processes to this technology in use have high-energy requirements and are unable to produce such high quality granules.

The Green Gum process uses less energy than traditional methods involving nitrogen freezing or high-pressure water

Purchasing process for rubber granulate (diameter 6–8 mm) in *Astra Green Gum Technologies* Ltd. The price of the rubber powder on the world market is changing between, 200–700 €/tons. One of the most important facts, which define the price, is the purity of the raw materials (no extraneous materials in the rubber granulate).

To the Company's knowledge the technologies used in Europe at the moment are not suitable for the production of rubber granulate with extra purity. Therefore it cannot produce rubber powder with extra purity from these raw materials and for this reason the rubber powder cannot be sold at a higher price level. We cannot currently buy rubber granulate with extra purity from the market.

Market research has justified clearly that there is unlimited demand for rubber powder with extra purity; therefore the Company has changed the original purchasing policy. The Company does not plan to buy rubber granulate, but produce the raw material for production with Green Gum improved technology. The Company co-operates with the Council of the city Devcser and other companies who can support the activity in collecting, pre-treatment, storage, recycling processes, transportation etc.

Astra Green Gum Technologies Ltd gives to the partner companies for the recycling process the permissions, technologies and equipment. Using the new technology the Company's purchasing becomes safer and the purchasing price is decreased from € 150/tons to 75 €/tons.

Another important advantage is the Company are able to produce rubber powder with extra purity from the raw material and can increase the selling price with € 100/tons minimum. The technology will be introduced from 30th of April 2015 and continuously improve collection and pre-treatment according to the demand of the market. New jobs are created with the application of the new technology and the Company has a good chance of attending several EU competitions, which belong to the environment getting important supports.

Whilst other known processes and apparatuses for producing rubber granules do exist, the disadvantage of these known apparatuses and processes is that they are not suitable for the preparation of tyre grinds with predetermined, fine granule size and the tyre grinds with the determined size of granules may only be prepared by the addition of further steps. A further disadvantage is that they are rather expensive and because of these high costs, they are not suitable for the preparation of grinds in an industrial quantity.

Green Gum's technology overcomes both of these issues and with consistent and smaller granule size means improved bonding in recycled rubber applications. The low energy footprint of Green Gum's technology also means economic industrial production volumes can now be achieved, where this was not previously possible.

Most synthetic rubber is created from two materials, styrene and butadiene. Both are currently obtained from petroleum. Over 454,000 tonnes of this type of rubber was manufactured in the United States during the 1990s increasing to over 600,000 tonnes during the early 2000s. Other synthetic rubbers are made from specialty materials for chemical and temperature resistant applications. Tyres account for 60%-70% of all natural and synthetic rubber used. Other products containing rubber include footwear, industrial conveyor belts, car fan belts, hoses, flooring, and cables. High quality rubber granules can decrease the requirement for the petroleum based materials in the manufacture of synthetic rubber.

In addition to greatly enhancing the general bonding properties, it also makes it an extremely cost effective and profitable to use the Green Gum granules in the manufacturing of plastics and other similar materials such as bitumen.

The use of recycled rubber in plastics manufacturing processes is only possible with very high quality granules which are extremely fine and have special bonding properties due to their shape. The recycling of rubber products is currently limited by the quality of the recycled product. The Green

Gum process makes it possible to greatly increase the clean and environment friendly utilization of scrapped rubber.

High grade rubber granules are used in bitumen base for roads in Europe

The use of rubber in bitumen base for roads is becoming more common throughout Europe. These technologies are being continually researched and may become "proprietary" as in the case of the Swedish company, Svevia. Mixtures consist of crushed stone granules, and other materials. Approximately 20% of fine rubber granules are added to the mixture thus producing a cohesive effect and an eminently usable product. These mixture technologies are in some cases proprietary, as in the case of Svevia, the Swedish road-building firm. A liquid bitumen form is also in use and is being further developed for the repairs of road surfaces, which have suffered small damage such as cracks, breaks and potholes. This process is possible only with the use of high-grade rubber granules, and the savings produced in road repairs are extremely high. This repair process is also under further development by major road building companies such as Svevia and Strabag.

Proprietary Rights

The manufacturing process, methodology, and the technologies are fully documented in the intellectual property held by Astra. Unlike several other existing technologies for granularisation of recycled rubber that use either chemicals, thermal (hot and cold) processes, fluids at high-pressure and other various apparatuses, Green Gum uses a grinding approach to produce rubber granules of a size and consistency similar to flour.

Production will be done internally rather than outsourced to protect the IP

Previously outsourced engineering and manufacture of key plant components have recently been brought in-house to a dedicated Engineering workshop, which is also on site at the plant, so as to further, protect IP.

The output from manufacturing test runs is being sent to the University of Miskolc for quality testing. Quality control testing will be carried out by a Nationally Accredited laboratory, for which the relevant documents have already been signed.

Stage of Development

The viability of the technology has been proven at the mill, however the technology remains in a manufacturing testing phase as the plant attempts to scale beyond the test rig.

Production test runs and quality control tests are being carried out to ensure the product meets the required quality and specifications of prospective purchasers

Numerous test productions runs and quality control tests were conducted in early-mid 2012 to ensure the final product meets the qualities and specifications requested by prospective purchasers. The tests included the measurement of the ash content, carbon black content, rubber hydrocarbon content, moisture content, fibre content and metal content. Testing will continue to finalise the required compliance for the plant.

Green Gum has received a number of enquiries from potential customers. Road building companies in Sweden and Austria have already expressed interest in using large amounts of Green Gum's product, while a German company that manufactures automotive cabin components is also considering Green Gum's product.

Further test manufacturing runs were carried out in late 2012 where the final product quality was proven by electron microscope examination results. Samples accompanied by the results were then made available to a number of interested parties, including WIL AG, TY-RE MIX and MOL.

The test manufacturing process involved:

- The actual configured machines running on full loads
- Mechanical loads over a prolonged period
- Electrical loads over a prolonged period
- Internal material transport infrastructure (raw material input and output of finished granules)
- Cleaning processes required for different raw materials
- The effect of extremely poor raw materials (Worst Case Scenario)
- Preparation of granules from EPDM rubber based raw material
- Staff requirements
- Production capacities
- Market reaction to the manufactured products

Market and Industry Analysis

Market Size and Growth

Global

The International Rubber Study Group (IRSG) is an intergovernmental organisation recognised as an international body located in Singapore, formally established by a Headquarters Agreement with the Government of Singapore. The purpose of the organisation is to prepare current estimates and analyse future supply and demand trends, while undertaking statistical and economic studies on specific aspects of the industry. According to their research:

- Global rubber consumption reached 24.6 million tonnes in 2010, 15.3% higher than in 2009, reflecting a strong recovery in the demand for vehicles and tyres. Global Synthetic Rubber production was 14.1% higher than in 2009, in line with the strong recovery seen in Synthetic Rubber consumption, while global Natural Rubber supply was 7.2% higher than in 2009.
- Global rubber demand (both Natural Rubber and Synthetic Rubber) is forecast to reach 27.6 million tonnes in 2012.
- Global Synthetic Rubber demand is expected to grow by 9.0% in 2015, while global Natural Rubber demand is forecast to rise by 5.4% in 2015.
- Partly due to the impact of higher prices, and assuming normal growing conditions, global Natural Rubber production is forecast to rise by 8.2% in 2016.
- In the longer term, global rubber consumption is forecast to reach 35.9 million tonnes by 2020, with Natural Rubber consumption of 16.5 million tonnes and Synthetic Rubber consumption of 19.4 million tonnes.

Europe

The current production of synthetic rubber granules in Europe is 15,000 tonnes of low-grade product, which is grossly inferior in quality to the Green Gum technology. The need for rubber granules in road building and road maintenance alone is expected to be in excess of 35,000 tonnes per year over the next five years with considerable use of the product throughout Europe.

Current rubber granule products are of inferior quality

It should be noted that the established size of a market is a reasonable indicator of the potential future size, however with the introduction of any new technology the market has the potential to grow beyond initial consideration. Green Gum as a first mover has the ability to, in part, make a market through technological innovation.

Trends

Product

Green Gum's rubber granules are used for the production of Styrene Butadiene Rubber (Butyl rubber), which is now the major general purpose

synthetic rubber which accounts for around 37% of the world's solid synthetic rubber.

Butyl rubber is a synthetic rubber, has excellent impermeability, and has better flexibility properties.

It is used in many applications requiring an airtight rubber and is used in the manufacture of:

- Adhesives
- Agricultural chemicals
- Fibre optic compounds
- Ball bladders
- Sealants
- Personal care products
- Gasoline and fuel additive
- Pigment concentrates for rubber and polymer modification

Butyl rubber can also be used for protecting and sealing and in certain equipment for areas where chemical weapons may be present.

Price

Green Gum is looking to take advantage of rising natural rubber prices by offering a cost effective alternative synthetic rubber product to customers.

Target Market

Green Gum's target market is seen as being primarily Europe. The initial target areas will include Hungary, Austria, Germany, Ukraine, Romania, and France. The secondary target areas will include Slovakia, Czech Republic, Poland, Slovenia, Serbia, and Croatia. There is also considerable interest being shown from a German company, which manufactures automotive cabin components, which include dashboards. The rubber granules are used in road building in the colder climates, because of their inherent flexibility and are mixed into the road building materials such as bitumen.

Green Gum's target market is primarily Western Europe, specifically Sweden, Norway and Austria. Particularly in road building in the colder climates

The sale price is directly related to bitumen, which is currently approximately EUR 500 (AUD 660) per tonne. The initial sale price of the rubber granules would be around EUR 360 (480 AUD) per tonne. Green Gum has received interest from a number of road building companies. The Austrian company, WIL AG, is interested in purchasing the entire production output as soon as the plant becomes operational. Svevia, a state owned road building company in Sweden, has also expressed interest in the product. Green Gum is approaching WIL AG in the first instance and is in the process of having the

sample results confirmed by WIL AG. WIL AG has expressed an interest in purchasing 600 tonnes per month (7,200 tonnes per year).

Competitive Environment

There are other manufacturers of rubber granules located in India and China; however, these manufacturers are generally unable to produce such high quality fine granules, as Green Gum is capable of

Competing technologies require high energy levels and are unable to produce the extra fine granules which Green Gum is capable of

Machinery currently in use in Europe for the production of rubber granules is manufactured by ELDAN and MEWA. 95% of the granules, which can be produced on these machines, are above 1mm i.e. 1000 microns, or comparatively 8 times larger than the premium Green Gum product.

Manufacturing of granules in the sub 500-micron range is restricted because of:

- High manufacturing costs
- Small usable capacities
- Non-availability of technology (except for Green Gum)

The granules produced by the Green Gum method, in terms of purity, quantity, surface geometry, size and size grouping, give Green Gum a very high and unique market advantage.

Similar competing technologies and processes detailed within the patent advice document are either expensive, require high energy levels, or they are potentially dangerous or environmentally damaging. Additionally these methods are unable to produce the extra fine rubber granules, which are 250–150 microns in size. Green Gum therefore sits alone as a potential market leader due to its superior technology.

Once production volumes are established, the target market will be aimed at rubber and plastics manufacturers who will need recycled rubber products as base materials. These manufactured products require very fine granules, and the Green Gum manufactured granules (200 -150 microns) are eminently suitable for this purpose.

Opportunity

Similar competing technologies and processes detailed within the patent advice document are either expensive, require high energy levels, or they are potentially dangerous or environmentally damaging. Additionally these methods are unable to produce the extra fine rubber granules, which are 250 – 150 microns in size. Green Gum therefore sits alone as a potential market leader due to its superior technology.

Green Gum produces granules which are
250–150 microns in size

Manufacturing Costs, Overheads and Operating Margins

Based on calculations using the latest data, the margins are more than favourable irrespective of the end product. Offers have been received for 100% clean passenger/truck tyre raw material compound at EUR150 per ton and EPDM type material at around EUR160-€170 per ton.

It is possible to obtain raw material at around EUR70-80 per ton, however this material is highly contaminated by steel and cloth. Based on the findings of recent testing, it makes more sense to buy raw material at a slightly higher price, which is 99% clean and thus requires very minimal cleaning during the manufacturing process.

Stage 2 of the development will include further cleaning technology so that the manufacturing cycle could be reduced even with mediocre input materials and thus, save time.

A very important consideration is that the fixed overheads do not change even if very high quality (e.g. EPDM 200 microns) granules are produced as opposed to say, 400-micron granules manufactured from passenger tyres.

Based on budgeting calculations, the minimum profit after expenses is expected to be at least USD130 per ton. In the event of 10,000 tons per annum production, the profit will be USD1.3 million based on the lowest profit margin. On a premium high priced product (which will need to be strategically supplied) the profit margins will be two or three fold.

The aim is to increase production to over 14,000 tons by the end of 2015 and to possibly 20,000 tons by the middle of 2016.

It is also possible that any major expansion in manufacturing capacity could be funded from a EU Grant.

European Union Grants

There is a possibility that Green Gum could be eligible to receive EU grants. The EU for member countries, independent of the country and its politics, administers these grants. On a large scale, these grants are granted for such purposes as transport infrastructure, renewable energy projects, creation of meaningful employment and road infrastructure.

Green Gum will be able to qualify for various EU subsidies relating to recycling of polluting materials, related workplace developments, and practical research with support from the University of Veszprém.

The EU grants range from as little as EUR 25,000 to several million euros. The process requires the completion of a set application process, reports, technical, and business appraisals and a financial audit of the applicant company.

A very large number of smaller to medium sized businesses are unable to meet the financial and environmental criteria, required for the application. According to a number of sources, Green Gum meets all the criteria, especially since it fully owns the plant and has so far demonstrated that it actually is in the process of manufacturing recycled products. Furthermore, the local government would support the application very strongly in terms of being a "green industry" and would also stand to gain from the grant by the way of industrial taxes and other factors.

Marketing Plan

Target Market Strategy

Green Gum has actively pursued foundation customers within the target market and has achieved through ongoing negotiations signed Letters of Intent with Svevia who intends to purchase approximately 10,000 tonnes p.a., and Austrian company, WIL AG, who are interested in purchasing 7,200 tonnes per annum.

Green Gum has received expressions of interest from potential customers

Once production commences, quality control data and specifications will be made available to potential customers.

Positioning

Green Gum plans to position itself at the premium end of the market due to the higher quality, extra fine rubber granules produced by its technology. The Green Gum product will be differentiated from competing products by its granule size and the absence of contaminations such as steel and cloth particles.

Following recent test manufacturing, it has come to light that the Green Gum product mix needs to be based on different quality input source materials.

The range of source materials of differing quality includes:

- Tyres from passenger vehicle (original concept).
- Mix of passenger vehicle and truck tyres in various proportions
- Truck tyres only.
- Tyres from Industrial vehicles and machinery such as forklifts.
- EPDM rubber, good quality.
- EPDM "cut offs" obtained direct from manufacturers such as the automotive industry.

The most important factor, which was not present, previously is that the potential customers will specify the exact type of raw material required in the end product which will be used for their own particular purposes.

The “one product fits all” concept has to be replaced with a more customised approach as the heart of the business, but still retaining the original product concept. Allowing the type of input material to be requested opens up new markets in addition to the originally and exclusively targeted road building and related industries. EPDM based materials are becoming a priority and the initial R&D required a substantial demand in terms of manpower and technical resources in order to accommodate the different base materials.

Pricing Strategy

Pricing will be structured for maximum market acceptance and maximum profit margins. The initial (worst case scenario) selling prices have been calculated at EUR 360 (AUD 480) per tonne for the road building industry. This amount is regarded as the minimum and prices in excess of EUR 500 (AUD 660) per tonne are highly probable within twelve months of the initial introduction of the product. The synthetic rubber manufacturing market is willing to pay in excess of EUR 800 (AUD 1,070) per tonne, or higher, for the high grade rubber granules. The Green Gum process is a clean technology, which satisfies EU requirements for the recycling of used tyres.

Pricing will be structured for maximum market acceptance whilst maximising profits

WIL AC, who is taking initial volumes generated by manufacturing test runs, are currently negotiating raw material and product price structures.

Sales Strategy

Green Gum plans to directly approach end users of rubber granules, initially targeting the road building market in Europe before expanding to other markets such as rubber, paints, and plastic industries. The company will adopt a single point of marketing approach. As the proposed sale quantities are relatively large per customer, there will be no need for a heavy marketing structure. Most marketing activities will involve confidential negotiations.

Initial marketing will rely upon industry contacts and in turn utilising their chain of contacts.

A traditional “door knocking” and cold call approach, is not a viable option for the moment, but this could change in the future in order to cater for smaller and casual sales.

It is important to note that the types of strategic relationships, which are now being developed, are normally only possible when the plant has been in

operation for some time, i.e. it has a track record. In the case of Green Gum this early acceptance and the high level of confidence (e.g. MOL) was due to the quality of the samples and lab reports.

WIL AG has proposed that it would act as a marketing arm of Green Gum on an exclusive basis in a number of countries. This arrangement would have to be a corporate decision in terms of financing the marketing on the “coat tails” and reputation of WIL AG.

The Green Gum products, irrespective of its excellent technical qualities will need to be promoted and branded. The marketing approaches either through WIL AG or separately will require:

- Personal contact with potential users
- Support material and application notes produced and verified on a university R&D level
- Data sheets as above
- Material safety data sheets
- Travel budget
- Direct arrangements with EPDM producers and users
- ISO certification within a relatively short time frame

Operations Plan

Operations Strategy

Scaling the patented apparatus and processes at the existing plant in Devecser, Western Hungary and overcoming technology issues from manufacturing test runs is the primary focus of Green Gum. Any volumes resulting from manufacturing test runs of saleable quality and quantity will be sold to WIL AG who have agreed to take these initial volumes. Full production is planned to commence in Q4 2015 and at full production (12,000 – 20,000 tonnes p.a.).

Enhancing the plant and undertaking minor repairs, maintenance and improvements is also a priority. Green Gum will then increase fine rubber granule production to meet the preliminary demand expressed by European road contractors. The initial and immediate business is based on the road building requirements, where the granules are purchased by the users at a cost of EUR 360 (AUD 480) per tonne.

The existing milling plant covers a total area: 21,560 sq. metres, over two blocks. There is an adjoining main railway line and it sits approximately 40km from the M7 motorway to Vienna. It is approximately 130km to Vienna and 100km to Graz. Capitalising on existing infrastructure and location of the plant is paramount, however establishment of additional manufacturing plants within Hungary is the next logical step. The market is able to absorb over 400,000 tonnes per annum.

For high calibre use, such as the manufacturing of plastics and vehicle components where granules between 200 microns and 150 microns are required, the selling price would be in excess of EUR 800 (AUD 1,070) per tonne.



The production capacities are influenced by the design of the material transport, the type of raw material and the number of shifts worked. The initial arrangement was based on the simultaneous production of different qualities of granules using two or three machines as one “bank” and keeping one in reserve.

As a result of the data obtained from the large scale test manufacturing and potential customer requirements, it has been decided to implement a batch processing system, where only one type of granule is produced at any one time.

EPDM rubber is able to be processed on the existing machinery within the existing design. Due to its softness, the production of 300-150 micron EPDM granules is almost impossible by methods other than the Green Gum technology. The mechanical demands on the machines are however greater than with the “normal” granules and hence require a higher level of “on the shelf” spares and a higher maintenance frequency.

Scope of Operations

The initial focus will be on Europe, however there is the possibility of licensing and royalty structures for Australia, India and other target markets. The scope of operations will include production of rubber granules, warehousing and transportation to the end user. Licensing and franchise-type operations may be possible in markets outside of Europe, but Green Gum intends on keeping control of the technology within Europe in order to maximise profits.

Licensing and franchise structures will be considered outside of the European market

Ongoing Operations

Used tyres are a logistical and environmental challenge the world over. If Green Gum could vertically integrate back down the supply chain by collecting used tyres into various local storage depots, cleaning and striping prior to the rubber being sent to plants for the manufacture of granules then this would mean that raw materials would be basically free.

The existing plant has ample closed storage space to store over 3 million used tyres. Government subsidies are available which actually pay for the controlled and verified collection and recycling of tyres. Under a proposed business model, Green Gum would receive approximately EUR 2 per collected and re-utilised tyre.

Development Plan

Development Strategy

Green Gum's current priority is to establish production credibility, focus on scaling the existing technology and for the plant to be operating at full capacity. The company will then focus on gaining significant market share in Europe before expanding globally to other target markets. European road builders will purchase the product initially, however Green Gum plans to build more capacity with a network of manufacturing plants within close proximity to end markets. However, in order to protect the intellectual property of the Green Gum technology, the company intends to keep the manufacturing in Hungary for the next 3–4 years. Capacity will be increased as required.

Green Gum's current priority is to establish production credibility

As with all of its businesses Astra is willing to establish strategic relationships with major end users.

Green Gum has future plans to produce its own raw material from collected rubber tyres. This is planned for late 2015, once various permit procedures have been satisfied. The plant has capacity for storage of the materials and machinery will be purchased and modified.

Management Plan

Company Organisation

There is a possibility of introducing a centralised Board of Directors to oversee all of the operations based in Hungary (T-Steel, Carbony and Green Gum) to report back to Astra on a combined basis. This is still to be discussed and determined.

There is potential for a centralised management structure for Astra's business operations in Hungary

The rationale behind a centralised management structure for business operations in Hungary is to maximise management control, accountability and to ensure a proper corporate structure is maintained and acceptable to investors.

Astra's technology based projects located in Hungary and possibly in other locations in Central Europe at a later date may be centralised under one local Board of Directors and a Supervisory Board. Creating an organisational structure in this way will allow for full intellectual utilisation of the current informal Hungarian management team and provide a high level corporate structure. The centralised board should oversee t-Steel, Green Gum and Carbony.

The project management of Carbony will require a high degree of control due to its complexity and international ramifications, as well as its earning potential for Astra investors. The management of the prototype development and following commercialisation process should function in a similar fashion as proposed for Green Gum. This will involve having a plant manager, a technical director and marketing manager. These positions should report directly to a designated director on the board.

In very general terms, Green Gum will have a plant manager, a technical director, and a marketing manager. These positions will report directly to a designated director on the board.

Management Team

The management team includes Mr Peter Laszlo who has established the Carbony and Green Gum projects along with industry specialists.

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