

The Product Accelerator Model of Engagement of Researchers with the Manufacturing Industry

An effective model of engagement to penetrate niche export markets with innovative products

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Abstract

The Product Accelerator model is an effective way to collaborate with the industry by engaging researchers and academics with a deep understanding of science knowledge to identify the missing science and technology gaps, through interacting and accessing new science and technology. This leads to rapid evolution and application of new technology.

The Product Accelerator is a New Zealand government funded programme hosted by the University of Auckland established to support the manufacturing industry in New Zealand. The model of engagement across sectors and the value chain involving technology and industry partners and the service providers in Sri Lanka with the Product Accelerator capabilities in the R&D development in the manufacturing environment, has made it possible to commercialise some unique rubber products from Sri Lanka in the overseas markets.

Introduction

The Product Accelerator (PA) programme, hosted by the University of Auckland, evolved at eight Universities and Crown Research Institutes (CRIs) through the last decade to provide capability for NZ companies with opportunities to innovate in materials science initially, and it has progressively expanded its reach to all

economically important manufacturing areas, engaging with all regions throughout the country.

Although each University now has a science commercialisation programme to connect entrepreneurial researchers with expertise in various technologies, who are focused in their area of research, it is now clear that in R&D driven economy a great deal of effort and money is wasted by the academics' in trying to promote their new findings or innovations and push them into manufacturing environment. This model has now been replaced with an industry pull process that the Product Accelerator has adopted, where the companies with R&D culture and people with deep industry knowledge can identify the technology gaps, and access new science and technological capabilities available from the government institutions. This has led to rapid evolution and application of new technology at minimum risks to the companies.

The connects businesses seeking specialist expertise, to talent within the universities and the wider R&D ecosystem, to solve real and diverse challenges in our market. It operates a 'best team' approach nationally for each unique challenge, bringing specialists and industry experts from government funded R&D institutions and the universities so that the research functions make it the only partnership of this nature in NZ. The Product Accelerator, supports the manufacturing industries

Karnika contributes to NZ Product Accelerator as the Senior Industrial Materials Specialist and a Project Lead. She has a background in rubber, plastics, composites and coatings and interests in sustainable manufacturing. Currently, she is engaged in several industry-funded projects in multidisciplinary technology platforms. Karnika has worked in the industry and has academic experience at the University of Auckland. She is co-supervising postgraduate students and has several publications in her credit.

Karnika has her PhD from University of Aston, UK. Before migrating to New Zealand in 2001, she was the Deputy Director Research (Technology) at the Rubber Research Institute of Sri Lanka. She has won numerous awards including Commonwealth scholarship and worked on several projects on funding from NSF, NSERC, CIDA, UNIDO, CFC and Malaysian and Australian government funded assignments on rubber related projects.



to increase export revenues and create new market opportunities through the development of commercially driven technology platforms and our mission is to connect NZ Industries with the best science and technology teams from across our network and assist companies with new product development, problem-solving, and embedding technology innovation through the “missing science” in the NZ research and development ecosystem. Every country should atleast have one strong group funded by the government working on R&D on this effective “Industry Pull” model.

The Product Accelerator has developed high value potential technology platforms across 6 distinct Research Portfolios; Design Innovation, Energy & Emissions, Manufacturing Systems, Materials & Surfaces, Sensing & Automation, Soft Materials, Recycling & Bioprocessing, extending and integrating the The Product Accelerator network and enterprise engagement model to foster collaboration with NZ enterprises and researchers through a pull Science mechanism, and it involves four stages, Engage, Define, Connect and Deliver as shown in the Figure 1 below.

In brief, in the Engage stage, the Product Accelerator team explores the business opportunity with the client. Once the technology definition and translation are complete in the Define stage the team moves in to the most important third stage which is the Connect stage where the missing science to articulate the science and design capabilities are finalized and the “Missing Science” to take the innovation forward is identified. Once this is done the industry-funded project is managed under an experienced Project Manager to achieve the milestones defined in the proposal.

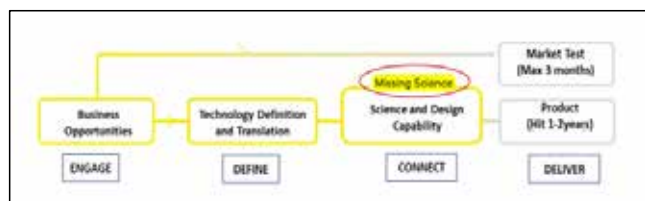


Figure 1 - NZ Product Accelerator Model of Engagement with the Industry

The Product Accelerator has a broad range of capabilities from practical business skills and technology development and application, as well as deep capability in materials and manufacturing areas. The Business Development team supported by an Advisory Board with most experienced and connected company CEOs in New Zealand. The technological capability centered in six portfolios: Materials & Surfaces; Manufacturing Systems; Bioprocessing & Recycling; Design

Innovation; Energy & Emissions; Sensing, Monitoring & Automation are shown in Figure 2 below.



Figure 2 – The Product Accelerator Portfolios and Technology Platforms

The National Testing Register hosted by the Product Accelerator covers a wide range of product performance testing materials analysis and characterisation, materials processing and manufacturing facilities is widely used by the New Zealand manufacturing industry for various reasons, not only for testing but also to get engaged with us to do short and long-term R&D projects and innovations.

A Case Study involving the Product Accelerator with Overseas Industry and Technology The partners –

This case study is based on a strategy to get lead companies in NZ involved in the Product Accelerator model of supply chain engagement to facilitate rapid commercialization.

The project involved developing and commercialization of a unique product, requested by the company EPI Group supplying pylons to the harness horse racing tracks as a safety measure in Australia and New Zealand. This mainly required the replacement of highly plasticized poly(vinyl chloride) (PVC) pylons failing in service with UV durable rubber-based pylons.

It is known that wrong material selection is one of the most common causes of failures experienced in product manufacture and successful material selection requires a judicious scientific approach in order to evaluate the requirements of the application.

The old PVC pylons failed in service within 6 months due to the low molecular weight plasticizer leaching from the highly plasticized rigid PVC. The addition of plasticizers that are by design not covalently bound to the polymer matrix, makes them highly susceptible to leaching. The potential risks related to some phthalates such as Di(2-ethylhexyl)phthalate (DEHP), a widely used plasticizer to render PVC soft and malleable,

include degradation of the polymer during service causing surface embrittlement and micro-cracking, yielding micro-particles that persist in the environment. It is known that the use of phthalates, into plastics as plasticizers comprise ~70% of the U.S. plasticizer market, and It is becoming under increasing pressure in Europe in several applications. A report by the US Green Building Council [1] has concluded that the risk of dioxin emissions from PVC puts it consistently among the worst materials interns of human health impacts [2].

On the other hand, the combination of unique morphology, excellent physical and mechanical properties make rubber, an appealing raw material for many industrial applications including tyres, rubber springs and vibration mounts. Rubber has high structural regularity, providing it with unique characteristics such as high tensile and tear strength, good resilience, high elasticity, excellent impact resistance, good low temperature performance and excellent overall performance and durability in service conditions. The case study discussed here show the development of a speciality product based on rubber with the supply chain engagement to meet the requirements of pylons exposed to harsh environment conditions in some the Product Accelerator rts of New Zealand and Australia.

The case study discussed here clearly shows that the model adapted by the Product Accelerator to create new market opportunities through the development and accelerate commercialization of innovative products for New Zealand companies have been successfully achieved. This unique working model administered by the Product Accelerator has enabled the local lead company to work closely with technology providers and service providers in developing new customized products needed by demanding customers. This model also allowed the lead company to access a manufacturing technology that was not readily available in the manufacturing industry in New Zealand and offer the global end users a high quality better performing product meeting all the requirements.

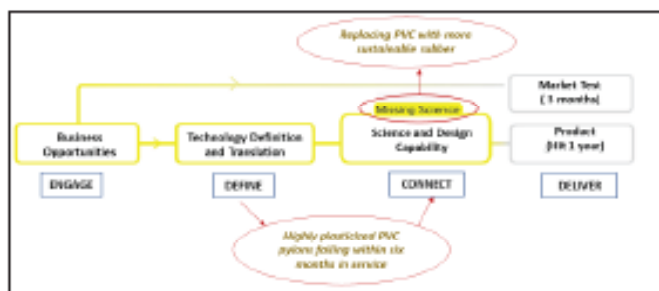


Figure 2 - Explore materials solutions for a sustainable product manufacture

The Product Accelerator model of engagement through technology the partners, industry the partners and

service providers to commercialize new products into local and international markets has prompted undertake this project to improve performance of pylons in service. The rubber-based pylons have been developed at an international technology partner institution, with some advice and technical inputs from the Product Accelerator network expertise.

Figure 3 shows the Product Accelerator model adopted for the project on the development of rubber pylon to get international technology the partners and service providers that enable the commercialization of the product within a short time frame. This approach constitutes another aspect of the Product Accelerator multidisciplinary research contribution [3-14] engaging the expertise in its network the partners in various fields. Testing of rubber pylons was done at the international service provider, Rubber Research Institute of Sri Lanka, RRISL. The manufacturing of prototypes and commercial scale production were done by Samson International Plc for the client, EPI Group in New Zealand.

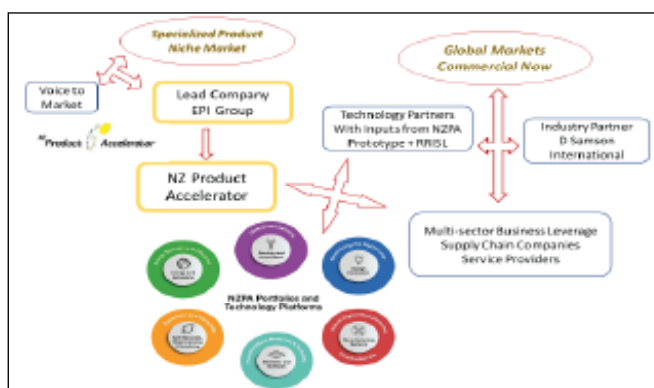


Figure 3 - Case Study on the commercialization of Rubber Pylons

The Product Accelerator Model of Engagement with the Supply Chain Partners

Rapid development of robust rubber pylon acceptable to the client in New Zealand was possible with the collaboration with a dedicated R&D at the leading rubber products manufacturer, Samson International Plc in Sri Lanka. A tax incentive given by the Sri Lankan government allowing to deduct double the expenditure incurred in R&D has been a great incentive to manufacturing companies because the finance sections always reject most of the R&D projects on evaluation of Return of Investment (ROI). These strategies and connections demonstrate alignment in more fundamental values – such as contributions to community, to support the developing countries to open new markets in develop countries and the global connections drastically support any kind of “Challenge Driven Growth”

A case study on a success story from a spun out from the Product Accelerator funded project focusing on missing science to solve an industry pull problem -

Out of several successful project outcomes, one of the projects created from the Product Accelerator funded research, the start-up company, Inhibit Coatings has successfully developed proprietary highly effective coatings to prevent the spread of the Product Accelerator pathogens and superbugs in hospitals, food processing facilities, workplaces, and health risk-prone environments with a technology partner, The Polymer Group Ltd in New Zealand, Inhibit Coatings is now an established antimicrobial and antiviral coatings company. Now working with large US and European resin and coatings companies and progressing international the patent protections and product approval. Inhibit floor and wall coatings are available through the partner The Polymer Group is another good success story of a challenge driven growth that the Product Accelerator is proud of.

Other products from Sri Lanka that penetrated the market and some pipeline product development through the Product Accelerator collaboration

Development and commercialization of high-impact resistant rubber electric plugs for construction sites and halogen-free fire-retardant rubber liners and mudflaps for Fire trucks fabricated in New Zealand for two industry partners through the Product Accelerator have also found markets in New Zealand. They are also manufactured at Samson International Plc in Sri Lanka as the supply chain industry partners for the Product Accelerator and commercialized in New Zealand.

There are few products in the development stage, and these include rubber sheets as trunk protectors in vineyards for a client in the agritech sector and a non-slippery, textured rubber tiles and nosing for the construction sector. If the trials are successful, these two products could fetch high volumes in the New Zealand market and the trend was again to approach Samson International Plc in Sri Lanka due to their track record in achieving the requirements of the clients and the milestones of the Product Accelerator contracted projects in shortest possible time frame. Following the recent audit held in November 2021 by amfori - BSCI at the Samson International Plc, the highest-grade compliance certification on global sourcing strategy on transparency and reliability and resilience and sustainability, has been offered to D. Samson International. amfori - BSCI, is a

company with a mission to enhance human prosperity, use natural resources responsibly and drive open trade globally, working towards the fulfilment of the UN Sustainable Development Goals (SDGs) and this Grade A compliance certification will help the company to attract more local and overseas customers promoting sustainable manufacturing principles and to capitalize more Challenge Driven Growth opportunities in the future.

Arpico, Richard Pieris Natural Foams Ltd is another company in Sri Lanka, developed a specially designed pillow for a start-up company in New Zealand through the Product Accelerator. The company has successfully commercialized the product out of natural rubber latex foam.

A project on value addition to geothermal waste, Colloidal Silica in sustainable tyre manufacture being led by the Product Accelerator and carried out in collaboration with the Rubber Research Institute of Sri Lanka and two industry the partners in Sri Lanka, GRI Tyres and Dipped Products collaborating and supporting sustainability. The Product Accelerator highly acknowledges the service extended by the RRISL towards fulfilling the lab scale trials on the Product Accelerator sub-contracted project to get engaged in this project. The industry the partners are actively participating at discussions with the client in New Zealand and carryout in-house research and run pilot scale trials. The client is intending to visit Sri Lanka in 2022 to negotiate the terms and conditions based on the techno-economic of the project outcomes.

Another challenging project that the Product Accelerator has undertaken involves developing sustainable wool carpets for the New Zealand and export markets. Currently used toxic carboxylated Styrene Butadiene (SBR) Latex to bind the wool fibres is neither environmentally friendly nor sustainable. The initial trials will be conducted at the RRISL as the potential technology the partners on this project to see the value for natural rubber latex from Sri Lanka as a suitable binder to replace C-SBR latex. There are various other opportunities that the Product Accelerator is exploring currently focusing on sustainable manufacturing as the Product Accelerator has the potential to turbo-charge the development of in the manufacturing technology platforms and identify quick action needed to facilitate any challenge driven commercialization efforts.

Acknowledgments -

This paper is the outcome of the engagements and commercialization activities encouraged by the Product

Accelerator program at the University of Auckland, funded by the Ministry of Business Innovations and Employment and the Callaghan Innovation.

The Product Accelerator appreciate and acknowledge the technical knowhow extended by the Senior staff at the Technology Departments of the Rubber Research Institute, Faculty of Technology at the University of Sri Jayawardnapura, and the Engineering Faculty of University of Moratuwa in Sri Lanka on various projects and the pilot scale and commercial scale manufacturing done by the private sector rubber products manufacturing companies as a part of our international collaboration.

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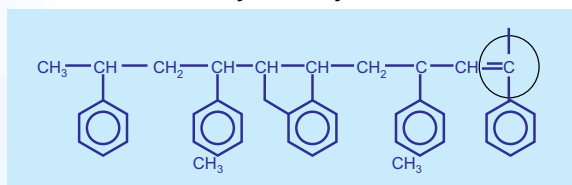
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Structure of the Hybrid Polymerized Structure



Technical Specifications

Parameter	Test Method	Value/Observation
Appearance	Visual	Pale Yellow / Transparent Beads
Softening Point °C	JIS-K-2207 Ring&Ball	95°C
Colour-Gardener	ASTM D-1544	6
Bromine No Br ₂ g/100g		35
C-5 Content %	H-NMR	30

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