MREPC
MALAYSIAN RUBBER EXPORT PROMOTION COUNCIL

MREPC INDUSTRY LINKAGE FUND

RESEARCH PROJECT PROPOSAL FORM

- *Please read and understand the Application Guidelines of the MREPC Industry Linkage Fund before completing the form;*
- *All information required in these application forms must be provided unless otherwise stated; and*
- *MREPC will not accept any incomplete application.*

For MREPC Use Only			
Date of Submit	Type of Fund	Reference No.	Processing Officer
23/08/17	*Full Grant*	*2017/001*	*Shafinaz*

ALL THE INFORMATION SUBMITTED IN THIS APPLICATION IS CONSIDERED PRIVATE AND CONFIDENTIAL

A. PROFILE OF RESEARCHER

1	**Institution/Organization**	*UNIVERSITI SAINS MALAYSIA*		
2	**Faculty/Department**	*SCHOOL OF CHEMICAL ENGINEERING*		
3	**Project Leader/Professor**			
	Name	**Faculty/Department**	**Email Address**	**Contact No.**
4	**Deputy Project Leader**			
	Name	**Faculty/Department**	**Email Address**	**Contact No.**
5	**Project Team**			
	Name	**Faculty/Department**	**Email Address**	**Contact No.**
	1.			
	2.			
	3.			
	4.			
	5.			
6	**Name of Collaborator [if any]**			
	Name of Collaborator's Institution			

B. PROJECT IDENTIFICATION

1	**Research Sector**	Dry Rubber/~~Latex/Automation/Infrastructure and Construction~~				
2	**Focus Product**	*Silica Dispersion Technology for Green Tyres*				
3	**Type of Research**	Applied/~~Experimental Development/Pre-commercialization/ Commercialization~~				
4	**Project Title**	*Development of inner liner compound based on specialty rubber*				
5	**Keywords** *(minimum of 3 keywords)*					
	i.	*Inner liner*				
	ii.	*Epoxidised natural rubber*				
	iii.	*Specialty rubber*				
	iv.	*Butyl rubber*				
	v.	*Air permeability*				
6	**Project Duration (Months)**	*27*	**Year Start:** **Month Start:**	*2017* *October*	**Year End:** **Month End:**	*2019* *September*
7	**Project Cost (RM)**	*50,000.00*				

C. OBJECTIVES OF THE PROJECT

1	**Project Status** *(Please tick on appropriate box)*
	☑ **New Project** ☐ **Modified/Extended** *(Please write the previous project title)* _____ _____ ☐ **Ongoing**
2	**Objective**
	1. To develop inner liner compound based ….. *2. To optimize the compounding ingredients ….* *3. To gain an understanding of rubber to ….* *4. To diversify the use of ….*
3	**Problem Statement**
	The recent years have seen an increasing demand for eco-friendly and renewable materials in tyres, due to the growing concern on global warming and the need to reduce carbon dioxide emissions. *For inner liner compound, the commercial polymer use one of petroleum based, butyl rubber. Butyl rubber has ….*
4	**Literature Review**
	The tyre is an assembly of numerous components that are built up on a drum and then cured in a press under heat and pressure. Heat facilitates a polymerization reaction that crosslinks rubber monomers to create long elastic molecules. These polymers create ….

5	**Project Summary**
	Butyl rubber is a co-polymer of isobutylene (97%) and isoprene (30%). The isoprene imparts sufficient unsaturation of the molecule to permit curing or vulcanization. The largely saturated chain structure of IIR determines its main properties – good resistance to oxidative and ozone degradation of chemicals …
6	**Related Research**
	Green tyre technology based on Ekoprena (S2012/GTT/2013(36)/438)
7	**References**
	https://www.hankooktyre.com.au/Tech/Structure.aspx?page... *Jones, G.E. (2000) 157th ACS Rubber Divisional Meeting-Spring 2000. Preprints. Dallas, Tex., 4th – 6th April, 2000. Paper 56. Exxon Mobile Chemical Co.* *Morton, M (1988) Ch. 10 Butyl and Chlorobutyl Rubber in Rubber Technology, 2nd Ed. Van Norstrand Reinhold Company New York Cincinnati Toronto London Melbourne. 249 – 273.*
8	**IP Search** *(Please tick appropriate items)*

☑	**Patent**	☐	**Copyright**
☐	**Trademark**	☐	**Industrial Design**

Provide Details:

[1] US Patent 8997812 B2 (2015) Pneumatic tire with specified inner liner. Sumitomo Rubber Industries Ltd.

[2] EP1798257 A1 (2005) Rubber composition for inner liner and tire having an inner liner using the same …

D. BENEFITS OF THE PROJECT

1	**Expected Output/Outcome**				
	i	**Commercialization:**	*(tick if any)*		
		Cost Saving	☐		
		New Product	☑		
		Existing Product Improvement	☐		
		Time Frame of Commercialization:	*(tick if any)*		
		Immediate	☐		
		Require Further Action	☑		
	ii	**Publication:**	*(tick if any)*		
		Journal	☑		
		Conference/Seminar/Workshop Paper	☑		
		Technical Paper	☑		
	iii	**Intellectual Property:**	*(tick if any)*	**Quantity**	**Expected Delivery**
		Invention	☑	☐	
		Patent	☑	☐	
		Trademark	☐	☐	
		Copyright	☐	☐	
		Industrial Design	☐	☐	
2	**Sectoral/Industrial Impact**				

Developing Technologies for Innovative and Value-Added Products and Industrial Support (Development of Expertise and Industrial Support in Tyre Technologies).

Commercialization and Promotion of Ekoprena in national and global market which supports National Key Economic Areas project.

Expected outcome:

1. *An understanding of tyre inner liner performance which relates to specialty rubber blends.*
2. *Increased export earnings from Ekoprena.*
3. *A positive impact to the environment with the use of non-petroleum derived resources.*

E. PROJECT RISK

	Low	Medium	High
Technical	☐	☑	☐
Financial	☐	☑	☐
Timeline	☐	☐	☑

F. RESEARCH APPROACH

1	**Background Information** *(Please include project justification)*
	With billions of tyres being produced and disposed yearly in this decade, tyre manufacturers play an important role in protecting the environment and its resources. Using sustainable materials for the production of new tyres, reuse, recycle, reclaim and burning by utilising the stored energy for used tyres are some of the available methods to save the environment and reduce the usage of depleting natural resources. *Natural rubber is labelled as one of the sustainable …*
2	**Methodology**

3	**Parameters to be recorded**
4	**Data Analysis**
	The key data are: *Processing behaviour of blends* *The physical properties of the inner liner blends* *Effect of surface area of fillers on air permeability and other physical properties* *Dispersion and miscibility of blends*

I. PROJECT SCHEDULE (PLEASE ATTACH EXCEL SHEET IF NECESSARY)

ACTIVITIES	20__												20__												20__											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
To study air permeability of elastomers ….		x	x	x																																
To mix filled black inner liner compounds, rheological behaviour and …				x	x	x	x																													
To evaluate the physical properties and air permeability of the moulded samples ….				x	x	x	x	x	x																												

II. PROJECT MILESTONES

No.	Target Date (dd/mm/yy)	Milestones
1	*28/02/2018*	*To complete screening of air permeability of elastomers*
2	*31/07/2018*	*To understand the effect of viscosity on air permeability properties*
3	*28/02/2019*	*To gather information on the best and level of fillers on air permeability properties*
4	*31/07/2019*	*To optimize the blend ratio of specialty NR/halobutyl for good air permeability properties*
5		

III. FINANCIAL REQUIREMENT (PLEASE ATTACH EXCEL SHEET IF NECESSARY)

Expenses Categories and Items	Total (RM)	Year 1				Year 2				Year 3			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Temporary and Contract Personnel													
Travel and Transportation													
Rentals													
Research Materials and Supplies	*28,000*	*5000*	*5000*	*5000*	*5000*	*4000*	*4000*						
Minor Modification and Repairs													
Special Services	*22,000*	*5000*		*5000*		*5000*		*5000*		*2000*			
Prototype Development													
Total Expenses	*50,000*	*10k*	*5k*	*10k*	*5k*	*9k*	*4k*	*5k*		*2k*			

Expenses Categories and Items	Year	Total (RM)	Details
Temporary and Contract Personnel	20__		
	20__		
	20__		
Travel and Transportation	20__		
	20__		
	20__		

Rentals	20__		
	20__		
	20__		
Research Materials and Supplies	20__	*20,000*	*For purchasing specialty rubber, synthetic rubber and special chemicals*
	20__	*8,000*	*To purchase general chemicals and consumable chemicals*
	20__		
Minor Modification and Repairs	20__	*10,000*	*Payment for raw rubber characterisations, physical properties and microscopy*
	20__	*10,000*	
	20__	*2,000*	
Special Services	20__		
	20__		
	20__		
Prototype Development	20__		
	20__		
	20__		
Total Expenses		***50,000***	

G. DECLARATION

I / We certify that:

a. I / We have read, understood and agreed to abide by the latest version of the MREPC Industry Linkage Fund Application Guidelines;

b. The information provided in this application is true and correct to the best of my / our knowledge; and

Project Leader's Name :

Designation :

Identification Card No. :

Date :

Signature :

This section must be signed by an individual with the legal authority to represent the entity (institution or organization) in the signing of contract.

Endorsed by :

Designation :

Identification Card No. :

Date :

Entity's Official Stamp :

MREPC reserves the right to revoke application and withdraw approval if false information is submitted by applicant.