

Blo-Wiper: A Feasibility Study and Introduction of New Methods to Approach National Car Development Project (A Case Study for Malaysia Small Medium Enterprise-SME)

Muhammad Zaidi bin Mohtar and Norli binti Umar

Techno Brozek Enterprise, Melaka, Malaysia

E-mail: technobrozek@gmail.com

Abstract. Malaysia is the only country in South East Asia has local capability to manufacture car from concept until mass production. The manufacturing sector has contributed as the largest Gross Domestic Product (GDP) for Malaysian economy. Thus, the decision of new government elected on 2018 to start a new national car project is the best decision to boost manufacturing sector to the next level. Currently, involvement of Malaysian SMEs in automotive manufacturing sector is still small and this time needs to be improved. Thus, new methods are suggested to help more SMEs to take part in 3rd National Car Project. The Characteristics of Potential High Skilled Automotive Entrepreneur (C-POSITIVE) and Rapid Development of Automotive SMEs (RADAS) will help related government agencies to selected suitable candidates to be Malaysian automotive SMEs. Besides that, the authors have invented Blo-Wiper concept to improve conventional windshield wiper which is ineffective during heavy rain especially for countries located at equatorial climate like Malaysia. The Blo-Wiper concept using two rain droplets removing process; blowing and wiping shown significant result to increase driver visibility based on preliminary simulation study. This white paper is prepared by the authors to help Malaysian government in 3rd National Car Project.

Keywords: Blo-Wiper, Windshield Wiper, 3rd National Car Project, Smart Car, C- POSITIVE, RADAS, Equatorial Climate

1. Introduction

On 11-June-2018 in 24th Nikkei Conference on the Future of Asia, Malaysia Prime Minister, Tun Dr. Mahathir bin Mohamad has announced that a new elected government will work on a new national car to boost manufacturing sector [1]. In fact, the manufacturing sector is the largest contribution for Malaysian Gross Domestic Product (GDP). Hence, a new national car project called as 3rd National Car will further nourish the automotive manufacturing sector especially on development of new local vendors. Even though the past years involvement of Small Medium Enterprise (SME) in automotive manufacturing sector is small but it was successful to develop high skilled local entrepreneur. They are the people who are struggled to setup a manufacturing companies from paper of proposals until successfully produce various high precision automotive parts. One of this example is Azman Hamzah Plastik Sdn Bhd which started on 1989 as a small local vendor which supplying plastic injection part for Malaysian first national car, *Perusahaan Otomobil Nasional* (PROTON). Today, they are Tier-1 vendor for PROTON and also as a global supplier chain for automotive main players such as TOYOTA, DAIHATSU and ISUZU [2][3]. This successful story has inspired the author to propose a method to determine candidates which have abilities to take responsibility of government mission to develop local automotive SME. Characteristics of **Potential High Skilled Automotive Entrepreneur (C-POSITIVE)** to be proposed as general guideline to related government agencies that are involve in selection of local SME for 3rd National Car Project. Until now, there is no specific method to do this.

Normally, a project is awarded to a vendor based on the best quotation submitted by invited vendors. This qualified Original Equipment Manufacturer (OEM) vendors are registered in a database. For Malaysia case, such as PROTON has a club called Proton Vendors Association (PVA) and same also to *Perusahaan Otomobil Kedua* (PERODUA). The club name is *Kelab Vendor Perodua* (KVP)[4][5]. All vendors must comply with PROTON and PERODUA standards. Yet, they also must

pass the internal audits conducted by PROTON and PERODUA. As a result, only quality vendors that achieved this high level of standards are qualified to supply automotive parts to PROTON and PERODUA. Hence, this process is consuming a lot of time and capitals. This huge challenge caused difficulties among SMEs to sustain until the end of process. In this paper, a new method to be introduced to ensure more SMEs can be developed. The method is **Rapid Development of Automotive SMEs (RADAS)**.

Windshield wiper is widely used by almost vehicle such as car, truck, lorry etc.. The invention of windscreen wiper is date back over 100 years by Mary Anderson [6]. During that time, she was riding inside a trolley. Suddenly, she noticed that the motorman needs to stop the trolley when to remove snow and sleet from the front window. From that observation, she designed a device called window cleaning device that operated manually by hand via a lever inside the vehicle. After 19 years later, a pair of brother William M. and Fred G. Folberth invented an automatic windshield wiper powered by air engine on 1922. The automatic windshield wiper was constantly cleaning the windscreen compared with manually cleaning by hand. Then, Robert W. Kearns realised that a continuous windscreen wiper was blocking the driver vision during light rain. He got an idea to improve the operation of windscreen wiper from continuous operation to intermittent operation. On 1970, he discovered that in most cars was being used his technology [7]. The revolutionary of windshield wiper can be seen on below images.

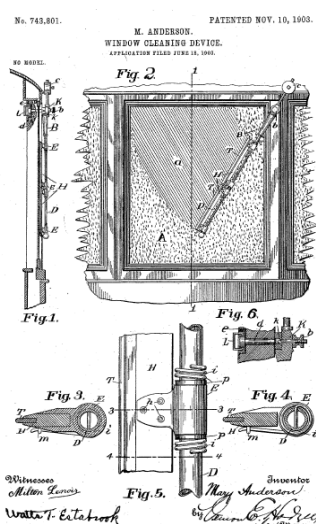


Figure 1.0 Windshield cleaning device invented by Mary Anderson (1903)[8]

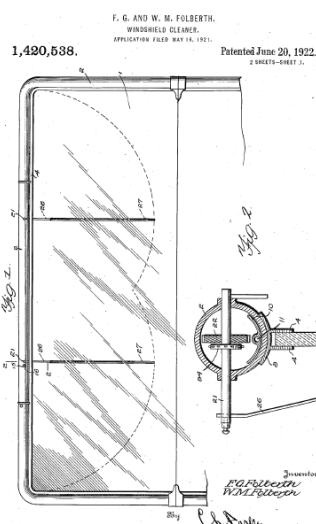


Figure 1.1 Windshield cleaner invented by William M. and Fred G. Folberth (1922)[9]

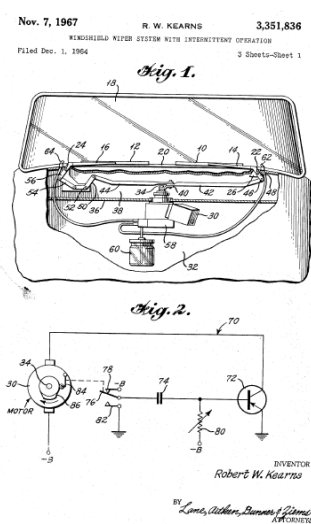


Figure 1.2 Windshield wiper system with intermittent operation invented by Robert W. Kearns (1970)[10]

However, the concept of windshield wiper invented by William M. Folberth is used till today. Unfortunately, revolutionary of windshield wiper is stagnant even though the current windshield wiper concept still having problems not yet solve. Currently, most cars are equipped with rain drop sensor that will automatically activate wiper when rainy and the rotation speed can automatically adjust based on rain density. Cadillac is the first model of General Motor (GM) introduced this feature on 1996 [11]. Although the term “Smart Car” is familiar with rain drop sensor feature, this “smart feature” still not improves driver visibility through windshield during heavy rain. Figure 1.3 shows the author bad experience driving in heavy rain. The visibility of road lines and front vehicles are blurred despite the windshield wiper rotating at the maximum speed and the condition of the wiper still good. Heavy rain is normal for equatorial climate likes Malaysia yet intensity increasing during Monsoon season. Sometimes, it's take hours to stop. Therefore, driving at this bad condition is dangerous and contributing for road accidents. A research conducted by Malaysia Institute of Road Safety Research (MIROS) stated that rain is a prominent factor for road accident happened compared to the other factors. Inside Table 1.1 contains the total number and percentage of road accident at highway according to weather classification [12].

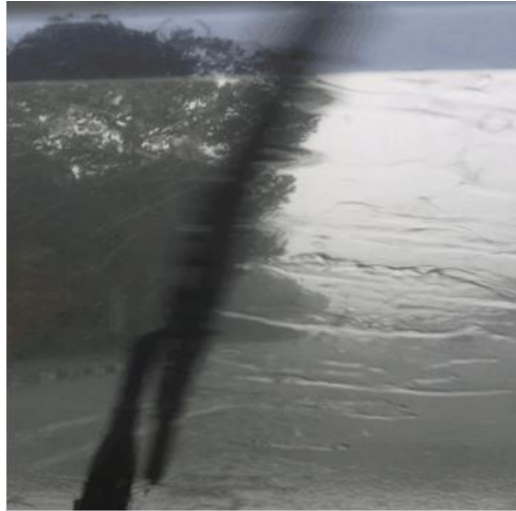


Figure 1.3 Bad visibility through windshield during heavy rain

Table 1.1 Summary of accidents at highway according to weather classification (2003-2007)[12]

Weather	Total	Percentage
Fine	26919	72.92
Rain	9809	26.57
Windy	87	0.24
Foggy/Haze	102	0.28
Total	36917	100.00

Based on Malaysian researchers study, the mean annual rainfall in Malaysia is significantly considered high at 2500mm and the readings are vary from 1500mm to over 4000mm annually which is depend on places [13]. While at extreme conditions, the highest and lowest rainfalls are 5687mm and 1151mm respectively. Furthermore, the highest average number of rain per day is 247 days. By comparing the data of rainfall at United States of America (US), the mean annual rainfall is in range from 200mm to 1500mm which is much lower compared to Malaysia. The highest and lowest rainfalls are 1455mm and 203mm respectively [14]. See Table 1.2 below for side by side comparison. As summary, mean annual rainfall for Malaysia is more than three times compared to US. Meaning that, the conventional windscreen wiper which originally invented in US is less effective to be used in Malaysia and others equatorial climate countries.

Table 1.2 Comparisons of Rainfall Data between Malaysia and US

Rainfall Data	Malaysia	US
Mean Annual Rainfall (mm)	1500 - 4000	200 - 1500
Highest Rainfall (mm)	5687	1455
Lowest Rainfall (mm)	1151	203
Highest Average Number of Rain Perday (days)	247	Not available

Hence, the author invented a new concept of windshield wiper that will improve the conventional design of windshield wiper called Blo-Wiper. **Blo-Wiper** is an acronym for **Blow Wiper**. The new design will enhance functionality of wiper by using combination of two removing process; blowing and wiping. In this paper, the author will explained a feasibility study conducted to compare result of removing rain droplet between conventional windshield wiper and Blo-Wiper. Blo-Wiper is one of few futuristic technologies currently develop by Techno Brozek Enterprise to meet Malaysian Standard as highlighted in *Garis Panduan Kelulusan Jenis Kenderaan (Pindaan) 2015* by *Jabatan Pengangkutan Jalan* [15] and comply with international standard such as UN Regulation 43[16].

2.0 Methodology

For Malaysian manufacturing sector, SMEs are defined as firms with sales turnover not exceeding RM50 million or number of full-time employees not exceeding 200 manpower [17]. Detailed definition of SMEs category, namely micro, small and medium as explained inside Figure 2.1 below.

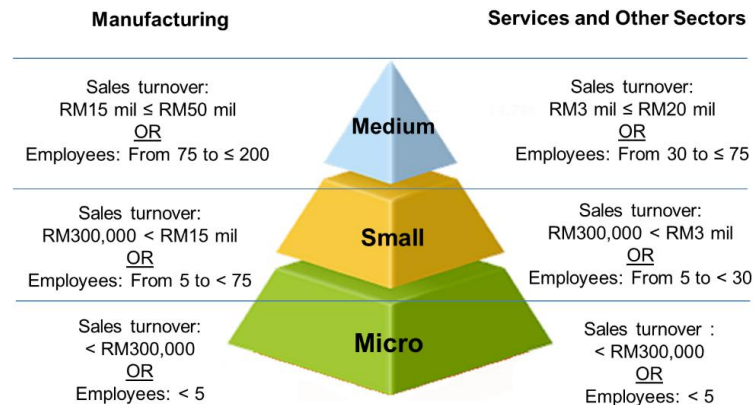


Figure2.1 Malaysian SMEs Category [15]

On early development stage, a SME are highly depends on ability of company owner. The owner characteristics are important to drive company from 5 employee to 200 employee and increase sales turnover from RM300 thousand to RM50 million. Thus, to develop a successful automotive SME must start from selection candidate of SME owner. The owner must able to;

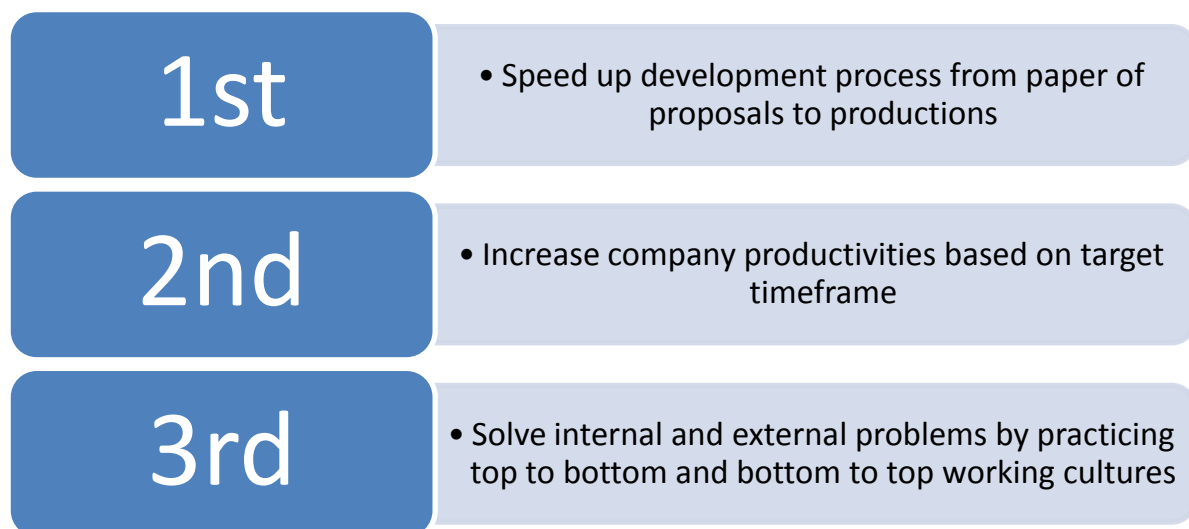


Figure 2.2 Three Critical Abilities of SMEs Owners

Based on above three critical abilities, the author proposes Characteristics of Potential High Skilled Automotive Entrepreneur (C-POSITIVE) as a method of selection the automotive SMEs.

On the other hands, only small numbers of SME are interested to invest in automotive manufacturing because of the challenge is too big yet to catch the production deadline in short period of time. Therefore, chances of success are very small. As a result, the government can't achieve their objective even though a lot of trainings, grants, loans are given to SMEs. Generally, the main challenge that SMEs always face can be divided into **4M**; **Man**, **Method**, **Machine** and **Material**. They are still new in the automotive manufacturing process. In addition, all of these 4M are still unstable.

Unless, enough Research & Development (R&D) time is given to them. The less time given, the low quality and quantity of mass production parts will produce. In this case, the critical factor is to have enough R&D time. Details are explained inside Figure. 2.3. From this finding, the author proposes Rapid Development of Automotive SMEs (RADAS) to solve this issue.

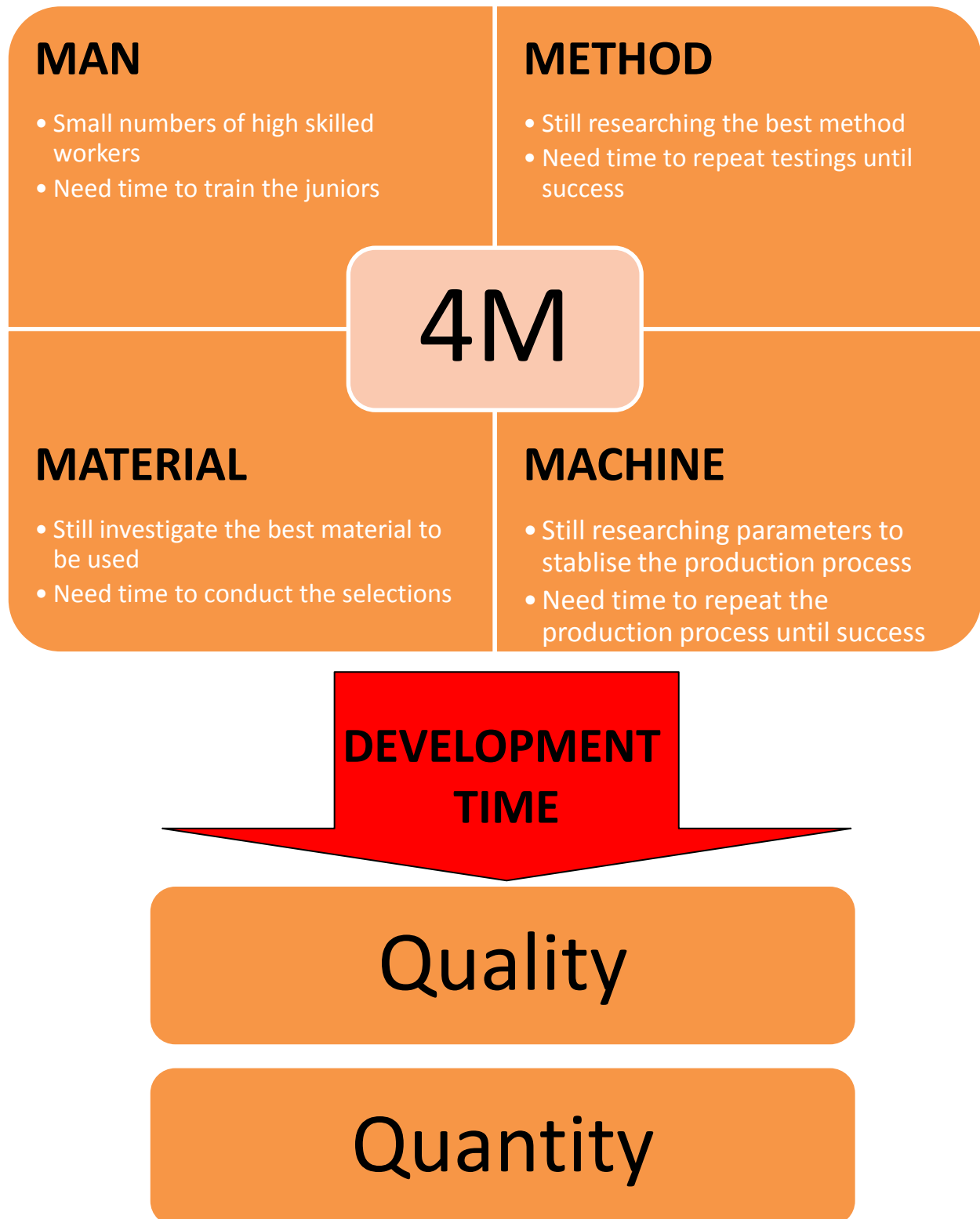


Figure 2.3 The Main Challenge Face by SMEs

According to the author investigation, the conventional wind shield wiper has thin line rain droplets removing area. During heavy rain, the rain droplets intensity and volume are very high. At this condition, the fastest rotation speed of windshield wiper moving is still ineffective to remove rains droplets. It is because the accumulation of rains droplets on the windshield is too dense in short time. The Figure 2.4 shows pictorial of this problem.

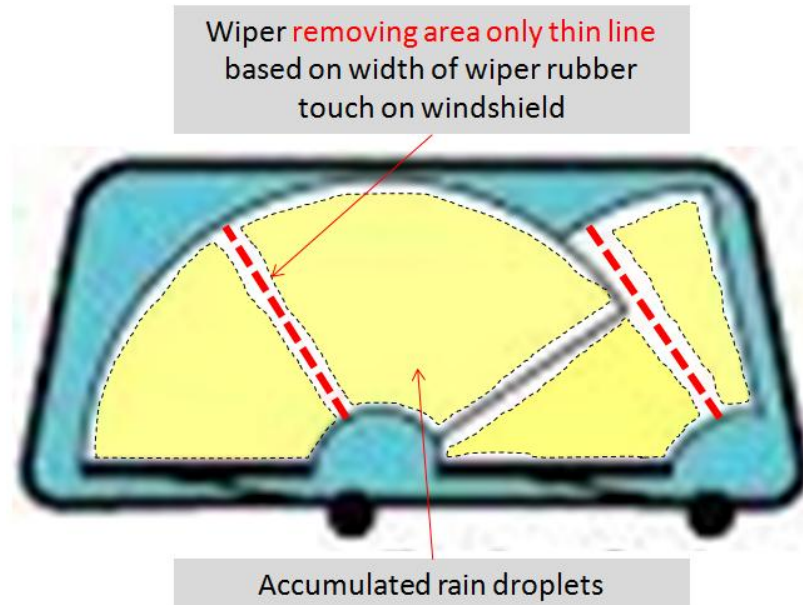


Figure 2.4 Conventional Windshield Wiper Removing Area

To solve this issue, the author suggests using air blow to wider the wiper removing area. Air is naturally transparent, light and it's free. Thus, it will not blocking the driver vision. The strength of air blow can be adjusted to increase the removing area. Refer to Figure 2.5 below for the details.

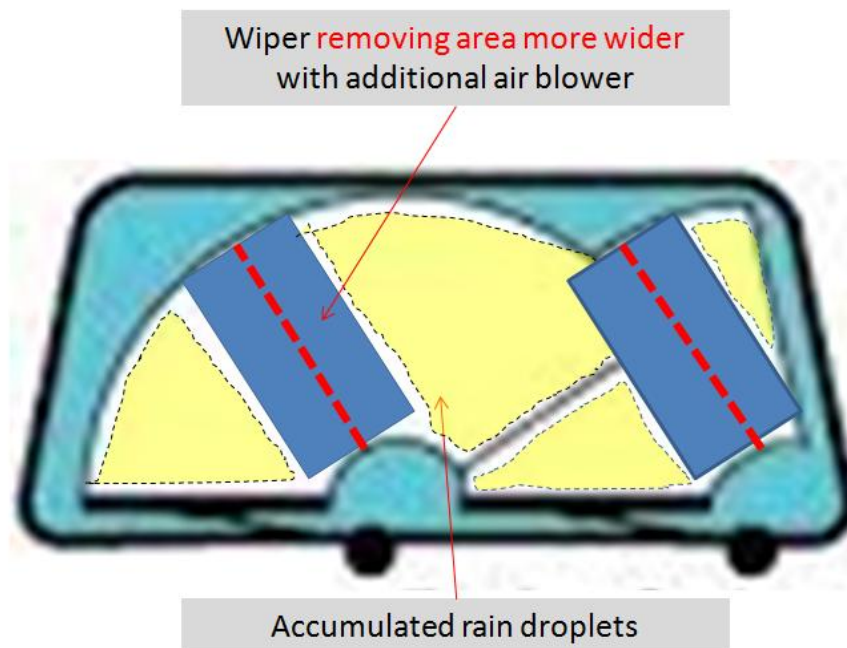
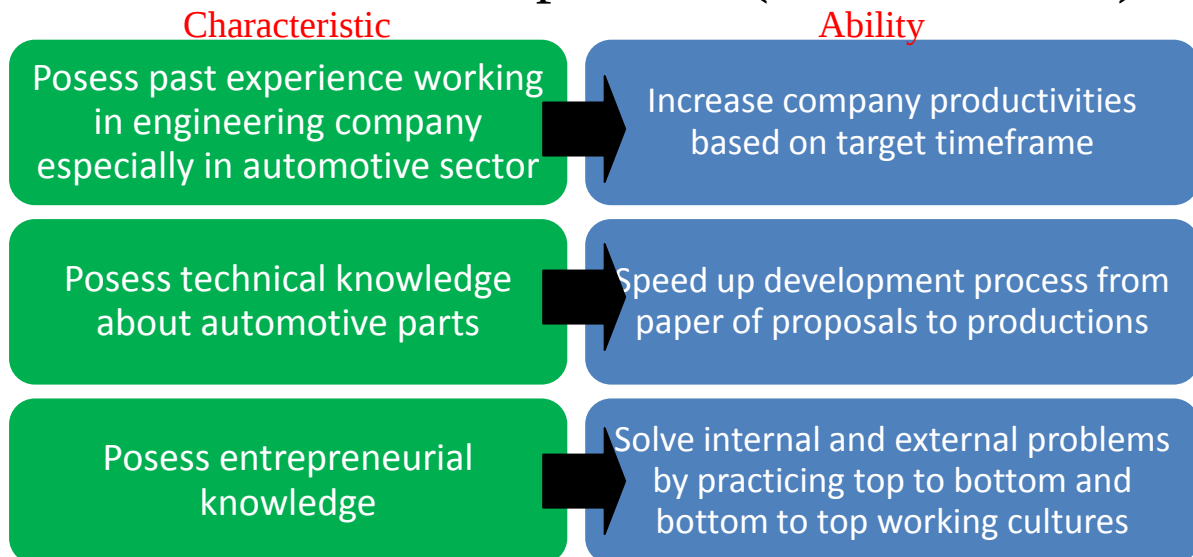


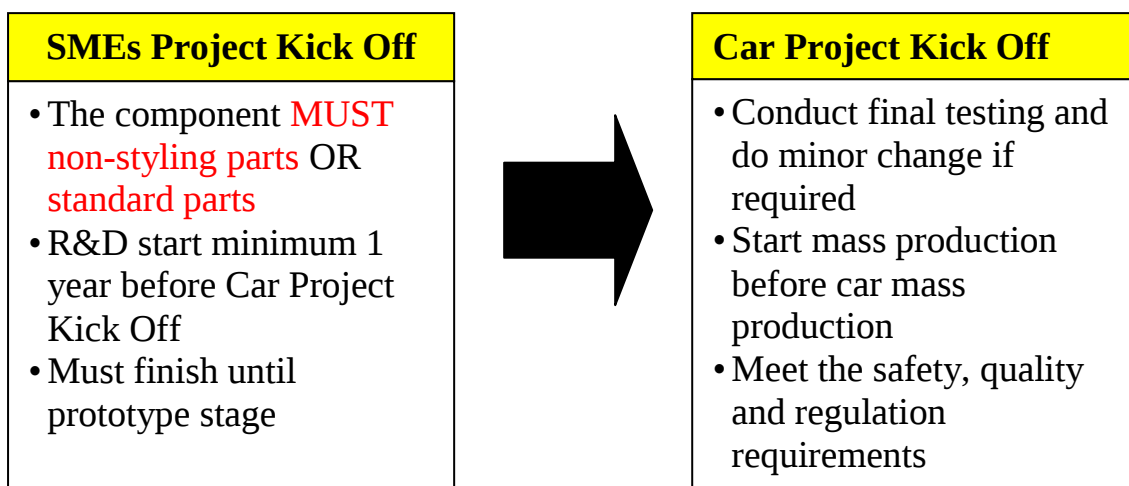
Figure 2.5 Windshield Blo-Wiper Removing Area

2. Results

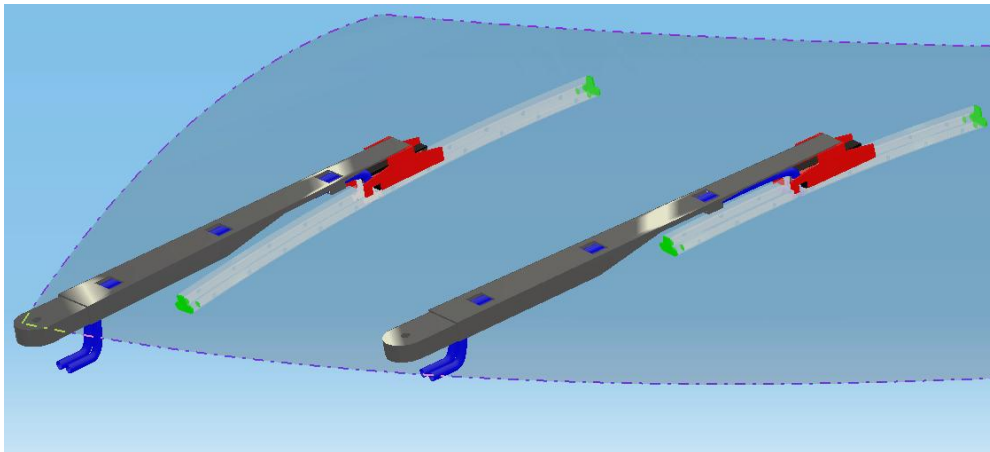
Characteristics of Potential High Skilled Automotive Entrepreneur (C-POSITIVE)



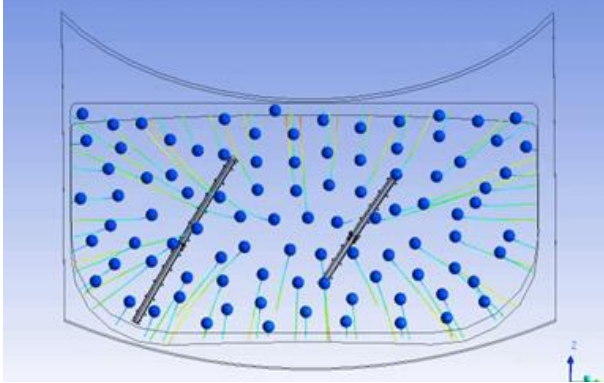
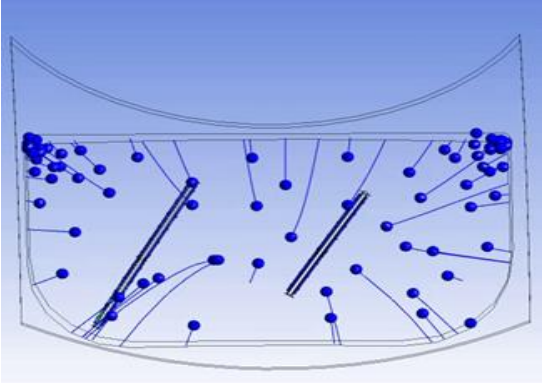
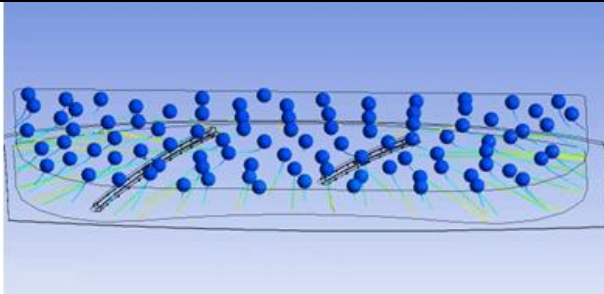
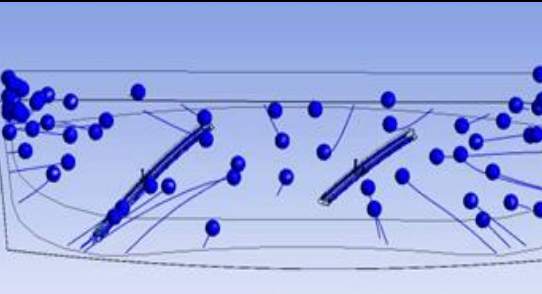
Rapid Development of Automotive SMEs (RADAS)



Conceptual Design of Blo-Wiper



Comparison of Rain Droplets Pattern between Conventional Windshield Wiper and Blo-Wiper (Preliminary Simulation Result)

CONVENTIONAL WINDSHIELD WIPER	BLO-WIPER
TOP VIEW	TOP VIEW
	
FRONT VIEW	FRONT VIEW
	
Blo-Wiper result shows less number of rain droplets near the wiper compared to conventional windshield wiper	

3. Conclusion

The authors have suggested new methods for Malaysian SMEs to take part in National Car Project 3.0. Hopefully, Malaysian government can consider the Characteristics of Potential High Skilled Automotive Entrepreneur (C-POSITIVE) and Rapid Development of Automotive SMEs (RADAS) as general guidelines to help related government agencies to determine the suitable candidates to be developed as Malaysian automotive SMEs. It also helps to stimulate more SMEs to enter the automotive manufacturing sector. Besides that, the authors also propose new invention of windshield wiper called Blo-Wiper which is the designed can increase the driver vision during heavy rain. Our study result shows that Malaysia climate contributes to high volume of rains. Therefore, highly encouragement all vehicles to use Blo-Wiper concept to avoid road accident caused by bad visibility during driving.

Acknowledgments

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