

# The Next Wave of Air-Filled Tires

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**ABSTRACT:** *The air filled tires have been a domain design of the automobile industry for nearly a decade and they appear until today-although they are carrying risks of tires failure which could lead to injuries and death in road accidents. Alternatively, the airless tires have a lot of potential and capable to resolve existing tires deficiencies. However, to date, the airless tires are confined to be used on motorized golf carts or heavy equipment. The objective of this study is to investigate the awareness of Malaysian drivers on both air filled tires and airless tires. Through descriptive quantitative research with the structured interview on 100 customers whom were servicing their tires at 20 professional tires shops located at Kuala Lumpur and Selangor, the strengths and weaknesses of air filled tires and airless tires were examined respectively. As a conclusion, the existence of air filled tires and airless tires are two completely different technologies that have their own respective weaknesses that need to be overcome. We strongly believe that airless tire will represent the next step in a long innovation path for tire industry, while the air filled tire, we foresee this technology will continue for a long time to come. By learning from the Blue Ocean Strategy and by understanding the four action framework, we foresee the next wave of air filled tires would bring a revolutionary new tire technology which is beyond the air filled or airless tires narrow classification.*

**KEYWORDS:** *Tire Technology, Blue Ocean Strategy, Air Filled Tires, Airless Tires*

## 1. INTRODUCTION

When Benz invented a gasoline car in 1885, it was equipped with the steel-spoked wheels and solid rubber tires with his own design. In 1888, the air filled rubber tires were invented by Dunlop for his child's tricycle.

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Although the different inventions were initially taken off on different types of vehicles while the development continues, both solid tires and air-filled tires converged at the point of fulfilling the consumer's comfortability where the competition began. At the early stage, solid rubber tires were preferable over the air filled tires because of their durability and perception of tires solidness which would support the entire vehicles when it remains stationary or mobile. Yet, the solid rubber tires were unable to provide the same level of ride comfort as the air filled tires. When the consumer satisfaction dominated the market orientation, the popularity of solid rubber tires decreased, subsequently gave a window opportunity for the air filled tires to be developed further. Historically, the automotive air filled tires were firstly used and pioneered by Michelin Brother, Andre and Edouard in a road race from Paris to Bordeaux in 1895 (Thomson, 2017). This has become the key milestone of tires industry. From this moment onward, the air filled tires have been a domain design for the automobile industry and they appear until today. According to Brand Finance (2017), the tires industry are being dominated by a few big names of tires manufactures such as Bridgestone, Michelin, Continental and Hankook. The tires produced are either air filled, filled with foam (to eliminate the risk of losing air pressure) or to fill with pure nitrogen (more stable when temperature change happens on tires). The run flat tires which were introduced in 1980s are chained by higher cost which attract small market segment of customers who are meticulous on road safety. Even though, the air filled tires have dominated the market for more than a decade, they are carrying risks such as tire failure and blowout resulting from tire deficiencies which could lead to injuries and death in road accidents. Therefore, in order to reduce the number of accidents on roads, it is important to come up with a new solution to this problem (shakeel et al., 2018). In 2005, Michelin took the first step to introduce the world first airless tires named "Tweel" which combined both tire and wheel which can last longer resulting in costs saving. Since the design does not retain any air, the tires cannot go flat. Besides, it can be made to shed the water quicker and reduce the hydroplaning (Szondy, 2014). The head of Michelin Tweel Technologies, Ralph Dimenna (2014) stated that Tweel airless radial tire is the industry's first commercialized airless radial

solution (Michelin, 2014). It could be differentiated them from their competitors and enter a new market which could expand the existing business segment into a new level. As good as it is announced (shakeel et al., 2018), Tweel seems to have a potential in solving existing accident occurrence that involve tires failure. However, to date, the airless tires are confined used on motorized golf carts or heavy equipment such as rear tractor or military vehicles (operating in rugged activities) aimed to eliminate the risk of tires punctures on the construction sites or war zone. There is still lack of evidence the airless tires could be adopted on private cars on the road. By apprehend the innovation on the airless tires, this concept is supported by Kim and Mauborgne (2016) the “Blue Ocean Strategy”. The key concept of this theory is to generate new product and/or new service that differentiate itself from the existing offerings in the market. Therefore, the main objective of this research is to investigate the awareness of Malaysian Driver on both air filled tires and airless tires, which we hope that would provide some insights to the tires producers on the next wave of air filled tires (shakeel et al., 2019).

**1.1 RESEARCH QUESTION**

The overarching research question is: What are the awareness levels of air filled tires and air-less tires among Malaysian drivers?

**1.2 RESEARCH OBJECTIVE**

The purpose of this research is to investigate the awareness of Malaysian Driver on both air filled tires and airless tires.

**2.0 LITERATURE REVIEW**

**2.1 DEFINITION OF BLUE OCEAN**

In order to help the tires industry to generate the next wave of air filled tires, Blue Ocean Strategy created by Kim and Mauborgne by analyzing the commonalities in the method from previously successful products and services. From the analysis, Kim et al., (2016) induced that Blue Ocean is a new and uncontested market place that had yet to be explore. Similarly, Barros et al., (2013) agrees that Blue Ocean Strategy can be defined as an attempt to develop a new market. Furthermore, the main focus of Blue Ocean Strategy is to generate new products and/or new services that would differentiate themselves from the current one in the market.

**2. THE FOUR ACTION FRAMEWORK OF BLUE OCEAN STRATEGY**

The Four Actions Framework developed by Kim and Mauborgne (2016) is used to rebuild the buyer value elements in order to create a new value curve. Moreover, to break the trade-off between differentiations, four key questions will be poses to the industry as shown in figure 1. The first question guides the company to consider eliminating factors that bring no value in it. Sometime there is a fundamental change in the buyer’s value but for those companies that are focus on benchmarking one another tend to unnoticed the change. The second question lets the company to determine whether the product or service have been over designed in order to compete with their rival.

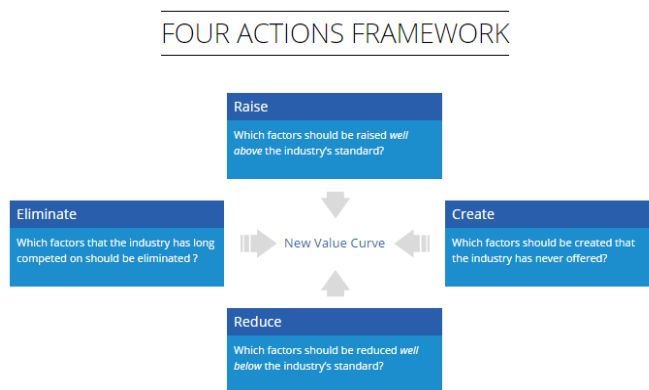


Figure 1: Four Actions Framework  
Source: Kim and Mauborgne (2016)

The third question pushes the companies to uncover and eliminate the compromises that industry force to the customer. The fourth question will help the companies to discover an entirely new source of value for buyers and create new demand (Kim and Mauborgne, 2005). Kim and Mauborgne believe that by following the first two question (of eliminating and reducing), the companies will gain an insight on how to lower the cost structure. Furthermore, they found that most of the companies rarely set out to eliminate and reduce their investment on factors that bring no gain to the companies. Meanwhile, the last two questions provides with insight into how to lift buyer value and create new demand. These two questions allow the organization to explore and reconstruct the buyer value element across the alternative industries. As a result, the companies can push beyond value maximization with existing factors of competition.

### 3. RESEARCH METHODS

The data collection on 100 completely answered respondents which took 3-week-time for this descriptive quantitative research was derived from the customers whom were servicing their tires at 20 professional tires shops located at Kuala Lumpur and Selangor. These big cities have many professional tires shops put our data collection at ease. Based on the researchers administrated questionnaire, the first criteria of selection on the respondents was, they have to know both air filled tires and airless tires. Once the respondent fulfilled the criteria, the structure interview was conducted. This was to ensure the data collection able to obtain complete information while the missing data or errors would be minimized. The questionnaire consisted of 2 sections, about the air filled tires and air less tires with their strengths and weaknesses respectively. A five point Likert scale was employed to measure the respondents, with one scale marked as “0” allowed respondents to express if he/she did not know the actual answer.

### 4. DISCUSSION AND ANALYSIS

From 100 respondents (as shown in Table 1), many of them knew the strengths of air filled tires, which justified their continuous use of these air filled tires. Yet, many of the respondents did not know the air filled tires require more force to start in motion.

Item	Detail	Frequency (Percentage)					
		I Do Not Know	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Strength of Air Filled Tires	Air filled Tires have the ability to absorb shock loads from impacts.	4%	4%	4%	6%	52%	30%
	They can be used off-road	4%	2%	5%	4%	53%	32%
	They produce lower noise when driving	4%	7%	4%	6%	55%	24%
Weakness of Air Filled Tires	They require more force to start in motion	13%	13%	25%	19%	19%	11%
	They can leak air which lead to tires flat and we need to pump air from time to time	2%	4%	4%	11%	58%	25%
	The air pressure can be affected by surrounding heat temperature	7%	7%	8%	15%	40%	23%
	Air filled tires are easy to be damaged	11%	11%	15%	31%	21%	11%
	Air filled tires have to be maintained constantly	4%	11%	17%	17%	30%	21%
	Air filled tires have a shorter life span compare to airless tires	13%	11%	10%	17%	34%	15%

Summarized by the Researchers

Table 1: Strength and Weakness of Air-Filled Tires  
Summarized by the Researchers

They knew the air filled tires need to pump air from time to time (mostly agreed every week once or once for every fortnight) and the tires have to be maintained constantly

since they are easily damaged after 7000km to 10,000km use. Meanwhile in Table 2, most of the respondents acknowledged and agreed on the strengths of airless tires. Most of them have seen the airless tires used on military vehicles which strongly associate with rugged activities that tires punctured has to be eliminated completely from the operations. Some of them have experienced the usage of airless tires on golf carts which gave a bumpy ride which was rather uncomfortable. As such, the technical aspects of airless tires on specific size fitting to specific vehicles and generate more heat were new to most of the respondents. After the introduction of Tweel in 2005, many companies start to conduct a research and new product development on airless tires.

Item	Detail	Frequency (Percentage)					
		I Do Not Know	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Strength of Airless Tires	Airless Tires will not lead to flat.	4%	7%	11%	13%	38%	27%
	They save more cost for longer term use	6%	7%	7%	11%	46%	23%
	They have higher resistance to damage	9%	7%	7%	17%	30%	30%
	Better fuel economy for the car since there will be no extra load of spare tires	7%	6%	12%	13%	45%	17%
	They use recyclable materials	7%	7%	4%	17%	32%	32%
	They help to reduce the number of accident associate with tires as they do not puncture	6%	10%	11%	11%	34%	28%
	They reduce maintenance cost	8%	6%	13%	6%	42%	25%
	They have longer wear life than air filled tires	6%	17%	8%	18%	42%	9%
Weakness of Airless Tires	They cannot be adjusted since different car needs different setting	17%	15%	9%	17%	21%	21%
	They produce a lot of noise	9%	9%	15%	21%	31%	15%
	They generate a lot of heat	20%	6%	7%	23%	31%	13%
	They costs more compare to air filled tires	13%	9%	9%	11%	24%	34%

Table 2: Strength and Weakness of Airless Tires  
Summarized by the Researchers

Bridgestone Group has introduced their second generation “Air Free Concept” at 43<sup>rd</sup> Tokyo Motor Show 2013 while Hankook Tire Group announced their new airless tires the HankookiFlex. The Hankook Group respond to this trend by announcing that the company has completed its ride and handling tests for its latest HankookiFlex, which is made from recyclable materials (Hankook, 2015). This trend showed that the companies were tapping airless tires as a new business opportunity and aimed to create a new driving experience for the user. From the data collected in this study, the customer

awareness on air filled and airless tires could be concluded as mid-to-high levels which are evidenced by the skewness moved towards a higher percentage on the answer of “agree” and “strongly agree”. However, this would merely indicate the higher level of awareness and understanding on different tire technologies. Hence, we need to dig further to get a better understanding on what is the market data actually means. This will be discussed at the part of conclusion.

## 5. CONCLUSION

To date, the existence of air filled tires and air less tires are two completely different technologies which serve two similar purposes: firstly, to support the weight of the vehicles (which is usually more than 50 times of one single tire’s weight) and secondly, allows mobility of the vehicles-when the activities of carrying, driving (acceleration, breaking, guiding), absorbing (absorb obstacles and irregularities of the road) are taking place. Meanwhile, the performance, the conformance, reliability, durability (of the tires) and comfortability of the users are the key quality dimensions on tires where all of the drivers would not tolerate for driving safety reason. When these two technologies are good in counter solving on each other’s weaknesses (durability and reliability) these two technologies also have its own respective weaknesses that need to be overcome (performance, conformance and comfortability) at the first place. Therefore, the skewness of the data collected affirmed that the customers aware on both the strengths and weaknesses of these two different technologies. We agree that airless tire represents the next step in a long innovation path for tire industry, while the air filled tire, we foresee this technology will continue for a long time to come. As such we argue, albeit the recent focus of the tires manufactures on airless tires technology is plausible, it is rather a one-sided development which has not resolve the fundamental weakness of the airless tire technology. It is suggested, instead of continuing this one-sided development, the manufacturers should take a fresh look, thinking on ways to tap both strengths of the air filled and airless tires in order to resolve their respective natural weaknesses. Learning from the Blue Ocean Strategy and by understanding the four action framework, the tires industry should have a new aim on creating new tire technology that would comply with the quality dimensions of the tires and fulfil them all without tolerance on any of the quality dimensions as mentioned above. By putting down the lenses of technological substitution where many of us would hypotheses ‘airless tire would replace air filled tire or vice versa’; thinking outside the box as an advice to the tires

manufacturers, we are looking forward a revolutionary new tire technology which is beyond the air filled or airless tires narrow classification.

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