



Mini Review

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Literature Review on The History of Bajaj Rickshaw Vehicles

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Abstract

The article presents a brief outline of the history of Bajaj rickshaw vehicles industry. Vehicle design, the incorrect usage of petrol and lubricating oil mixture, safety risks in riding rickshaw, and environmental impact were integral activities. Almost all of the engine designers mentioned in the article also were automobile designers, and a few went on to become major manufacturers of automobiles. All of these inventors and more made notable improvements in the evolution of the Bajaj rickshaw vehicles.

Keywords: History; Bajaj rickshaw; Design; Incorrect petrol-oil mixture; Environmental impact

Introduction

Rickshaw began as a two or three - wheeled passenger cart, called a pulled rickshaw, generally pulled by one man with one passenger. The first known use of the term was in 1887. Over time, cycle rickshaws, auto rickshaws, and electric rickshaws were invented [1]. Pulled rickshaws created a popular means of transportation, and a source of employment for male laborers, within Asian cities in the 19th century. Their appearance was related to newly acquired knowledge of ball bearing systems. Their popularity declined as cars, trains and other means of transportation became widely available. Auto rickshaws are becoming more popular in some cities in the twenty first century as an alternative to taxis because of their low cost of fuel and maintenance.

The word rickshaw originates from the Japanese word Jinrikisha, which literally means human powered vehicle [2].

A Brief Outline of History of the Internal Combustion Engine

There are several theories about its invention, which may be summarized into the following points:

It was invented in Japan in 1869 by Izumi Yosube, who formed a partnership with Suzuki Tokujiro and Taka Yama Kousbe to build the vehicles, having been inspired by the horse carriages that had been introduced to the streets of Tokyo a few years earlier [3-8].

An American missionary to Japan called Jonathan Scobie is also said to have invented the rickshaw around 1869 to transport his wife through the streets of Yokohama [9-11].

An American blacksmith called Albert Tolman is said to have invented the rickshaw in 1846 in Worcester, Massachusetts for a South American bound missionary [12].

In New Jersey, the Burlington County Historical Society claims an invention in 1869 by carriage maker James Birch, and exhibits a Birch rickshaw in its museum [13].

Though the origins of rickshaw are not entirely clear, they seem to be Japanese, and of Tokyo specifically. The most widely accepted theory offers the name of the past mentioned four inventors and gives the year of 1869 as the date of invention [3].

In the last quarter of the 19th century the rickshaw was spread all over Asia to Singapore (1880), China (1873) [4], and [14-16]. In the 20th century, the rickshaws were introduced To Durban city in South Africa, Kenya, Tanzania, Sudan and other areas of East Africa for short distance trips [17-22]. The 21st century has seen resurgence in rickshaws, because they are about 1/3 to 1/2 the cost of regular taxis. Therefore, they were spread all over the world to Asia, Africa, America, and Europe [23-26].

India is home to three quarters of the world's auto – rickshaws, which are three – wheeled engine vehicles that are hired to move both people and goods. These vehicles play an important role in urban transport in the country, being used for a wide range of trip purposes, often for trips that cannot be practically undertaken on the other types of public transport, at a considerably lower cost that would be incurred in a taxi.

Safety Risks in Riding Rickshaws

Auto – rickshaws are perceived to be unsafe, first because the vehicle itself is seen as hazardous and the drivers as poor vehicle operators, who are willing to overload their vehicles and at the same time make many trips in short periods of time.

Auto – rickshaws are seen as unstable and liable to turn turtle, due to a shunt from another vehicle, a bump in the road, or overly rapid speeds caused by the drivers, with the passengers being thrown against the sparse, hard metal interior, whose sole soft surfaces are the rear passenger bench and the driver's seat. The lack of doors means that the occupants could be thrown onto the road, with the potential for serious injury, even at low speed.

Air Pollution and Environmental Impacts

Auto – rickshaws have been seen as significant contributors to urban air pollution, and regrettably it is not included in policy making circles in Sudan. The rates of pollutants leaving the exhaust pipe including carbon dioxide, carbon monoxide and unburned hydrocarbons contribute negatively in human being's health in different forms of diseases ranging from chest infections to cancer [27-28].

Auto – rickshaws are thought to cause congestion in near future due to the impact of their increasing numbers and therefore, major cities would be prone to lungs related diseases and other dangerous impacts related to animals and natural environment surrounding these cities. Therefore, major cities must strictly regulate and rationalize the number of auto – rickshaws through a permit system, based on the belief that auto – rickshaw numbers would otherwise reach a level that would cause intolerable congestion which leads to serious human and environmental impacts.

The perceptions of auto – rickshaws amongst the middle classes, media, consumer organizations and policy makers are largely negative. The vehicles are seen as polluting, unsafe, and a significant cause of congestion and environment degradation. Auto – rickshaws are perceived as an intrusion into organized urban space and therefore, they should be tamed and controlled with strict policies and punitive penalties.

As stated above the two-stroke gasoline engine driven vehicles are major source of air pollution by their smoky emissions particularly in Asia and Africa. An immediate ban on gasoline – powered two stroke engine vehicles would be extremely difficult and costly because these vehicles are numerous and popular. Two immediate simple solution proposals which include use of correct mixture of lubricant oil to fuel and regular vehicle preventive and

corrective maintenance, which ultimately will improve air quality and increase the operation life of the vehicle [29] & [30].

The Usage of Auto – Rickshaw in Sudan

Auto – rickshaw which also called tuk tuk is used extensively in different parts of Sudan (i.e. urban and non – urban regions) as a mean of transport for short distance trips. These small size vehicles constitute about one – third of all transport population in Sudan according to the statistical records of Sudan National Statistical Bureau.

In Sudan there is a high misunderstanding of the correct mixture of oil to fuel among technicians and vehicles' mechanics and vehicles' drivers as they think that the engine will give its highest performance due to the increase of oil – fuel ratio. The oil – fuel proportion recommended by those technicians and/or mechanics may reach more than 12%. That means they do not abide with the operation instructions of the manufacture's manual. The manufacturer always recommends that for every liter of gasoline (i.e. Benzene) charged, a lubrication oil proportion of about 2% or 3% should be added to the fuel and should be agitated and mixed perfectly before engine's operation. To do this job, always the rickshaw is equipped with a calibration cup which has two graduated scales engraved on the outside surface of the cup. One of the graduated scales represents the proportion of 3% oil to Benzene, which ought to be used in summer season when the atmospheric temperature is high and therefore, the evaporation rate of the mixture is elevated. The other graduated scale of 2% is recommended to be used during winter when the atmospheric temperature is low and so the evaporation rate. Often, the incorrect mixture of oil to fuel (i.e. more than 5%) is detriment on the performance of the engine due to the increase and accumulation of carbon deposits inside the combustion chamber which minimize the size of the chamber and consequently cause a considerable drop in pressure and power of the engine. The carbon deposits formed during combustion may be inserted and consequently reciprocate between the piston and cylinder. This action causes scratches on the surface of the cylinder and leads repeatedly to engine overhaul maintenance.

Also, the increase of lubrication oil in the oil – fuel mixture causes major defects in spark plug terminal gap which in turn needs repeated and continuous maintenance or replacement of the defected plugs. Another limitation of excessive oil in the mixture is the formation of layers of carbon particles which blocks the exit of exhaust gases through the exhaust pipe, and this problem leads to a considerable drop in exhaust gases pressure and consequently, the exhaust gases are imprisoned inside the cylinder [31].

Conclusion

Rickshaws are seen as unstable and liable to cause accidents due a bump in the road, or overly rapid speeds caused by the drivers. Also, the lack of doors means that the occupants could be thrown onto the road, with the potential for serious injury, even at low speed.

Generally, the two-stroke gasoline engine driven vehicles are major source of air pollution by their thick smoky emissions. Two immediate simple solution proposals which include use of correct mixture of lubricant oil to fuel and regular vehicle preventive and corrective maintenance will improve air quality and increase the operation life of the vehicles.

From previous experimental work and the continuous improvement of rickshaw vehicles, it was found that the manufacturers' recommended oil – fuel mixture ratios of 2% in winter season and 3% in summer season are the suitable and optimum ratios that could be used by rickshaw drivers. The advantages of using these ratios could be summarized as follows: (1) longer life of engine, (2) divergence of overhaul maintenance periods, (3) less impact to the surrounding environment.

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Conflict of Interest

No conflict of interest.

Author

Osama Mohammed Elmardi Suleiman Khayal was born in Atbara, Sudan in 1966. He received his diploma degree in mechanical engineering from Mechanical Engineering College, Atbara, Sudan in 1990. He also received a bachelor's degree in mechanical engineering from Sudan University of science and technology – Faculty of engineering in 1998, and a master's degree in solid mechanics from Nile valley university (Atbara, Sudan) in 2003, and a PhD in structural engineering in 2017. He contributed in teaching some subjects in other universities such as Red Sea University (Port Sudan, Sudan), Kordofan University (Obayed, Sudan), Sudan University of Science and Technology (Khartoum, Sudan), Blue Nile University (Damazin, Sudan) and Kassala University (Kassala, Sudan). In addition, he supervised more than hundred and fifty undergraduate studies in diploma and B.Sc. levels and about fifteen master theses. The author wrote about forty engineering books written in Arabic language, and fifteen books written in English language and more than hundred research papers in fluid mechanics, thermodynamics, internal combustion engines and analysis of composite structures. He authored more than thousands of lectures notes in the fields of mechanical, production and civil engineering. He is currently an associated professor in Department of Mechanical Engineering, Faculty of Engineering and Technology, Nile Valley University Atbara, Sudan. His research interest and favorite subjects include structural mechanics, applied mechanics, control engineering and instrumentation, computer aided design, design of mechanical elements, fluid mechanics and dynamics,

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References

- (2013) Merriam Webster, "Rickshaw".
- Chamberlain, Basil Hall (1891) *Things Japanese: being notes on various subjects connected with Japan for the use of travellers and others.* K Paul, Trench, Trubner and company limited, Pp. 241–242.
- Hanchao Lu (1999) *Beyond the neon lights: Everyday Shanghai in the early twentieth century.* University of California Press; Pp. 348.
- James Francis Warren (1880–1940), *Rickshaw Coolie: A people's history of Singapore.* Nus Press, Pp. 14.
- Chris Carlson (2002) *Critical mass: bicycling's defiant celebration.* AK Press, Pp. 170.
- Stephen Mansfield, DK Publishing (2009) *Eyewitness top 10 travel guide series.* Tokyo Penguin, Pp. 84.
- Louis Fredric (2002) *Japan encyclopedia.* Harvard University Press, Pp. 424.
- Boye De Mente and Demetra De Ment (2010) *The bizarre and the wondrous from the land of the rising sun.* Cultural Insight Books, Pp. 94.
- David Diefendorf (2007) *Amazing but false: Hundreds of facts you thought were true but aren't.* Sterling Publishing Company. Pp. 223.
- Parker F Calvin (1990) *Jonathan Goble of Japan.* New York: University Press of America.
- Ed Sobey (2009) *A field guide to automotive technology.* Chicago Review Press, Pp. 172.
- William E Lewis (2007) *Through the heartland on U.S. 20: Massachusetts: (17) Volume 1: Ahistorical travel guide.* Publish America.
- (2011) Corson Poley Centre. Burlington County historical society, retrieved.
- Leo Suryadinata, "Chinese adaptation and diversity: Essays on society and literature in Indonesia, Malaysia and Singapore". NUS Press, National University of Singapore, Center for advanced studies, Pp. 37.
- Pamela Kanwar (2003) *Imperial Simla: the political culture of the Raj,* second edition. Oxford University Press, Pp. 176.
- Kwang Joong Kim (2003) *Seoul, Twentieth Century, growth and change of the last 100 years.* Pp. 164.
- (2010) EtheKwini Municipality Communications Department, edited by Fiona Wayman, Neville Grimmet and Angela Spencer, "Zulu Rickshaws", Durban, South Africa, retrieved.
- Mary Fitzpatric and Kate Armstrong, South Africa: Lesotho and Swaziland, "lonely planet", Pp. 308.
- A Adu Boahen (1985) *Africa under Colonial Domination (1880–1935).* UNESCO, International Scientific Committee for the Drafting of a General History of Africa, UNESCO, Pp. 666.
- Werner Voigt (1995) *60 Years in East Africa: The life of a settler,* General Store Publishing House, Pp. 32-35.
- Osama Mohammed Elmardi Suleiman Khayal (2019) *The History of Bajaj Rickshaw Vehicles.* Pp. 1-9.
- China travel guide, "Tiki travel". FB editions; Pp. PT 61.
- Boye De Mente, Demetra De Ment (2010) *The Bizarre and the wondrous from the land of the rising sun.* Cultural insight books, Pp. 95–96.
- Jay Heale, Zawiah Abdul Latif, Madagascar. culture of the world, Marshall Cavendish. 15: 75–76.

25. Madagascar travel guide (2013) Lonely Planet.
26. Pippa et al. (2010) Frommer's India. John Wiley and Sons, Pp. 15,57,156.
27. Ye Shun Hua, Zhou Wei, Song Jian, Peng, Bao Cheng, et al. (2000) Toxicity and health effects of vehicle emissions in shanghai. Atmospheric Environment 34(3): 419-429.
28. Jai Shanker Pandey, Rakesh Kumar, Sukumar Devotta (2005) Health risk of NO_2 , SPM and SO_2 in Delhi (India). Atmospheric Environment 39: 6858-6871.
29. Osama Mohammed Elmardi, et al. (2016) Study of the effects of excessive mixture of lubricant oil with gasoline in Bajaj engines (rickshaw). research thesis, Nile Valley University, Faculty of Engineering and Technology, Atbara, Sudan.
30. Osama Mohammed Elmardi, et al. (2016) Modification of silencer device in rickshaw. research thesis, Nile Valley University, Faculty of Engineering and Technology, Atbara, Sudan.
31. Osama Mohammed Elmardi Suleiman Khayal (2018) The Effect of using Excessive Oil-Gasoline Mixture on the Acceleration of Bajaj Rickshaw Vehicles, Global Journal of Researches in Engineering, J General Engineering 18(4): 11-16.