

# **The History of Bajaj Rickshaw Vehicles**

Dr. Osama Mohammed Elmardi Suleiman Khayal

Department of Mechanical Engineering, Faculty of Engineering and  
Technology, Nile Valley University, Atbara – Sudan

## **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

## **I. 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 19<sup>th</sup> 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].

## **II. 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:

- A.** 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 being inspired by the horse carriages that had been introduced to the streets of Tokyo a few years earlier {[3] – [8]} .
- B.** 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]} .
- C.** 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].
- D.** 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 19<sup>th</sup> century the rickshaw was spread all over Asia to Singapore (1880), China (1873) [4], and {[14] – [16]} . In the 20<sup>th</sup> 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 21<sup>st</sup> 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.

## **II. 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.

## **III. 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 beings 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] and [30].

#### **IV. 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].

## **7. Conclusions**

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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### 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 degree in mechanical engineering from Sudan University of science and technology – Faculty of engineering in 1998, and a master 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 under graduate 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, heat and mass transfer and hydraulic machinery. The author also works as a technical manager and superintendent of Al – Kamali mechanical and production workshops group which specializes in small, medium and large automotive overhaul maintenance and which situated in Atbara town in the north part of Sudan, River Nile State.