

Modified silencer and air intake system

National Second
Student



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Bhagwan Singh (23) is a student innovator with a few innovations and scores of other ideas. While in graduation he developed many innovations, the most promising among which is the modified silencer and air intake system for two-wheelers.

Born in village Kotra to Kailash Narayan Vishwakarma and Kalabai, Bhagwan Singh comes from a modest background. His father is an assistant sartor in a boutique while his mother is a housewife. Growing up was not easy due to the limited financial resources. However, he and his two brothers worked hard to study well and ensure a better future for their family. His elder brother Jaipal, a science postgraduate, is working as a lecturer in mathematics in a regional college while his younger brother Vinod is an undergraduate student. Bhagwan Singh himself is completing his post graduation in Geology (at the time of submission of his entry to NIF he had just entered his graduation).

Bhagwan Singh was shy and quite as a child. He liked being alone in his own world. He was average in studies, in fact did not like it much. Reading,

learning and remembering the syllabus was quite a bit for him. Everyday, he used to walk down to his school alone as he did not have many friends. In the school also, he kept to himself. Though he never had any surplus to buy things, he maintained a box where he kept all the things (mostly scrap) needed for his creative works, collected from all possible places. He recalls himself as a child playing with tape-recorder cassettes and making models of tape recorders and similar electric gadgets. Sometimes, his younger brother used to assist him in his work. Struggling to make ends meet, his parents and elder brother seldom took note of his avocations. All they mentioned to him was to also concentrate on studies and not to do anything wrong.

Life changed in class nine when he participated in a science exhibition and won a state level award for making a model of a JCB crane. Suddenly he became famous and everybody in his school knew him. His skill to make good projects started getting appreciated. This opened up a source of income for him too. He started making science projects for students with which he financed his studies as well as generated funds for his innovations. He started to dwell more in his innovations than in studies, for which he was reprimanded by his family. Left with no choice, he worked on his innovations after midnight when all other family members were fast asleep. His mother, understanding her son's desires, took special care of him amidst all the scolding at home and ridicule outside. His elder brother, being a student himself, was not able to support him financially but he always encouraged him.

He took a break from studies after class 12 in 2003 to prepare for engineering entrance but as he could not get through, he had to take admission in graduation in 2004. During his preparations he took electronics hobby classes at Jawahar Bal Bhavan, run by the State Government. There he met a couple of teachers who motivated him and egged on him to develop more innovations. Another major source of support was his school teacher and NCC coordinator.



Modifying the two-wheeler silencer

While facing problem commuting to his college everyday in the undulating terrain of Bhopal, Bhagwan came up with his E-Bicycle in 2005. In this E-Bicycle, he used a dynamo, which charged a battery. The power from this battery was used to run the bicycle when required. But the problem with this E-Bicycle was that due to the use of dynamo, the resistance increased and more effort was required to pedal.

While working on the E-Bicycle, Bhagwan started to think of ways to increase the mileage of two-wheelers so as to reduce the running cost saving money and fuel both.

Being a science student whenever he read about a new law or a theory, he tried to find its practical applications. He observed that the heat of the exhaust gases of vehicles remained unutilized. He started thinking for its useful application. He read a lot of material to understand the whole process and functioning of the engine and concluded that pre-heating of intake air may increase the combustion efficiency and hence the mileage.

He tried to develop two prototypes to harness the heat of exhaust gas, but failed on both the occasions. After some hard work, on the third occasion, he was able to develop a prototype that could preheat the intake air and partially exchanges heat with charge (the mixture of air and fuel). He replaced the silencer of his brother's moped (Hero Puch) with the modified attachment and took test drives with and without silencer. He observed an increase in the mileage by almost 25 per cent when this system was incorporated.

The modified silencer

The innovation is a modification in silencer of the two wheelers where part of the exhaust gas is used to pre-heat the air and charge leading to increased combustion efficiency of the engine. It results in the increase in the mileage by 25 to 30 per cent.

The exhaust gas enters the heat exchanger through the nozzle attached to the main exhaust line and supplies the exhaust gases from the same pipe to the heat exchanging chamber. One end of the modified intake air line is kept between the engine fins so that it gets fresh air easily and the other end of the pipes is connected with the filter. This line is made of copper. The additional chamber is situated behind the main chamber is connected with smoke outlet nozzle on the other side. Its purpose is to reduce the noise level. The aluminium covers are provided at both the sides of main chamber and make the device cool from the outside.

In this system¹, the intake air is passed over the exhaust manifold (silencer), which results pre heating of the intake air. NIF facilitated its testing at BIT Mesra, Ranchi. The test report mentions that the use of the modified silencer and the system for preheating of intake air increases the mileage by 25 to 30 per cent. This technology is still in the process of being refined so that it can be used at a wide scale and needs some adjustments in filter, intake manifold and the timing of fuel supply. NIF also filed a patent (1460/MUM/2009) in his name for the technology.

Bhagwan Singh is a serial innovator and has contributed many ideas and innovations a few of which are mentioned below.

Front wheel driven E-bicycle: It is a battery operated bicycle where the front wheel has been powered². It can be operated both manually and through a battery. However, further work is required on this as this may have some steering and braking issues.

Multipurpose jogging machine: This machine serves the dual purpose of exercising as well as electricity generation, which can be stored in batteries. This idea is not entirely new and NIF database has many such references apart from others available on the internet.

Electricity control board: It is an electric circuit that disconnects the power supply if there is voltage fluctuation for more than a preset time in seconds. Also when connected an appliance, this system switches off the

power supply whenever the load is less than a preset value. The technology may possibly be available but is not in much use either in industrial setups or at home.

Apart from these he has also developed a timer system that switches on/off a device as per the predefined value, centralized control system for electricity connections, theft alarm system, motorized wood cutter, etc. NIF supported some his innovations for prototyping apart from providing support for basic fabrication machines like hand grinder, welding station, etc. His work has been covered by local print media and also by Sahara Samay, C TV, Bhaskar TV and Raj News earlier.

Bhagwan Singh is a hard working, perseverant and an optimistic person. Apart from his scientific explorations, he likes motorcycling and watching television. He specially likes Discovery Channel and Hollywood movies. He continues to work away in small workshop and study as well. He mentions that one's head and heart should be at the right places. Doing innovations may be a passion but earning a living is also a reality and is necessary. He wishes to make a career in earth sciences and continue working on his innovations too, some of which, he hopes, may attract entrepreneurs. To the youngsters his message is "*Agar unka dhyān vigyan mein hai aur wo kam umar mein hi kaam shuru kar dete hain to wo satrah saal ki umar tak hote-hote apne naam kisi technology ka patent karva sakte hain*" (If they develop interest in science at an early age and start experimenting, they may have a patent in their name by the age of 17 years).

¹ Prior art discloses preheating method of intake air (for cold start) for small period of time (US 499164 4, US 7084374-August 1, 2006, US 7064293-June 20, 2006, US 4665880-May 19, 1987, US 5758610-June 2, 1998, US 4548186-Oct 22, 1985); heat exchanger for preheating of intake air (US 4723527-Feb 9, 1988 and US 4155338-May 22, 1979); use of external source of or preheating of intake air (US 4122679-Oct. 31, 1978, US 5655506-Aug. 12, 1997, US 4628889-Dec. 16, 1986, US 5205250-April 27, 1993, US 4516556-May 14, 1985 and US 5280776-Jan 25, 1994)

It also discloses modified auto engine for increasing the mileage (Sib Shankar Mondal, NIF database). However, it does not disclose the use of exhaust gas for preheating the intake air on a continuous basis, which results in the increased combustion efficiency (and hence the mileage) of the engine.

² <http://www.cruzbike.com/>

; <http://www.made-in-china.com/showroom/richardjian/product-detailueSxJPdKaGUg/China-128-Bldc-Motor-Front-Wheel-Drive-for-E-Bike-HD-1002-.html>