The Soleckshaw, powered by human and solar power, combines both environmentally friendly transport and less hard work for the driver.

**Photo: Jaideep Malaviya**

**Driven by the sun**

A newly developed solar powered rickshaw might make drivers’ lives easier without causing additional emissions.

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f you travel along the historic lanes and by-lanes of Chandni Chowk, the major street and market area in the walled city of Old Delhi, you cannot fail to notice the pedal cycle rickshaws. The cycle rickshaw is a small-sized local means of popular transport carrying 1 to 2 passengers in addition to the driver. It embodies many elements that are characteristic of India and her culture and generates a lot of employment. Nearly 3 to 4 billion passengers commute annually by cycle rickshaw.

However, driving a cycle rickshaw is drudgery. Bappa Chatterjee has been pedalling his cycle rickshaw in Old Delhi for ten years, carrying 20 to 30 passengers a day for an average of 10 Indian Rupees (INR 10 = € 0.15) per ride. He works 10 to 12 hours a day, seven days a week — and his callused hands and wiry frame bear witness to his punishing schedule. At the same time, many large cities in India have banned the cycle rickshaws from important roads for both reasons of congestion and also for passengers’ safety and comfort. It is usual in India that traffic runs on the principle of the survival of the biggest and the most able. Consequently the auto-rickshaw, which is a gasoline-based 3-wheeler, has replaced the cycle rickshaws and is now one of the chief modes of urban public transportation. But auto-rickshaws emit greenhouse gases (GHG).

To both mitigate the GHG emissions and to ease the aching limbs of men like Bappa Chatterjee, the Central Mechanical Engineering Research Institute (CMERI) at Durgapur in Eastern India designed and developed a solar rickshaw called “Soleckshaw” - a redesigned version of the cycle rickshaw that is dual powered – both solar and human. It has been prototyped by the Council for Scientific and Industrial Research (CSIR) as part of the CSIR-800 Science & Technology intervention. The Soleckshaw may very well be the first indigenously developed solar rickshaw.

Developed in a record time of eight months and weighing about 210 kg, the Soleckshaw is able to run at a speed of 15 to 20 km/h using a robust brushless DC motor operated off an 18 Ah lead-acid battery. “It also comes equipped with novel features like FM radio and a mobile phone charging point. The energy is transmitted to a gear system which drives the three wheels of the rickshaw. Though pedalling is not required, if pedalled, the Soleckshaw will gain power”, says Amitav Roy, senior scientist at CMERI. A typically charged battery can operate for 70 km before needing a recharge. The cost-effectiveness of the Soleckshaw...
has been engineered by optimizing the system around the most appropriate commercially available components. Only the novel sub-assemblies like the differential drive, the special hub motor with a regeneration capability and the light-weight solar panel need to be manufactured separately from the chassis, which is designed to give a comfortable ride even for senior citizens and the physically challenged. The Soleckshaw can be comfortably driven on level as well as uphill roads without any strain or imbalance.

Tested first at Durgapur city in Eastern India in August 2008, it was formally launched in the Chandni Chowk area in Delhi city on October 2, 2008, to mark the birthday anniversary of Mahatma Gandhi, the Father of the Nation. After the initial trial runs the motor design was modified to enable smoother pedalling, while simultaneously enabling battery charging while in motion, explains Pradip Sarmah of the Centre for Rural Development (CRD).

To charge the batteries a 1.95 kW capacity PV charging station has been set up on Delhi Metro Rail Corporation premises which will charge batteries of 600 Ah total capacity. The capacity is sufficient to bridge up to 3 sunless days. These charged batteries later transfer the charge to up to 10 batteries of 18 Ah using a DC in/DC out voltage converter switch mode power supply (SMPS) in the night. Thus a rickshaw driver has access to fully charged batteries when he starts his operations in the morning and can run them down during the day. According to CRD, this is more economical than charging the 18 Ah batteries of the Soleckshaw directly from the PV system. Secondly, on cloudy and colder days there would not be enough power available to charge the batteries with a direct charging method, thus depriving the driver of his income. Initially the Soleckshaw will ply between the Red Fort and the Old Delhi Railway Station and the charge per trip will be INR 15 (€ 0.23).

Here is a catch — the Soleckshaw costs INR 22,000 (€ 335) compared to INR 8,500 (€ 130) for a cycle rickshaw. The Indian government plans to alleviate the monetary issue for drivers by guaranteeing loans so that they can buy their own vehicles. An innovative business model is being developed with NGOs (non-governmental organizations) and corporate houses to make the rickshaw affordable.

An advanced version of the Soleckshaw is under development and will have better aesthetics, improved speed, a modern battery (Li-ion type), a hybrid transmission and a recumbent driving position to make it an engineering marvel. The present version is wide-bodied and if found to be unsuitable in the narrow by-lanes, it will then be suitably modified. It will be ready for a fully-fledged launch before the Commonwealth Games 2010 in New Delhi. The Soleckshaw is also to be introduced for visitors travelling to the Taj Mahal in Agra city.

The Soleckshaw promises to be a delight to tourists visiting India and, with its zero carbon footprint, create a niche for itself in the Indian transportation system.

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Further Information:
Council for Scientific and Industrial Research: www.csir.res.in
Central Mechanical Engineering Research Institute: www.cmeri.org
Centre for Rural Development: www.crdev.org
Central Electronics Ltd.: www.celsolar.com

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