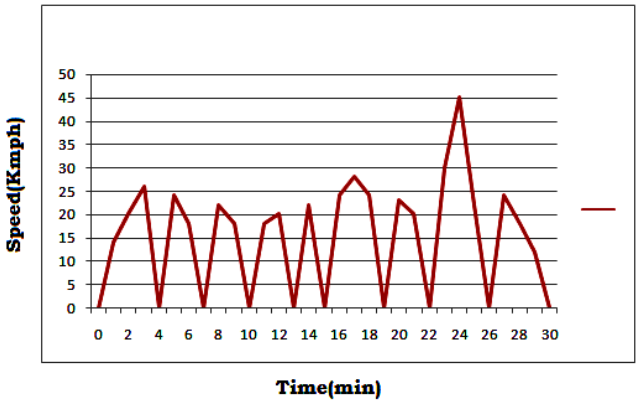

Figure 22. Typical 30 min evening driving cycle (tested with solar assisted electric auto rickshaw)

Table 8. Test results of electric auto rickshaw

Variable	Day time	Evening
Time (Hours)	2.5 (8.00-10.30A.M)	2.5 (6.00-8.30P.M)
Distance (Km)	35	23
Max.speed (Kmph)	45	45
Average Speed(Kmph)	27	22
No. of stops	20	32
Stoppage Time (min)	30	42

6. CONCLUSION

The paper has been taken up with the motive of bringing about a radical change in the way auto rickshaws contribute towards urban pollution and providing a feasible solution for the same. The primary objective is to have zero tail pipe emissions and replace the fossil fuel dependency. This helps in moving towards greener society. This benefits the people who make a living out of auto rickshaws as they can save more in the long run though capital costs are on the higher side. The prototype is to prove practically that this concept can be implemented in an auto rickshaw which has a massive role to play in public transportation in most of the Asian countries. The prototype developed had a zero emission at the tail pipe with the usage of renewable solar energy. From the test results it is concluded that the fabricated solar assisted auto rickshaw mimic the existing conventional auto rickshaws.

REFERENCES

[1] Vezzini A, Sharan H, Umanand L. (2013). Low-pollution three-wheeler autorickshaw with power-assist series hybrid and novel variable DC-link voltage system. Journal of the Indian Institute of Science 85(2): 105.

[2] Miller JM. (2006). Hybrid electric vehicle propulsion system architectures of the e-CVT type. IEEE Transactions on power Electronics 21(3): 756-767. http://doi.org/10.1109/TPEL.2006.872372

[3] Hofman T, Van Der Tas SG, Ooms W, Van Meijl EWP, Laugeman BM. (2009). Development of a micro-hybrid system for a three-wheeled motor taxi. World Electric Vehicle Journal 3(3): 572-580.

[4] Gonder J, Simpson A. (2007). Measuring and reporting fuel economy of plug-in hybrid electric vehicles. World Electric Vehicle Journal 1(1): 134-141.

[5] Williamson SS, Emadi A, Rajashekara K. (2007). Comprehensive efficiency modeling of electric traction motor drives for hybrid electric vehicle propulsion applications. IEEE Transactions on Vehicular Technology 56(4): 1561-1572. https://doi.org/10.1109/TVT.2007.896967

[6] Road Transport Year Book (2011-12). Transport Research Wing Ministry of Road Transport & Highways Government of India New Delhi, from http://in.toolalfa.com/LinkClick.aspx?fileticket=RhX00HSiIT4%3D&tabid=72&mid=486

[7] Minami S. (2011). Reality and virtuality of electric vehicles. Journal of Asian Electric Vehicles 9(1): 1447-1451. https://doi.org/10.4130/jaev.9.1447

[8] Mulhall P, Naviwala M, Lukic SM, Braband J, Emadi A. (2007). Entrepreneurial projects program at Illinois Institute of Technology: solar/battery hybrid three-wheel auto rickshaw for India. In Vehicle Power and Propulsion Conference,2007. VPPC 2007. IEEE pp. 682-689. https://doi.org/10.1109/VPPC.2007.4544210

[9] Lebeau K, Van Mierlo J, Lebeau P, Mairesse O, Macharis C. (2013). Consumer attitudes towards battery electric vehicles: A large-scale survey. International Journal of Electric and Hybrid Vehicles 5(1): 28-41. https://doi.org/10.1504/IJEHV.2013.053466

[10] Faria R, Moura P, Delgado J, De Almeida AT. (2012). A sustainability assessment of electric vehicles as a personal mobility system. Energy Conversion and Management 61: 19-30. https://doi.org/10.1016/j.enconman.2012.02.023

[11] Caricchi F, Ferraro LD, Capponi FG, Honorati O, Santini E. (2003). Three-wheeled electric maxi-scooter for improved driving performance in large urban areas. Proceedings of the IEEE Electric Machines and Drives Conference 3: 1363–136. https://doi.org/10.1109/IEMDC.2003.1210629