



CLIMATE SOLVER 2014 AWARDEE

GHG Reduction: PLUGnCHILL — Phase Change Material (PCM) based Thermal Energy Storage Technology (for mobile cold storage)

Developed by: Thermal Energy Service Solutions Pvt. Ltd. (TESSOL)

INNOVATION

With increasing globalisation, cold storage has become a critical component for transporting food from producers to consumers. The demand for refrigerated trucks in the surface cold chain network is also bound to increase with the constantly evolving cold chain storage and logistics market. The global refrigerated road transportation is projected to grow at a Compound Annual Growth Rate (CAGR) of 17.95 percent between 2014 and 2019. Refrigerated trucks, also known as reefer trucks, use the vehicle's engine to power the refrigeration unit which comprises a refrigerant and a heat exchanger to accomplish the cooling. This, however, requires fossil fuel i.e. diesel to run the refrigerant compressor.

Thermal Energy Service Solutions Pvt. Ltd. (TESSOL) has developed an alternate solution known as "PLUGnCHILL" for mobile cold storage supply chain. This Phase Change Material (PCM) based thermal energy storage technology uses electricity and eliminates the use of diesel, unlike conventional reefer trucks. The "PLUGnCHILL" solution improves heat transfer and temperature regulation inside the refrigeration unit, thereby reducing the operational costs and GHG emissions.

This solution contains a PCM heat exchanger, a charging unit that has a compressor/condenser for the refrigeration system, an automatic controller and an electrical fan. Innovation in the heat exchanger's coil and circuit design reduces the refrigeration charging time from a typical 12-14 hours to 6 hours. The vehicle can thereafter maintain its charge for 20-25 hours for point to point delivery and around 12-14 hours for multiple openings. Heat exchanger design, along



Reefer vehicle using TESSOL's "PLUGnCHILL" solution

The inside of a reefer truck

with fans, also allows a very fast pull down after each opening of the container.

TESSOL storage solutions are available in two vehicle variants - chilled and frozen. Capable of operating in temperatures ranging from -25 to +15°C, PLUGnCHILL solution is not dependent on continuous fuel usage for cooling, thereby ensuring product safety and quality in case of mechanical engine failure or manual intervention. Besides, the PCM heat exchanger, along with its coils, is versatile in terms of types of PCMs and refrigerants that can be used with it.

TESSOL also provides a remote charging unit option that completely decouples the refrigeration system from the vehicle and can charge multiple vehicles in series. Therefore, it not only reduces the capital cost per vehicle, but also reduces the weight carried by vehicles. During the vehicle run, the automatic controller monitors the refrigeration unit's temperature which helps in regulating the unit's fan operation and its charging. A small 8 feet reefer vehicle using PLUGnCHILL solution can save around 1000 liters of diesel per year, and also offers 50-60 per cent savings in operating costs compared to conventional reefers.

ABOUT THE COMPANY

Thermal Energy Service Solutions Pvt. Ltd. (TESSOL) is a Mumbai based company that designs, manufactures and integrates products and solutions for specific applications such as mobile cold storage supply chain using thermal energy storage technology. Operating mostly in western regions of the country, TESSOL is rapidly growing its sales and service network across India.

BENEFITS

"PLUGnCHILL" presents an economically viable and a greener alternative in an otherwise energy and carbon intensive cold chain market. With its energy efficient and fuel saving solution, TESSOL ascertains product safety, lowers operating costs, sustains charge and ensures temperature stability. The estimated global GHG emission reduction through a wide scale utilisation of this solution is likely to be 5.3 million tonnes by 2024.





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GHG Reduction: BioUrja — Low Cost Dry Anaerobic Digester

Developed by: GPS Renewables Pvt. Ltd.

INNOVATION

With the exponential growth in urbanisation, the municipal solid waste (MSW) management in cities has increasingly become a significant environmental concern. According to estimates, the quantum of MSW is expected to double to 2.6 billion tonnes per year globally by 2025. Incidentally, global liquified petroleum gas (LPG) demand by 2020 has been projected at around 360 million tonnes, which is almost 26 per cent more than what it was in 2013. In this scenario, waste-to-energy technologies enunciate a tremendous scope as they address the issue of waste management, and also produce useful forms of energy such as biogas. Even though conventional waste to energy technologies are prevalent in the market, a number of associated limitations such as land footprint, higher O&M cost, aesthetics, etc. hinder the upscale of these solutions.

GPS Renewables, a waste-to-energy technology firm, offers an innovative decentralised solution for solid waste management, and addresses the challenges faced by traditional anaerobic digesters. The solution, known as BioUrja, is a low cost dry anaerobic digester system that uses organic kitchen waste and poultry droppings as feedstock to generate biogas. It is an economically and technologically feasible solution that can be widely used in both rural and urban areas.

The BioUrja solution differs from the conventional wet type anaerobic digesters due to a number of key innovations. With an extended state-of-art thermophilic biodigestion technology, the solution has been developed as a low-cost and stable design, and has 1.5 to 2 times more biogas generation efficiency. BioUrja employs a dry fermentation technique and utilises the inherent moisture present in kitchen waste for the water-dependent stages of

BENEFITS

BioUrja is an ideal waste treatment solution for bulk waste generators such as hotels, restaurants, corporates/industrial canteens, educational and religious institutions. By addressing the challenges of existing waste treatment and composting solutions, BioUrja system offers an economically and technically viable solution that has the potential to close the circle of waste collection & management and energy generation at a decentralised level. The estimated global GHG emission reduction by wide adoption of this system is likely to be 44 million tonnes by 2024.



BioUrja's twin balloon biogas compression system



A 1000kg BioUrja system installed at one of the site locations

biomethanation, thus avoiding additional need for water for the digestion process. With its low-footprint design, the area required is 10-20 per cent lesser than that required in conventional systems. GPS has also developed a proprietary sensor-suite-and-remote-monitoring system (RMS) that keeps regular health-checks using their patented automatic titration system, and provides status notifications on a mobile phone, for preventive maintenance. In addition, the solution has a logic control circuit based twin balloon biogas compression system that ensures consistent gas pressure similar to LPG burners.

Unlike existing solutions, GPS bioreactors are of ready-to-assemble nature. This makes the potential scalability of GPS significantly higher, and reduces the investment cost and installation time.

A typical BioUrja system of capacity of 1 tonne per day (TPD) can generate around 140-145m³ of raw biogas per day, which is around 70kg of LPG and 80kg of organic manure per day. The BioUrja is available in capacities ranging from 100kg to 5,000kg. Irrespective of its size and quantity, it is an easy to setup solution and pays back the initial investment, inclusive of running costs, in about two years.

ABOUT THE COMPANY

GPS Renewables, a Bangalore based waste-to-energy technology firm founded in 2011, is pioneering the development of clean and low-cost technology for waste management solutions. The company started off with the commercialisation of BioUrja solution in 2013. Since then, GPS has expanded its presence to five states with 12 operational projects of a cumulative waste processing capacity of 10 TPD.

