Moisture reduction in Municipal Solid Waste (MSW) by parabolic solar dish method

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The moisture content of MSW in tropical countries is higher when compared with temperate countries due to the climate (hot and humid weather with abundant rainfalls), compositions and types of waste generated. The moisture adversely affects the waste to energy conversion process as the process consumes more energy to evaporate moisture from MSW. Therefore, waste to energy concept receives less attention in MSW treatments, especially in tropical region. However, reduction of moisture of MSW would be beneficial to convert waste into thermal energy effectively and efficiently. Use of solar energy is a widely-practiced strategy to reduce moisture content in many materials. In this concept, the present paper suggests a method to reduce moisture in MSW by utilizing solar energy. Objective of this study is Develop a Model for Moisture Reduction of MSW by using solar energy.

The parabolic solar-energy concentration method is applied to convert solar energy into thermal energy. The method is used as a principle of solid waste moisture reduction instrument. Three major components can be identified in the instrument, namely shredder, parabolic dish and compacter. Purpose of shredder is to reduce the size of waste that enables the entry to parabolic center pipes. As well, it increases the surface region of waste to evaporate water vapor without difficulty. The parabolic dish consists with parabolic dish, solar radiation center with hot air fans and waste flow pipes. Concentrated solar energy is centralized by using parabolic dish. Then solar energy is converted into thermal energy when focus onto the counter and exhausted, hot air fan generate Dry Air flow with higher temperature, because of the properties of air flow, it reduces humidity and thereby decrease of moisture content is accelerated. Temperature of dry air flow in center level is higher than boiling point of water ($T > 100^{o}C$), and this high temperature conditions generated from concentrated direct solar energy to center level and heating element converts solar energy into heat through the process of Joule heating, flow passing through this heating element resulting in heating of the air. Contact time of air flow with waste stream depend on moisture reduction of waste. Also, the continuous solid waste stream is transferred through the pipes and speed of flow depends on the decrease rate of moisture content at a center level. Solar electrical energy is used to operate this instrument. This scheme is fully automated and electronic detectors are applied to measure temperature, moisture content. After reducing the moisture content in solid waste, it can be compressed and used to produce pellets. This resultant pellets can be used as fuel. Besides, it can be applied as ecofriendly bricks by mixing with strong solidified materials. In addition, no greenhouse gas emission is expected

during the operation. Optimal instrument size depend on the Size of parabolic dish that displays quantity of solar energy concentrated to center point. As most of the industries have to spend a considerable amount of money on reducing the moisture content in the final disposal; especially in the Sri Lankan case, the waste generated is sent to a monopoly holder for further treatment. If industries can use this method as a preprocessing method to reduce moisture content in semi-solid or solid waste, it would reduce a significant cost. The proposed system is controlled according to a computerized system within specified limits. However, further development is needed to overcome bottlenecks and gaps in the system.

Keywords: Municipal solid waste, waste to energy, parabolic solar energy concentration.