



## Standardized Energy Consumption Analysis for the Practical Application of a Superheated Steam Degreasing System Applied for Oily Waste Metal Cutting Chips

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**Abstract.** Superheated steam is applied to oily waste metal cutting chips disposed by metalworking factories for degreasing. A practical circulation-type superheated steam degreasing system is introduced in the experiment. The system can process the waste material continuously using a processing chamber with a rotary kiln. However, it is difficult to conduct experiments under stable conditions, because the chips have very complicated shapes and they entwine with each other. Therefore, it is important to examine the obtained experimental data based on standardized conditions. Here, aluminium lathe dust with water-soluble cutting oil was introduced as an oily waste material. In this paper, the influence of the process temperature and steam flow rate on the energy consumption is evaluated based on the standardized experimental results. In addition, this degreasing system consumes considerable energy for the preheating of system equipment and steam generation. The energy recovery time, i.e. energy recovery capacity of waste material, which reduces the effect of energy consumption of preheating is also estimated and evaluated. The relative relationship of the energy consumption of both preheating and degreasing operation is numerically shown based on the standardized energy consumption analysis. An effective operation condition for practical application is proposed.

**Keywords:** Material recycling, Energy consumption, Standardization, Oily waste, Superheated steam