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DESIGN PROCEDURE OF MOBILE WASTE HEAT RECOVERY SYSTEM FOR PRODUCTION OF HOT WATER IN AGRICULTURAL APPLICATIONS

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Abstract

Pesticides are widely used in the control of agricultural pests by spraying machines. While a significant part of the fuel energy used by the tractor in pesticide applications is used for the cooling of the engine, the other important part is discharged from the exhaust as heat energy. In this study, the possibilities of controlling agricultural pests by producing superheated water from waste heats at high temperature and flow rates with an integrated production method from cooling and exhaust systems were investigated. The use of this high-value lost energy in the control of agricultural pests is important for reasons such as economic and environmental factors. The water in the engine cooling system circulates at about 100°C. The waste heat of the exhaust gases can reach up to 600°C. It is possible to produce superheated water at 150°C by using both waste heat. For this, some equipment is added to the engine cooling system and the waste energy of the water circulating in the system is transferred to the water used in spraying. This water with a temperature of 100°C is passed through the heat exchanger placed in the exhaust system and its temperature is increased to 150°C. In the evaluation made regardless of the time-dose relationship, pests can be struggled with 7-51 Lha^{-1} diesel fuel and 558-875 Lh^{-1} capacity hot water. Considering the time-dose relationship, it is predicted that the fuel consumption will decrease and the temperature and superheated water capacity will increase.

Key words: ecological agriculture, heat transfer, plant protection, sustainability, thermodynamics

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