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PROGRESS REPORT NO. 2

IMPROVED PRODUCER GAS CLEANING SYSTEM

A RESEARCH PROJECT

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Project Profile

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Project Leader	:	Pojanie Khummongkol
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1. Introduction

This report summarizes the the work done during the last three months (January - March, 1987). The work in this period concentrates on the test running of the gasifier. About ten runs have been accomplished; each run lasts for at least 15 hours, some up to 30 hours. Many probelms have been encountered; however, almost all the problems are solved successfully. Some of them are mentioned in this report.

2. Objectives

The objective of the work in this period is to test run the gasifier and to check any troublesome during the operation.

3. Operation procedure

The gasifier is run according to the following steps

3.1 Rice husks are manually loaded by the screw conveyer into the gasifier until it is about a quarter full.

3.2 The rice husks are then lit via the ignition port at the lower part of the gasifier. The combustion occurs by natural convection of air through this opening.

3.3 When the rice husks are well burned, the ignition port is closed and more rice husks are loaded into the gasifier till the gasifier is full to the determined level (almost full to the top).

3.4 The blower is started to force the air to flow through the rice husk bed.

3.5 The water pump is switched on to circulate water into wet scrubber, the gasifier jacket and the stirrer.

3.6 The automatic mode of loading the rice husk is operated when the temperature at about the center of the gasifier reaches at a set value. At this temperature the stirrer automatically ratates one revolution and the rice husks are automatically loaded by the conveyer upto the determined level. At the same time the ashes produced at the bottom are scraped out of the gasifier.

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3.7 At the end of each run, the water pump and the blower are switched off. All the openings of the gasifier are closed. The rice husks in the gasifier are allowed to burn slowly.

4. Results and discussion

The gasifier is run about 10 times during the past three months. Many problems are encountered. Examples are :

4.1 Low gas production

In the first few runs, it has been found that the gasifier produces gas at very low flow rate and the gasification tends to cease easily; the gasifier shows high instability. To solve the problem, the temperature at the center of the gasifier is varied between 50 C and 90 C. When the temperature is set at 90 C, the actual temperature is found to be lower than the setting value; consequently, the automatic loading of rice husk has never been sensed. At the setting temperature of 50 C, loading of rice husk occurs occasionally. However, the production rate of gas is still low. This observation implies that air flow rate, induced by the blower, could be the cause: if the air flow rate is too low, the combustion is poor and not much heat is generated, resulting in low temperature of the center zone. With this deduction, the air flow rate is increased by adjusting the blower. After such adjustment, the gasifier continuously produce the gas at the setting temperature of 50 C.

4.2 Blockage of the screen

At the end of each test run of the gasifier, it is found that the screen is blocked by ash and tar. The gasifier need to be emptied and the screen requires some cleaning. During the operation of the gasifier, the blockage is unlikely to occur since the gas temperature is higher than the condensation point of tar. When the gasifier is shut down and the combustion is going on slowly, the heat generated should be sufficient to prevent tar from condensing. It was later found that the blockage occurs because the level of water under the gasifier is at the same level of the screen; the water reduces the temperature, resulting in the condensation of tar. Moreover, the dirty water itself also agglomerates ash.

4.3 Poor quality of producer gas

The problem is observed after increasing the air flow rate. The gas samples have been analyzed by gas chromatography; it is found that the amount of carbon monoxide is very low, no hydrogen is detected. The problem is, at the moment, under investigation. Two hypotheses are proposed: one is due to the poor condition of the gas chromotography, and two is the low setting temperature.

5. Work schedule

For the next three months (April - June, 1987), the cleaning system which consists of a wet impinger and a demister will be connected to the gasifier and the overall cleaning train will be investigated.