kerja sama jerman
DEUTSCHE ZUSAMMENARBEIT

Published by:
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

In cooperation with:
Directorate General for New and Renewable Energy and Energy Conservation

LCORE Factsheet

Fuel Savings through Heat Recovery in the Tapioca industry

Framework

The objective of "Promotion of Least Cost Renewables in Indonesia" or LCORE-INDO is to promote the application of renewable energy in Indonesia where they show the highest economic viability. One main task of LCORE-INDO is to assess the potential of waste-to-energy in the agro industry in Indonesia in order to find profitable and economic solutions to energy issues. Furthermore, it strives at enabling the Directorate General for New and Renewable Energy and Energy Conservation (DG-NREEC) in Indonesia to develop practical policies and promote programs for effective support of renewable energy implementations. The project is executed through studies, pilot projects, capacity building, policy guidelines and monitoring. The following factsheet provides an overview of fuel saving options through Heat Recovery in the Tapioca industry. The assessment was jointly conducted between LCORE-INDO and the private sector partner.

Background & Motivation

High Cassava starch production costs

Indonesia is the second largest cassava starch producer in the world with more than 5 million tons of cassava produced. However, its production costs are higher compared to other countries like Thailand or Vietnam .These high costs result from the fact that most tapioca mills in Indonesia are still using coal or diesel to produce the required heat for the drying processes. This inefficient energy situation needs to be improved in order to increase the industry's international competiveness.

Figure 1. Thermal oil heater and gas engine at a Tapioca mill

Untapped heat energy in the agro-industry

Aside from the economic aspects, the use of coal and diesel also heavily contributes to environmental pollution and climate change due to their high CO_2-emissions. In order to promote a sustainable energy supply, the project attempts to re-use waste heat from power generation process for the drying process by way of an innovative technology. Apart from the tapioca industry, there is a big up-scaling potential for waste heat recovery concept in the rice, corn maze, wood market and other agro- industries where drying processes are present.

Heat Recovery Technology

In the production of tapioca starch, two sources of energy are required namely heat and power. Heat is needed for the starch drying process, whereas power is needed for the strach extraction process and the general operation of the plant. Heat is commonly provided by coal-fired thermal oil heater and power is generally derived from diesel generators or electricity import from PLN.

Few tapioca starch manufacturers have taken the initiative to develop biogas plant from their waste effluent and produce their own electricity using gas engines

Gas engines have power generation efficiency of around 40% which means most of the heat produced is left untapped. This apparent lack of heat re-utilisation for the drying process provides many opportunities to save high amounts of fuel and therefore significantly reduce the production costs. The installation of a heat exchanger unit allows tapioca starch manufacturers to self-supply their own heat demands and reduce their reliance on fossil fuels to a great extent.

Figure 2 illustrates the heat streams from gas engines including options on how to utilize them for the starch drying process through the provision of heat exchanger units.

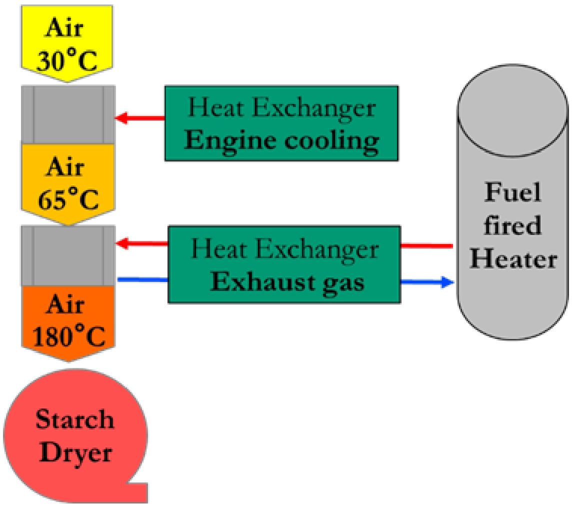

Figure 2: Utilization of waste heat by heat ex-

One example of a heat recovery application is to pre-heat the incoming air for the starch drying process by a heat exchanger. As such, ambience air temperature can be preheated to the optimum dryer temperature (usually 170 - 180^{0}C) needed for the starch drying process. The heat produced in this manner will reduce heat demand from the coal-fired thermal oil heater which will in turn reduce the coal consumption.

Costs & Benefits – A Case Study

A thermal oil heater with a 10 MWth output, generally requires more than 30 tons of coal supply daily. Assuming that the plant operates 330 days per year and the price per ton of coal is 60 USD, the plant spends around USD 600,000 annually on coal expenditure. If a heat exchanger unit is installed, a 50% reduction in coal consumption equal to a saving of USD 300,000 per year can be achieved. With investment costs of around USD 600,000 for the heat exchanger unit, the **payback period would be around 2 years**.

After this payback period, the heat recovery measure results in annual benefits from the coal cost saving. In this particular case, halving the coal consumption results in **30% reduction in energy production cost.**

Up-Scaling potential

This heat recovery concept can be applied to many tapioca mills in Indonesia. In Lampung alone where 30% of the national cassava production takes place, there are more than 200 tapioca plants of similar size scattered around the province. The substitution of 50% of coal per plant would lead to:

- Yearly coal savings of around 990,000 tons
- Yearly reductions of more than 2 million t CO_2-emissions.

These coal and fuel savings are not only applicable for tapioca plants but also for other industries in the agro sector like the rice, corn maze, and wood industry.

Highlights:

- Reduction of coal consumption by ~50%
- Lower energy production cost by ~30 %
- Short pay pack period of the heat exchanger unit (< 2 years)

Figure 3: starch extraction, drying and packing processes

Project name	LCORE- Promotion of Least Cost Renewables in Indonesia
Commisioned by	Federal Ministry for the Environment, Nature Conservation, Building nd Nuclear Safety, Germany (BMUB)
Country	Indonesia
Lead executing agency	Directorate General for New and Renewable Energy and Energy Conservation (NREEC) under the Ministry of Energy and Mineral Resources (MEMR)
Duration	2012 to 2015

Published by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Least Cost Renewables in Indonesia (LCORE-INDO)
c/o Directorate General for New and Renewable Energy and Energy Conservation, 5th Floor
Jl. Pegangsaan Timur, No. 1A, Jakarta Pusat 10320, Indonesia

T + 62 (0)21 3919971
E lcore.indonesia@giz.de
W www.lcore-indonesia.or.id

October 2014

GIZ is responsible for the content of this publication