



Viegand
Maagøe

PT Indolakto Pasuruan – East Java Energy Audit Report

4th May 2023



DIREKTORAT JENDERAL ENERGI BARU TERBARUKAN
DAN KONSERVASI ENERGI (EBTKE)

Jujur, Profesional, Melayani, Inovatif, Berani



Danish Energy
Agency



EMBASSY
OF DENMARK
Jakarta

Project no:	Mapping/benchmark on Energy Efficiency in Industries under the Energy Partnership Programme between Indonesia and Denmark (INDODEPP)
Report:	Energy Audit Report PT Indolakto
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Prepared by:	Rusmanto et al., PT. LANGGENG CIPTALINDO
QA by:	Peter Kristensen, Viegand Maagøe
Approved by:	Nadeem Niwaz, Danish Energy Agency

Executive Summary

1.1 Introduction

The Directorate of Energy Conservation (DEC) under the Ministry of Energy, Mineral and Resources (MEMR) in Indonesia has embarked on a mapping of energy intensive industries which is in its early phase. The aim is to update information on energy consumption in a selection of industries starting with a focus on the food and beverage sector (F&B). This will support work on developing national industry benchmarks for energy efficiency and set a future direction for industries with high energy consumption. MEMR coordinates with the Ministry of Industry (MOI) on existing available data and is the key partner for this activity. This activity will specifically support empirical data gathering through review of available information on energy consumption and conducting energy audits within the selected F&B sub-sector i.e. sugar processing industry.

The first objective of this project supported by INDODEPP is to conduct a relevant number of energy audits to get an empirical reference for energy consumption as well as the potential value of implementing energy efficiency measures in the food and beverage sector. The potential will be highlighted for reduction of energy consumption, reduction of energy costs and reduction of CO₂ emissions.

The second objective of the project is to share findings from the energy audits through a workshop/seminar with the private sector and relevant stakeholders from food and beverage sector.

The outcome of this project will provide input to the efforts of strengthening national and regional focus on energy efficiency at energy intensive industries and at the same time provide valuable suggestions and ideas for specific energy saving projects to be implemented in selected industries.

This energy audit report for PT Indolakto documents the main findings and results for the energy audit that was carried out in March 2023 with great assistance from PT Indolakto

1.2 Plant description

PT Indolakto – Purwosari factory, located in Pasuruan, is a company engaged in the dairy products manufacturing industry which is part of Indofood Group. Indolakto Purwosari plant is the largest of the 7 Indolakto factories in Indonesia. This factory was established in 2012 which produces several types of products such as sweetened condensed milk (Susu Kental Manis, SKM) and liquid sterile milk which includes Ultra High Temperature (UHT) milk and Indomilk Liquid Milk (Susu Cair Indomilk, SCI). Factory layout of Indolakto Purwosari is shown in Figure 1.



Figure 1. Indolakto facility in the Purwosari Factory

1.3 Operation

The Indolakto Purwosari facility is operation 24 hours per day in 330 days per year resulting in 7920 operation hours per year. Each day 3 working shifts are present 8 hours. The production has historically amounted as shown in Table 1.

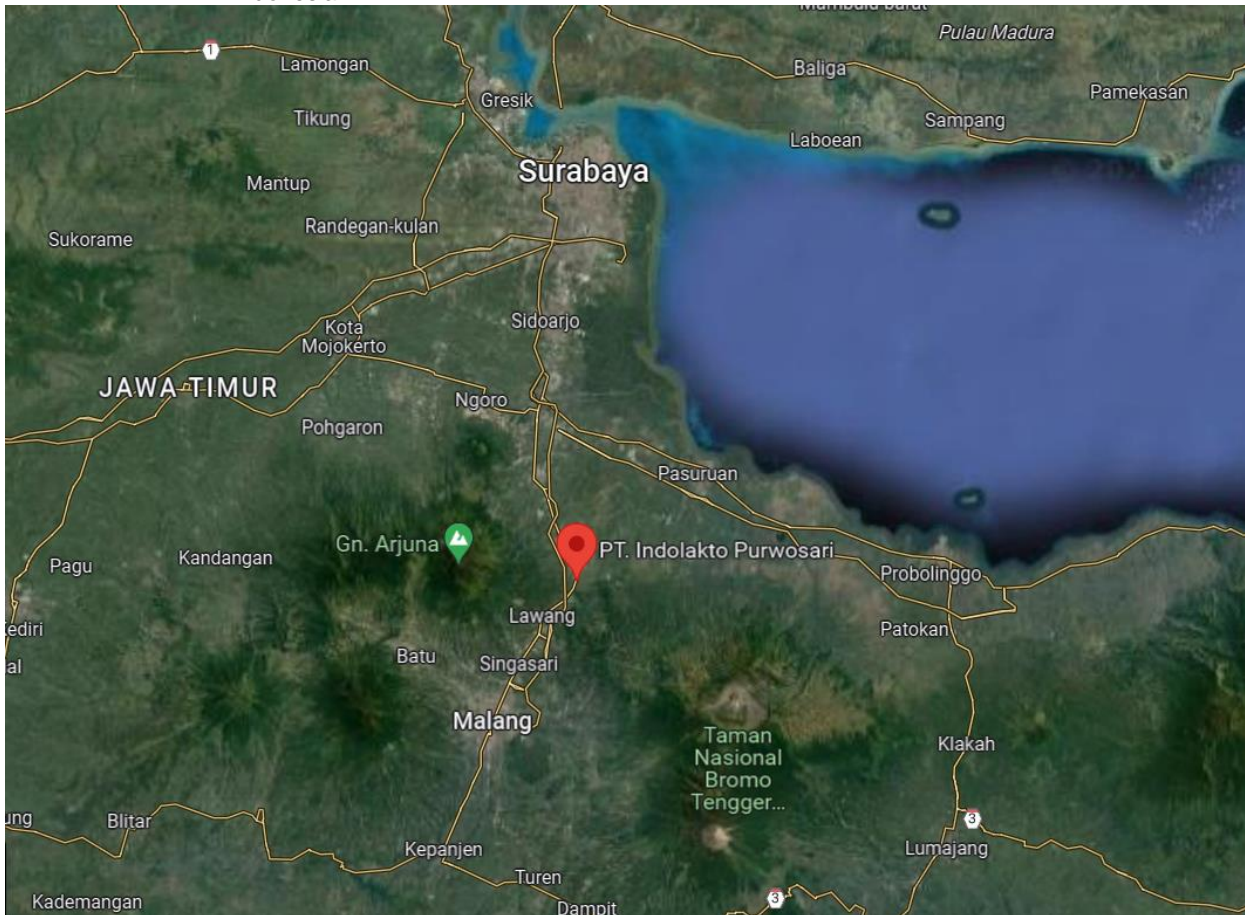
Table 1. Production in 2022

Years	Production, ton
2022	250,409

1.4 Location

Address:

Jl. Raya Purwosari No.KM.62, Kemirahan, Tejowangi, Kecamatan Purwosari
Kabupaten Pasuruan, Jawa Timur
Indonesia



1.5 Methodology

The objective of the energy audit is both to provide the data necessary to establish the baseline for the energy consumption for Indolakto and to estimate the potentials for increasing energy efficiency in the F&B sector. The site visit was prepared with main data collected in a questionnaire.

A three-day site visit was planned and conducted from the 14th to 16th of March 2023. In the site visit the local consultant PT. Langgeng Ciptalindo fielded seven people, five engineers and two technicians under the leadership of Pak Rusmanto.

The site visit was commenced with a meeting between the Indolakto management and team, representatives from EBTKE via online and the auditing team

The auditing started with a line walk for understanding the process and get an overview. During the audit information was gathered from Indolakto, data was taken from meters and measurements was conducted when needed. Every morning and evening a status meeting was held with the Indolakto team to coordinate the next steps. The site visit was concluded with a common recapitulation.

1.6 Overall findings

1.6.1 Specific energy consumption

PT Indolakto – Purwosari plant can be divided into 2 processing line, as follows :

- Line 1 produces Susu Kental Manis (Sweet Condensed Milk) with production volume unit using as ton SKM
- Line 2 produces Ultra High Temperature (UHT) with production volume unit using ton liquid

By relating the total energy consumption with the production volume is the specific energy consumption found. Therefore, specific energy consumption (SEC) is divided by each line production, is shown in Table 2 based on date 09 March 2023.

Table 2. Total energy distribution to production lines per day (Date: 09 March 2023)

	SKM					LIQUID	Warehouse		Utility				
	SKM-PROSES	SKM-CAN	SKM-SACHET	CAN MAKING	OTHER	UHT & SCI	ASRS	LIGHTING	UTILITY SKM	UTILITY LIQUID	WWTP	BOILER	OFFICE & QA
Electricity, kWh	6,715	1,055	1,958	1,368	4,511	18,726	578	595	23,500	29,013	2,144	1,717	2,006
Thermal, kWh	492,601					424,133							
Production, ton	391					265							
SEC SKM, kWh/ton	1,300												
SEC Liquid, kWh/ton						1,670							
SEC Organization	1,540												

Total energy distribution for the plant based on Year 2022 is shown in Table 3. Total accumulation of SEC in year 2022 was found to be 0,351 MWh/ton production. This SEC can be analysed further in the future using Energy Performance Indicator (EnPI) to get better view in how EnPI is a function of production volume only or other variables such as utility performance and etc.

Table 3. Specific energy consumption in MWh per ton production in 2022

Year	Total Energy, MWh	Production, ton	SEC, MWh/ton
Electricity	31,268		
Thermal	56,746		
Total energy ^{*)}	88,014	250,409	0,351
88,014 MWh \approx 7,568 TOE			

^{*)} Total Energy is sum of electricity and thermal energy

1.6.2 Energy saving potential

The energy savings are assessed in relation to Best Available Technology (BAT) and will therefore also include savings that are not financially profitable with current energy prices, but which may become so in the future.

The subsequent energy saving proposals are based on estimations. As an example, are the energy efficiency for all motors compared with the BAT motor with the same rated power and a standardised investment per motor has been used. The feasibility of a replacement shall be examined with the actual conditions of the individual motor. In case of replacement due to break down it is always advisable to substitute with a motor according to BAT as motors have a long lifetime.

Thermal energy

Only saving potential for the coal delivered to the boiler and steam delivered into the SKM and Liquid production lines are included in the Table 4 below.

Table 4. Thermal energy distribution to production line and saving potential

THERMAL ENERGY	Estimated Consumption, MWh	Share of consumption, %	Saving potential, MWh	Estimated CO2-emmission reduction, ton	Estimated Invesment, Mill. Rp	Estimated PBP, years
Boiler			3,157	1,935	1,590	1.5
SKM	30,492	54				
Liquid	26,254	46				
IN TOTAL	56,746	100	3,157	1,935	1,590	1.5

Electricity

Saving potential for electricity consumption delivered production line, warehouse, and engineering (utilities) are included in the Table 5 below.

Table 5. Electricity distribution to production line and saving potential

ELECTRICITY	Estimated Consumption, MWh	Share of consumption, %	Saving potential, MWh	Estimated CO2-emmission reduction, ton	Estimated Invesment, Mill. Rp	Estimated PBP, years
SKM Production Line	5,198	17	-	-	-	-
Liquid Production Line	6,237	20	-	-	-	-
Warehouse	390	1	-	-	-	-
Engineering	19,443	62	548	443	6,900	10,4
Transformer			163	132	2,400	14,2
Centrifugal type instead of screwed type compressor			184	149	3,600	12,6
Compressed air demand side control			152	123	9,00	5,4
Improved modulating level control system at chilled water buffer tank			49	40	70	1,4
IN TOTAL	31,268	100	548	443	6,900	10.4

1.7 Electrification and renewable energy

1.7.1 Present situation

Currently, Indolakto Purwosari factory receives 100% electricity from a common energy building from the grid, PLN, that is generated from fossil sources. Meanwhile, thermal energy resource is coming from coal. The use of electricity reached 34% of total energy demand of the plant, while coal covers the remaining 64%. Electricity is used for main equipment of production line from raw material to packaging, utilities, and lighting, while coal is used for steam generation of boiler at 12 barg distributed to SKM and Liquid processing lines.

To meet renewable energy use and reduce CO₂ emissions, Indolakto has tried to operate coal boiler co-firing with cocoa shell. However, due to limited in cocoa shell supply, co-firing that mix coal and cocoa shell was operated only in a few days. Therefore, wood pellet can be optionally proposed in the future as co-firing fuel due to relatively sustainable supply from local supplier around the plant. Noted that a few of dairy factories have been converting boiler fuel from fossil such as coal or natural gas to biomass.

1.8 Electrification of the processes

All thermal energy consumption is allocated mainly to 2 units of 10.5 ton/h or 1 unit 16 ton/h coal boiler to generate saturated steam at 12-13 bar for SKM and Liquid production lines. Steam users in SKM production line are mainly for mixing, CIP, and hot water generator while in Liquid production line for Choco, Thermis, CIP, Recombine Pasteurizer, and SCI.

Particularly to meet hot water requirement, current commercial heat pumps using electric source can deliver 90°C output on the hot side, but different vendors have heat pumps that can deliver 120°C or more in operation in industrial applications. It will be reasonable to assume that the entire thermal energy demand in the hot water generation process can be covered by heat pumps in the future. Furthermore, Indolakto should upgrade 100% electricity using *renewable energy certificate* (REC) issued by PLN.

1.9 Different ways of electrification

With the current range of power outage, electrification requires upgrading the grid for higher uptime. For reducing the CO₂ emission, the supply to the grid must be changed to non-fossil power generation. In this case the high temperature energy must be delivered by electrode boilers.