PT Amerta Indah Otsuka Pasuruan – East Java Energy Audit Report

4th May 2023

DIREKTORAT JENDERAL ENERGI BARU TERBARUKAN DAN KONSERVASI ENERGI (EBTKE)
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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 Amerta Indah Otsuka**
Date:	**4th May 2023**
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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 Amerta Indah Otsuka documents the main findings and results for the energy audit that was carried out in February 2023 with great assistance from Amerta Indah Otsuka.

1.2 Plant description

Founded in 1997, PT Amerta Indah Otsuka was built through a joint venture between Otsuka Pharmaceutical Japan and PT Kapal Api. Firstly, the company was known as PT Kapal Indah Otsuka before changing to its current name in 1999. The company's very first product was Pocari Sweat.

As the company started to grow, in 2004 PT Amerta Indah Otsuka opened their first manufacturing facility in Sukabumi, West Java. Followed by their manufacturing in Kejayan, Pasuruan, East Java, 6 years later. Factory layout is shown in Figure 1.

Since being successful in marketing our product, PT Amerta Indah Otsuka has reached customers through focused product distribution strategy until now. The distribution was not only done through the official branch office, but also of distributors throughout Indonesia and Southeast Asia.

At PT Amerta Indah Otsuka, robust quality control and reliable supply are very important. Thus, the company implemented Quality Management System of ISO 9001:2015, Food Safety System of ISO 22000: 2015, and Environment Management System of ISO 14001: 2015. To comply energy efficiency standard, PT Amerta Indah Otsuka also implemented Energy Management System of ISO 50001:2018.

Figure 1. AIO facility in the Kejayan Factory

1.3 Operation

The Amerta Indah Otsuka facility is operation 24 hours per day in 300 days per year resulting in 7,200 operation hours per year. Each day three working shifts are present 8 hours. The production has historically amounted as shown in Table 1.

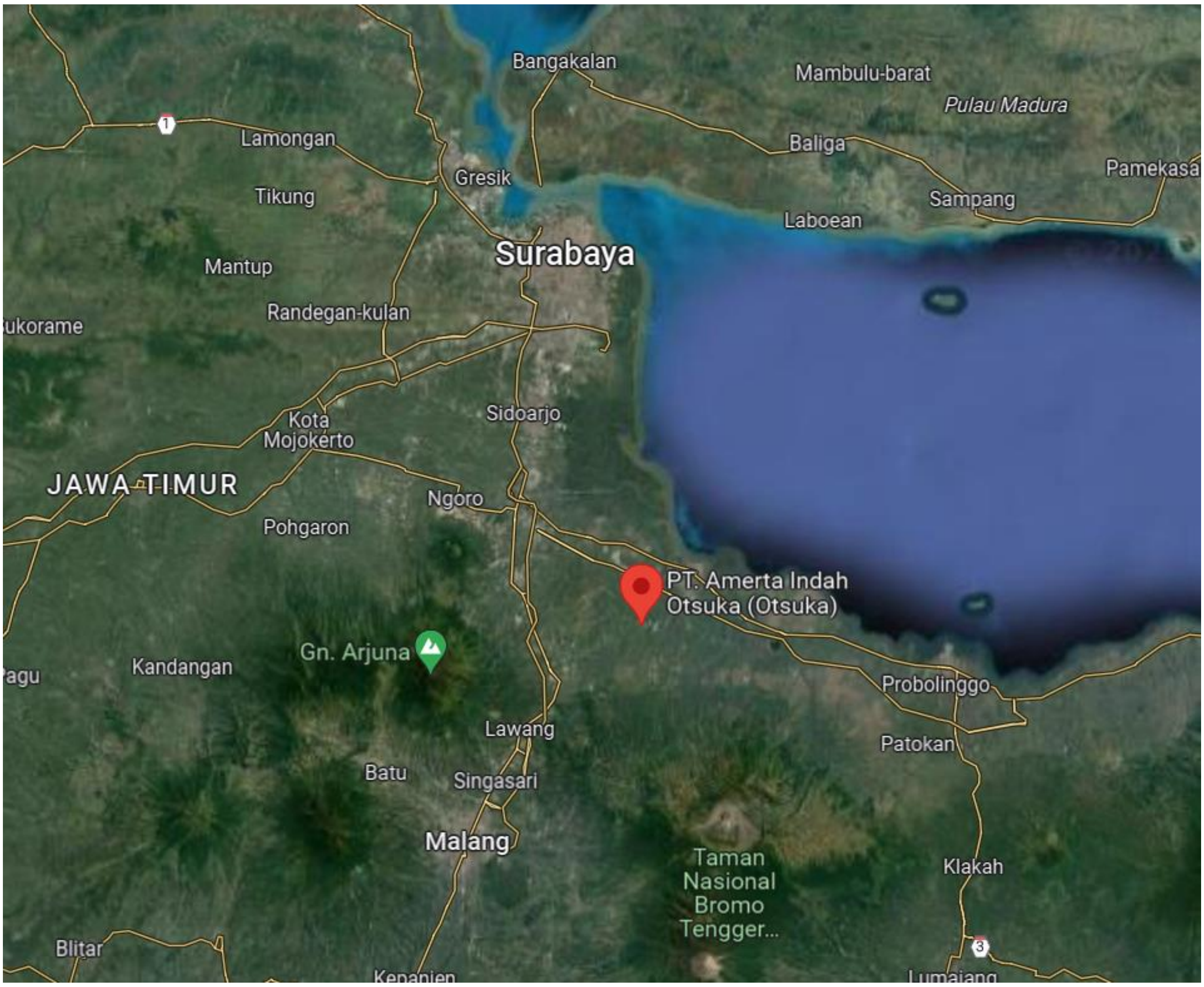
Table 1. Yearly Production of each processing line

Year	Processing line	
	Pocari, kL	FSB, bars
2021	87.618	6.544.860
2022	94.699	10.000.692

1.4 Location

Address:

Jl. Raya Pasuruan, Tromo Barat
Pacar Keling, Kec. Kejayan
Pasuruan, Jawa Timur (East Java)
Indonesia



Bangakalan
Mambulu-barat
Pulau Madura
Lamongan
Baliga
Pamekasa
Gresik
Tikung
Sampang
Laboean
Surabaya
Mantup
Randegan-kulan
ukorame
Sidoarjo
Kota
Mojokerto
JAWA TIMUR
Ngoro
Pohgaron
PT. Amerta Indah
Otsuka (Otsuka)
Gn. Arjuna
Kandangan
agu
Probolinggo
Lawang
Patokan
Batu
Singasari
Malang
Taman
Nasional
Bromo
Tengger...
Klakah
Blitar

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 AIO 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 February 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 AIO management and team, representatives from EBTKE and the auditing team. At the meeting, information was given about AIO as well as the EBTKE and DEA cooperation and the objective of the audit.

The auditing started with a line walk for understanding the process and get an overview. During the audit information was gathered from AIO, data was taken from meters and measurements was conducted when needed. Every morning and evening a status meeting was held with the AIO 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

The AIO (Amerta Indah Otsuka) - Kejayan plant can be divided into 2 processing lines, as follows:

- Pocari PET bottle processing line (OC1 and OC2) with production volume unit using kL (kiloliter)
- Food & Snack Bar (FSB) processing line with production volume unit using no. of bars produced.

Total energy distribution for the plant based on Year 2022 data is shown in Table 2. By relating the total energy consumption with the production volume the specific energy consumption is found. Therefore, specific energy consumption (SEC) is divided by each processing line, which is shown in Table 3 based on 2021 and 2022 data. Table 3 shows SEC in the last 2 years. In 2022, SEC for Pocari production line was reduced against 2021 that indicates the impact in successfully applying the energy conservation programme such as the flash steam recovery system to reduce gas consumption of boiler.

Table 2.Total energy distribution to each processing in 2022

Remarks	OC 1	OC 2	FSB	AC system, Lightning & general	Others
Electricity, MWh	8,021	8,416	1,922	2,056	8,127
Thermal, MWh	3,452	8,348	1,655		
Production Volume Pocari, kL	41,342	53,357			
Production Volume FSB, bars			10,000,692		
SEC Pocari, MWh/kL	0.27	0.31			
SEC FSB, MWh/1000bar			0.36		

Table 3. Specific energy consumption (SEC)

Year	Total Energy *), MWh		Production Volume		SEC	
	Pocari	FSB	Pocari, kL	FSB, bar	Pocari, MWh/kL	FSB, MWh/1000 bars
2021	41,824	3,503	87,618	6,544,860	0.47	0.31
2022	38,422	3,578	94,699	10,000,692	0.40	0.36

**) 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.

<u>Thermal energy</u>

Only saving potential for the steam delivered into the Pocari and FSB plant are included in the Table 4 below.

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

THERMAL ENERGY	Estimated Consump-tion, MWh	Share of consump-tion, %	Saving potential, MWh	Estimated CO2-emission reduction, ton	Estimated Investment, mill. IDR	Estimated payback period, years
Boiler	12.663	94.1	1,075	197	3,000	5.9
Pocari OC 1	*3,532*	*26.2*	-	-	-	-
Pocari OC 2	*8,542*	*63.5*	995	182	292	0.6
FSB	*882*	*6.5*	-	161	700	-
Losses	*584*	*4.3*	356	65	1,500	9,4
Baking	793	5.9	-	-	-	-
IN TOTAL	**13.456**	**100**	**2,070**	**540**	**3,992**	**4.1**

<u>Electricity</u>

Only saving potential for electricity consumption delivered into the Pocari dan FSB plant is included in the Table 5 below.

Table 5. Electricity distribution to production line and saving potential

ELECTRIC ENERGY	Estimated Consump-tion, MWh	Share of consump-tion, %	Saving potential, MWh	Estimated CO2-emission reduction, ton	Estimated Investment, mill. IDR	Estimated payback period, years
Pocari (OC 1 + OC 2)	-	-	-	-	-	-
HVAC (Heating Ventilation Air Conditioning)	3,408	11.94	-	-	-	-
Compressor Air Filter	2,781	9.74	-	-	-	-
Compressor 7 bar line	2,162	7.57	918	750	1,798	1.7
Compressor 10 bar line	569	2.00	-	-	-	-
Injection Moulding 0	2,566	8.99	-	-	-	-
Cooling Tower 0	1,510	5.29	-	-	-	-
Chiller Maglev 1	1,124	3.94	243	198	13,000	2.5
Chiller Maglev 2	922	3.23	959	783	8,750	1.9
Blow Moulding	1,393	4.88	-	-	-	-
AC system, Lightning & general	2,056	7.20	-	-	-	-
FSB (Food & Snack Bar)	1,922	6.73	-	-	-	-
Others	8,127	28.47	-	-	-	-
Trasformer losses			380	310	2.500	5.6
Motors			51	42	754	10.5
IN TOTAL	**28,543**	**100**	**2,551**	**2,084**	**26,802**	**9.1**

1.7 Electrification and renewable energy

1.7.1 Present situation

Currently, AIO receives 100% electricity from the PLN grid, and AIO purchase *renewable energy certificate* (REC). Meanwhile, thermal energy resource is coming from natural gas (NG) pipeline. The use of electricity reached 75.6% of total energy demand of the plant, while NG was 24.4% remaining. Electricity is used for main equipment of production line from raw material to packaging, utilities, and lighting, while NG is used for steam generation of boiler at 7 barg distributed to Pocari processing line and for baking in FSB processing line.

1.8 Electrification of the processes

All thermal energy consumption is allocated mainly to 3 units of 2 ton/h gas boiler to generate saturated steam at 7 bar for Pocari (OC1 and OC2) production line. Steam users are mainly for Pure Steam Generator (PSG), Hot Water Heat Exchanger, CIP System, C/SOP System, AUHT, and FSB. Today commercial heat pumps can deliver 90^{o}C output on the hot side, but different vendors have heat pumps that can deliver 120^{o}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.

Besides Pocari processing line, current gas boiler also generates steam and distributes to FSB that use steam to generate lower pressure of pure steam about 3-4 bar with capacity of 200 kg/h. It will give an option to explore electric-to-steam generator instead of steam-to-steam generator. While existing hot water generation at FSB area is using electric water heater.

1.9 Different ways of electrification

To achieve net zero carbon, AIO currently is using electricity source with *Renewable Energy Certificate (REC)* from PLN. Therefore, this is great electrification opportunity in the future to convert gas steam boiler to electric steam boiler. This conversion will reduce approximately 2,339 ton CO_2 emission per annum as shown in Table 6. However, care must be taken that it will be followed by increasing around double cost of steam. REC electricty is around double cost of natural gas (around 2.3 times gas, in MMBTU unit).

Table 6. Effect of boiler conversion

Type of steam boiler	Energy Consumption per annum	Energy cost, Rp per annum	Cost of steam, Rp/ton	CO_2-emission, ton per annum
Natural gas boiler (*current boiler*)	1,155,351 m^3	6,049,420,424	424,116	2,339
Electric boiler	10,412,426 kWh	11,974,291,105	839,500	0

To compensate on increasing energy bill in case of using electric steam boiler applied, it can be explored to do further steps such as follows:

- energy conservation program such as steam and heat distribution losses reduction, maximise hot condensate recovery, etc.
- conversion from steam used hot water generator to commercial heat pump hot water generator

installation solar PV panels with supply from the grid to further reduce the overall electrical consumption per annum.