PT Lautan Natural Krimerindo Mojokerto – East Jawa Energy Audit Report

29th November 2024

DIREKTORAT JENDERAL ENERGI BARU TERBARUKAN DAN KONSERVASI ENERGI (EBTKE)
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Danish Energy Agency

EMBASSY OF DENMARK
Jakarta

Project no:	**Energy Audit and Pre-feasibility Study in Industries under the Energy Partnership Programme between Indonesia and Denmark (INDODEPP)**
Report:	**Energy Audit Report PT Lautan Natural Krimerindo**
Date:	**29th November 2024**
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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.

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 CO_2 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. Lautan Natural Krimerindo documents the main findings and results for the energy audit that was carried out in end November 2024 with great assistance from PT. Lautan Natural Krimerindo (LNK).

1.2 Plant description

PT Lautan Natural Krimerindo is a leading company based in Mojokerto, Indonesia, specializing in the production of plant-based creamers. The company has grown to become one of the largest producers of plant-based creamers in Indonesia, with a strong focus on innovation, quality, and sustainability. Below is a description of the company's history, production processes, products, awards, and certifications it has received.

PT Lautan Natural Krimerindo was established with the mission to become a leading supplier of high-quality plant-based creamers in both domestic and international markets. With years of experience in the industry, the company has expanded its operations and introduced new innovations to meet the growing demands of the market. The company's rapid growth is driven by the increasing consumption of food and beverage products based on creamers, as well as the demand for healthier and more environmentally friendly additives.

The main product of PT Lautan Natural Krimerindo is plant-based creamer (non-dairy creamer), which is widely used in beverage products such as coffee, tea, and instant drinks. This product is available in several variations, depending on customer needs, including:

- Powdered Plant-Based Creamer: This product is used as a substitute for milk in various beverage and food products.
- Liquid Creamer: Used in both commercial and household applications.
- Custom Products: The company also offers custom formulations tailored to client needs, such as specific fat content or other features like gluten-free options.

PT Lautan Natural Krimerindo has received various awards for its achievements in product quality, innovation, and sustainability. These awards reflect the company's commitment to excellence in the food and beverage industry. The awards include:

- Green Industry Award: Given to companies committed to environmentally friendly and sustainable operations.

- Best Export Award: This award is granted to companies that successfully penetrate international markets with high-quality products.
- Food Product Innovation Award: Recognized for innovation in the development of plant-based creamers that align with global health trends.

PT Lautan Natural Krimerindo also adheres to various international standards to ensure product quality and safety. Some of the standards achieved by the company include:

- ISO 9001 (Quality Management System): This certification demonstrates that the company has implemented a quality management system focused on quality and customer satisfaction.
- ISO 22000 (Food Safety Management System): This certification indicates that PT Lautan Natural Krimerindo complies with international standards for food safety in its production processes.
- Halal Certification: The company also holds halal certification, ensuring that its products adhere to Islamic principles and are suitable for consumption by Muslim communities worldwide.

With a dedication to innovation, product quality, and environmental sustainability, PT Lautan Natural Krimerindo continues to grow and establish itself as a leader in the plant-based creamer industry, both in domestic and international markets.

1.3 Operation

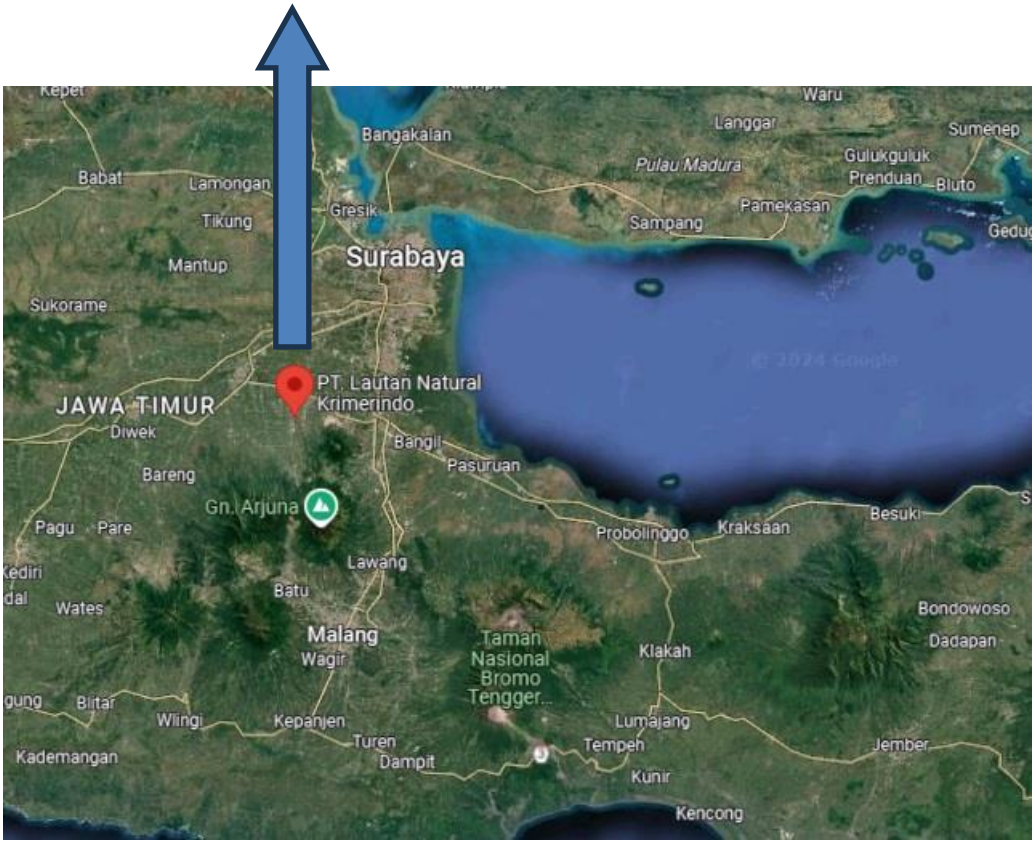
The LNK facility operates 24 hours a day, 12 months a year. The period of non-operation is only 1 day per month, or in a year the total operation is 353 days. Each day three working shifts are present 24 hours. The production has historically amounted as shown in Table 1.

Table 1 Yearly production of each processing line

Year	Non Dairy Krimer Product, Ton
2021	48,558
2022	58,382
2023	50,285

1.4 Location

Address:
Ketidur, Mojosari – Pacet Street No.KM.04, RT.001/RW.001,
Pesanggrahan, Kec. Kutorejo, Kabupaten Mojokerto, East Java 61383



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 Ceres 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 10th until 12th of October 2024. In the site visit the local consultant PT. Mitra Solusi Energi Berkelanjutan (Enercoss) fielded eight people, six engineers and two technicians under the leadership of Pak Yuli Safangat.

The site visit was commenced with a meeting between the LNK management and team, representatives from EBTKE and the auditing team. At the meeting, information was given about LNK as well as the EBTKE and DEA cooperation and the objective of the audit.

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

Total energy consumption for the plant based on Year 2021, 2022, and 2023. The results of LNK's energy production and consumption for 2021-2023 are presented in the following table:

Table 2 Annual Energy Consumption, Production and Specific Energy Consumption

Month	2021			2022			2023		
	Production (Ton)	Energy Consumtion (MMBtu)	SEC (MMBtu/ton)	Production (Ton)	Energy Consumtion (MMBtu)	SEC (MMBtu/ton)	Production (Ton)	Energy Consumtion (MMBtu)	SEC (MMBtu/ton)
January	3.178	15.159	4,770	4.806	24.100	5,015	4.081	22.043	5,402
February	2.903	13.839	4,766	4.342	18.687	4,304	3.751	21.423	5,711
March	3.101	14.141	4,560	4.938	14.461	2,928	3.437	21.654	6,301
April	3.693	14.705	3,982	4.976	13.690	2,751	1.404	21.656	15,421
May	4.311	19.414	4,504	4.995	22.030	4,411	2.476	21.494	8,682
June	5.003	22.962	4,590	5.144	21.513	4,182	3.685	21.484	5,831
July	4.288	21.156	4,934	5.484	20.252	3,693	4.969	21.556	4,338
August	5.224	24.037	4,601	5.047	19.492	3,862	5.033	21.635	4,299
September	5.125	23.098	4,507	4.399	19.836	4,509	5.306	21.547	4,061
October	4.179	19.436	4,651	5.141	23.326	4,537	5.404	21.615	4,000
November	4.292	19.368	4,513	5.152	23.426	4,547	5.023	21.596	4,299
December	3.261	17.259	5,292	3.959	20.392	5,150	5.716	21.626	3,783
TOTAL	**48.558**	**224.573**	**4,625**	**58.382**	**241.205**	**4,132**	**50.285**	**259.327**	**5,157**

PT Lautan Natural Krimerindo based in Mojokerto, Indonesia, produces powdered vegetable creamer, liquid creamer and other custom products. Data for 2021 shows production results of 48,558 tons with energy consumption of 224,573 MMBtu so the SEC is 4,625 MMBtu/ton of product. Data for 2022 shows production results of 58382 tons with energy consumption of 241205 MMBtu so the SEC is 4,132 MMBtu/tonne of product. Data for 2023 shows production results of 50,285 tons with energy consumption of 259,327 MMBtu so the SEC is 5,157 MMBtu/ton of product.

The lower the SEC achievement, the lower the energy performance. Vice versa, the higher the SEC, the lower the energy performance.

From the data for 2021, 2022 and 2023, it can be seen that the best performance was in 2022. Then followed by 2021 and finally 2023.

PT LNK's energy consumption consists of electricity from PLN, natural gas, and HSD (diesel fuel) for diesel engines. From previous data, it is clear that natural gas is the largest source of energy consumption. Natural gas is primarily used for the operation of the boilers, gas engines, and dryers 1 and 2. The boiler generates steam, which is used for the heating system, Clean-In-Place (CIP) processes, and other thermal needs. The gas engines are used to generate electricity, with a significant portion of the electricity consumed by PT LNK being produced by these gas engines. Meanwhile, the dryers are used in the drying system for PT LNK's products

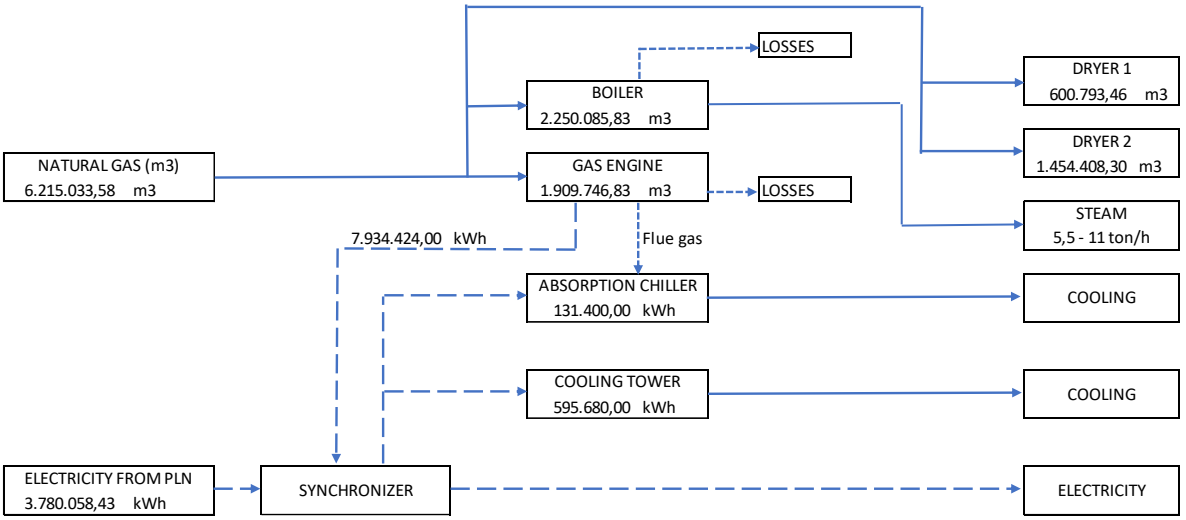


Figure 1 Existing Energy Flow Diagram

Here is the data for natural gas consumption over the past three years: 2021, 2022, and 2023.

Table 3 Natural Gas Consumption

Month	Natural Gas Consumption 2021				Natural Gas Consumption 2022				Natural Gas Consumption 2023			
	Boiler (m3)	gas engine (m3)	dryer 1 (m3)	dryer 2 (m3)	Boiler (m3)	gas engine (m3)	dryer 1 (m3)	dryer 2 (m3)	Boiler (m3)	gas engine (m3)	dryer 1 (m3)	dryer 2 (m3)
January	147.991,58	77.657,66	22.586,27	109.852,79	202.496,30	143.639,66	51.182,06	39.546,91	202.496,30	173.611,09	51.182,06	119.099,60
February	135.499,64	75.875,07	16.258,34	100.152,04	171.406,22	151.286,91	32.759,21	42.756,20	171.406,22	175.891,41	32.759,21	111.668,32
March	138.225,79	79.648,80	11.506,94	110.451,33	158.986,63	1.788,98	34.431,08	73.945,90	158.986,63	120.146,88	34.431,08	84.398,76
April	139.766,87	61.962,54	10.148,58	135.660,10	87.819,70	3.161,42	26.565,98	71.214,29	87.819,70	43.144,19	26.565,98	31.527,46
May	157.596,41	147.197,57	75.024,17	115.602,66	149.527,97	151.893,17	33.409,13	57.620,77	149.527,97	103.522,94	33.409,13	74.896,74
June	199.730,08	210.110,88	67.210,65	147.610,51	187.641,39	147.550,82	43.775,16	65.762,97	187.641,39	157.794,11	43.775,16	113.417,72
July	178.918,91	188.544,83	76.834,51	83.278,39	230.231,64	137.383,01	56.220,05	82.382,91	230.231,64	178.654,11	56.220,05	160.293,36
August	217.862,19	190,20	73.483,33	158.409,03	213.261,49	131.685,90	62.661,15	73.838,04	213.261,49	199.441,20	62.661,15	151.710,66
September	226.269,84	174.953,86	67.306,61	152.493,24	223.239,23	123.720,69	69.062,41	69.287,20	223.239,23	201.892,90	69.062,41	153.929,72
October	178.659,00	145.494,94	67.670,85	117.297,18	188.212,63	164.531,14	61.499,62	61.860,32	188.212,63	188.522,70	61.499,62	155.789,79
November	188.494,10	139.008,35	67.413,67	120.826,25	212.981,36	183.292,37	61.334,34	48.117,21	212.981,36	178.427,50	61.334,34	142.939,54
December	167.415,36	148.677,87	76.338,85	65.416,10	224.280,45	169.030,96	67.893,27	53.305,33	224.280,45	188.697,80	67.893,27	154.736,62
SUB TOTAL	2.076.429,77	1.449.322,57	631.782,77	1.417.049,62	2.250.085,00	1.508.965,03	600.793,46	739.638,05	2.250.085,00	1.909.746,83	600.793,46	1.454.408,30
TOTAL	5.574.584,74				5.099.481,54				6.215.033,58			

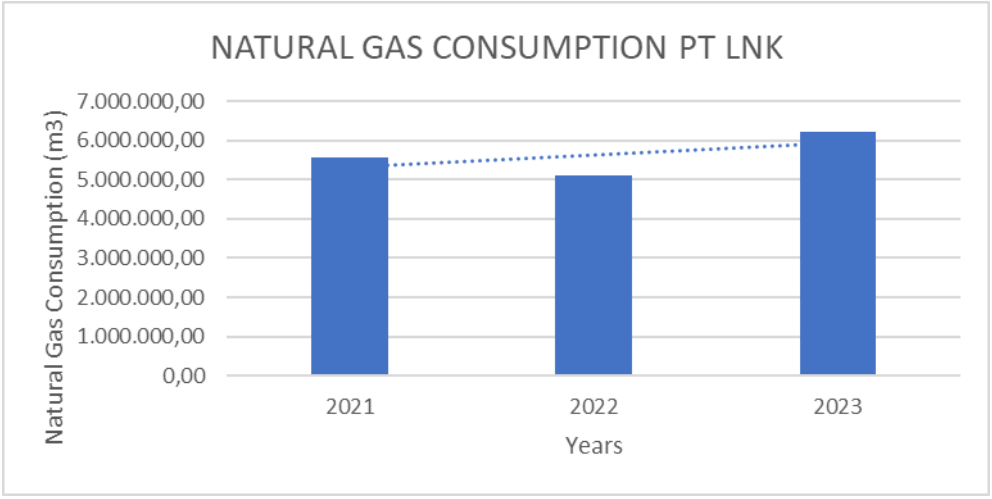


Figure 2 Natural Gas Consumption 2021, 2022, 2023

From the graph above, it can be observed that natural gas consumption has shown an increasing trend over the past three years. This rise in consumption is aligned with the increase in production output.

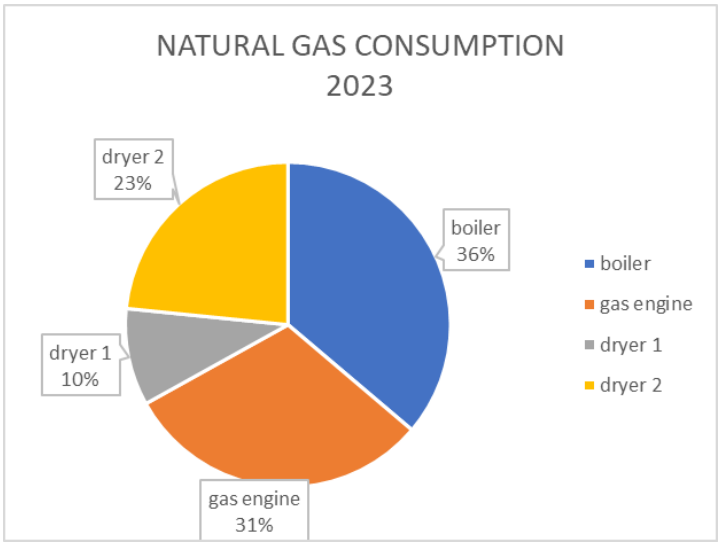


Figure 3 Natural Gas User 2023

1.6.2 Energy saving potential

Energy savings are assessed in terms of Best Available Technology (BAT) and therefore also include savings that are financially beneficial at current energy prices. it is hoped that profits will be achieved in the future. The next energy saving proposal is based on estimates to obtain the efficiency of the equipment used or the system.

For example, if the use of a gas engine to produce electricity is replaced with the entire electricity supply from PLN, financial savings will be obtained.

The difference between the price of natural gas and the price of electricity from PLN. From the GHG calculation aspect, a significant reduction in GHG will also be obtained.

Another example, replacing a boiler with a smaller capacity boiler that uses biomass fuel, will result in savings on energy prices and a reduction in GHG because biomass is considered renewable energy. Biomass is considered carbon neutral because the carbon dioxide (CO_2) released during biomass combustion comes from the carbon that plants absorb during photosynthesis in their life cycle.

Table 4 Energy Potential Saving

RECOMENDATION		ENERGY CONSUMPTION / YEAR	POTENTIAL SAVING		ESTIMATED INVESTMENT IDR	SIMPLE PAYBACK PERIOD (YEAR)	REMARK
			ENERGY	ENERGY COST (IDR)			
UTILITY							
Gas Engine	Deactivating the gas engine, meeting all electricity needs by subscribing to PLN	69.445,34 m3 natural Gas		1.652.799.074,69	2.000.000.000,00	1,21	The energy costs of subscribing to LN are cheaper than the energy costs of operating a gas engine
Boiler	Install Oxygen Trim Control to Regulate Excess Air	2.250.085,00 m3 natural gas	5.625,21 m3 natural gas	30.437.513,00	200.000.000,00	6,57	to achieve more optimal excess air levels, ideally between 5-10%, indicated by an O2 content of 1-2%.
	Substitution Boiler from Natural Gas to Wood Pellet Fuel			4.705.132.284,00	14.400.000.000,00	3,06	energy costs for biomass boiler operations are more economical than natural gas boiler
Compressor	Replacement of compressor 2 of the screw compressor type, replaced with a magnetic levitation centrifugal air compressor	1155,71 MWh/year	462,28 MWh/year	577.853.400,00	1.280.000.000,00	2,22	maglev compressor more efficient 40% than conventional compressor
Cooling tower	Use of VSD on Circulation Pumps	134,90 MWh/year	53,96 MWh/year	67.452.000,00	175.000.000,00	2,59	By installing VSD, an average energy savings potential of 40% can be achieved
	Use of VSD on Cooling Tower Fans	459,90 MWh/year	183,96 MWh/year	229.950.000,00	1.050.000.000,00	4,57	By installing VSD, an average energy savings potential of 40% can be achieved
WWTP	utilize methane from effluent as an energy source		9.363,89 MWh/year	11.704.862.500,00	6.000.000.000,00	0,51	
PROCESS							
Dryer	Optimizing process in the dryer section with heat recovery mechanism	2.055.201,75 m3 natural Gas	262.064,63 m3 natural gas	1.572.387.760,12	9.600.000.000,00	6,11	By install heat recovery mechanism energy savings potential of 12,751% can be achieved

Figure 4 Existing Energy Flow Schematic Diagram

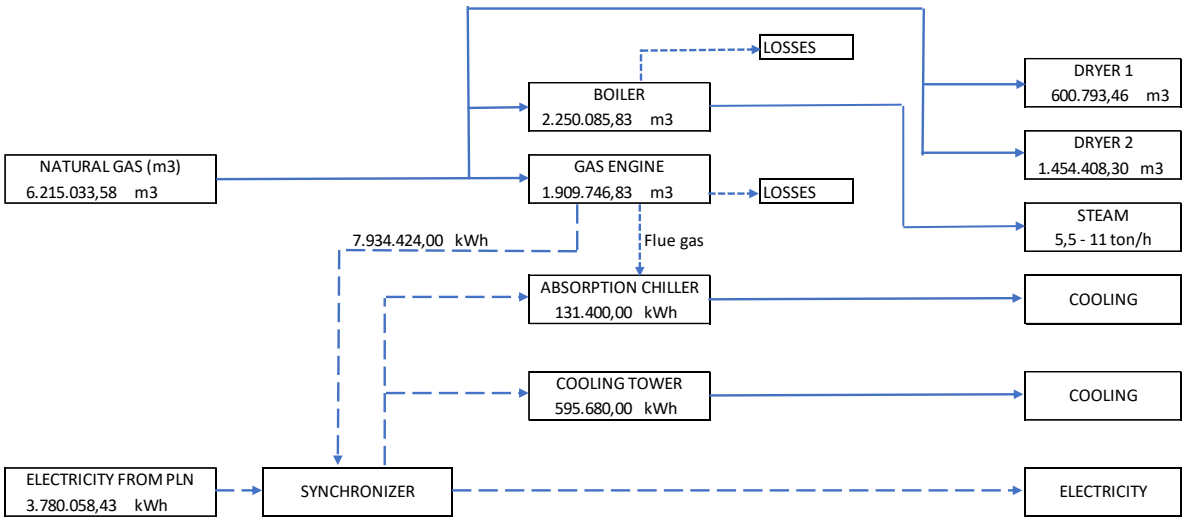


Figure 5 Recommended Energy Flow Schematic Diagram

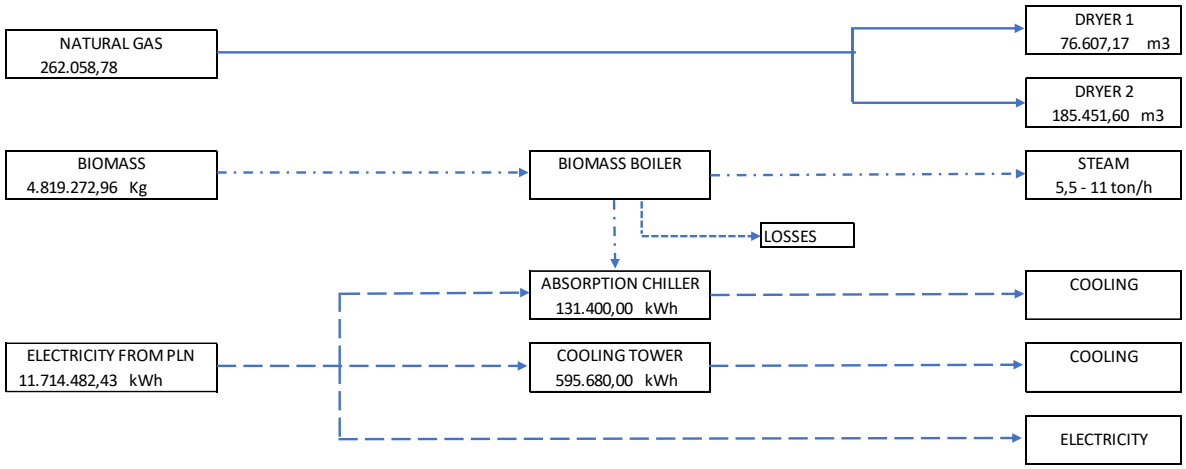


Figure 6 Existing Dryer Process

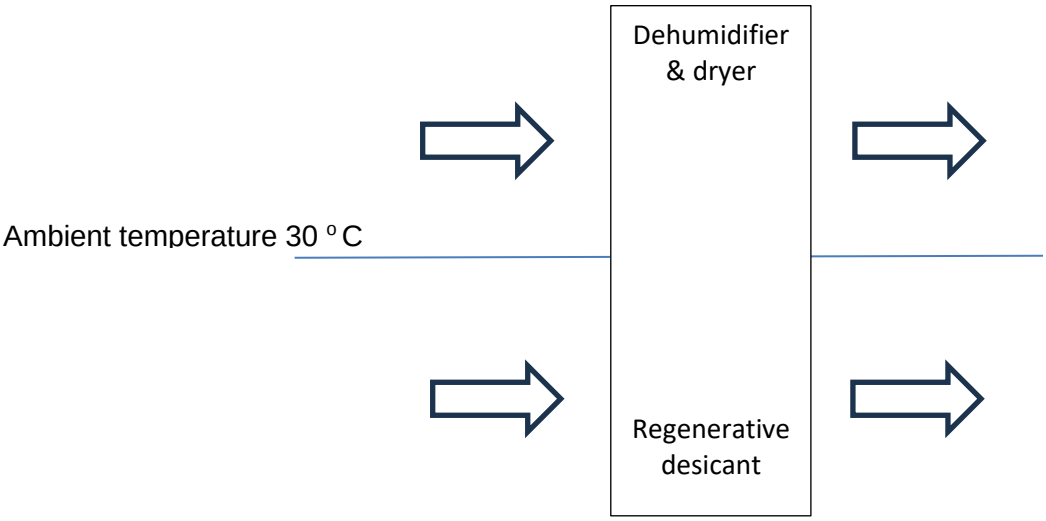
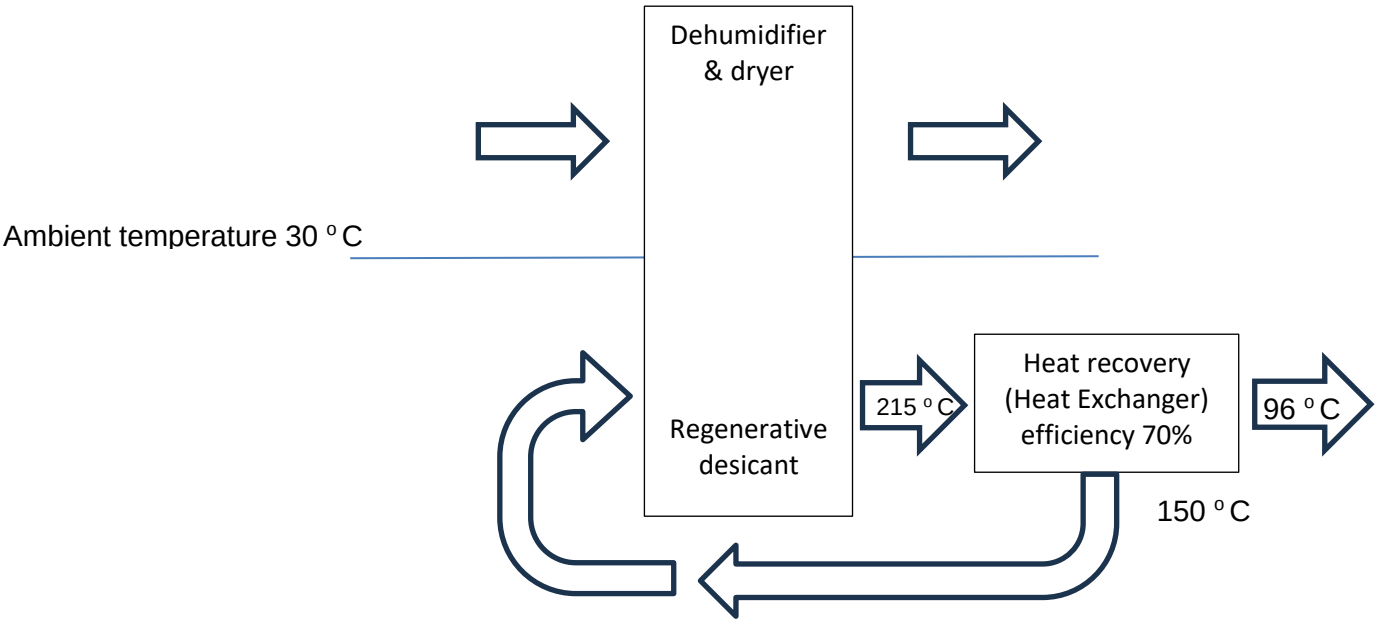


Figure 7 Recommended Dryer Process



1.6.3 Saving strategy when implementing an energy management system (EnMS)

PT LNK has developed an energy monitoring system. This can be seen from the use of centralized energy monitoring in the control room. However, this control system is not yet comprehensive in all production and utility systems that use energy, so improvements need to be made to make it easier to monitor energy use. This improvement will be in line with the implementation of an energy management system (EnMS) which is expected to improve sustainable energy performance. This monitoring is critical to understanding the current state of energy performance, as it can help identify opportunities for efficiency improvements and energy savings.

PT LNK to develop an energy monitoring system. It is indicated by the increasing energy monitoring installed on both utility and production line. The implementation of Energy Management System (EnMs) will improve monitoring and evaluating energy performance This monitoring is crucial for understanding the current condition regarding energy performance, as it can help identify opportunities for efficiency improvements and energy savings.

1. Root cause analysis
    - helps understand sources of energy waste
    - finds out why equipment is not operating
2. Finds out the power quality
    - finds out how good the quality of electricity is on the network, whether there are voltage or frequency fluctuations
    - finds out the harmonic distortion that appears
3. Measurement and verification
    - able to estimate energy usage trends in a facility
    - verifies the benefits of implementing energy conservation
4. Cost allocation
    - Can help estimate the cost of goods sold
    - Benchmarking with other similar tools or process

For it is highly recommended to install EnPIView application software to obtain advantages as follows :

1. Knowing the details of the energy consumed, utilized, and lost energy.
2. Analyzing losses both in total and partial to eliminate losses.
3. Setting energy baseline (EnB) and performing normalization if necessary.
4. Calculating Energy Performance Indicator (EnPI).
5. Providing warnings when decreasing in energy performance and identify areas / equipment that can be improved
6. Tracking annual progress of energy intensity and efficiency.

The EnPI View application will provide the above information in real time and can be monitored anywhere as long as connected with internet network.

1.7 Present situation

Currently PT LNK's energy consumption consists of electricity from PLN, natural gas, and HSD (diesel) for diesel engines. 2023 data shows that natural gas is the largest source of energy consumption, reaching 6215033.58 m3 of natural gas. Natural gas is used for boiler, gas engine, and dryer operations 1 and 2. Boilers produce steam, which is used for heating systems, Clean-In-Place (CIP) processes, and other thermal needs. The gas engine is used to produce electricity which is synchronized with electricity from PLN. Data on electricity consumption for 2023 shows that electricity from gas engines reached 7,934.42 MWh or 69%, while PLN electricity reached 3,780.06 MWh or 32%. Overall natural gas consumption is used for the operation of the boiler (36%), followed by the gas engine (31%), dryer 2 (23%), and finally dryer 1 (10%).

1.8 Different ways of electrification

From data for 2021, 2022 and 2023, PT LNK's electricity consumption fluctuates according to the rise and fall of production numbers. The composition of PLN electricity and self-generation also fluctuates with the average ratio of self-generation being around twice that of PLN electricity purchases.
In general, electricity from PLN is cheaper and more practical than generating your own electricity with a gas engine, especially for large and sustainable energy needs. Generating your own electricity with a gas engine may be more expensive due to lower efficiency, relatively high gas fuel costs, and large maintenance costs. However, gas engines could be an option if there is a need for a stable, uninterrupted electricity supply or if there is the potential for significant gas fuel subsidies for certain industries.
So replacing the electricity source from the PLN-gas engine combination with PLN as a whole will provide an opportunity for significant energy cost savings. The benefits to be gained include:

- Cost Savings: The cost of PLN electricity is lower than that of gas engine and less maintenance.
- Reliability: The PLN power supply is more reliable and plug and play.
- Environmental Friendliness: PLN electricity reduces emissions and noise compared to gas engine.
- Energy Efficiency: PLN electricity is more efficient, reducing energy waste.
- Convenience: No need maintenance cost