Environmental Governance and Operation Excellence (Process)

Environmental Governance

The Company committed on the environmentally friendly business operation by strictly complying with the requirements of the related environmental laws and regulations and complying with the requirements of the environmental management system (ISO 14001:2015) in friendly co-existence with the communities around the plant and mutual sustainable development. The operating successes in 2021 were as follows.

- Petroleum Production Plant (PPP), Sukhothai, passed the 2022 operating audit in accordance with the requirements of the environmental management system (ISO 14001: 2015) from the Management System Certification Institute (MASCI) on 21-22 September 2022.
- Petroleum Production Plant (PPP), Sukhothai, hired MET Company Limited to prepare the result report of the compliance with the preventive and corrective measure for environmental impact and monitoring measure for environmental impact during January-December 2021, and measurement of the environmental quality as required by law. It was found that PPP had complied with the preventive and corrective measure for environmental impacts and monitoring and inspecting measure for the environmental impacts (Source: Report of MET Company Limited).
- Biogas power plant, Mae Taeng (MT) hire MET company limited to prepare a report on the implementation of preventive measures, edit and monitor the environmental impact. That was according to the Code of Practice (Code of Practice: CoP). The implementation during the January - December 2022 found that preventive measures were followed, managed and monitor on the environmental impact (Source: MET Company Limited's report.)
- Petroleum Production Plant (PPP), Sukhothai Province, arranged risk assessment for all activities that affected employee health in accordance with ISO 45001:2008 safety and occupational health standards and arranged an Environmental Aspect.) and establish a control plan according to the environmental management system standard ISO 14001:2005.

Climate Change

Greenhouse Gas Management

The Company continuously focused and tried to manage greenhouse gas emissions from various activities. However, there has not yet been done by an external verifier (Third Party), but the Company plans to have it as well.

The company operated the business under the vision and guidelines for conducting business with responsibility and sustainable environmental management. The goal was to reduce greenhouse gas emissions and manage the environment in a balanced way. It was under SDG Goals 13, Climate Action, urgently measures the climate change and its impacts, and 17, Partnerships for the Goals, to build strong partnership and global cooperation for sustainable development.

In year 2022, the company supported to plant trees to increase more green areas together with the Association of Listed Companies in the Market for Alternative Investment (MAI) through the CARE THE WILD and " PLANT & PROTECT" project. That was considered as a collaboration platform to raise funds for truly plant forests and a sustainable source of food for the community by reforestation at Baan Aoy, Baan Boonrueng, Baanvieng subdistrict Rongkwang district in Prae province.

The amount of 1 rai was equal to 200 tons, which would help absorb greenhouse gases for 1,800 kilograms of carbon dioxide per year. Futhermore, the company continued to collect data and calculate the organization's greenhouse gas emissions. Summarized as follows:

Table 1.1 Comparative Table showing Greenhouse Gas Emission Volume (Electric power consumption) for 2022 - 2021 (Head Office)

Place	Unit	Total consumption volume (Kilowatt-Hour)			CO_2 emission (kg co_2)		
		2022	2021	Change (%)	2022	2021	Change (%)
19th fl	Kilowatt-Hour	105,547.00	96,502.00	+ 8.56%	52,762.95	48,241.35	+8.56%
20th fl	Kilowatt-Hour	73,248.00	57,080.00	+ 22.07%	36,616.68	28,534.29	+22.07%
Total		178,795	153,582.00	+ 30.63%	93,379.63	76,775.64	+30.63%

Remark : Referring to the calculation formula : Greenhouse Gas Management Organization (Public Organization)

Table 1.2 Comparative Table showing Greenhouse Gas Emission Volume (Paper Consumption) for 2022 – 2021 (Head Office)

Type of Paper	Unit	Total Consumption Volume (Ream)			CO_2 Emission Volume (kg co_2)		
		2022	2021	Change (%)	2022	2021	Change (%)
A 4 (80 Gram), 2.49 kg.	Ream	500	500	0%	2,616.99	2,617.10	-0.11%
A 3 (80 Gram), 5.0 kg.	Ream	0	5	-100%	0	52.55	-100%
F 14 (80 Gram), 3.08 kg.	Ream	0	5	-100%	0	52.55	-100%
Total		500	510		2,616.99	2,702.02	-0.11%

Remark: Referring to the calculation formula: Greenhouse Gas Management Organization (Public Organization)

Table 1.3 Comparative Table showing Greenhouse Gas Emission Volume (Air Travel) in 2022 (Head Office)

Type	CO_2 emission (kg co_2)
Domestic travel	16,612.88
International travel	16,203.28
Total	32,816.16

Remark: Referring to the calculation formula: Greenhouse Gas Management Organization (Public Organization)

Table 1.4 Reduced Flare Gas and CO_2 Emissions from useless burning (Sukhothai Province)

Plant	Reduced Flare Gas Emissions from useless burning (MMBTU)	Reduced CO_2 Emission (Ton CO_2)	Number of 10-year-old trees required to absorb CO_2 (Tree)
PPP Plant	571,186.33	33,805.95	558,984
Power plant STN-A	210,286.44	12,445.91	205,794
Power plant PTO-A	108,919.29	6,446.44	106,592
Total	890,392.06	52,698.30	871,370.00

Remark: The calculation was referred to IPCC Reference Approach for Estimating CO_2 Emission from Fossil Fuel Combustion United States Environmental Protection Agency

Biogas power plant from energy crops at Chiang Mai province promoted the cultivation of energy crops used in the electricity production process, such as Napier grass. One-time plantation could be harvested for 6-8 years. It could help reducing CO_2 emissions for soil preparation, cuttings, and planting. The purchase of corn after harvesting could be reduced CO_2 emissions as summarized in the table below.

Table 1.5 Shows the amount of CO_2 emissions reduced by cultivation and burning processes. (Mae Tang Plant)

Raw Material	Amount (Ton)	Reduced CO_2 Emission (Ton CO_2)
Napier grass	18,187.60	513.80
Corn	9,055.00	7,271.00
Total	27,242.60	7,784.80

Remark: Reference from Burapha Science Journal calculations (2015)

Resource Consumption

Raw Materials

1. Associated Gas at Petroleum Production Plant, Sukhothai

The Company had well improved and developed the production process and supervised and maintained the alignment of associated gas transmission pipeline from the source of oil production of PTTEP to Petroleum Production Plant or PPP, contributing to the reduction of environmental impact from flaring associated gas to atmosphere. Due to an increase in the quantity of associated gas delivered by PTTEP to PPP in 2022, it had also resulted in an increase in the quantity of associated gas raw material consumption used in the PPP process in the same way.

Raw Materials	2022	2021	2020
Associated gas (MMSCF)	403.71	350.45	295.84

Petroleum Production Plant or PPP, Sukhothai, was shut down for yearly maintenance (Turnaround) on 14 February-3 March 2022.

2.Raw Material (Energy Crop), Biogas from Energy Crop for Electricity Generation (Mae Taeng Plant), Chiang Mai

The Company had continuously purchased an unlimited quantity of raw materials in type of energy crop and agricultural crop from the agriculturists, such as Napier grasses and corns, to be used to produce biogas for electricity generation to be the sustainable income of the agriculturalists, contributing to the Company's availability of raw materials to be fed into production process and ability to continuously generate electricity. The purchase of raw materials for energy crops in 2022 was decreased comparing to the past two years as farmers suffer from floods causing damage to their crops and unable to replant them in a timely basis.

Raw Material	2022	2021	2020
	Tons	Tons	Tons
Energy Crop	27,242	30,208	29,124

Energy Consumption

1. Electric Energy

Throughout the past period, the Company committed to campaign the energy saving and energy consumption reduction. A measure for reducing the energy consumption at head office and plant was continuously carried out as follows.

- Energy Conservative Project
- Petroleum Production Plant (PPP), Sukhothai, uses surplus natural gas from delivering to Sao Thien Power Plant for generating the electric energy to be used inside the plant.
- Biogas from Energy Crop for Electricity Generation (Mae Taeng Plant), Chiang Mai, recycles electric energy generated by the plant to be used in the plant's activities.
- Turn off lighting electricity at nighttime in the unused areas.
- Control temperature of the air-conditioners at 25 C.
- Install Inverter – Deethanizer Reflux Pump size of 15 KW.

Summary of Comparative Table for Electric Energy Consumption (3 Years) (Unit : Baht)

Electric Consumption	2022	2021	2020	Change (%) From 2021
Head Office (H/O)	1,004,091.30	771,746.40	1,000,914.30	+23%
Mae Taeng Plant	719,537.21	401,383.41	88,545.00	+44%
PPP	4,368,136.05	5,073,135.41	3,557,272.00	-16%
Total	6,091,764.56	6,246,265.22	4,646,731.30	-2.53%

From the following summary of data, in 2022,

- Head Office: the electricity consumption increased when compared to 2021. It was due to most of employee were back to work in the office as normal.
- Mae Tang Plant, the eletricity consumption increased when compared with 2021 due to electric generator shut down for maintenance for long period, resulting in more consumption of the external electricity in the Company's activities.
- Petroleum Production Plant (PPP)'s electricity consumption rate was decreased when compared with 2021. It was because the plant could generate the power on their own that was effect to lower consumption.

2. Thermal Energy

The Company had used Diesel oil and benzene in internal undertakings and employee shuttles who traveled for working at Petroleum Production Plant, Sukhothai, and Mae Taeng Plant, Chiang Mai, as per the following summary.

Summary of Comparative Table for Fuel Consumption (Chiangmai Province)

Description	2022	2021	2020	Change (%) from 2021
Diesel (Liter)	18,538	31,760	29,156	-42%
Gasohol (Liter)	2,271	3,305	1,365	-31%
Total (Liter)	20,809	35,066	30,522	-41%

Waste and Unused Material Management

1. Waste water from Production Process

• Petroleum Production Plant (PPP), Sukhothai

PPP had not discharged wastewater from production process outward the outside of PPP due to PPP's installation of Corrugated Plate Interceptor (CPI) System for treatment of wastewater derived from production process. Wastewater was derived from sorting process of water contaminated with raw materials in very few quantities, and then delivered to Produced Water Separator and CPI System for separating oil from water. The water which was passed through CPI System delivered for collecting at Wastewater Pond inside the area of PPP without discharge down to the public water resource or outward the outside of PPP. However, in the case of high quantity of wastewater, PPP carried out to request for permission to deliver for disposal pursuant to the law of SorKor. 1, SorKor.2, and SorKor. 3, and hire a company authorized by Department of Industrial Works to further take them for disposal by a proper method in accordance with the Environmental Management System Standard (ISO 14001:2015) of which PPP has been accredited.

• Biogas from Energy Crop for Electricity Generation (Mae Taeng Plant), Chiang Mai

The Plant separated fermented water and grass residue (SIS) by Vertical Screw Separator. The fermented water which was partially came out was taken back into the production process, and the remaining was used for agricultural benefit, for instance, field crops, horticultural crops, because the fermented water contained mineral nutrients consisting of organics essential for various species of plants. In part of grass residues (SIS), they were dried to expel moisture and further used to produce soil conditioners (SIS).

• Burapha - A Petroleum Production, Sukhothai

There was no water drainage. from the production process (Produced water) to public water sources or outside the production base. All water from the production would be compressed and sent back to by the Water Injection Pump system. In case that the water cannot be returned, the plant would dispose by employing a legally licensed waste transporter and disposer.

2. Waste Sorting

● Petroleum Production Plant (PPP), Sukhothai

PPP's waste sorting system was in line with the requirements and standards. Wastes were classified into three types and disposed by PPP as follows:

1. General wet wastes were collected and delivered for disposal at Krai Nok SAO.
2. Recyclable wastes (non-hazardous) were collected to request for permission to deliver for disposal pursuant to the laws of SorKor.1, SorKor.2, and SorKor.3, and hired a company authorized by Department of Industrial Works to further take them for disposal by a proper method.
3. Hazardous wastes were collected to request for permission to deliver for disposal pursuant to the laws of SorKor.1, SorKor.2, and SorKor. 3, and hired a company authorized by Department of Industrial Works to further take them for disposal by a proper method.

● Biogas from Energy Crop for Electricity Generation (Mae Taeng Plant), Chiang Mai

Waste sorting was managed before delivering for disposal into 4 types consisting of:

1. Garbages were delivered to the waste disposal area of Mae Taeng Municipality.
2. General wastes were delivered to the waste disposal area of Mae Taeng Municipality.
3. Recyclable wastes were collected for sale to the purchaser of junks.
4. Hazardous and polluted wastes were disposed by hiring a company authorized by Department of Industrial Works to further take them for disposal.

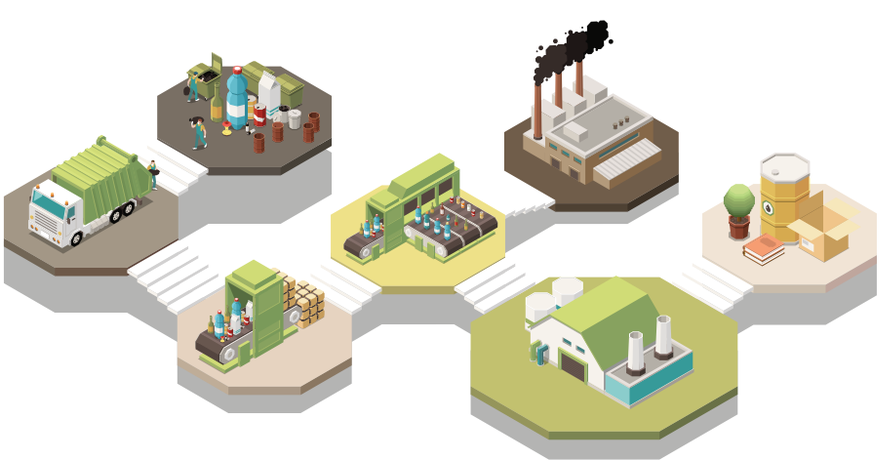
3. Used Engine Oils and Batteries

● Patroleum Production Plant (PPP), Sukhothai

PPP collected the used engine oils and batteries to request for permission to deliver for disposal pursuant to the laws of SorKor.1, SorKor.2, and SorKor.3, and hire a company authorized by Department of Industrial Works to take them for disposal by a proper method.

● Biogas from Energy Crop for Electricity Generation (Mae Taeng Plant), Chiang Mai

The plant collected the used engine oils and batteries for sale to a waste processor who was granted for a license from Department of Industrial Works.



Operational Excellence

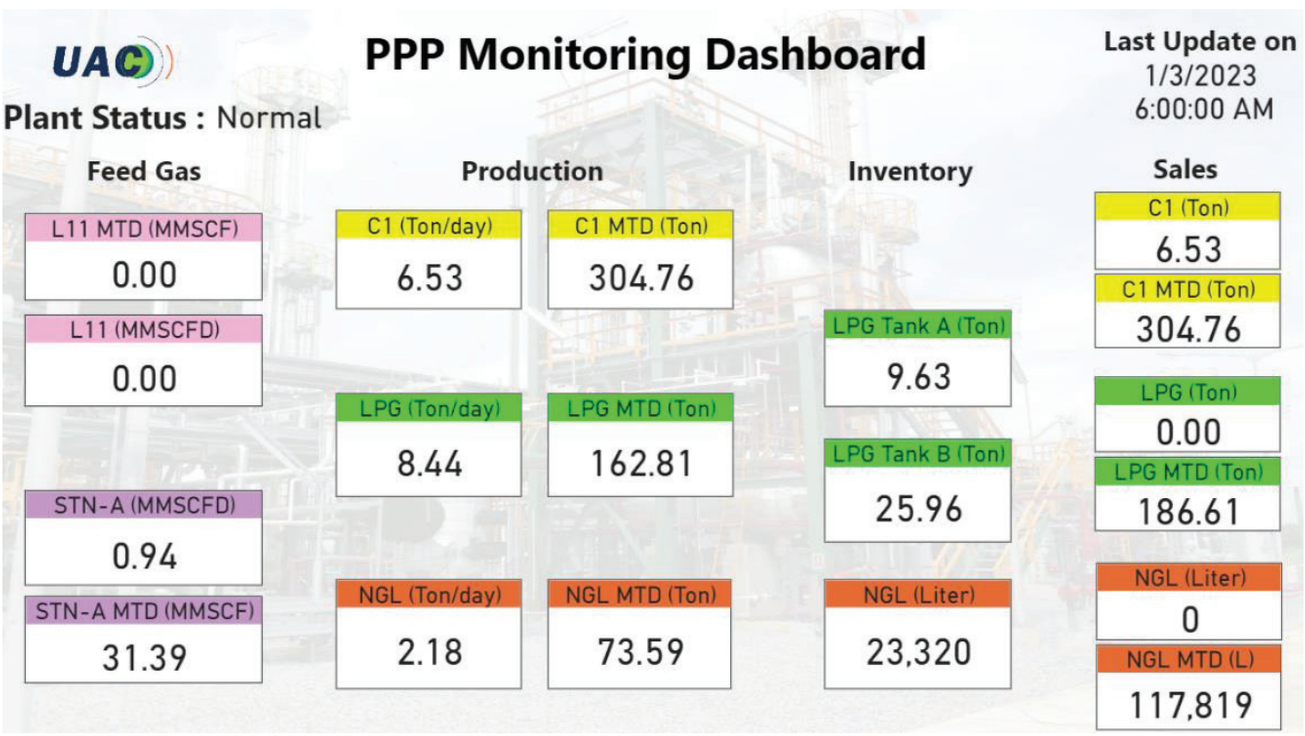
The company promoted and supportd to increase productivity to employees (Productivity). It was included 5S activities and Kaizen Suggestion in the form of Small Group continuously to reduce costs and wastage in the work process and increase efficiency as well as work safety. Therefore, KPIs had been set for Small Group activities under the concept of ESG in order to develop a sustainable organization that leaded to an organization of quality management in whole organization (Total Quality Management, TQM). The employees had accepted and participated in these activities seriously and the performance of such indicators (KPIs) was satisfactory accordingly.

Additionally, the company also seriously responsed to customer satisfaction by adopting various standard systems. It was started from receiving raw materials until products or services were delivered to customers and requiring employees to participate in thinking and developing in every process. Since 2018, the company had implemented the Kaizen system and 5S. planning and learnt the TQM system starting from doing Small Group Activities that was extended from Kaizen.

In 2022, the company was improved the process under the concept of Process Innovation, which used the Power app program to help in accounting departments for expense reimbursement, personnel departments for annual performance evaluations. and expanded to other sectors in the following year.

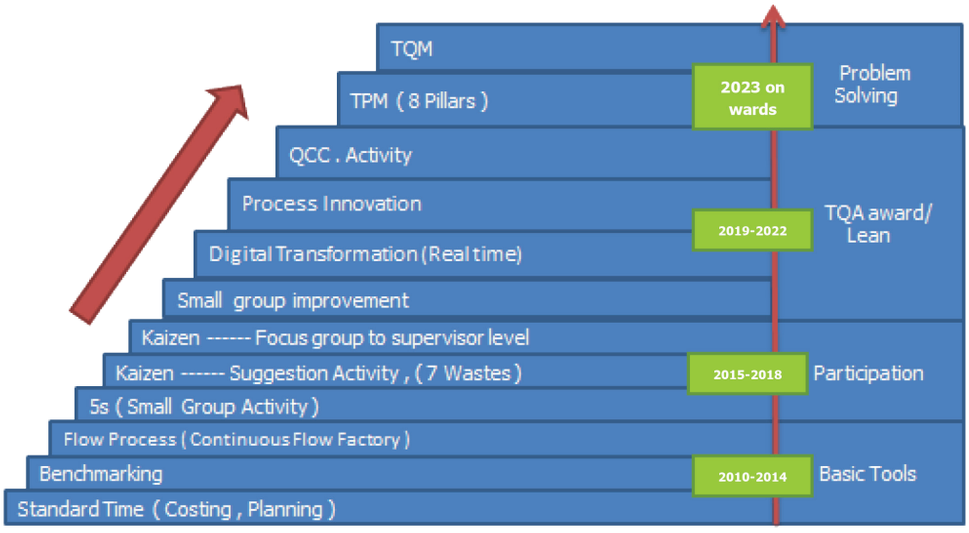
As for Digital Transformation (Real Time), there were Mornitoring Operation Process data displayed on the dashborad from the factory. and showed results to the head office. The screen would display (Details as shown in the below picture) In addition, the company was studying the implementation of the ERP system for application in the work process as well.

Monitoring Operation Process Dashboard



Achieve Operational Excellence

Productivity Improvement Road Map



Operating Results

5S activities

In 2022, the Company continuously carried out 5S activities and defined to be Individual KPI of the employee for the employee awareness and organizational change. In this year, the Company has aimed at the matters of S-Seiketsu, and S-Shisuke with more than 85% for the operating target of the enterprise-wide.

Target and result of 5S activities for 2022

KPI	Target	Result	Remark
5S Area Audit Score	> 85 %	88.20 %	More than 1.04 %

The company also set goals for Small Group activities to make staff awareness and have change in the organization. The goal of Small Group activities was to reduce waste of time, cost, and increase operational safety. And another goal was to increase efficiency and effectiveness in work under the concept of ESG for sustainable organizational development.

Target and result of Small Group Activities for 2022

Target	Result
25 Projects	24 Projects

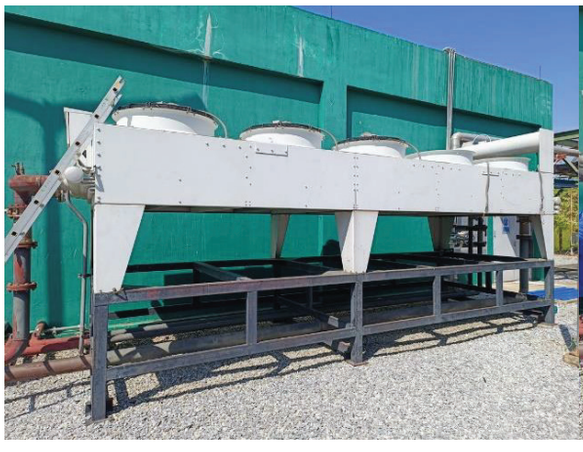
In 2022, the main Small Group activities were summarized by areas as follows:

Plant Group

• **Project Development group,** the power plant from energy crops, Chiangmai province made the Hot Air Oven tray from 2 layers to 4 layers in order to save power consumption and measuring time of of raw materials moisture. carbon could be decreased at 3.61 $kgCO_2e$ (as shown below).

Before	After
	

• **Creative Innovation group,** PPP prepared a heat shield to reduce energy.to reduce the workload of the radiator cooling fan motor because there was hot air coming back into the heat sink after doing this, the working volume of cooling fans could be reduced from 10 to 8 by reducing the use of 2.2 kW motors, which could reduce carbon emissions by 6,762 $kgCO_2e$.

Before	After
	

Head Office and Warehouse

- **Accounting Department** - Paperless for cost sheet
  Adjust the work process to less the document storage and expense., it would save the amount of 74000 Baht per year. And carbon emissions could be reduced by 85.5 $kgCO_2e$.

- **IT Department** – IT man used the POWER APP – online platform named IT REQUREST to use less of papers which could reduce the use of paper 350 sheets / year and reduce carbon emissions by 2.93 $kgCO_2e$.

In 2022, the Operational Exellence activities were scored by giving them token to the one who participated since year 2021. Those would get award from the management team.

Quality Management System

The company had continuously implemented quality management system activities. Summarized as follows:

No.	Quality System	Place	Accreditation Agency	Certification No.
1	ISO 9001:2015	Head Office and Warehouse	SGS-UKAS	TH09/3331
2	ISO 9001:2015	Biogas from Energy Crop for Electricity Generation (Mae Taeng Plant), Chiang Mai	SGS-NAC	TH13/7479
3	ISO 9001:2015	Petroleum Production Plant, Sukhothai	MASCI-NAC	QMS15011/1566
4	ISO 14001:2015	Petroleum Production Plant, Sukhothai	MASCI-NAC	EMS17020/457
5	ISO 45001:2018	Petroleum Production Plant, Sukhothai	MASCI	OHSMS20067/145