

Water Management

Water is a critical resource for businesses, industries, and various human activities. However, the risks and impacts of water-related problems, such as water scarcity and quality, have become increasingly severe in Thailand. Therefore, water management is essential to ensure the most efficient use of water and achieve sustainable water usage without harming the environment.

The Company, as an energy industry player that utilizes water in key production processes, such as steam generation for crude oil distillation and cooling, the Company recognizes the importance of water resources. The Company also acknowledges the risks and impacts of using water from sources in the operations and production processes, as well as the potential effects of wastewater discharge on the environment, external communities, and the company itself. Thus, the Company has conducted an enterprise-wide water risk assessment in terms of water quantity and quality, regulatory changes and pricing structure, and stakeholder conflict over water resources. Additionally, the Company analyzed water stress in the Chao Phraya River at the refinery and Samlae Raw Water Pumping Station in Pathum Thani Province, which are the sources of raw water that the Company receives from the Metropolitan Waterworks Authority for use in its production process. The Aqueduct Water Risk Atlas from the World Resources Institute and the ThinkHazard tool

from the Global Facility for Disaster Reduction and Recovery (GFDRR) were used to manage water appropriately in areas with water stress. These assessments indicated that the refinery and Samlae Raw Water Pumping Station are not in water-stressed areas.

The Company continuously manages water use risks through the Water Footprint of Product process for six product types to reduce tap water use in production, monitoring drought, flood, and water level changes in the Chao Phraya River, and managing the refinery's water management with the 3Rs principle (Reduce, Reuse & Recycle) to minimize tap water use. The results of water management are collected and presented for consideration and improvement through working groups at all levels, from operational to management levels. Further details can be found in the Bangchak and Sustainability section. Additionally, the Company actively listens to the opinions of all stakeholders, especially communities surrounding the refinery and government agencies that prioritize this issue, through various channels such as feedback during community activities and meetings with relevant government agencies. More detailed information can be found in Bangchak and Stakeholders section.

Tap Water Usage Reduction Project in 2023 is as follows:

- Installation of the new cooling tower for plant no. 3

2023 Targets



Use water efficiently to control the new water in the production process of

no more than **0.053** cu.m. per barrel of crude oil processed.



Reduce tap water and groundwater by

40% comparing to the water requirement in proportion to the crude oil quantity in the base year 2019.

Strategy



Adopt 3Rs principle (Reduce, Reuse & Recycle) to increase efficiency of water usage.



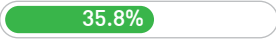



Manage water with tools/modern technology.

Operating Results in 2023

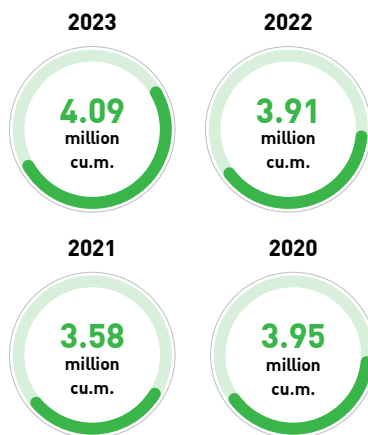
The Company used 2.61 million cu.m. of tap water from the Metropolitan Waterworks Authority and a small portion of groundwater according to the water management plan, which is one of the measures to reduce tap water usage during the drought crisis and maintain the groundwater wells at 0.02 million cu.m. In 2023, the Company received water from various sources totaling 2.64 million cu.m., including water separated from crude oil, and 2.63 million cu.m. excluding water separated from crude oil. This is equivalent to 0.060 cu.m. per barrel of oil equivalent. The Company discharged 0.945 million cu.m. of water into natural surface water sources. The amount of water used for the production process was 1.94 million cu.m., or 0.04 cu.m. per barrel of production capacity.

Order	2023 Plan	Operating Results
Water Reduction		
1	Improve water quality with Micro-filtration System and Reverse Osmosis System, along with the Electro De-Ionization System to treat raw water with Demineralization System in the power plant.	Reduce water consumption 0.16 million cu.m. per year¹ (0.06% of tap water demand excluding water extracted from crude oil and equal to 3,704 cu.m. per million barrels of oil equivalent)
Water Reuse		
2	Condensate high quality water from the production process to be reused in the steamers.	Reduce water consumption 0.59 million cu.m. per year (0.23% of tap water demand excluding water extracted from crude oil 13,498 cu.m. per million barrels of oil equivalent)
3	Reuse stripped water from the sour water stripping unit and wastewater from stripping steam process of the distillation unit no. 3 to use instead of tap water in the desalter unit.	Reduce water consumption 0.09 million cu.m. per year (0.04% of tap water demand excluding water extracted from crude oil 2,123 cu.m. per million barrels of oil equivalent)
Water Recycle		
4	Recycle condensate water from the distillation unit 4 (plant 4) to treat and use in the boiler feed water.	Reduce water consumption 0.45 million cu.m. per year (0.17% of tap water demand excluding water extracted from crude oil 10,308 cu.m. per million barrels of oil equivalent)
5	Recycle the wastewater by treating with Micro-filtration System and Reverse Osmosis System to use in the cooling process.	Reduce water consumption 0.18 million cu.m.per year (0.07% of tap water demand excluding water extracted from crude oil 4,130 cu.m. per million barrels of oil equivalent)

Success Metrics

In 2023	Control water consumption per production unit	Percentage of New Tap Water Usage Reduction in the Production Process for the Year (Percentage and Amount of Water Usage Reduction)	Water saving in household equivalent
Reduce tap water and groundwater use by 40% (Compared to the baseline year 2019) ¹	(Target: less than 53 cu.m. / thousand barrel of oil equivalent) 60 cu.m. / thousand barrel of oil equivalent	 35.8% 2023 Reduce New Water Usage by 1.48 million cu.m.	3,900 households^{2,3}
		 40.04% 2022 Reduce New Water Usage by 1.56 million cu.m.	
		 41.13% 2021 Reduce New Water Usage by 1.47 million cu.m.	
		 36.60% 2020 Reduce New Water Usage by 1.45 million cu.m.	

Water Demand Requirement



Remark: ¹ Not including water usage to Commissioning New Cooling Tower P#3
² Compared to the baseline year of 2015, this includes a combination of reused water from good quality condensate water used in the boiler and within the 4th distillation unit, alongside water from the oily wastewater treatment unit further improved by the reverse osmosis system, and the water that has been treated from the wastewater treatment unit further improved by the reverse osmosis system and used in the cooling tower.
³ Water usage in Bangkok region, In Phra Khanong district where the refinery is situated, there is a member of 1.85 person per household, with the water consumption rate of 0.56 cu.m./person/day or 1.04 cu.m./household/day (source: MWA 2015)

Water Management in Collaboration with External Organizations/Entities and Stakeholders

The Company engages in various environmental conservation activities, especially in water resources management through projects in collaboration with external organizations, agencies, and stakeholders. These activities include:

- **River Cleanup and Tree Planting:** Bangchak organizes river cleanup and tree planting activities along the Chao Phraya River in collaboration with local communities.
- **Oil Spill Response Vessel:** Bangchak has partnered with the Marine Department to procure the Sri Thararak 8, an oil spill response vessel, to help maintain the cleanliness from garbage and oil spill in the Chao Phraya River.
- **Used Cooking Oil Collection Project:** Bangchak collects used cooking oil from households and markets around the refinery and Bang Nam Phueng Floating Market to prevent oil from being discharged into the Chao Phraya River and public water sources.
- **ECO School Project:** Bangchak collaborates with the Department of Environmental Quality Promotion, Phra Khanong District Office, and Bang Na District Office to promote environmental education in 11 schools around the refinery. The project focuses on training school administrators, science teachers, and environmental teachers on integrating environmental education into the curriculum. This year, Banpithwitthaya School has implemented a project on “Wastewater Management in the Cafeteria” to reduce or eliminate wastewater from the school’s cafeteria from entering public water canals near the school, which eventually flow into the Chao Phraya River.
- **Project Citizen:** Bangchak collaborates with the King Prajadhikok’s Institute to enable students to propose public policies related to water, including preventing water pollution in schools and communities.
- **Canal Clean-up Awareness:** Bangchak partners with The Krung Thep Thanakom Company Limited to raise awareness among youth about the impact of canal waste on the environment and communities.
- **Fry to Fly Project:** Bangchak promotes and collects used cooking oil from households and food businesses to prevent oil from being discharged into public water sources.
- **The Beautiful Khlong, Clear Waters Project:** Bangchak collaborates with Phra Khanong District Office, Bangkok Metropolitan Administration, and Chulalongkorn University to improve the landscape of Bang O canal and the water quality in the canal to make it a clean and beautiful water source. This will have a positive impact on the ecosystem and biodiversity.

Water Pollution Management

Water is a vital factor for the livelihood of living organisms, serving as the habitat for a diverse range of aquatic animals and plants. Additionally, water has benefits in agriculture, household use, and industry. The distillery business of the Company also relies on water for production processes. Therefore, reducing water pollution is crucial, and the Company must take responsibility to minimize its impact on natural water sources.

The Company manages water pollution through an efficient wastewater treatment system, resulting in treated water quality that exceeds legal standards. Moreover, the Company reduces wastewater volume through the principles of 3Rs (Reduce, Reuse, Recycle). Treated water is recycled back into the production process to reduce natural resource consumption and minimize environmental and community

impacts around the distillery. The wastewater treatment process of the distillery is divided into three parts.



Physicochemical Treatment Process:

Reducing the contamination of oil and heavy metals in water



Biological Treatment Process:

Reducing the contamination of water-soluble organic substances



Tertiary Treatment Process:

Filtering out small solid particles and absorbing water-soluble organic substances remaining to ensure that the water meets appropriate quality standards before entering the recycling system.