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## Innovation and Technology

Currently, the innovation is important to business development and operation in order to increase competitiveness and create sustainability for the organization. The company realizes the importance of business innovation development in line with corporate values, as well as developing the Kaizen project and improving working conditions to promote a learning environment and innovation of technology both the development of research support processes and support for technology and working tools.

### Operating Policy

#### 1. Corporate Values

Running business to achieve the vision and mission based on the satisfaction and the utmost benefit of the stakeholders by means of :

- Continuous Improvement
- Proactive & Initiative
- Teamwork

#### 2. Sustainable Development Policy

The Company's innovation promotion is stated in the Sustainable Development Policy section "Continuity business process development" as published on the website.

<https://www.ttwplc.com/storage/about/policy/sustainable-development-policy-en.pdf>

### Operating in the field of innovation and technology

#### 1. Technology

The Company uses **Membrane** technology, which is the most modern and internationally accepted standard of tap water production technology in the water production process at Krathum Baen Water Treatment Plant, Samut Sakhon Province, it uses Ultra Filtration (UF) system and Membrane technology to separate suspended solids or dissolved solids from liquids by pumping raw water through a membrane with openings (Pore Size) only 0.01 microns which can effectively remove contaminants, germs, viruses and bacteria, resulting in tap water quality is cleaner and safer, as well as reducing the use of chemicals in the production process. Membrane is a world-class standard technology, similar to use in the US, Singapore, and European Union. It can be considered that the Krathum Baen Water Treatment Plant is the largest commercial tap water production in Thailand that has chosen Ultra Filtration (UF), which serves the demand for tap water of industrial, commercial, and household sectors with full efficiency.

In the past, the company has continuously improved the production process, working tools and equipment to promote and develop the tap water production process to be modern and support future production capacity expansion. In 2025, the company plans to improve the production process at the Bang Len Water Treatment Plant. and Pathum Thani water Treatment plant.

## 2. Innovation

### 2.1 Hybrid Technology

The Company invents an innovative manufacturing process that incorporates Conventional technology with Ultra Filtration Membrane (UF) technology, thus becoming **“Hybrid Technology”** at Krathum Baen Water Treatment Plant, the largest commercial tap water production plant in Thailand and the only tap water treatment plant to use hybrid filtration. The Company’s tap water treatment plant is located near the service area with heavy tap water users in Krathum Baen, Samut Sakhon Province, this can reduce electricity costs by reducing the distance of pumping water approximately 40 kilometers and reducing the cost of chemicals in the production process. The Company can manage the seasonal fluctuation of raw water quality while keeping production costs low, as well as serve the continually increasing demand for tap water in both the household, commercial and industrial sectors at full efficiency.

### 2.2 Kaizen Project

The continuous development and improvement of work processes are conducted under the Kaizen project, utilizing the Small Group Activity approach by employees across all company departments. Collaboratively, they engage in projects aimed at elevating work standards within and across units. Recognition and awards are presented quarterly to individuals or groups demonstrating outstanding performance in each department. Moreover, support is extended to integrate methodologies and innovative thinking into refining the efficiency of each unit’s workflow. Employees are encouraged to participate in competitions during the final quarter of each year, showcasing their achievements.

In the year 2024, the company promoted the implementation of Kaizen activities by supporting the Small Group Activity approach of employees in every department. Additionally, the company provided a platform for employees to present their achievements to the company’s management during the final quarter of the year.

## Achievements in Kaizen

Unit : Subject

Detail	2019	2020	2021	2022	2023	2024
Kaizen project results	357	363	368	534	510	570

## The Kaizen project that received awards within the organization

### Year 2023

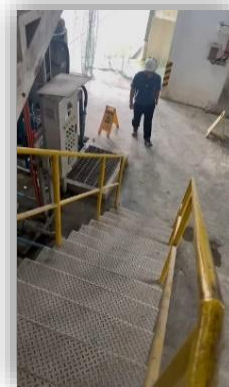
#### 1. Single Room Project

##### 1.1 Problem Statement

Controlling the Belt Press involves the initial step of operating the sludge pump located in the lower section of the press building, followed by the polymer pump on the upper floor. This process, which requires a significant amount of time for operation, aims to control the sludge output to meet specific requirements. However, this extended operation duration poses a risk of accidents for operators, especially during the manual adjustment of polymer dosing rates, involving frequent movement between the upper and lower floors using stairs.

##### 1.2 Improvement Plan

The control pump for the sludge is relocated from the lower floor to the upper floor by installing new electrical and signal lines. This adjustment eliminates the need for operators to spend an extended period walking between the installation equipment areas located on different floors.



#### A Performance Comparison Before-After

Details	Before	After	Result (Increased / Decreased %)
<b>1. Economic</b> • Decrease operating period.	100 Minutes	20 Minutes	Decreased 80%
<b>2. Environmental</b> • Reduce the risk of accidents for workers.	<u>Have a risk</u>	<u>Not have a risk</u>	Decreased 100%

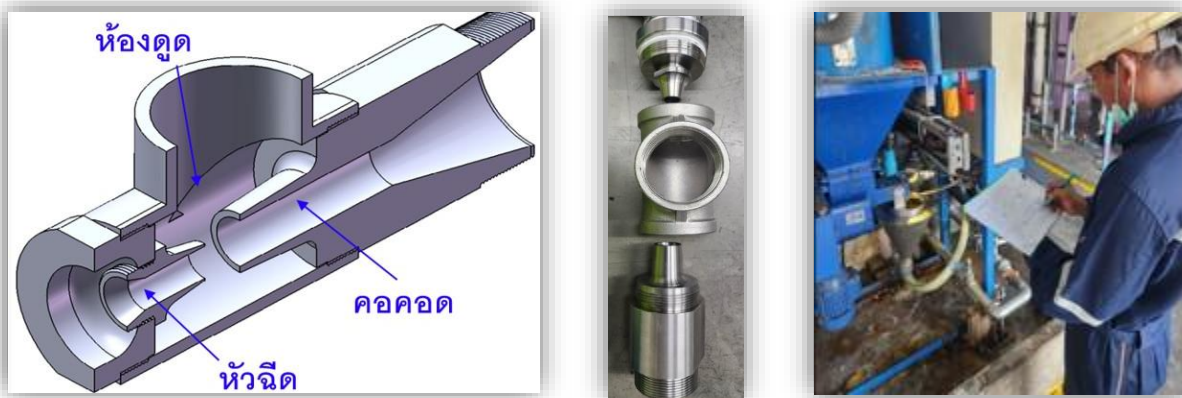
## 2. Project Efficient Vacuuming

### 2.1 Problem Statement

Currently, the equipment used for aeration in various systems (Ejectors) in the Sludge Polymer chemical preparation system is deteriorating. The Ejector equipment, designed by the manufacturer to operate with water pressure in the system exceeding 5.0 Bar, is constructed with components molded together. When these components deteriorate, it necessitates the purchase of an entire set, resulting in high expenses. To reduce costs in procuring Ejector equipment, there is a proposal to redesign it, allowing for the replacement of only the damaged components and utilizing water pressure in the system less than 5.0 Bar.

### 2.2 Improvement Plan

Develop a new design for the Ejector equipment, enabling the replacement of internal components.



### A Performance Comparison Before-After

Details	Before	After	Result (Increased / Decreased %)
<b>Economic</b> <ul style="list-style-type: none"> <li>Reduce the cost of replacing ejector equipment.</li> </ul>	90,000 Baht	10,000 Baht	Decreased 89%

### 3. Project High-pressure Cleaning Equipment

#### 3.1 Problem Statement

Cleaning residues on elevated surfaces such as the walls of various buildings, including Clarifier Tanks, Treated Tanks, and Ultrafiltration Buildings (UF), poses challenges due to their elevated nature. This results in fatigue and inconvenience for workers, as well as an increased risk of accidents from slips or falls.

#### 3.2 Improvement Plan

Designing equipment that can be used to clean residues, reduce fatigue, and minimize the risk of accidents for workers.



#### A Performance Comparison Before-After

Details	Before	After	Result (Increased / Decreased %)
<b>Social/Environmental</b> <ul style="list-style-type: none"> <li>• Reduce the risk of accidents for workers.</li> <li>• Reduce alleviate worker fatigue.</li> </ul>	<b>High risk</b>  <b>32 Point</b> (Rest and recover)	<b>Low risk</b>  <b>12 Point</b> (normal)	<b>Decreased</b>  <b>Decreased</b> <b>63%</b>

## Year 2024

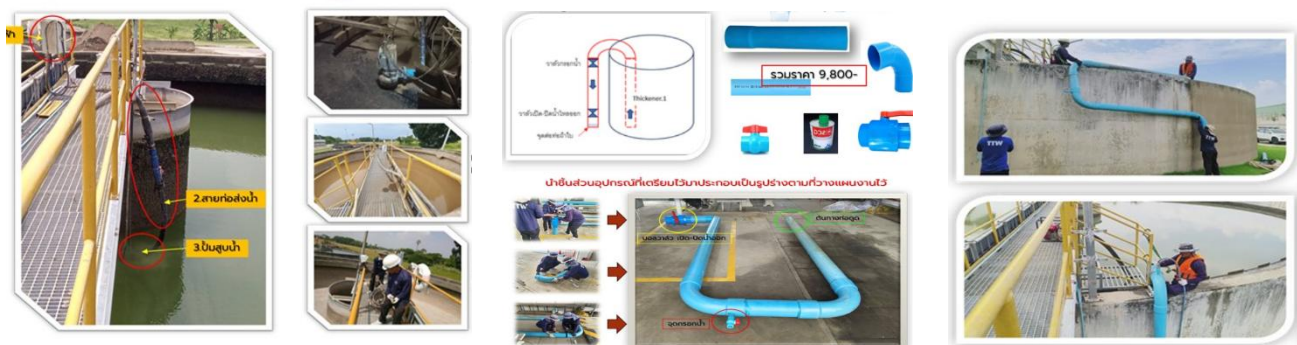
### 1. Project: Thickener 1,2 Suction Pipe

#### 1.1 Problem Description

Each time the Thickener tank is cleaned, it requires several preparation steps, involving machinery that consumes fuel and electricity. Additionally, lifting heavy equipment poses a risk of accidents. There is also insufficient manpower, requiring staff from multiple departments.

#### 1.2 Improvement Measures

A 6-inch PVC pipe was used, bent into a U-shape with each side 4 meters long. A valve was installed on one end of the pipe. One end of the pipe was placed at the drainage channel of the sedimentation tank No. 1, while the other end was submerged into the Thickener tank. Once the suction pipe assembly was completed, the outer valve of Tank TK was closed. Water was then filled through the inlet until the pipe was full. The outlet valve was subsequently opened to allow water to flow to the designated point.



Comparison Table: Performance Before and After Implementation

Item	Before	After	Result (Increased / Decreased %)
<b>1. Economic</b>			
• Reduced operation time	14 hours	4 hours	Decreased by 72%
• Reduced electricity cost	420 Baht/time	152 Baht/time	Decreased by 64%
<b>2. Social</b>			
• Risk of accidents	At risk	No risk	Decreased by 100%
<b>3. Environmental</b>			
• Reduction in GHG emissions	40.62 KgCO <sub>2</sub> eq	0 KgCO <sub>2</sub> eq	Decreased by 100%

## 2. Project: Pump Head Reduction for Energy Saving

### 2.1 Problem Description

In 2023, the demand for tap water in Amata City Rayong Industrial Estate increased. Water consumption rose by 10.29% compared to 2022. In particular, water demand in the Chinese Zone, including the newly developed 1,650-rai area, increased by 26.12% compared to 2022—significantly higher than the average growth rate. This posed challenges to water supply management, leading to issues such as supply inconsistency and high energy consumption in water distribution at 31,200 m<sup>3</sup>/day.

### 2.2 Improvement Measures

The company replaced the existing pumps with four new high-efficiency pumps, each rated at 90 kW, with a flow rate of 700 m<sup>3</sup>/hr and a TDH of 30 meters. The pipeline system was also upgraded to support the projected increase in tap water demand in the Amata Industrial Estate for the next 10 years.



Comparison Table: Performance Before and After Implementation

Item	Before	After	Result (Increased / Decreased %)
<b>1. Economic</b>			
• Energy consumption	0.227 Kwh/m <sup>3</sup>	0.132 Kwh/m <sup>3</sup>	Decreased by 42%
<b>2. Social</b>			
• Complaints about weak water pressure	Present	None	Decreased by 100%
<b>3. Environmental</b>			
• Reduction in GHG emissions	1,241,536 KgCO <sub>2</sub> eq	721,014 KgCO <sub>2</sub> eq	Decreased by 42%

### 3. Project: Easy Water Sampling – Anyone Can Do It

#### 3.1 Problem Description

The traditional method of collecting water samples for analysis using a manual water scoop involved multiple steps, was time-consuming, and posed risks to employees' health and safety.

#### 3.2 Improvement Measures

A new water sampling device was installed, consisting of a water pump, battery, discharge hose, and a support base for the sampling container, to reduce process steps and resolve existing issues.



**วิธีการเก็บน้ำ**  
**ข้อควรระวัง**  
\* ห้ามโดนขอบปูนหรือขอบเวียร์ หรือติดติดตะกอน "ต้องตักใหม่"

**ขั้นตอนการเก็บน้ำ**  
เตรียมขวดเก็บน้ำ (95 วินาที)  
เตรียมกระบอกใส่ขวดเก็บน้ำ (1.3 น = 12 ครั้ง)  
ก้มตักน้ำ บริเวณจุดเก็บน้ำ (9.5 วินาที)  
กรองน้ำลงในขวดเก็บน้ำ (1.1 น = 360 ครั้ง)  
เก็บกระบอกใส่ขวดเก็บน้ำ (1.0 = 4,380 ครั้ง)

**วัสดุที่ใช้**  
สวิตช์ เปิด-ปิด 1 ชิ้น 500 บาท  
ปั๊มขนาดเล็ก 1 ชิ้น 500 บาท  
ชุดสายพ่วงเหล็ก ถาดรองกระบอกน้ำ 2 ชิ้น 500 บาท  
แม่สายสำหรับ แอแดปเตอร์ 2 ชิ้น 500 บาท

**รายการวัสดุ/ค่าจ้าง**

ลำดับ	รายการวัสดุ	จำนวน	ราคา
1	แม่สายพ่วง	1 ชิ้น	500 บาท
2	ชุดสาย	1 ชิ้น	500 บาท
3	ปั๊ม 12 VDC	2 ชิ้น	500 บาท
4	ชุดสายพ่วงเหล็ก	2 ชิ้น	300 บาท
5	แม่สายพ่วง	3 ชิ้น	400 บาท
6	ชุดสาย PVC	1 ชิ้น	500 บาท
7	แม่สาย	2 ชิ้น	- บาท

**รวมค่าใช้จ่าย = 2,300 บาท**

#### Comparison Table: Performance Before and After Implementation

Item	Before	After	Result (Increased / Decreased %)
<b>1. Economic</b>			
• Working time	95 seconds/time	15 seconds/time	Decreased by 84%
<b>2. Social</b>			
• Work-related fatigue	130 bpm	60 bpm	Decreased by 54%

## 4. Project: Easy Rotation

### 4.1 Problem Description

At the Mueang Ek Water Distribution Station, operators are required to manually turn large 1,200 mm valves multiple times (100–200 turns) to adjust water pressure to meet customer demand. This process causes physical fatigue among the workers.

### 4.2 Improvement Measures

A mobile actuator unit was designed to replace manual valve rotation. This system enables valve adjustment without relying on physical force, utilizing tools, equipment, or alternative mechanisms to open and close the water valves efficiently.



Comparison Table: Performance Before and After Implementation

Item	Before	After	Result (Increased / Decreased %)
1. Economic			
• Reduced number of operators	2 persons	1 person	Decreased by 50%
2. Social			
• Work-related fatigue	Present	None	Decreased by 100%

## 5. Project: Visibility During Power Outages

### 5.1 Problem Description

Currently, the water distribution station uses a fiber optic communication system to transmit PLC data. The signal is converted using a device called a Media Converter, which operates on a 5V DC adapter powered by a 240V supply. When a power outage occurs, the converter shuts down as well, causing communication failure. As a result, the control room loses visibility of the affected station. To resolve this, a new power supply solution for the adapter is needed to ensure continued visibility of equipment status during outages.

### 5.2 Improvement Measures

A backup power system was developed to support the communication signal system during power outages. This involved constructing a power conversion device that draws electricity from an existing battery backup system. A Step-Down circuit, also known as a Buck Converter, was used to convert the voltage appropriately.



Comparison Table: Performance Before and After Implementation

Item	Before	After	Result (Increased / Decreased %)
<b>1. Economic</b> <ul style="list-style-type: none"> <li>Travel cost for equipment inspection</li> </ul>	131.76 Baht	0 Baht	Decreased by 100%
<b>2. Environmental</b> <ul style="list-style-type: none"> <li>Reduction in GHG emissions</li> </ul>	10.96 KgCO <sub>2</sub> eq	0 KgCO <sub>2</sub> eq	Decreased by 100%