Water Resource Management in Taiwan Fastener Industry (Part 2)

To address water scarcity through a long-term approach, the Taiwanese government, in accordance with Article 84-1 of the Water Act, has begun levying a "water consumption fee" starting in 2023. For major water users with a monthly water consumption exceeding 9,000 cubic meters, an additional fee of NT$3 per cubic meter is imposed on groundwater users. For non-groundwater users, the first 9,000 cubic meters are exempt, and then NT$3 per cubic meter is added. This fee will be incorporated into the Water Resources Operation Fund under the Taiwanese authorities, earmarked for water resource management, recycled water development, and water conservation promotion to foster sustainable use of water resources.

As mentioned in Part 1 of this article, Taiwan's fastener industry is apprehensive about water scarcity. The question is— how can businesses use each drop of water five times over to safely navigate water shortages? **The most effective system in the world is the ISO 46001:2019 (Water Efficiency Management System), which employs a systematic management structure and direction to regularly review and evaluate a company's water efficiency based on the Deming Cycle (PDCA Cycle) to identify and implement opportunities for improvement. Companies can use the ISO 46001:2019 management system to establish water performance goals, action plans, performance indicators and benchmarks, monitoring and analysis, regular review and audit mechanisms to achieve effective water resource management and improve water use efficiency and reduce costs through reduction, substitution, or reuse.** The standard is applicable to any type of business, with the expectation of achieving the following three water-saving effects:

(1) Achieve effective water use through reduction, substitution, or reuse. Reduction includes using water-saving devices, such as installing water consumption monitoring systems (water meters) or leak detection systems. Substitution includes replacing tap water with seawater, rainwater, or recycled water. Reuse includes recycling "gray water" (water discharged from washing) and wastewater.

(2) Set effective water efficiency goals and establish, implement, and maintain water-efficient manufacturing processes.

(3) Continuously improve and enhance water efficiency goals.

The ISO 46001:2019 standard adopts the High Level Structure (HLS) of ISO management system standards, comprising 10 sections, as summarized in **Table 1**. The main content of the standard is not complicated. The primary specifications are detailed in the appendix guide, which is divided into three parts: Appendix A, Guidance on the use of this standard; Appendix B, Examples of water efficiency scenarios; and Appendix C, Guidance on the preparation of water balance diagrams. Refer to **Table 2** for the ISO 46001:2019 Appendix Guide.

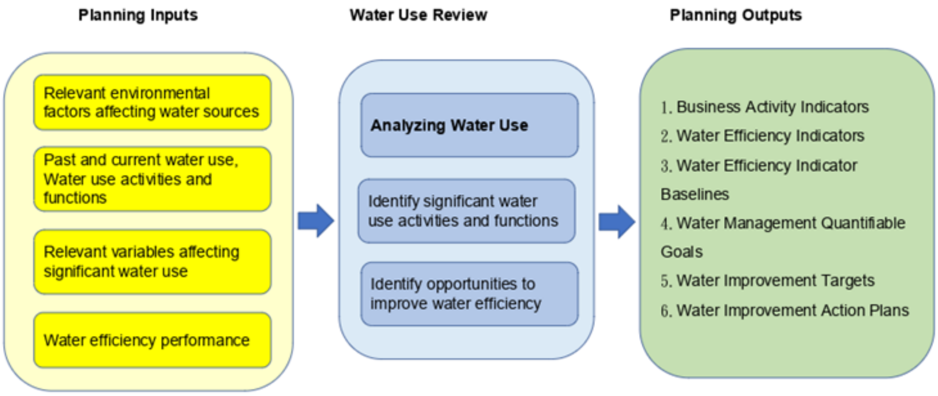
▼ Table 1: List of Sections in ISO 46001:2019

Chapter 1	Scope	Chapter 6	Planning
Chapter 2	Normative References	Chapter 7	Support
Chapter 3	Terms and Definitions	Chapter 8	Operation
Chapter 4	Context of the Organization	Chapter 9	Performance Evaluation
Chapter 5	Leadership	Chapter 10	Improvement

▼ Table 2: ISO 46001:2019 Appendix Guide

Appendix A: Guidance on the use of this standard	Appendix B: Examples of water efficiency scenarios
A.1 General	B.1 Case 1 — Best Manufacturing Process
A.2 Understanding the organization and its context	B.2 Case 2 — Isolated reduction of pollutant load
A.3 Identification and engagement of stakeholders	B.3 Case 3 — Recycled water process
A.4 Leadership and commitment	B.4 Case 4 — Non-water process cycle
A.5 Policy	B.5 Case 5 — Use of alternative water
A.6 Organizational roles, responsibilities, and authorities	B.6 Case 6 — Use of water-saving accessories, devices, appliances, and products
A.7 Planning for water efficiency management	B.7 Case 7 — Optimization of cooling tower operation
A.8 Support	Appendix C: Guidance on the preparation of water balance diagrams
A.9 Documented information	Appendix D: Examples of business activity indicators
A.10 Planning and control of operations	
A.11 Procurement of water services, products, equipment, and water use	
A.12 Monitoring, measurement, analysis, and evaluation	
A.13 Internal audit of water efficiency management system	
A.14 Management review	
A.15 Non-conformities and corrective actions	

In 2019, the International Organization for Standardization (ISO) released ISO 46001:2019, "Water Efficiency Management Systems—Requirements with Guidance for Use," a global international standard specifically for water resource management. This standard, based on Singapore's national standard SS 577:2012 (the world's first water management standard), aims to help organizations of all types improve water efficiency and achieve the goals of minimizing water use and maximizing efficiency through a continuously improving management system. ISO 46001:2019 has a broad scope of application, covering non-residential water users such as manufacturing, commerce, office buildings, government agencies, schools, and hotels. Organizations can use this standard to establish a water resource management framework (as shown in **Figure 1**), develop specific action plans and implementation schedules through strategies such as reviewing water use methods, examining water consumption, and recycling washing water to ensure effective water resource management.



▲ Figure 1: Water Resource Management System Framework in ISO 46001:2019

Amid the global ESG (Environmental, Social, and Governance) trend, companies are required to strengthen environmental sustainability management, and water resource management has become an important disclosure item in ESG reports. ISO 46001:2019 can not only enhance a company's environmental image but also improve operational efficiency, reduce costs in using water resource, and align with global sustainability development.

Taiwan CSC has already made many efforts in the practical management of water resources. According to the article "Taiwan CSC Increases the Proportion of Reclaimed Water Use to Put Corporate Social Responsibility into Practice," the company's internal circulating water can be used 5 to 6 times at each level, and the recovery rate of process water is as high as 98.5%. In addition to conserving water, Taiwan CSC is also proactively promoting a diversified water source strategy, with a daily reclaimed water usage of approximately 60,500 tons. **Taiwan CSC has stated implementing the reclaimed water substitution project for Ho-fa Industrial Park in Kaohsiung City (Southern Taiwan), further increasing the daily plant-wide reclaimed water usage to 70,200 tons, accounting for as much as 59% of the current daily supplementary water consumption. This not only strengthens Taiwan CSC's resilience in water usage but also increases Taiwan Water Corporation's flexibility in allocating support for domestic residential water use, fulfilling the corporate social responsibility in ESG.** With reference to the water resource recovery systems of globally renowned companies, recycled water is divided into three types: tap water, pure water, and secondary water, as described below:

(1) Tap Water:

1-1. Pure Water Backwash Wastewater Recovery System: A recovery system used to recover and reuse the backwash wastewater produced by pure water equipment (such as RO reverse osmosis systems, EDI electro-deionization systems). The main purpose is to reduce water waste, improve water use efficiency, and reduce discharge costs.

1-2. Air Conditioning Condensate Recovery System: A system that collects, treats, and reuses condensate generated during air conditioning. This will help save water resources, reduce water costs, and reduce wastewater discharge, meeting environmental protection requirements.

1-3. Rainwater Recovery System: A system that collects, treats, and reuses rainwater, designed to reduce tap water consumption and drainage pressure, and improve water resource utilization.

(2) Pure Water:

2-1. Pure Water Recovery System: A system that recovers, treats, and reuses pure water generated during industrial or commercial production processes. This system can effectively reduce water costs and wastewater discharge, and improve water resource utilization.

2-2. Analyzer's Drainage Water Recovery: Analyzers (such as chemical analyzers, medical testing instruments, and laboratory pure water systems) generate a certain amount of wastewater during operation. This drainage usually comes from cleaning, reagent rinsing, or pure water system discharge and contains small amounts of impurities, but the water is still relatively pure. A system to collect, treat, and reuse this water can effectively reduce water costs and wastewater discharge, and improve water resource utilization.

(3) Secondary Water:

3-1. Scrubber Wastewater Recovery System: Scrubbers are used to treat industrial waste gas by spraying water or chemical solutions to absorb pollutants such as acid mist, alkaline gases, dust, and volatile organic compounds (VOCs). However, the scrubbing process generates wastewater containing suspended solids and chemical pollutants. Direct discharge would increase environmental treatment costs and may affect the environment. A scrubber wastewater recovery system aims to recover and treat this wastewater so that it can be recycled, or discharged when meeting the requirements, reducing water waste and pollution.

3-2. Acidic and Alkaline Wastewater Recovery System: An acid and alkaline wastewater recovery system is for recovering, treating, and reusing acidic or alkaline wastewater generated during industrial production. The main purpose of this system is to neutralize wastewater, remove pollutants, and bring the water quality up to the standard for reuse or compliant discharge, reducing environmental pollution and lowering the company's water treatment costs.

The 2024 COP29 conference and the California wildfires in early 2025 once again warn us that the threat from climate change is intensifying. This is not just a local crisis but an epitome of global extreme climate challenges. Although Taiwan is surrounded by the sea, it is not a land abundant in water resources. Recent drought crises have highlighted the importance of water resource management. From the once-in-a-hundred-year drought in 2021 to the uneven temporal and spatial distribution of rainfall in 2024, the Taiwanese government and businesses must face the challenge of water scarcity and take more proactive water-saving measures.

The ISO 46001:2019 water resource management system provides a systematic water resource management framework. Through reduction, substitution, and reuse, companies can effectively improve water use efficiency, reduce costs, and reduce environmental impact. For example, Taiwan CSC has taken the lead in implementing water resource recovery and reuse strategies, significantly improving water resource use efficiency, and providing a valuable reference case for Taiwan's fastener industry and other manufacturing industries.

In the face of extreme climate and water resource challenges, companies should take active measures, from strategic planning and the application of water-saving technologies to management mechanisms, in order to comprehensively improve water resource management capabilities and ensure that companies can maintain stable development under the impact of climate change. Only through efficient management and the implementation of sustainable operations can we gain a firm foothold in the severe climate environment of the future. ■