



# Cash flows with water

Investing in industrial water efficiency solutions can pay off quickly – even if water is free

IN PARTNERSHIP WITH



*Creating Markets, Creating Opportunities*

This booklet presents water efficiency solutions adopted by three manufacturing companies in Europe and Central Asia. These companies operate in countries with some of the region's lowest water tariffs. A recent drive to expand their operations, cut costs, and improve environmental sustainability led them to focus on water use.

These real-life examples illustrate that:

- 💧 Simple water-efficiency measures have **short payback periods**, even if water intake is free of charge;
- 💧 Reducing reliance on public water **brings significant value** to companies, regardless of low water tariffs;
- 💧 There is always room for **substantial optimization and efficiency gains**, even in closed-loop water systems;
- 💧 Improved water efficiency means **less energy, chemicals, and waste** – further enhancing project returns;
- 💧 Investment in wastewater treatment **minimizes regulatory risk** and environmental footprint.

See how water efficiency projects generated attractive returns, with even shorter payback periods due to subsequent hikes in water and energy tariffs.

The following case studies are based on materials provided by three companies operating in Europe and Central Asia. Europe and Central Asia in this publication encompasses the following countries: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Georgia, Kazakhstan, Kosovo, Kyrgyzstan, Macedonia, Moldova, Montenegro, Romania, Russian Federation, Serbia, Tajikistan, Turkmenistan, Turkey, Ukraine, and Uzbekistan.

IFC was not involved in any of these projects and presents these cases as a good example of how efficiency in the use of water can bring value to businesses. The contents of this work are intended for general informational purposes only. Application and returns on select water-efficiency projects may depend on a number of site-specific, economic, regulatory, and other factors, based on which additional water measures and practices may be needed in certain contexts.

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# FOCUS ON WATER UNLOCKS CASH

## COMPANY

### A REGIONAL DOMESTIC APPLIANCE PRODUCER RELYING ON A LOCAL RIVER

The company, an appliance manufacturer with more than 5,000 employees and an international client base, sought practical and cost-effective solutions to reduce energy and water use in its production cycle. Its main factory is located in a large industrial city, and its production center is near the heart of a residential area. The local river is both the source of its production water and the destination of much of its wastewater.

## CHALLENGE

### RISING COST OF RESOURCES HAMPERS EXPANSION PLANS

In less than four years the price of river water had almost doubled. A cubic meter of water may have cost a few cents, yet the company's production cycle demanded more than 2.5 million cubic meters a year. At that volume, small costs quickly became large liabilities. In just three years, the company's water bill grew from \$100,000 to more than \$160,000. Prices of other inputs like electricity, heat, and natural gas rose by 80%, the company was repeatedly penalized for failing to meet wastewater quality standards.

Meanwhile, a robust recovery from the global financial crisis was driving a boom in consumer products. The management team saw an opportunity to increase market share, however finding ways to reduce costs was a priority. With water tariffs skyrocketing, the right place to start was water efficiency.

## IMPACT

### A COMPREHENSIVE WATER-EFFICIENCY PROGRAM LEADS TO FINANCIAL GAIN

The company formed a Water Efficiency Task Force staffed with internal technical experts. Together they planned a multi-pronged effort to explore new opportunities to increase efficiency, examining water use in every aspect of the production cycle.

The result was a comprehensive package of water efficiency improvements, implemented over a period of five years. The initiative was a great success. The company had invested \$440,000 and completely overhauled its water use, saving almost 600,000 cubic meters per year. The costs were paid back in less than three years.



See how the company achieved savings of \$150,000 per year by investing in water efficiency.



# Energy bill savings from reduced water use

**APPROACH** The company commissioned a Water Efficiency Task Force of dedicated, hands-on staff to analyze and prioritize high-value opportunities. Improvements were phased in over several years, providing the task force flexibility to optimize investment timing. Capital was directed towards priority projects that could be carried out with minimal disruption to production.

After a comprehensive audit of the production cycle, the task force created a company-wide blueprint showing where water efficiency improvements were crucial. Over five years, more than 14 major overhauls and retro-fits were implemented.

**SOLUTION** The task force reviewed the blueprint and identified investments that could yield immediate cost savings.

First, the company needed to modernize the freshwater treatment and monitoring process. Old pumps were replaced with newer equipment with variable-speed drives, saving energy and water. Investments in new wastewater treatment facilities brought down treatment costs and cut water use by over 150,000 cubic meters per year through recycling of storm water and wastewater. Formerly manual processes (such as monitoring water quality) were automated, freeing staff to focus on other critical tasks and optimizing labor costs.

Second, the cooling tower was old and inefficient, using large amounts of energy yet still failing to cool sufficiently. Outdated compressors were water-intensive, consuming up to nine cubic meters of treated water to produce 1000 cubic meters of high-pressure air. By modernizing the cooling tower with innovative spray devices and replacing older, water-cooled compressors with new, highly-efficient air compressors, the team has saved almost 444,000 cubic meters of water each year.

**RESULTS** Simple water-efficiency solutions reduced water consumption by 600,000 cubic meters or by 25%, and helped the company save \$70,000 per year. Annual consumption of electricity was reduced by 500,000 kilowatt-hours.

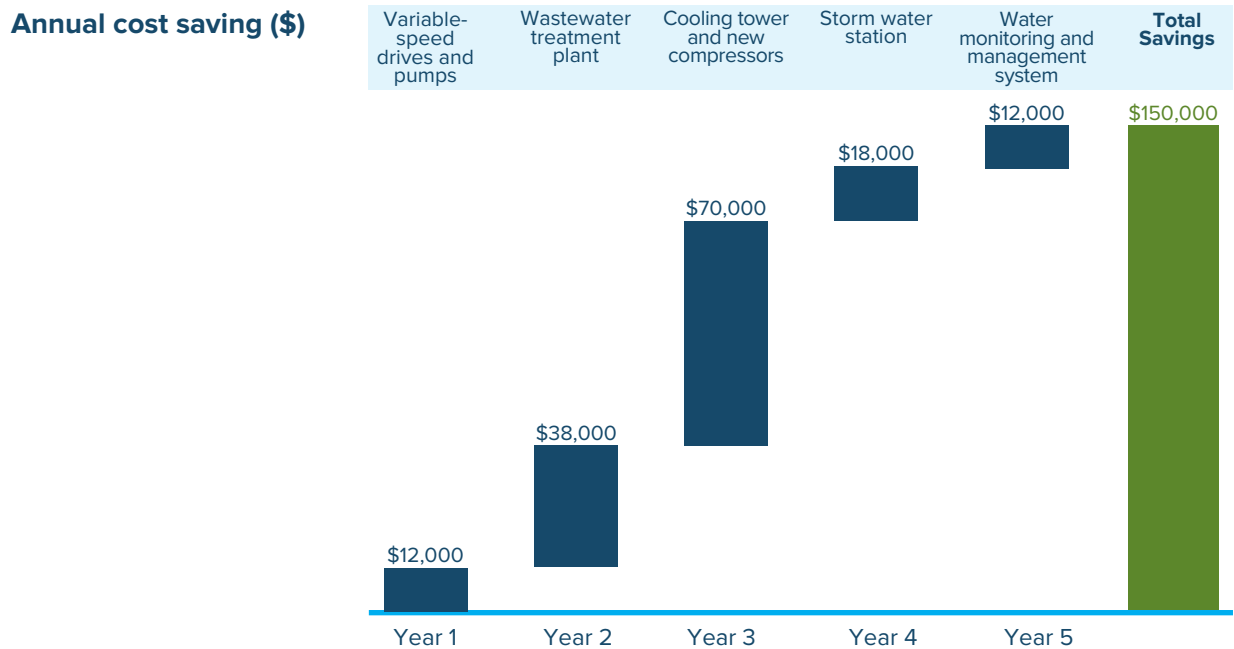
The improvements also yielded benefits in the regulatory sphere, as the company no longer faced expensive environmental penalties for the quality of its wastewater.

*“Our efforts were aimed at reducing consumption of raw materials, energy, and water in all technology processes. Water consumption is among the company’s most important yet difficult problems, as local environmental laws contain strict requirements that we try to uphold. Our industrial facility is situated very close to a residential part of the town, so our task was to improve our technology to be more acceptable to our society.”*

Task Force Technical Director

## Significant water savings opportunities identified

Efficiency task force saves more than \$150,000 annually, recovering costs in just three years.



## Water efficiency task force saves money and cuts pollution

The company is committed to expanding their production while using natural resources such as water and energy as efficiently as possible.

### A FIVE-YEAR COMMITMENT TO WATER EFFICIENCY

The Water Efficiency Task Force opted for a comprehensive, multi-year strategy that integrated the most cost-effective improvements with the company's expansion plans. This thoughtful approach enabled the company to sequence investments appropriately while minimizing any disruptions to production.

The company's approach can be divided into three work streams:

- Resource-efficiency Improvements – compressor upgrades, cooling tower modernization, installation of more energy-efficient pumps
- Automation and Quality Control – upgrades to water-use management systems, improved accounting and measurement systems, automation of measuring and processing water intake
- Environmental Improvements – evaluation of natural resource supply, analysis of water quality

### CREATING FUTURE ENVIRONMENTAL BENEFITS

In addition to cutting costs, the task force recommended actions targeting several important environmental results, including:

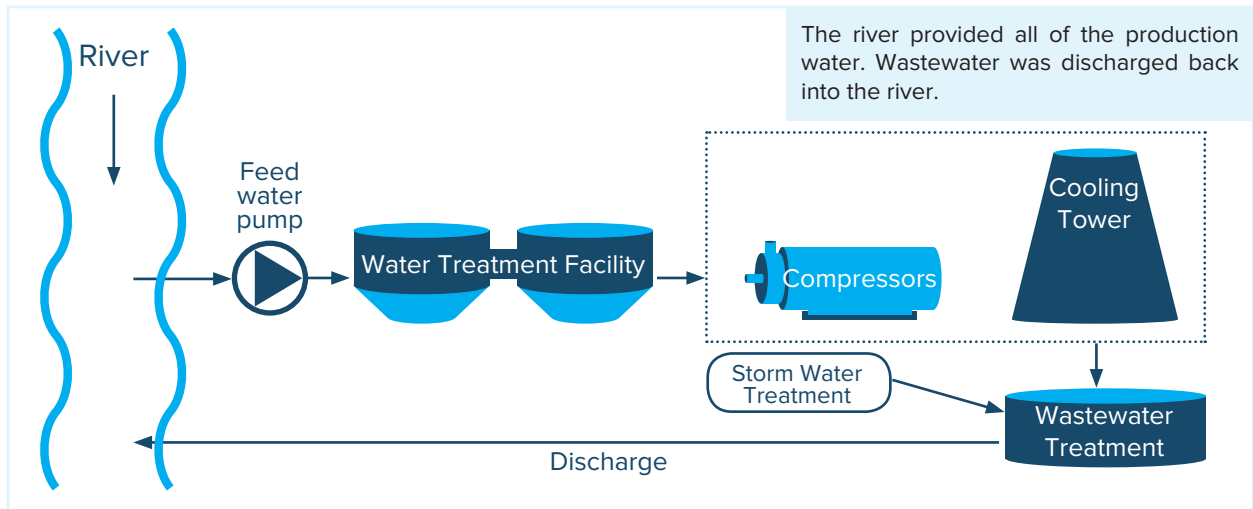
- Improved records of resource inputs and registration of pollutants emitted
- Continuous, automated monitoring of environmental indicators



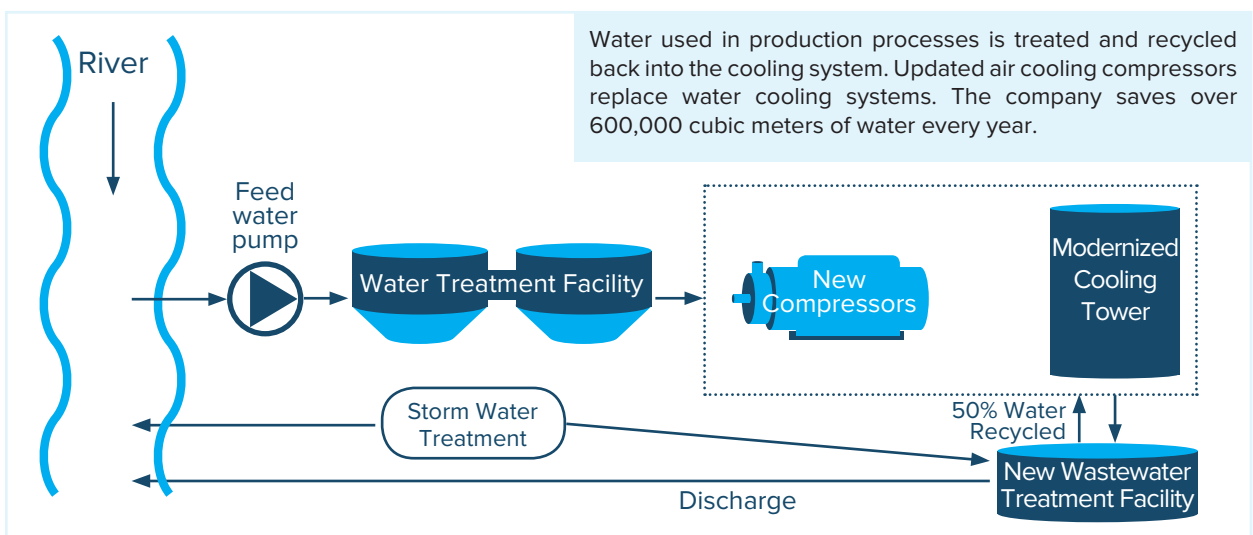
# Multiple improvement opportunities exploited

The company spent 72% of its investment on pumping and cooling, 21% on environmental improvements and 7% on automation.

## BEFORE WATER FLOW PRIOR TO THE WATER-EFFICIENCY INITIATIVE



## AFTER WATER FLOW AFTER THE WATER-EFFICIENCY INITIATIVE



### KEY TECHNICAL MEASURES

#### Resource Efficiency Improvements

- Installed frequency drives in pumping stations for river water intake and discharge
- Replaced two water-cooled compressors with new, air-cooled devices
- Modernized cooling tower with innovative spray devices and the ability to work without turning on fans
- Replaced energy-intensive pumps with energy-efficient ones at water intake stations

#### Automation and Quality Control

- Installed automated water consumption accounting system
- Automated and separated a storm water station to reduce costs of unnecessary treatment
- Installed a wastewater accounting system and water measurement system in different divisions of the factory

#### Environmental Improvements

- Installed water softeners to improve drinking water quality and eliminate regulatory penalties
- Periodically evaluated natural resources and analyzed drinkable water quality

# SQUEEZING CASH FROM WATER RE-USE

## COMPANY

### LARGE METALS PRODUCER WITH HIGH ENVIRONMENTAL RISK

The company is a major European manufacturer of high quality-metals, with almost 3,000 workers and exports sold all over the world. Its location near a river presents both a benefit and a challenge: although the river supplies most of the production plant's water and carries away its wastewater, the company must be constantly vigilant to ensure that harmful byproducts are not washed into the river along with wastewater.

The company decided to initiate a Water Efficiency Program to identify cost-effective changes that could improve the way it used water.

## CHALLENGE

### HIGH WATER COSTS AND UNSAFE WASTE DISPOSAL THREATENS THE BUSINESS

Water is a crucial element in manufacturing metals, and the volumes required for even basic production are immense. With more than 30 furnaces, the company's main plant consumed over 4 million cubic meters each year, including nearly 1 million cubic meters of treated water. Without a closed-loop cooling system to recirculate water through the cooling tower, the annual cost of water for cooling would have been almost \$500,000.

Another use is waste discharge. For each ton of metal produced, dust, scrap metal, and sulfides are generated. The company washed these materials into a nearby slag dump, consuming about 3 million cubic meters of water per year for this process alone. However, excess water was draining through the slag, washing particles and pollutants into the river.

## RESULT

### HIGH SAVINGS AND A CLEANER RIVER

Like many of its regional peers, the company believed water was relatively cheap. Nevertheless, the Water Efficiency Program discovered that investments in water efficiency can deliver outstanding returns. By adopting as few as two basic water-efficiency measures, the company achieved annual savings of \$1.6 million.

The two straightforward recommendations also greatly improved the company's environmental footprint. Freshwater withdrawal was cut by over 60%, saving around 2.6 million cubic meters of water. What is more, the discharge of contaminated water into the river was eliminated.



See how two water-efficiency improvements saved a company \$1.6 million per year.



# Optimizing water flows improves cooling and saves money

## SMALL CHANGE IN OPERATIONS MAKES A BIG DIFFERENCE

To identify cost-effective improvements to water use, the Water Efficiency Task Force started by assessing the cooling system, which required almost 1 million cubic meters of water per year. First, a closed-loop cooling system was installed. This brought significant improvements in water efficiency, resulting in savings of almost \$500,000. Yet there was another pressing problem not usually directly associated with water efficiency: suboptimal cooling. A closer look revealed that the water flow rate in the cooling system was too high. The team found out that if they decreased the flow rate by 40%, to about 70 cubic meters per hour, they could save substantial pumping costs while keeping the water temperature within the required range.

Reducing water flow in the cooling system provided an optimum cooling performance. Additional benefits came from installation of an automatic control system and sensors to optimize the flow rate. As water flow dropped, so did a host of related costs. A lower flow rate required less energy for pumping and lower pressure in the system. Lower pressure reduced water leakage and loss. A direct 4% reduction in fresh water consumption at the factory translated to almost \$50,000 in annual savings. The monitoring and sensor equipment was relatively inexpensive, bringing the payback period for modernizing the cooling system down to less than 60 days!

## WASTEWATER TREATMENT UPGRADE SAVES CASH AND ELIMINATES RIVER POLLUTION

For the second challenge – how to prevent pollutants from draining into the river – the team came up with a smart solution. They realized it was futile to focus on improving the existing slag dump. Instead they decided to redirect the used water – right back into the production process. With a new preliminary wastewater treatment system, the company could recycle around 1.5 million cubic meters of wastewater per year, by processing the slag in a series of crushing and sorting complexes. This enabled them to cut further pumping and treatment costs related to withdrawing fresh water from the river. As a result, a much cleaner wastewater was discharged into the river.

Construction of the new wastewater treatment system represented more than 90% of the company's total resource efficiency investments. By investing \$3.1 million, the company built a new drainage system and installed efficient pumps to carry water back to the main production site. Recycling wastewater allowed the company to significantly reduce freshwater intake for slag removal. Although upfront costs were large, the resulting savings in water usage and in related energy and water treatment costs amounted to \$1.6 million each year, thereby allowing a payback period of less than two years. Better yet, the improvements enabled the company to completely eliminate sulfide-rich discharge into river, reducing the company's environmental impact.

### WATER EFFICIENCY PROGRAM BENEFITS

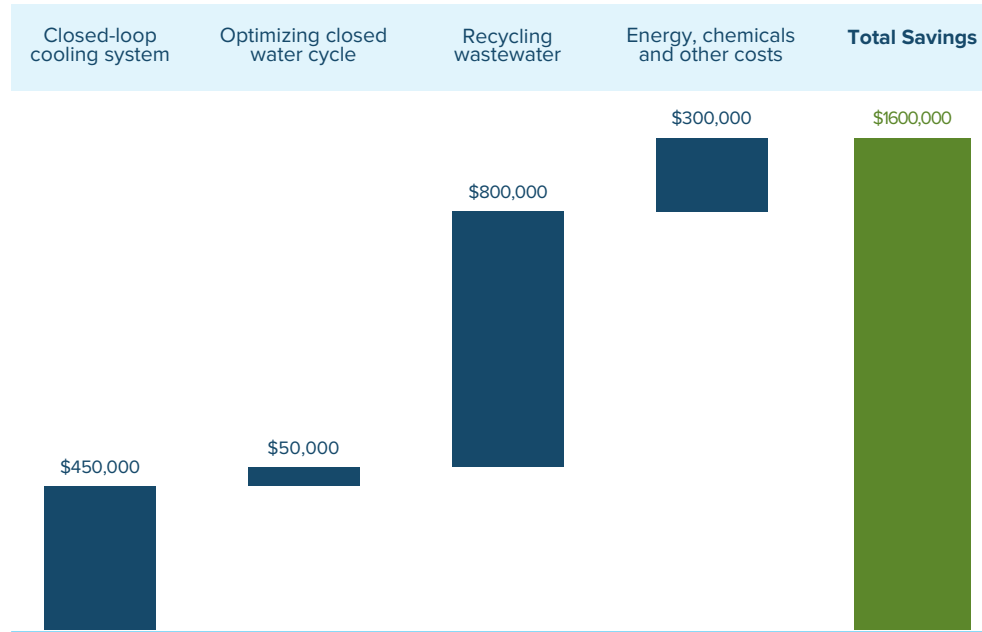
- 2.6 million cubic meters of water saved annually by modernizing the water cooling system and building a new wastewater treatment plant
- \$1.6 million saved each year in water, energy, and associated water treatment costs
- Elimination of sulfide-containing discharges into the local river



# Short payback on both low- and high-investment measures

Water efficiency program saves over 2.5 million cubic meters of water per year, leading to annual savings of \$1.6 million and a payback period of less than two years.

Annual cost saving (\$)



## WATER-EFFICIENCY INITIATIVE

The Water Efficiency Program had two clear-cut goals: to reduce freshwater consumption during the production cycle, and to minimize the company’s impact on the local environment and watershed. Internal technical experts chosen for the Water Efficiency Task Force brought together crucial expertise on all aspects of the production cycle. By looking at water consumption throughout the company, the team was able to find solutions that were practical, cost-effective, appropriate, and comprehensive.

## DETECTING THE PROBLEM

The Water Efficiency Task Force was aware of the cooling system’s importance in maintaining optimal temperatures during metal production. They also recognized that, even though the company was compliant with local regulations, it could do more to minimize pollutants being carried into the local river with wastewater. When the team set out to trace water use across the production process, they discovered many hidden costs stemming from inefficient water practices, including from intake fees, treatment, pumping, and losses. These costs not only led to inefficiencies; they also reduced the company’s profitability. With each cubic meter of water that was used inefficiently, company cash was being wasted.

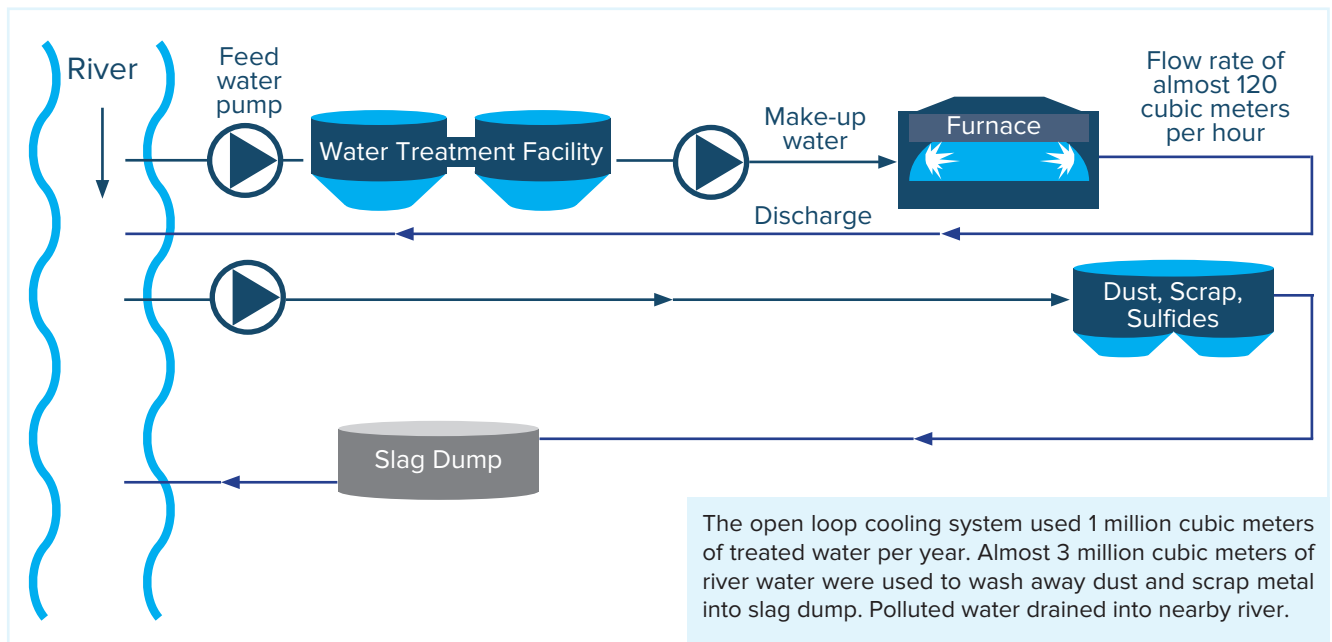
## SIMPLE MEASUREMENTS UNLOCK LONG-TERM BENEFITS

Using portable equipment such as ultrasonic flow meters and thermal vision cameras, the task force conducted a careful inspection of the cooling system. They concluded that a 40% reduction in the flow rate would bring improvements in temperature control, resulting in a better functioning of furnaces as well as water and cost savings. The team also recommended construction of a new, modern recycling system for wastewater collection and treatment, using best practices and appropriate technologies to safely clean polluted industrial wastewater and minimize the environmental impact on the local river.

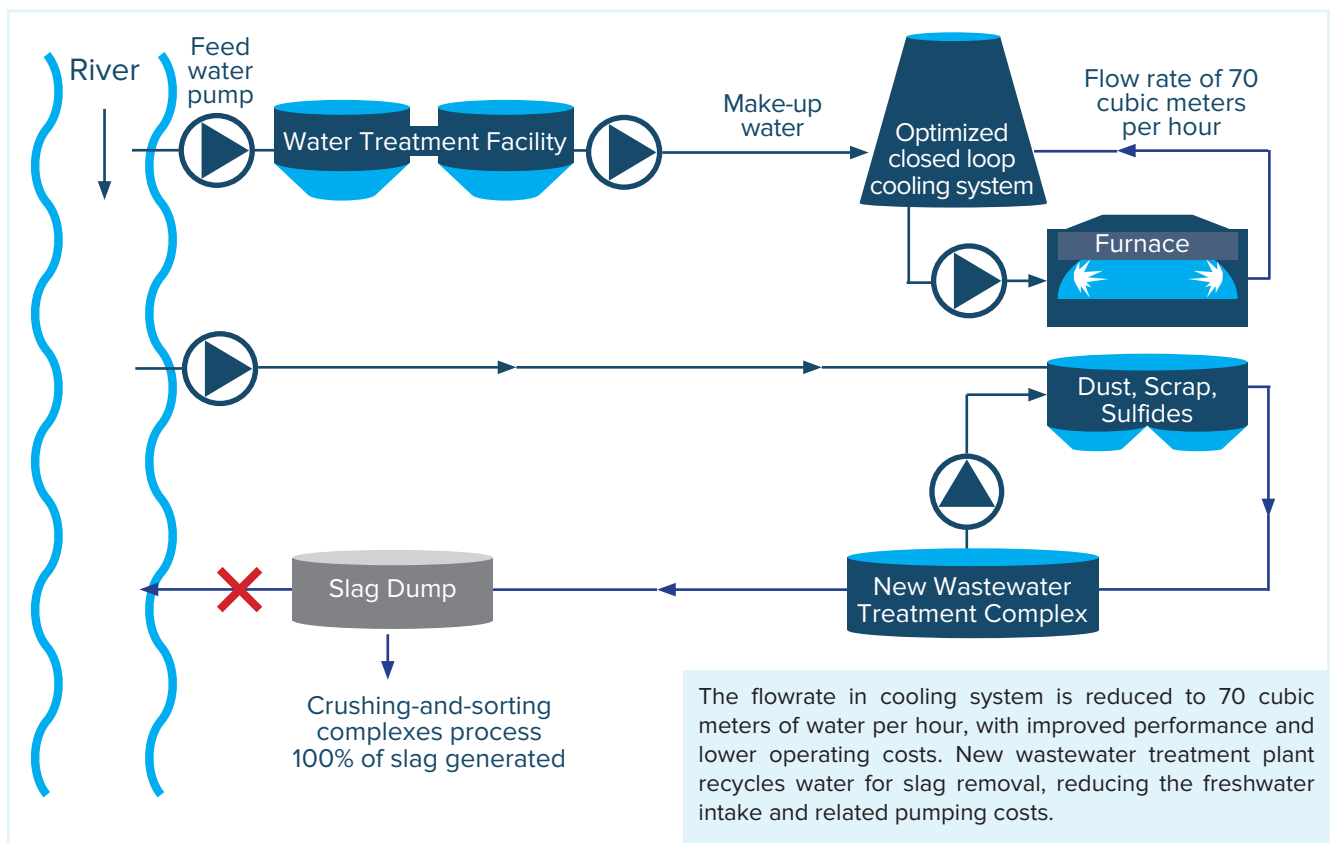
# Better cooling and treatment means less water

Modernized water cooling system and wastewater facility improve technological processes, provide large water savings and eliminate pollutant discharge into river.

## BEFORE WATER FLOW PRIOR TO THE WATER-EFFICIENCY INITIATIVE



## AFTER WATER FLOW FOLLOWING THE WATER-EFFICIENCY INITIATIVE



# RETHINKING RAINWATER IMPROVES BOTTOM LINE

## COMPANY

### A MAJOR ELECTRODE PRODUCER WITH A HIGH DEMAND FOR COOLING WATER

The company is a leading manufacturer of carbon and graphite electrodes, exporting more than 100,000 tons of carbon each year to regional and international markets. Its plant is located in an industrial zone with access to a local river, and is near the residential heart of the nearby city, home to almost a million residents.

Fabrication of graphite requires temperatures of more than 2,500°C, which in turn demands substantial water for cooling purposes. Each year the company's cooling processes use as much water as nearly 20% of the entire residential part of the closest city.

## CHALLENGE

### COSTLY WATER PREPARATION AND RAINWATER DISCHARGE

Several years ago, the company implemented a closed-loop cooling cycle to reduce its water usage, but it still relied on the river to supply fresh water. Even with a closed-loop system, the company lost almost 2% of water due to evaporation.

The company did not need to pay for river water. However, when adding up the costs of purification, treatment, and pumping, it was clear that in practice, water was not at all free: one cubic meter of technical grade, high-quality, purified water cost \$0.50. In addition, the company was spending more than \$86,000 every year just to make up the evaporation losses.

Meanwhile the storm water polluted on company premises was dumped into the river. Local regulations required the company to pay a substantial fee for such water drainage.

## IMPACT

### CASH SAVINGS AND REDUCED DISCHARGE INTO RIVER

The company set up a Water Efficiency Task Force to explore opportunities for cost savings and improvements in environmental compliance. The solutions adopted focused on maximizing efficiency in use of all water resources, including rainwater.

As a result, they were able to cut freshwater consumption by 10% and minimize discharge of pollutants into the nearby river. The company achieved savings with a payback period of three and half years, and reduced its ecological footprint.



See how the company achieved savings of \$16,600 per year by cutting rainwater drainage into the river. →

# Think water outside the box

As a leading industrial manufacturer, the company is committed to constantly improving its technologies and processes, notably by streamlining resource efficiency, without losing focus on its core business. Here are four steps the company took to achieve better water efficiency.

## 1. Put the Right People on the Job

Realizing that water efficiency presented significant opportunities for cost savings, the company created a Water Efficiency Task Force staffed with internal technical experts to prioritize opportunities and propose solutions.

## 2. Identify the Right Problem

The task force's mandate was to reduce the company's environmental footprint by scaling back water use. Reducing reliance on the river was a top priority, and the team knew that curbing wastewater discharge was an important step forward.

## 3. Rethink Your Water Usage

Before the water-efficiency initiative, the company had never comprehensively studied its water use. Despite improvements from the closed-loop cooling cycle, the company still relied on river water. By reviewing water usage throughout the production cycle, the task force realized that rainwater from disposal drains, which the company paid to discharge, could be diverted back into the cooling system to replace evaporation losses.

## 4. Create an Environment for Continual Improvement

A simple fix that generated immediate savings helped the company realize that optimizing its use of resources such as water, energy and materials can be very beneficial. Recognizing that even small measures can make a difference, the company has committed to several principles to ensure that future opportunities for efficiency are identified and tapped, early and often:

- Implement quality controls for key technologies and processes that focus on environmental and labor improvements
- Increase employee awareness of environmental issues
- Incentivize management to be personally responsible for the company's adherence to international quality standards

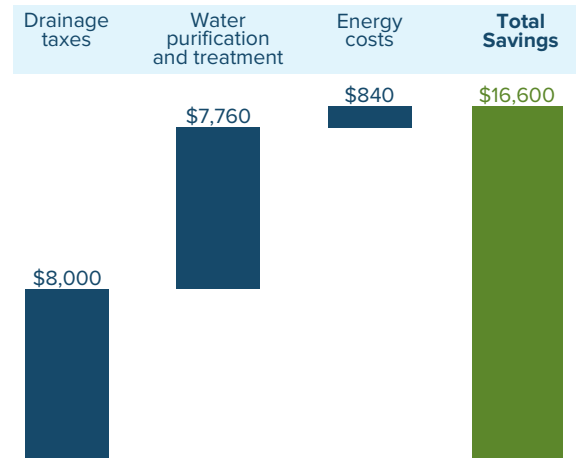
### MAXIMIZING STORMWATER EFFICIENCY BRINGS BENEFITS:

- Saved 17,500 cubic meters of water annually, covering 10% of evaporation losses
- Eliminated warm wastewater discharge into the local river
- Prevented 261 tons per year of hard particles (carbon, tar and dust) from being discharged into the river
- Saved \$8,000 per year in drainage taxes
- Reduced harm to the local ecosystem and watershed

# Using rainwater frees cash

Investments in water recycling had payback period of 3.5 years.

Annual cost saving (\$)



## APPROACH

To find alternative solutions, the company organized a Water Efficiency Task Force to review overall water use, including water intake, treatment, and wastewater disposal. The team identified several priority items that were immediately actionable.

First, they noted that it was becoming increasingly expensive to treat river water to be used for cooling. Although a closed-circuit cooling system was in place, significant amounts of water were still needed to compensate for evaporation losses. The costs of special chemicals needed to reduce hardness and remove impurities, and of energy to pump water from the river, were rising faster than other production costs.

Second, in accordance with local environmental regulations, the company was paying almost \$8,000 each year to dispose of rainwater collected on its 4.3-hectare plant.

## SOLUTION

This led the task force to consider a different approach. Why not employ the rainwater in the cooling cycle? This would have the double benefit of reducing water treatment costs (which are typically lower for rainwater than for river water) and eliminating rainwater disposal costs.

Calculations based on meteorological data showed that the volume of water then collected on-site was enough to cover 10% of evaporation losses. The task force estimated that, with minimal investments, the company could eliminate rainwater drainage into the river and reduce river-water intake by 10%.

## RESULTS

An initial investment of \$58,000 allowed the company to retro-fit two rainwater drains, so that water could be looped back through the cooling system. As soon as the project was finished, the company was able eliminate its rainwater discharge completely and reduce river-water consumption by 10%.

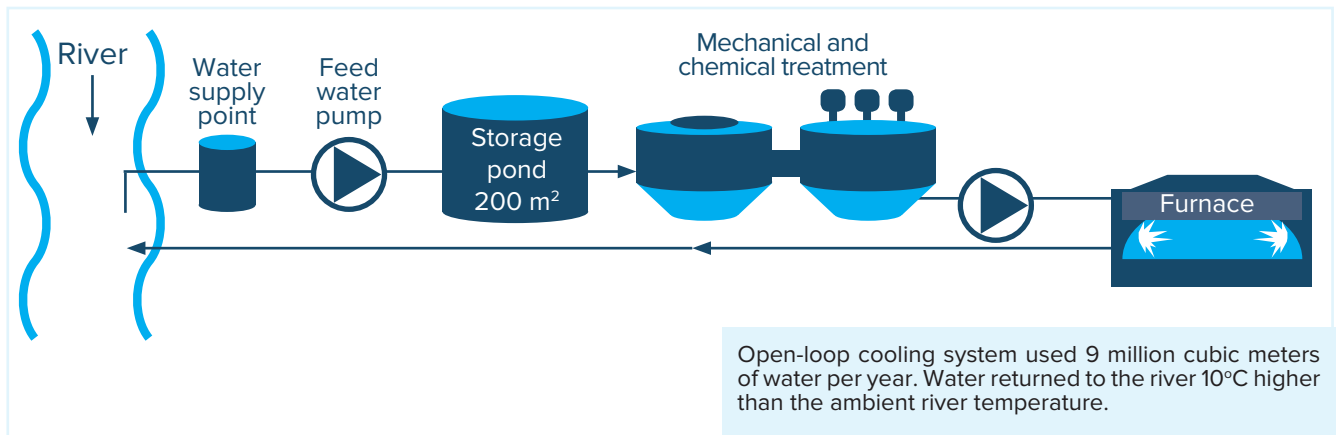
This solution brought additional benefits for the local river. Discharge of hard particles like carbon, tar, and dust into the river with rainwater was reduced by nearly 261 tons per year, helping the company become a better corporate neighbor to the surrounding communities. A creative approach to problem-solving turned a loss stream into a revenue stream. Together the task force’s recommendations saved a total of \$16,600 every year.



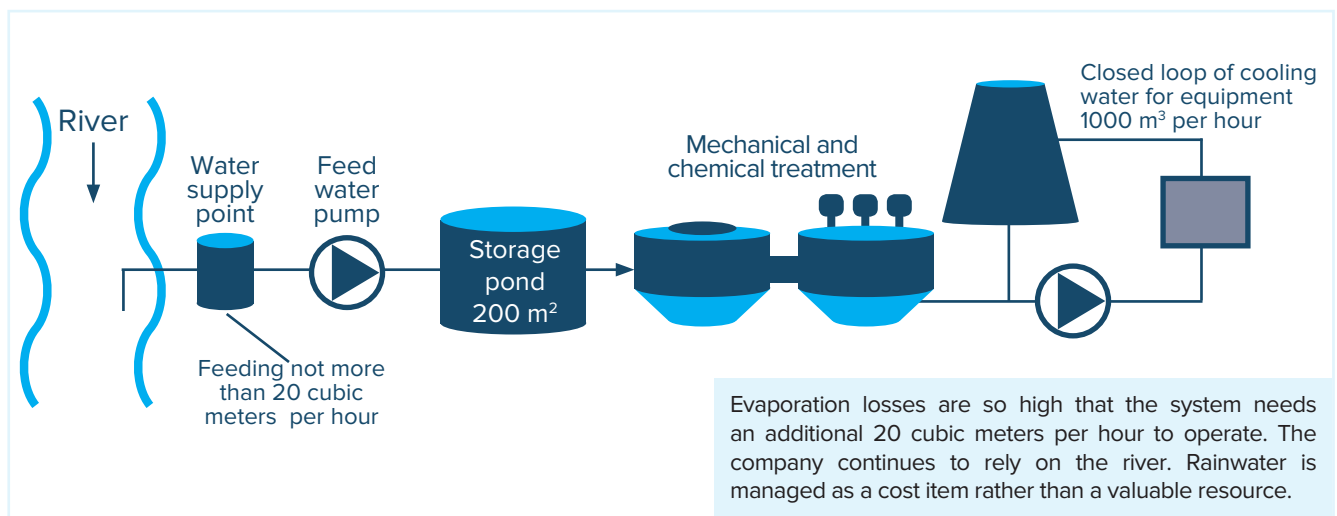
# Mastering all available water streams

How a company saved almost \$20,000 per year by recycling rain water.

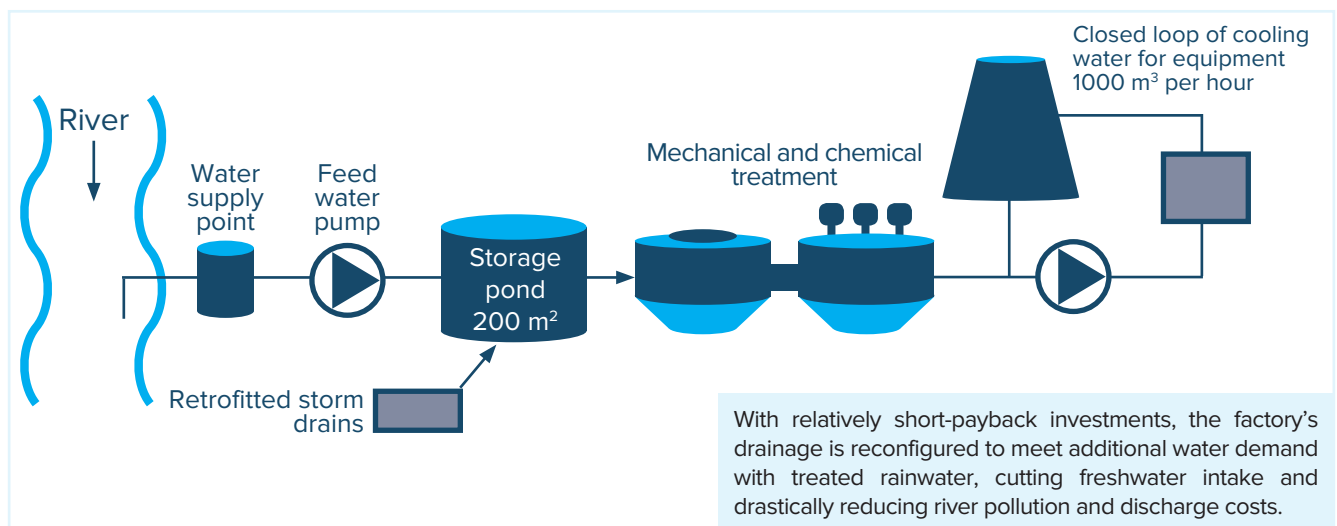
## BEFORE PRODUCTION PRIOR TO INTRODUCING A CLOSED-LOOP COOLING CYCLE



## DURING PRODUCTION FOLLOWING INSTALLATION OF A CLOSED-LOOP COOLING CYCLE TO REDUCE RIVER-WATER INTAKE



## AFTER WATER USAGE FOLLOWING THE WATER-EFFICIENCY INITIATIVE



# TRUE COST OF WATER

Water efficiency pays off even when water tariffs are low.

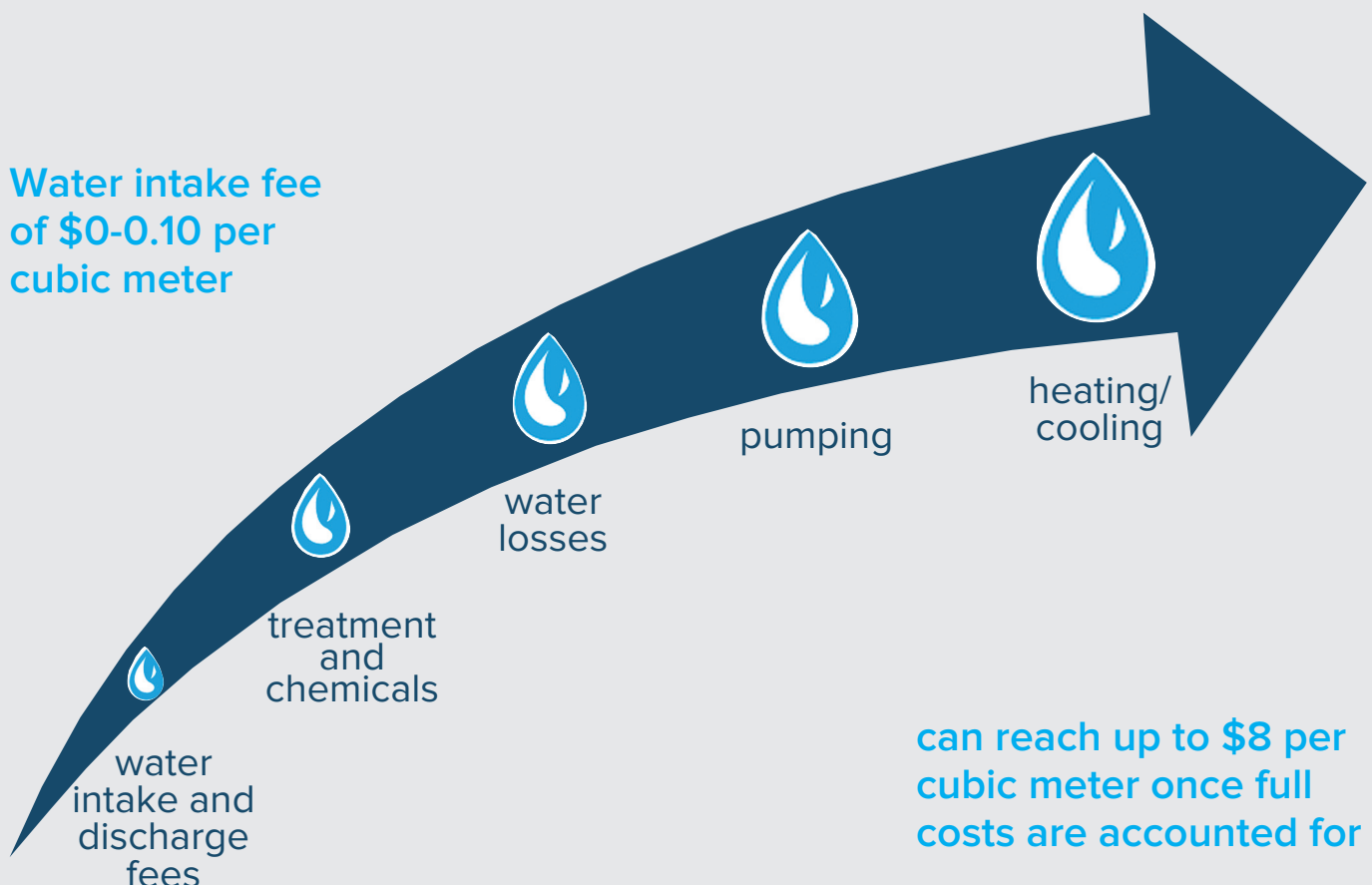
One of the key lessons demonstrated in these case studies from the metals, graphite, and appliance sectors is that regardless of low water tariffs, water is neither cheap nor unimportant for companies.

Low tariffs may lead to the perception of water as a small cost item. However, if all water-related expenses are properly accounted for, the total cost of water can be considerable. When you include all embedded costs of water and water systems operation – such as water preparation, treatment, pumping, cooling, and heating – the true cost of water can be up to 80 times more than the water intake tariff. Therefore, even simple measures taken within the water-energy-materials nexus can bring sizable savings with very short payback periods.

The companies also understood that water was essential to their business, as their processes required and discharged large amounts of it every day. The need for reliable and abundant water supply, dependence on natural bodies of water, strict environmental regulations, and proximity to urban areas were all increasing the water-related risks they faced – risks that have no directly attributable cash value but a potentially major negative impact on business. The companies therefore resolved to enhance their water efficiency and improve wastewater treatment as a way of managing the risks and costs of water usage.

## Calculating the true cost of water

Total embedded water costs can be up to 80 times higher than water intake tariffs\*.



\* Own calculation based on data from five companies operating in the Europe and Central Asia region in the automotive, paper, and food processing sectors

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