

Case studies

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CASE STUDY 1: Reduction and Reuse of water in a dairy Facility – Saudi Arabia¹

With daily production reaching 400,000 liters, this company is the largest ultra high temperature (UHT) recombined milk producer in Saudi Arabia. Everyday, the company purchases 2,020 m³ of water and discharges 1,420 m³ of wastewater.

When it has realized the strategic importance of water, the company decided to systematically address water efficient use. A group's operations engineer, with extensive international resource productivity experience, was brought to the Jeddah site.

Water use was quickly assessed and the specific consumption was determined to be **4.26 liters of water for each liter of milk**. Through the engagement of employees a set of SMART targets was set up.



One of the new water meters installed.

In the next step, the company has installed water meters in the lines suspected to be large users.

“Once-through” cooling system was found to be a major source of water wastage. The existing system for the equipment with the largest cooling loads was transformed into a “re-circulating” system by retrofitting the necessary pipes, pumps, and cooling tower. Work is underway to install re-circulating cooling systems for other pieces of equipment.

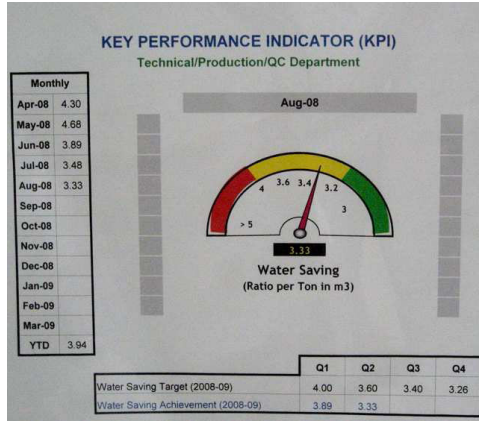
The company has also reduced the amount of water used for space and equipment cleaning by educating its personnel

¹ Material for the case study is provided by Wafeer Initiative, see: www.wafeer.net

about optimum cleaning frequencies and by installing trigger-activated nozzles on hoses.

Results of the water saving program were clearly communicated to staff through the use of a simple but effective performance chart.

Performance tracking for communicating progress.



Trigger-activated nozzles on hoses.

The outcomes of the company's water efficiency program are summarized in **Table 6.1**.

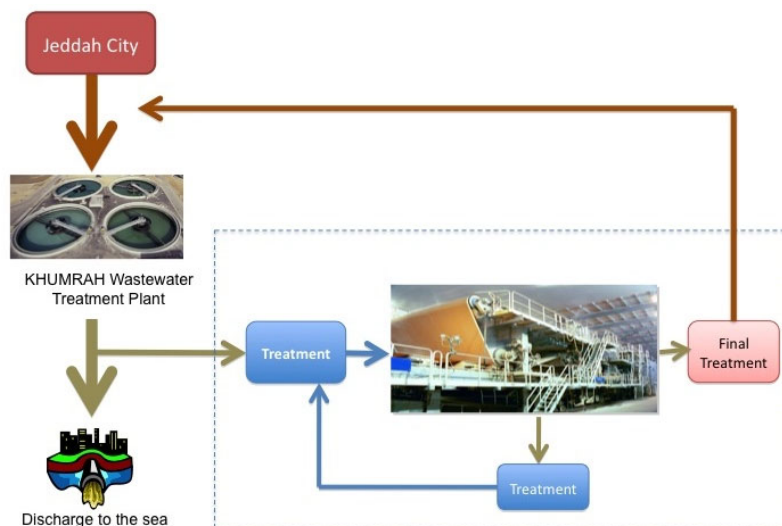
Water savings	160,000 m ³ /year
Financial savings	US\$153,000 /year
Approaches used	Reduction and reuse
Key success factors	Top management support; systemic approach; effective monitoring; employee involvement

Table 6.1: Summary results of the water efficiency program at a dairy facility

CASE STUDY 2: Internal and External recycling in a Paper Production Facility- Jeddah, Saudi Arabia²

Running a water intensive process like paper production in Saudi Arabia, a water-scarce country, is a challenging task. The management of the paper production company was highly aware of this challenge and decided to meet it with strong commitment and continuous innovation. First, the company reached an agreement with the nearby municipal wastewater treatment plant to permit reuse of treated domestic wastewater in the company's operations. This has already enabled significant water productivity gains. However, the innovations did not stop there.

When it started operations, the plant used 20 m³ of water for every ton of product. Convinced about the possibilities to reduce this ratio, the company's management aggressively searched for options. With input from the general manager, trained as an environmental engineer, the company systematically screened all water inefficiencies in the plant and thoroughly assessed all effluent streams for their recycling potential. Based on these assessments, a treatment unit consisting of screens, drum filters, two dissolved-air floatation units, and gravity filters was installed to treat effluent streams. Treated effluents are now fed back into the process for reuse.



² Material for the case study is provided by Wafeer Initiative, see: www.wafeer.net

Water use dynamics around the paper mill.

With this new arrangement, the company managed to reduce its specific water consumption from 20 to 8 m³/ton of product. This system has also allowed the recovery of fibers and boosted the plant's fiber conversion efficiency from 80 to 90%. With the introduction of additional steps to allow the internal recycling of water, the company was able to reduce its water consumption by 420,000 m³/year. The investment made was paid back in two years. This initiative is saving the company around US\$400,000 every year. Results of the company's water efficiency program are summarized in **Table 6.2**.

Water savings	420,000 m ³ /year
Financial savings	US\$400,000 /year
Approaches used	Internal and external recycling
Key success factors	Solid commitment from top management; systemic approach; effective monitoring; high technical capacity

Table 6.2: Summary results of the water efficiency program at a paper production facility

CASE STUDY 3: Saving water and money in a food processing facility – Egypt³

Excessive water use at a food processing facility, a major producer of frozen potatoes and vegetables, was forcing the company to bear additional costs. Where the facility is located, there was an excess pressure on water resources and on the sewer network in the area. Moreover, the food plant's high rates of wastewater generation were having negative impacts on the surrounding environment. When the company realized the strategic importance of reducing water consumption, it decided to address the efficient use of water in the company's operations.



Potatoes processed by the company

Originally, the company's average water consumption was about 5.1 m³/ton of product while the industry norm is averaging about 4 m³/ton. Process operations in the food facility were re-analyzed in order to identify opportunities for reducing water consumption. This analysis has prompted the company to implement projects to repair water leaks and to reuse water.

³ Material for this case was provided by the Egypt National Cleaner Production Center (www.encpc.org), which is affiliated with the Ministry of Trade and Industry (MTI) in close cooperation with the United Nations Industrial Development Organization (UNIDO).

Water leaks in the cooling towers area were repaired, leading to reduced water use by about 26,000 m³/year and cost savings on the order of US\$6,000 /year.

Water reuse projects were implemented throughout the plant at an investment cost of about US\$10,500, resulting in water savings of about 120,000 m³/year and US\$27,000 /year in cost savings. The payback period, after electricity and maintenance costs were factored in, was about 4.3 months.

As a result of implementing these water efficiency projects, the company's new water consumption average was about 3.04 m³/ton of product, which is below the world average standard for this industry. The outcomes of the company's water efficiency program are summarized in **Table 6.3**.

Water savings	146,000 m ³ /year
Financial savings	US\$33,000 /year
Approaches used	Reuse, leak repairs
Key success factors	Top management support; effective monitoring; good practical training

Table 6.3: Summary results of the water efficiency program at a food processing facility

CASE STUDY 4: Greywater Recycling And Reuse In A Hotel Building - Dead Sea, Jordan⁴

Water is a scarce commodity in Jordan. During peak season, a Spa Hotel on the Dead Sea, Jordan, has to hire private water suppliers to fill the hotel's water tank up to ten times every day. The cost to the hotel business and the environment is considerable. Public water supply is available at a significantly lower price, but it comes nowhere near to satisfying the needs of this four-star hotel.



The Dead Sea Spa Hotel.

Approximately 80 per cent of the wastewater generated daily by each hotel room at a wellness facility like the Dead Sea Spa Hotel takes the form of greywater. This water comes from baths, showers, and wash basins, and can be treated and reused. When the growing stream of tourists made it necessary to expand the hotel complex in 2008, it became more critical for the hotel owner to try new ways of managing water at the resort.

The hotel became a pilot operation and the first company in the Arab world to install a modern greywater recycling plant that allows greywater to be reused within a single building. With support from the Jordanian water authorities and technical assistance from Deutsche Gesellschaft für

⁴ Material for this case study was kindly provided by the GTZ program in Jordan. The greywater system was supported by Pontos GmbH, a subsidiary of Hansgrohe AG. Contact information: Dieter.Rothenberger@gtz.de, Friederike.Sorg@gtz.de. For further information see www.developpp.de.

Technische Zusammenarbeit (GTZ) GmbH on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), a greywater capture and treatment system was installed in the hotel. A public-private partnership (PPP) was formed to ensure that hotel staff and Jordanian plumbing companies receive training in assembling the plant and carrying out maintenance work independently.



Greywater recycling system.

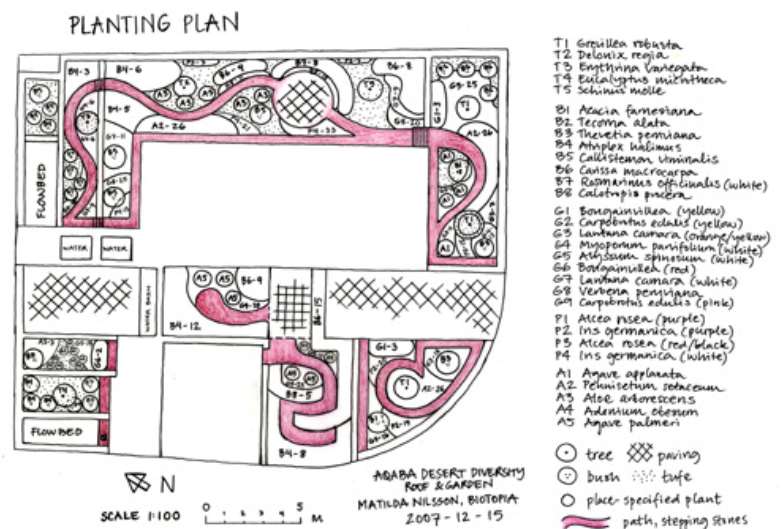
Greywater from the Dead Sea Spa Hotel is now being turned into high quality industrial service water that meets the hygiene requirements of the European Union (EU) Bathing Water Directive. The water is treated without chemical additives in an entirely mechanical-biological process and is subsequently used to flush toilets. A summary of the hotel's greywater recycling program is shown in **Table 6.4**.

Saving potential	17 % of total water consumption in the hotel
Investments in the greywater system	US\$80,000
Approaches used	High quality greywater treatment and reuse
Key success factors	Investment costs can be minimized if integrated in early planning

Table 6.4: Summary results of greywater recycling at a hotel

CASE STUDY 5: Efficient landscaping in a residential garden – Aqaba, Jordan⁵

The Aqaba Residence Energy Efficiency (AREE) is a newly constructed building model for sustainable design and construction in Aqaba, Jordan, including energy, water, and material efficiency. The purpose is to inspire adoption of best practices in sustainable residential construction for the future.

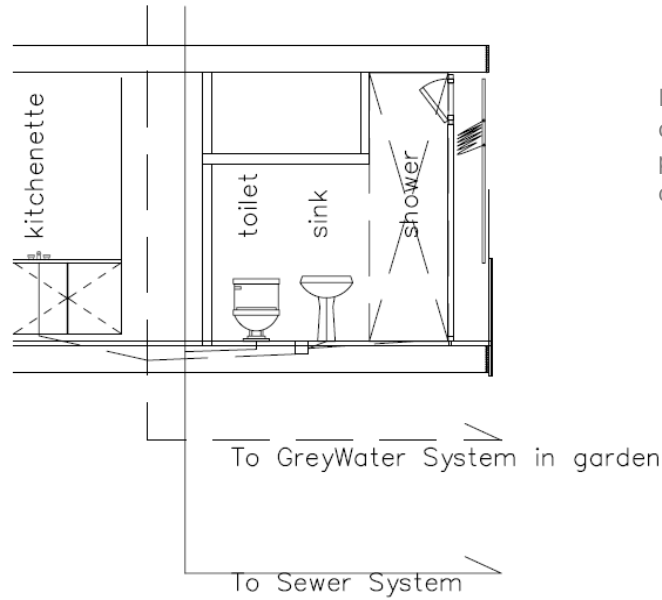


A greywater recycling system is an integral part of the building design, intended to demonstrate the case for low cost greywater recycling for residential water saving. Recycled greywater is used for watering of the garden. The low cost greywater system is made of a mechanical filter, a horizontally constructed bamboo wetland (5 m³), and a charcoal filter for odor removal. Greywater is collected through separate piping lines from sinks and showers and is channeled by gravity into the horizontal flow bed. Then, the water is collected and stored in an underground storage tank for use within 48 hours. The water is then pumped through a drip irrigation network for landscaping.

When the building is fully occupied, the system collects on average around 300 m³ of filtered greywater per year, more than enough to maintain a 250 m² of landscape area.

⁵ Material for this case study is kindly provided by Architect Florentine Wisser and Landscape designer Matilda Nilsson.

When the building is fully occupied, the system collects on average around 300 m³ of filtered greywater per year, more than enough to maintain a 250 m² of landscape area.



Early integration of greywater plumbing in the design phase.

The settling barrel (back) and the horizontal flow constructed wetland (sand filter) (front).



The wetland (filter bed) after 6 months of operation. The grass and bamboo started to grow.



The wetland (filter bed) with fully-grown bamboo.

The garden is also designed to be water-efficient. The desert climate of Aqaba necessitates use of heat- and drought-tolerant plants that can cope with little water and still thrive. The plants selected for the garden are durable and tolerate higher pH levels and some chemical residue. Many of the plants are local or are from similar arid regions and most of them are evergreen, for an all year value. The plants also play a role in enhancing the energy efficiency of the building by providing shading and insulation. The roof garden gives a lower indoor temperature and less fluctuation depending on the outdoor temperature. The surrounding garden is going to provide more shading to the walls of the building in the future when trees grow in size. **Table 6.5** is a summary of project results.

Water savings	300 m ³ /year
System costs	US\$1,500 (excluding water storage tank)
Approaches used	Alternative water use in landscaping
Key success factors	Integration of system in early design phase through double piping in the residential plumbing system; attention to water demand by plant varieties in landscaping

Table 6.5: Summary results of the water efficiency program at the AREE building model