

Water recycling in paper production

City of Jeddah, Saudi Arabia

water scarcity impact



Reduced withdrawal	●
Reduced consumption	
Improved water quality	
Increased productivity	●
Net basin benefit	

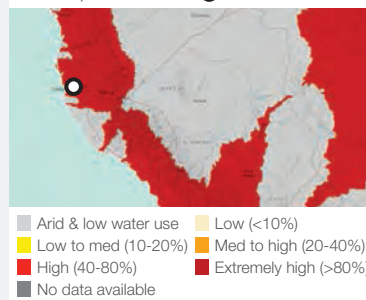
volumetric impact
6 000 000m³/yr

capital cost
\$5 700 000

estimated unit cost of water
10¢/m³

Water Stress

Jeddah, Saudi Arabia



Water Stress Map:
Gassert, F., M. Landis, M. Luck, P. Reig, and T. Shiao. 2013. "Aqueduct Global Maps 2.0."

Confidence level
● Low ● Medium ● High

Water Scarcity Impact Key
● Main ● Minor

Credits
We wish to acknowledge the input of Sami Safran, Osama Ibrahim, Manoj Mall, and Abbas Mohamed of Middle East Paper Company in the preparation of this case study.

Project Overview

The Middle East Paper Company (MEPCO) is a paper producing company based in the City of Jeddah, Saudi Arabia, a city with extremely limited access to natural water resources. The paper producing plant is classed as a water intensive operation and is governed by an operating licence granted by the local environment authority.

The plant purchases treated wastewater from the nearby Khumarh wastewater treatment works and pays to return its process effluent back to the waste water treatment works. In 2006 the company increased its production capacity from 100 000 tonnes per year to 250 000 tonnes per year and in 2010 this was further expanded to 400 000 tonnes per year. This substantially increased the demand for raw water; in order to minimise business costs and water demand the company developed an on site water recycling process. In 2002 the company required an intake of approximately 20 000 litres of water per tonne of product produced. By 2010 this was reduced to 5 000 litres per tonne of product.

Key Elements

- Installation of screens, drum filters, two dissolved air flotation units and gravity filters to recycle a large share of the water internally.
- Installation of an effluent treatment plant, comprising of a biological treatment unit to reduce organic loading in effluent and an anaerobic treatment unit for treatment of effluent with high organic content.
- The project cost of \$5.7m was funded by the Middle East Paper Company.

Key Outcomes

- Plant water demand reduced from 20 000 litres to 5 000 litres per tonne of product.
- Total reduction in demand of 6 000 000m³/yr.
- Payback time of two years for the installation of screens, drum filters, two dissolved air flotation units and gravity filters for internal recycling.
- Payback time of approximately two years for the installation of the effluent treatment plant.
- Recycling of 2 500kg of paper per day.



City of Jeddah, Saudi Arabia

Intervention Features

- Wastewater recycling in paper production

Project Levers

(1) Internal recycling of water:

Previously treated wastewater from the nearby Khumrah wastewater treatment plant was transferred to MEPCO for use in the plant process. The wastewater is pre-treated by chemical precipitation and reverse osmosis membranes before use in the paper process. Effluent from the paper process was then treated before being discharged back to Khumarh wastewater treatment plant.

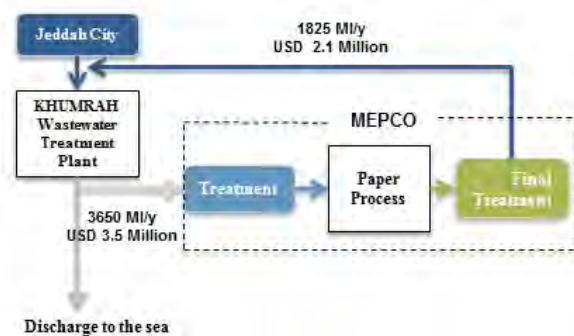
In 2006, after the paper plant was expanded, MEPCO modified their on site effluent treatment plant in order to improve water quality by installing screens, drum filters, two dissolved air flotation units and gravity filters to recycle a large share of the water internally. This reduced the water consumption per tonne of product from 20 000 litres to 8 000 litres. The static screen installed enabled the separation of fibre from wastewater. This allowed recovery of fibres and increased the plants fibre conversion efficiency from 80% to 90%. Approximately 2 500kg of fibre is recovered and recycled daily. The intervention cost MEPCO \$1.2m with a payback period of two years.

In 2010, MEPCO expanded its plant capacity from 250 000 tonnes/year to 400 000 tonnes/year. To provide available water for this expansion, MEPCO installed an Effluent Treatment Plant (ETP). The ETP consists of a biological treatment unit which reduces the organic loading in the effluents and an anaerobic treatment unit for treatment of effluent with high organic content. This has resulted in a reduction in water consumption per tonne of product produced from 8 000 litres to 5 000 litres. The investment for the effluent treatment plant was \$4.5m with annual savings of \$2.3m, resulting in a payback time of approximately two years.

Outcomes and Challenges

- Reduction in effluent discharge to Khumrah wastewater treatment plant.
- Approximately 2 500kg of fibre is recovered and recycled daily.
- Providing an available source of water for new plant capacity.
- Decrease in operating cost for the discharge of effluent.

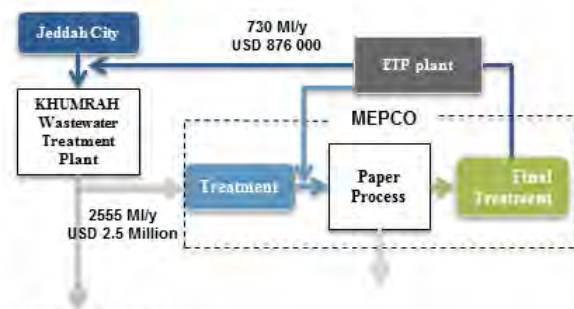
Pre-Intervention



Discharge to the sea

Earlier stages of production used 20 000 litres of water per tonne of production at 400 000 tonnes/year capacity.

Post-Intervention



Discharge to the sea

After the introduction of the internal recycling system specific water consumption is reduced to 5 000 litres of water per tonne of production at 400 000 tonnes/year capacity.

Above: Water Use at MEPCO with and without Internal Recycle
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