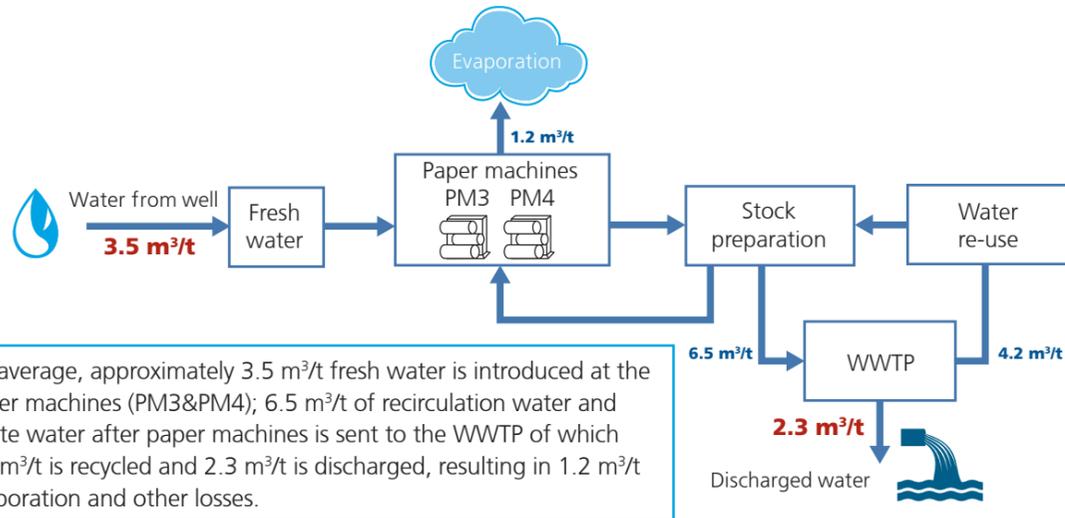


METHODOLOGY

BEFORE WATER BALANCE FOR PAPER MACHINES (PM3&PM4)

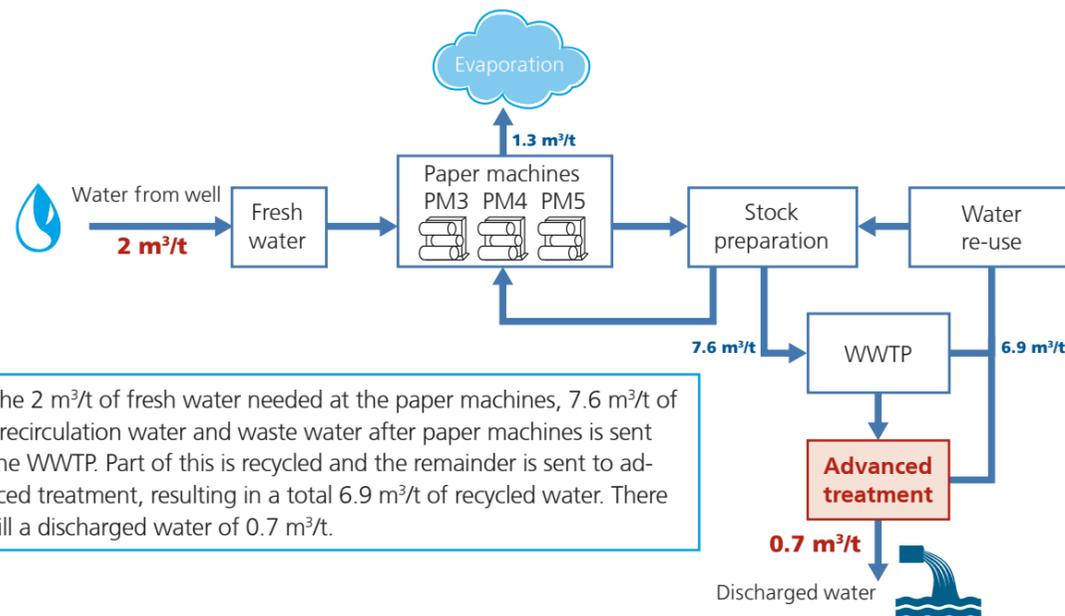
Paper machines (PM3 and PM4) produce corrugated medium, fluting, test liner, and white top liner. These machines not only have a standard waste water treatment plant that treats the water derived from the stock preparation process, they also have a recycling section that recycles treated water back into the process.



On average, approximately 3.5 m³/t fresh water is introduced at the paper machines (PM3&PM4); 6.5 m³/t of recirculation water and waste water after paper machines is sent to the WWTP of which 4.2 m³/t is recycled and 2.3 m³/t is discharged, resulting in 1.2 m³/t evaporation and other losses.

AFTER WATER BALANCE FOR PM3, PM4&PM5 WITH ADVANCED TREATMENT

With the installation of a new paper machine (PM5), Modern Karton needed additional capacity for ground water extraction. This drove the decision to treat the water presently being discharged into the river with additional advanced treatment; then use that water to replace the ground water now being used by this new paper machine, increasing the volume of recycled water and closing the water cycle as much as possible.



Of the 2 m³/t of fresh water needed at the paper machines, 7.6 m³/t of the recirculation water and waste water after paper machines is sent to the WWTP. Part of this is recycled and the remainder is sent to advanced treatment, resulting in a total 6.9 m³/t of recycled water. There is still a discharged water of 0.7 m³/t.

RESULT

The standout achievement of this water treatment methodology is the increased use of water reconstituted from the effluent of the current wastewater treatment. The increased reuse of this effluent has dramatically reduced the amount of fresh water used by the whole mill, from 3.5 to 2 m³/ton.

This study is based on materials provided by Modern Karton, a manufacturer of board and packaging paper operating in Turkey. IFC presents this case as an excellent example of water efficiency adding value to such a business.

NO BUSINESS GROWTH WITHOUT WATER EFFICIENCY

Achieving best practices in water use has allowed the company to capitalize on a business growth opportunity.

THE COMPANY

Modern Karton is a unit of Eren Holding A.S., a paper industry leader in Turkey. Since 1974, the company has been manufacturing cardboard raw material for corrugated cardboard production (e.g., testliner, white top testliner and fluting) from waste paper. It is now a major player in the European corrugated cardboard industry, as well as in the Middle East and North Africa. Modern Karton represents approximately 30% of Turkey's total corrugated cardboard production capacity.

THE CHALLENGE

EXPANDING CORRUGATED CARDBOARD PRODUCTION WHILE REDUCING WATER CONSUMPTION

Water is a crucial element in manufacturing paper. The company needs to access a significant amount of water – around 2.1 million m³ annually. In the area where the company operates access to water is limited. With current water consumption pegged at 3.5 m³ for every ton of cardboard, Modern Karton has already implemented numerous water-saving measures, making it among the most water-efficient corrugated cardboard manufacturers in the paper industry.

At the same time, the company has been seeking out new business opportunities to justify expanding its production and meet rising regional containerboard demand. The lack of regional water resources has become the company's biggest challenge, imposing serious restrictions on future growth. Company management has been keenly aware of this. They decided to meet it with a sharpened focus in this area and continuous innovation.

This is where IFC stepped in, helping the company to assess thoroughly its water needs and then working with it to build the most sophisticated water recovery and recycling system in Turkey's paper industry.

"Water is a key input for the paper industry. Due to rapid industrial development and the effects of climate change, access to sustainable water has been a major issue for us. The government of Turkey is encouraging water conservation, and industrial customers face limitations on water consumption. So we are grateful to IFC for helping us find a solution that has enabled us to expand without increasing our water consumption."

Eren Holding, Chairman Ahmet Eren



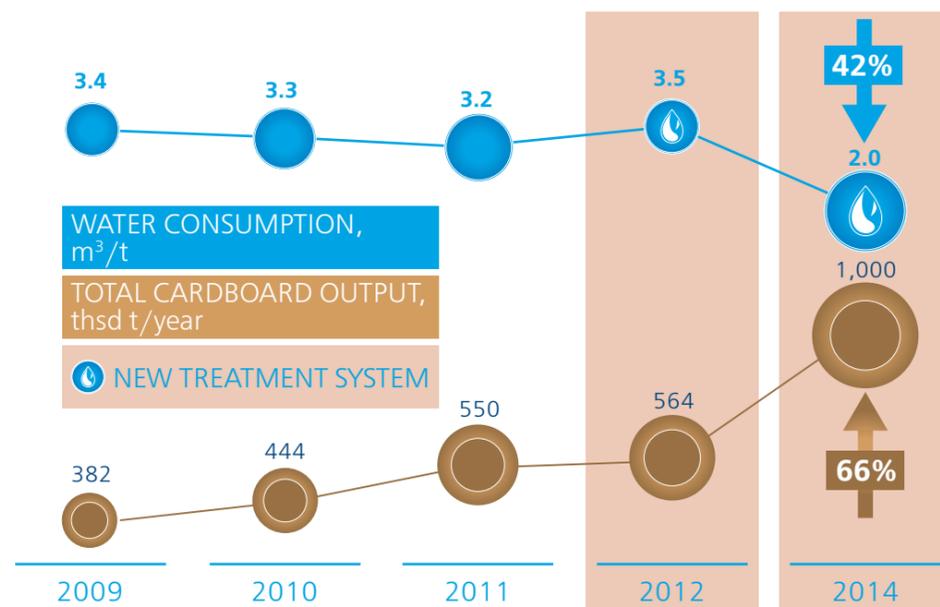
Saving 1,000,000 m³ of fresh water enables a 66% capacity extension →

SAVING 1,000,000 m³ OF FRESH WATER ENABLES A 66% CAPACITY EXTENSION

Corrugated containerboard production today consume is 1 to 13 m³ of water intake per ton of cardboard output. Modern Karton's level of water intake was estimated at 3.5 m³ per ton in 2012. These figures put the company among the most efficient paper producers in the industry worldwide. And looking ahead, the company's new water treatment system, along with several additional measures for water recycling, will further decrease the amount of water used per ton of paper produced.

Fresh water consumption will be reduced by 42%, setting a new benchmark of 2 m³ per ton, or saving 1,000,000 m³ of fresh water use annually. Furthermore, the company can use the water saved to expand production by more than 66%, to produce a total of about 1,000,000 tons of cardboard per year.

TOTAL MODERN KARTON WATER CONSUMPTION AND CARDBOARD OUTPUT COMPARED



EXPECTED EFFECTS AND RESULTS

Total project costs are estimated at about \$11 million. The work will not deliver direct cost savings but it promises various indirect benefits such as business growth and marked limits on water use and environmental impact.

- Allows further investment of approximately \$400 million, spurring production growth of more than 66%
- Business expansion without additional fresh water extraction
- Increases the recycled water portion by 42%
- Reduces the amount of water consumed from 3.5 m³/t to 2 m³/t
- Reduces the amount of water discharged from 2.3 m³/t to 0.7 m³/t
- Avoids 1,000,000 m³ of fresh water use per year

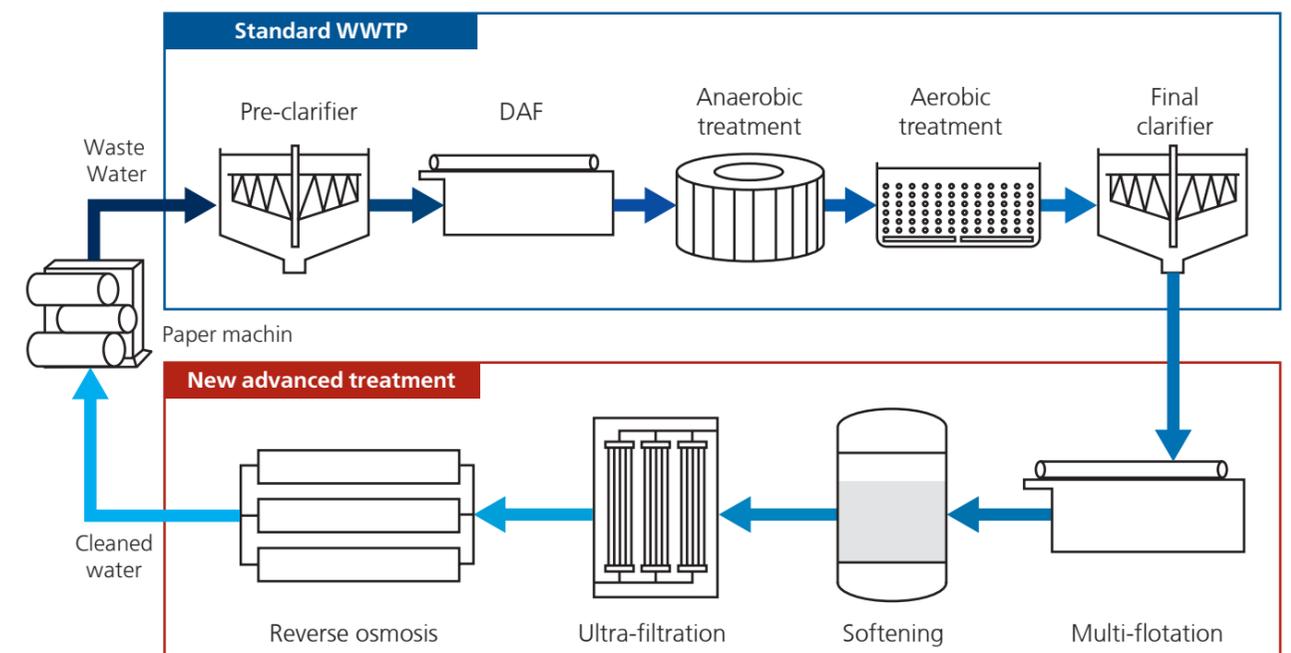
Considering that the government levies no charges for fresh water consumption, the new waste water treatment system will not lead to immediate cost savings. But with expectations that the government will start charging \$0,6/m³ for well water, the cost saving of new WWTP project would amount to additional \$600,000 annually.

WATER EFFICIENCY SOLUTION

Water used in the production process is treated in a waste water treatment plant (WWTP) on site. Through this process water is mostly discharged from stock preparation, where the pollution concentration tends to peak. The bulk of the fresh water is introduced at the paper machine. Because of this, pollution concentrations are lower at this stage, which has a positive effect on production rates.

The standard WWTP set-up is as follows: pre-clarifier; anaerobic treatment; aerobic treatment; and final clarifier. Part of the effluent is already reused in the production process. Then Modern Karton decided to tighten the water circuit and increase the amount of effluent reused in the production process, meaning less ground water was used.

THE NEW ADVANCED TREATMENT SYSTEM CONSISTS OF MULTI-FLOTATION, SOFTENING, ULTRA-FILTRATION AND REVERSE OSMOSIS TECHNOLOGIES. IT IS THE FIRST EXAMPLE OF SUCH A SOPHISTICATED SYSTEM IN THE TURKISH PAPER INDUSTRY.



LONG TERM PARTNERSHIP WITH IFC

IFC has partnered with the Eren Group since 1998, lending particular support to Modern Karton, the group's flagship company in the paper business. This has helped the latter evolve from a family-owned business to a sector leader. Specifically, IFC financed Modern Karton's successive capacity expansions (1998 and 2006) while providing working capital and liquidity support during the economic crises in 2001-2002, and 2008-2009.

This support has been a bulwark for the group. IFC has committed and disbursed some \$140 million in loans and quasi-equity to Modern Karton with

consolidated sales of \$370 million in 2012. Additionally, this latest project has extended IFC's long-term partnership with the client to include cooperation on clean production investments.

With the success of this cooperative partnership in March 2013, IFC provided an additional \$8 million loan to help the company build an advanced water recovery system to further reduce its business risk while, again, increasing resource efficiency. IFC extended this loan was through its Cleaner Production Lending Facility, an IFC financial instrument that finances resource efficiency projects.