

Reducing water use in fish and seafood processing

Adana, Turkey

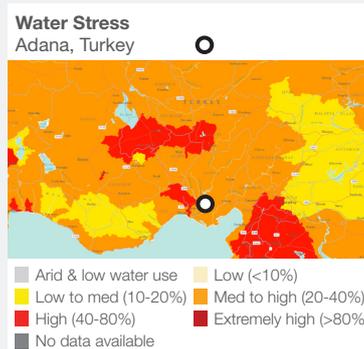
water scarcity impact

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

volumetric impact
29 000 m³/yr

capital cost
\$82 200

estimated unit cost of water
15 ¢/m³



Water Stress Map:
F. Gassert, P. Reig, T. Shiao, M. Luck and M. Landis, 2015. "Aqueduct Global Maps 2.1."

Confidence level
● Low ● Medium ● High

Water Scarcity Impact Key
● Main ● Minor

Credits
We would like to acknowledge Dr. Emrah Alkaya (Technology Development Foundation of Turkey) and Prof. Dr. Göksel N. Demirer (Middle East Technical University) for their input in the preparation of this case study.

Project Overview

The seafood and fish processing industry consumes high volumes of water in order to maintain appropriate hygiene levels and prevent the products from spoilage. In addition up to 70% of the raw fish is discarded as waste, predominantly through the wastewater system of the processing facilities, producing heavy organic effluent.

The Pakyurek seafood processing plant located in Adana primarily produces canned marinated anchovy. The groundwater aquifer, from which the plant is abstracting fresh water for its operations, has been recognised as extremely vulnerable to climate change. The company was selected to participate in the UN Joint Programme "MDG-F 1680 Enhancing the Capacity of Turkey to Adopt Climate Change", as it operates in a priority industrial sector in the Seyhan River Basin. The programme provided Pakyurek with partial funding and technical advice in order to improve its water footprint.

The evaluation of the anchovy processing revealed potential for water reuse and waste minimisation. Water treatment units were installed in the thawing (defrosting with water) and gutting stages to reduce water withdrawals by up to 70%. An oil separator was fitted within the new wastewater system and valuable fish oils were recovered as a by product.

The project was delivered with the support of the Technology Development Foundation of Turkey (TTGV) in collaboration with the Middle East Technical University (METU) and was partially financed by the United Nations Industrial Development Organisation (UNIDO).

Key Elements

- Audit of the environmental performance of the plant and benchmarking of processes against Best Available Techniques.
- Installation of a closed recirculation system for recycling thawing water.
- Installation of effluent treatment and reuse system including an oil separator for fish oil recovery.
- Participation in the UN Joint Programme "Enhancing the Capacity of Turkey to Adapt to Climate Change."

Key Outcomes

- Water withdrawn per tonne of product was reduced from 64.1 m³/tonne to 35.3 m³/tonne.
- Recovery of 1.7 tonne/year of fish oils and grease.
- Improvement of the downstream effluent quality by reducing the oil and grease content of the wastewater by 47.3 mg/L.



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Intervention Features

- Wastewater recycling in the food industry
- Education, technical training and capacity building
- Industrial water management

Project Levers

(1) Capacity building programme

“The “MDGF_1680: Enhancing the Capacity of Turkey to Adapt to Climate Change” programme is a joint United Nations programme financed by the Millennium Development Goals Fund (MDGF). The programme’s goal was to improve Turkey’s resilience in climate change adaptation and enhance its national, regional and local policies. One of the key initiatives of the programme was to demonstrate how industries can benefit from transition to more efficient and environmentally friendly practices. The Seyhan River Basin was targetted as a region following a basin hydrological assessment which concluded that local water availability is highly sensitive to climate change. Key industrial units in the area were selected as pilot projects, including the Pakyurek seafood processing plant in Adana.

(2) Identification of cleaner production opportunities

The water and energy performance of the company’s anchovy canning process was evaluated against the European Commission’s Best Available Techniques. It was concluded that opportunities for improvement of productivity could be achieved by reducing water use in the thawing (defrosting) and fish gutting processes.

(3) Improvements to thawing system

The existing thawing method was to employ a constant spray of fresh groundwater over a flat platform where the frozen anchovies were placed (one storey system with no recycling). This approach used 28.4m³ of water per tonne of raw fish. The revised system was four storeys high, enabling 60 boxes (900kg) of frozen fish to be thawed at once. Water was recirculated in a closed-circuit system without compromising the product quality.

(4) Effluent wastewater treatment and oil separation

Anchovy gutting was traditionally performed manually using a constant flume of water to wash away the fish waste into the sewer without treatment. A water recycling and treatment system was installed to treat the effluent. This comprises of a screen, sedimentation and flotation, ozonation and recirculation pumps. Furthermore, an oil separator was fitted to enable the collection of fish oil and grease from the effluent.

Outcomes and Challenges

As a result of the interventions, the water use in the anchovy processing line was reduced by 72.6% and the overall factory water use was reduced by 45% (from 64.1 m³ per tonne product to 35.3m³ per tonne product). 140kg/month of fish oil recovered reducing the organic load of the wastewater leaving the plant by 47.3mg/L. The reduced groundwater abstraction resulted in reduced pumping costs and increased resilience against future droughts.

It was estimated that the company saved annually \$48 175 due to the reduced water and energy use. Further revenue was achieved from the sale of the produced fish oil and grease to external companies.



Above: New thawing system and anchovy gutting/filleting line
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