

CASE STUDY IDENTIFICATION SHEET

This document has been developed as part of the activities under Task 3.2 of the “GREENPORT Alliances” project, for which MAR.TE. S.c.ar.l. serves as the responsible entity. Task 3.2 focuses on identifying and analyzing case studies that exemplify best practices for behavioral change among operators aimed at reducing the environmental impact of port operations.

The primary objective of this activity is to collect, document, and analyze concrete examples of technological, managerial, or behavioral innovation that have proven effective in contributing to the environmental, economic, and social sustainability of the port services sector. Through a structured selection and evaluation process, the document highlights the specific features of each case study and assesses their performance against key environmental and economic impact indicators.

The information gathered will be integrated into the overall framework of the GREENPORT Alliances project to promote the dissemination of sustainable solutions and the development of curricula for: a. higher education students (future personnel); b. current professionals (professional training); c. educators (train-the-trainer courses).

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1. GENERAL INFORMATION

A. **Case study title**

Gisaş Case Study: World's Largest Zero-Emission Tugboat Fleet

B. **Green practice implemented**

Practice 8: Implementation of eco-friendly propulsion systems

GİSAŞ POWER, also called Zeetug, is a joint R&D project of GİSAŞ and NAVTEK.

Gisaş has been operating the world's first zero-emission tugboat for five years. Afterwards, with the addition of three more electric tugboats to its fleet, GİSAŞ operates the world's largest electric tugboat fleet.

C. **Specific goals**

The aim of this case study is to demonstrate that zero emissions can be achieved in a bay with ports and shipyards, thanks to the tugboats serving the ships being 100% electric. By including the world's first 100% electric-engine tugboats into its fleet, GİSAŞ has introduced a novel paradigm for other global operators in alignment with the United Nations Sustainable Development Goals.

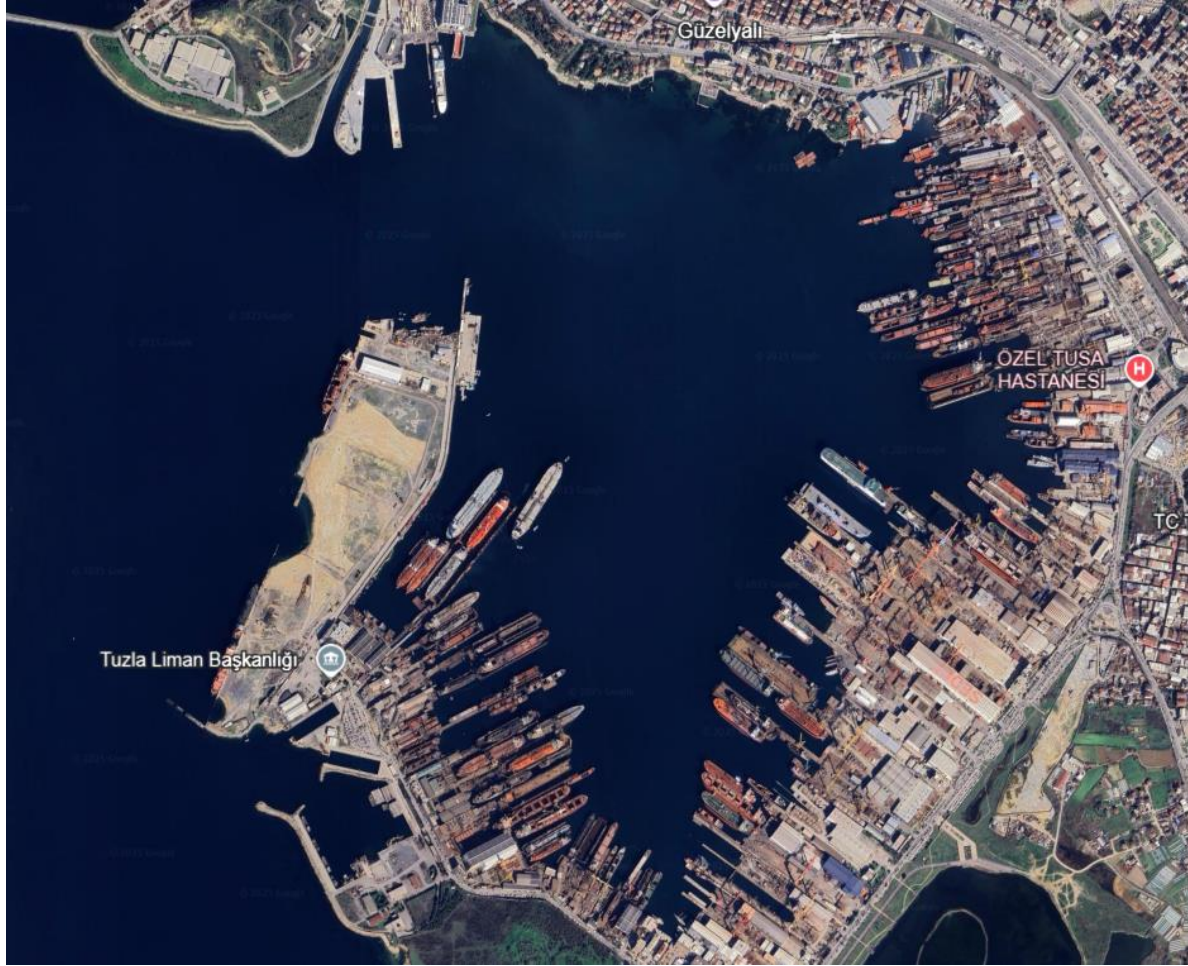
D. **Direct impact of the practice**

- Zero-emission
- 30% total fuel cost savings (energy savings).
- 86% total maintenance and repair cost savings.
- No waste heat of exhaust.
- 23% less noise than their diesel-powered counterparts.

E. **Place of implementation**

GİSAŞ primarily engages in "Piloting and Towage" services, which commenced in 1998 at Aydınlı Bay, under the jurisdiction of Tuzla Port Authority in Istanbul. GİSAŞ offers continuous service 24 hours a day, staffed by experienced and dynamic personnel possessing the qualifications outlined in the Seafarers' Regulation. The fleet comprises 5 tugboats, 3 mooring boats, and 1 pilot boat, all outfitted with equipment designed to combat fire and water pollution at Tuzla Port and its adjacent coastal areas.

Picture 1: Aydınli Bay, Tuzla, İstanbul, Türkiye



F. Start and end date or duration of the pilot project

GİSAŞ POWER, which was built by Navtek in 2019, started to be operated by Gisaş in March 2020. General features of Gisaş Power are given in the table below.

GISAS POWER Electric Tugboat	
Port of Connection:	İstanbul
Gross Tonnage	104
Building Location:	Tuzla - İstanbul
Date of Construction:	2019
Full Size:	18,70
Net Charge:	31
Host Type:	SIEMENS
Host Power:	2
Pull Power:	2x925 kW
Pull Power:	30 Tons

Gisaş Power, the world's first zero-emission, fully electric tugboat, has completed 1618 days of operation. Gisaş Power's first 5-year onshore survey was carried out in February-March 2025. See in the Picture 2.

Picture 2: The first 5-year survey of Gisaş Power



The success of Gisaş Power, the first and important project carried out within the scope of decarbonization that will increase environmental awareness and shape the maritime sector, has also led to the construction of the other 3 electric tugboats. In this context, Gisaş Power 2 started operating in April 2023, Gisaş Power 3 in July 2023, and Gisaş Power 4 in October 2023. These tugboats, also built by Navtek and operated by Gisaş, have made a significant impact on the international platform.

2. CONTEXT AND DESCRIPTION

A. Description of the practice

Gisaş's electric tugboats epitomize the new generation of environmentally friendly and advanced technology, being rechargeable, fully electric, and producing zero emissions with no noise. This revolutionary design enables the vessels to operate powerfully and efficiently while minimizing environmental impact.

B. Driving factor behind the adoption of the green practice

Electric tugboats are being developed with the aim of optimizing various factors such as operational efficiency and ease, minimizing environmental impacts, eliminating air and noise pollution and providing good working conditions for the crew.

c. Stakeholders involved

Gisaş provides pilotage and tugboat services in the bay under the responsibility of Tuzla Port Authority. This bay also includes the Tuzla Shipyards Region, which is the largest shipyard region in Türkiye. Since Gisaş provides service to all shipyards here, all shipyards in this region can be considered as stakeholders. Two other important stakeholders are, two important cargo ports in this region, AnadoluPort and DFDS. Especially, DFDS, one of the world's major ship and port operators, prefers only electric tugboats for their ships coming to the port it operates in this bay.

3. IMPLEMENTATION

A. Technologies used (if applicable)

Lithium-ion battery packs are used to power electric tugboats. Utilizing robust electrically charged battery packs, electric tugboat effectively accomplishes its daily heavy-duty tasks without causing environmental harm, allowing the port tugboat to work at night with minimal noise. This technology is compatible with any current short-distance watercraft. Moreover, the Smart Tug Energy Management System (STEMS) software, created by NAVTEK, optimizes the electrical energy consumption of electric tugboats, hence enhancing their driving range and operational cycles. STEMS is a web-based program that offers extensive functionalities for fleet control centers and tugboat operators. Its adaptable construction allows for integration into a fleet. STEMS aggregates all data from the devices and equipment aboard the tugboat and stores it in the Control Center's server. It utilizes pertinent data regarding performance to maximize electric power and provides feedback in the form of recommended actions to the operator.

4. DATA

The information and data included in the case study were obtained from face-to-face interviews with Gisaş and Navtek and by examining Navtek's operation reports.

The total operation time of Gisaş Power, the world's first zero emission tugboat, is 1618 days. The total number of operations (sortie) of Gisaş Power is 4194. While Gisaş Power's total e-motor operating time is 7194 hours, 657 hours were spent on maintenance and repair. Gisaş Power prevented a total of 954.4 tons of CO₂ emissions and 2.7 tons of NO_x emissions.

The total operation time of Gisaş Power 2 is 500 days. The total number of operations (sortie) of Gisaş Power is 827. While Gisaş Power's total e-motor operating time is 1315 hours, 150 hours were spent on maintenance and repair. Gisaş Power prevented a total of 168.7 tons of CO₂ emissions and 0.48 tons of NO_x emissions.

The total operation time of Gisaş Power 3 is 424 days. The total number of operations (sortie) of Gisaş Power is 835. While Gisaş Power's total e-motor operating time is 1511 hours, 126 hours were

spent on maintenance and repair. Gisaş Power prevented a total of 196.3 tons of CO₂ emissions and 0.55 tons of NO_x emissions.

The total operation time of Gisaş Power 4 is 320 days. The total number of operations (sortie) of Gisaş Power is 626. While Gisaş Power's total e-motor operating time is 720 hours, 129 hours were spent on maintenance and repair. Gisaş Power prevented a total of 142.8 tons of CO₂ emissions and 0.40 tons of NO_x emissions.

5. ECONOMIC AND ENVIRONMENTAL ANALYSIS

A. Key savings or economic impact

Electric tugboats provide 30% energy cost savings, and 85% maintenance and repair cost savings.

B. Contribution to environmental goals

As mentioned above, the electric tugboats used by GİSAŞ provide zero emissions. Moreover, electric tugboats have 23% less noise than their diesel-powered counterparts.

6. CONCLUSIONS

This case study aims to demonstrate the success of electric tugboats operating in a region with ports and shipyards in achieving zero emissions. Therefore, the case study is taken as a best practice example of Gisaş, which operates the world's largest electric tugboat fleet. Electric tugboats exemplify the latest generation of environmentally friendly and advanced technology, being rechargeable, fully electric, and producing zero emissions with minimal noise. This revolutionary design enables the boats to operate with enhanced power and efficiency while minimizing environmental impact.