

## SEMPER FI CONTAINER SHIP

## YEARS OF PERFORMANCE AND A POWERFUL PROPULSION UPGRADE

FLEET:	Scheepvaartonderneming Carpe Diem
SHIPYARD:	A.A. Vink, Sliedrecht
DIMENSIONS:	110 m x 11.45 m
BOW THRUSTERS:	1 CJ-1200 + KA 440 kW @ 1800 rpm
THRUSTER PERFORMANCE:	2 Veth Z-drives, azimuth thrusters, type VZ-900A-CR-VHD
ENGINES:	2 electrical engines and 2 diesel engines
POWER:	400 kW @ 1800 rpm and 515 kW @ 1800 rpm

Approximately five years after the original *Semper Fi* installation, we returned to enhance its efficiency by replacing the tailpiece with a nozzle and a single propeller—significantly boosting propulsion performance and reducing fuel consumption even further.

▶ Scan above to read the original case study.

▶ Read below to learn about the original installation and see how this recent upgrade continues to build on long-term success.

## SITUATION

The *Semper Fi*, a 13-year-old container ship, had reliably served its owner for over a decade. The owner sought a more fuel-efficient and sustainable propulsion system to extend the vessel's service life and align with modern environmental standards. Initially, plans were in place to retrofit the ship with a diesel-electric propulsion system, supported by a government subsidy.



However, after a detailed consultation and operational study with our team, it became clear that a hybrid solution combining diesel-electric and diesel-direct propulsion would deliver greater efficiency and long-term value. At that time, we didn't have an off-the-shelf hybrid system, which required us to develop a custom solution and apply for additional subsidy funding.

Despite the initial focus on diesel-electric, we successfully demonstrated that a hybrid system would surpass fuel efficiency targets and meet the green sailing requirements necessary for subsidy approval.

ALIGN WITH CURRENT ENVIRONMENTAL STANDARDS & EXTEND SERVICE LIFE

## CHALLENGE

Designing a bespoke hybrid propulsion system for the *Semper Fi* presented several key challenges. The system had to integrate diesel-electric and diesel-direct drives seamlessly, optimizing performance and minimizing emissions across varied operational conditions.



Our priorities included:

- Aligning the new propulsion system with the vessel's actual sailing profile
- Ensuring compliance with green sailing criteria for subsidy eligibility
- Balancing the use of diesel and electric power for peak efficiency
- Overcoming technical hurdles to develop and implement a novel hybrid architecture

This effort required an in-depth analysis of the ship's typical routes and operating patterns, significant engineering innovation and successful acquisition of supplementary funding.

OVERCOME TECHNICAL ISSUES AND BALANCE USE OF DIESEL AND ELECTRIC POWER



“ The *Semper Fi*'s hybrid system proved its value over time. Despite early system inefficiencies, targeted upgrades boosted performance, and fifteen years later, it remains a fleet benchmark for efficiency and sustainability. ”

**Veth Team**

## SOLUTION

We designed and delivered a customized Veth Z-drive type VZ-900 counter-rotating propulsion system featuring both Power Take-Off (PTO) and Power Take-In (PTI) functionality. This hybrid setup enabled seamless switching between diesel and electric propulsion modes.



Key technical highlights included:

- A diesel engine connected to a drive flange for direct propulsion
- An electric motor mounted at a right angle, functioning as a generator when the diesel engine was active
- A freewheel clutch system allows the diesel engine to disengage during electric-only operation
- Integration of Scania diesel engines, generator sets, and a Compact Jet system for enhanced flexibility

This configuration allowed the vessel to operate efficiently across a range of conditions, optimizing performance while reducing fuel consumption and emissions.

CUSTOM-ENGINEERED SOLUTION  
WITH A VETH Z-DRIVE FEATURING  
BOTH PTO AND PTI

## VETH COMPACT JET

Veth Compact Jet ensures minimal noise at maximum thrust and minimum draft. Other benefits include:

- Higher efficiency, especially at higher speeds
- Optimum maneuverability: maximum thrust possible through 360°
- Compact and easy to install

## RESULT

The hybrid propulsion system initially met the theoretical expectations from our studies. However, real-world operations revealed that the vessel's actual sailing profile differed slightly, causing the counter-rotating Z-drive to perform below optimal efficiency.



Approximately four to five years post-installation, we upgraded the system by replacing the tailpiece with a nozzle and a single propeller. This adjustment significantly improved propulsion efficiency and further reduced fuel consumption.

Fifteen years after the retrofit, the *Semper Fi* continues to benefit from ongoing optimizations, and discussions are now underway with the customer regarding a new vessel. The long-term success of the hybrid system has firmly established the concept as a preferred solution for their fleet, highlighting its lasting performance and environmental value.

## VETH Z-DRIVES

Veth thrusters deliver essential benefits:

- 360° full thrust, thus optimum maneuverability
- Higher efficiency as a result of propeller design and angle
- Lower fuel consumption over total speed range
- Possibility for flexible suspension, which provides better insulation from noise and vibration
- Compact, easy-to-install construction allows for more room for passengers and cargo
- No separate reduction gearbox is needed from the engine output to the thruster input
- Safer, through shorter emergency stopping distance and improved maneuverability