

WhitePaper AKOON Autonomous inland waterway navigation





Autonomously crossing the Rhine with AKOON

In many regions of the world, ferries are an important component of transportation infrastructure. Ferry operations avoid the need for often long and time-consuming detours along rivers and lakes. As a result, ferries also help reduce fuel consumption and emissions. To further increase this contribution, and at the same time make ferry operations even safer, Voith, Rheinfähre Maul, the Institute of Automatic Control at the RWTH Aachen University, and Argonav joined forces in a three-year collaborative project to develop a system for “automated and coordinated navigation of inland ferries” (AKOON in German).

Within the scope of this project, a Rhine ferry operating near Mainz between Oestrich-Winkel and Ingelheim was fitted with:

- + a track-following system with active collision avoidance,
- + a positioning assistant,
- + eight laser scanners and radar for monitoring the surrounding area and
- + other sensors, including for environmental and condition monitoring.

With over 600,000 people and 300,000 vehicles transported each year, the ferry service is an indispensable part of the local transportation infrastructure.

Thanks to the systems developed, the crossing, as well as the berthing and casting off at the pier, can be done automatically. The ferry skipper only has a supervisory role.



Less fuel, more safety

In spring 2023, the project partners analyzed the data from the research project and found that intelligent route planning and optimized control of the propulsion units allow the ferry operator to save around 11 percent diesel a year, i.e., between €10,000 and €20,000 depending on fuel prices. In addition, by means of continuous traffic monitoring, the autonomous steering system ensures maximum safety on the roughly 1 km long route. It is considered to be especially challenging due to narrow passages, sandbanks, strong currents and the high volume of traffic traveling along the river.

The propulsion system of the ferry, consisting of four Voith Schneider Propellers,

is a key factor in this success. They offer a combined propulsion and steering system with fast response times that allow the ferry to maneuver quickly, safely and precisely – and track the desired path accurately at all times. In addition, the autonomous system and the VSPs enable the ferry to maintain its position despite winds and currents and without having to anchor or moor. Thanks to this digital support, the ferry only deviated a maximum of 12 cm from its desired set-point. These values would barely be achievable with a human being at helm. These developments will continue to be refined within the scope of the autoFerry project.



Drive and steering in one:
the Voith Schneider Propeller
(VSP)

Due to its design, the Voith Schneider Propeller generates thrust in any direction. It is therefore a combined propulsion and steering system. Thanks to the very fast response time to control commands, the VSP also enables fast, safe and precise maneuvering even under adverse conditions, making it the ideal drive system for autonomous vessels.

Vessel data Horst ferry



- + Built in: 1987
- + Displacement: 255 t
- + Length/width: 57 m/13.40 m
- + Load carrying capacity: 135 t
- + Propulsion: 4 x Voith Schneider Propellers VSP10E
- + Drive power: around 1,000 hp
- + Max. number of passengers: 250
- + Max. number of vehicles: 32 cars



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