

## At a glance

### Location

Rotterdam, Netherlands

### Commissioned

November 2011

### Fuel

Liquid natural gas

### Technologies

- Two Capstone C30 microturbines.
- Two heat exchangers with 55kW thermal capacity.
- A small standard absorption chiller with 18kW cooling capacity.

### Results

- First dual-fuel driven ship on European inland waterways to install microturbines.
- Compliant with Central Commission for the Navigation of the Rhine (CCNR) regulations without exhaust aftertreatment.
- Microturbines approved by Lloyds Register of Shipping.
- The microturbine combined cooling, heating, and power (CCHP) system gives the Argonon high fuel efficiency for onboard power generation.
- Absence of engine lubricant helps limit surface water pollution.
- The microturbines ensure onboard comfort since there's essentially no vibration and very low noise.
- Microturbines generate auxiliary power for the ship to reduce emissions and fuel costs.
- Microturbines operate in N+1 setting and serve as the onboard electrical supply.
- The microturbines' exhaust is used to heat water onboard, which is then used to heat the LNG vaporizer.

## MTS Argonon

With ports around the world instituting strict emissions requirements, port authorities, regulators, and owners are fueling a high-tide demand for environmentally friendly vessels.

Capstone Turbine Corporation has plunged into the marine industry to help navigate the stringent regulations and support green ship innovations.

### First dual-fuel ship on European inland waterways installs microturbines

To deeply limit greenhouse gas emissions, two Capstone C30 liquid natural gas (LNG) MicroTurbines® were installed by the Dutch distributor Pon Power on a dual-fuel Type C Tanker for inland shipping this year. This innovative project is the first of its kind for a Type C Tanker.

Today, the MTS Argonon, named by its founder, Deen Shipping, cleanly cruises the Rhine River in compliance with Central Commission for the Navigation on the Rhine (CCNR) regulations. Its main engines run on an environmentally-healthy mixture of 80 percent natural gas and 20 percent diesel, achieving significant NO<sub>x</sub>, CO, CO<sub>2</sub>, and CH<sub>4</sub> emissions reductions. This sustainable ship relies on its two Capstone microturbines for auxiliary power and to further reduce emissions and fuel costs.



Dutch entrepreneur Deen Shipping constantly considers the safety of its people and the environment, hence the birth of Argonon. Pon Power teamed with Deen Shipping to integrate Capstone microturbines into the dual-fuel ship concept.

Deen Shipping officials believe the expansion of LNG issuance stations in the coming years will be an important contribution to the success of similar microturbine dual-fuel ship applications in the future.

The onboard clean-and-green microturbines, which are approved by Lloyds Register of Shipping for this project, can meet strict emission regulations without additional exhaust aftertreatment. The result is a tremendous reduction in service requirements, maintenance, and operational costs.

While the 110-meter (330-foot) Type C Tanker smoothly traverses the Rhine River making stops at storage depots in the Netherlands, Belgium, Germany, and Switzerland, the microturbines operate in an N+1 setting and serve as the electrical power supply onboard.

The microturbines' exhaust is captured in a heat exchanger to heat water onboard. The resulting hot water is diverted to heat the LNG vaporizer, which provides fuel to the microturbines and main propulsion engines. Additionally, the hot water produces heat for the boiler and domestic hot water system and also is used for central heating. The heat of the microturbines also is fed to an absorption chiller for the air conditioning system.



Two liquid natural-gas fueled Capstone C30 MicroTurbines onboard the MTS Argonon Type C tanker in Rotterdam, Netherlands, operate in an N+1 setting and serve as the main electrical power supply.

*“Argonon Shipping strives to be an innovative, socially-responsible company and Capstone microturbines absolutely fit our mission to have a clean-and-green profile.”*

— Gerard Deen,  
Deen Shipping

When compared to traditional diesel generator sets, the Capstone microturbines onboard the Argonon have extreme low NOx emissions and produce a negligible amount of particulate matters.

The CCHP system provides a high overall fuel economy for auxiliary power, which further reduces the ships overall carbon footprint. The microturbines' absence of lubricant also prevents surface water pollution. Additionally, the microturbines can run on natural gas, are extremely reliable, require minimal maintenance when compared to traditional diesel generators, and can easily integrate with existing onboard equipment. The microturbines ensure onboard comfort since there's essentially no vibration and very low noise.

“We created the first inland barge that runs on dual fuel,” said Gerard Deen of Deen Shipping. “Argonon Shipping strives to be an innovative, socially-responsible company and Capstone microturbines absolutely fit our mission to have a clean-and-green profile. Microturbines are rapidly expanding into a number of industries and will certainly be substantial power sources for inland navigation.” ■