Argonon, LNG Dual Fuel in inland waterway transport

Description:
Argonon is the first inland waterway transport vessel on dual fuel in Europe, i.e. liquefied natural gas (LNG) as main fuel (80%) and diesel as fuel for ignition (20%). The ship Argonon is equipped with a Caterpillar engine, adjusted to dual fuel. This dual fuel engine needs less diesel to produce the required power and keeps the same stability and responsiveness in all conditions.

Benefits:
• Less fuel costs (estimation: 20-25%)
• Decrease of CO2 emissions (around 20%)
• Decrease of NOx emissions (around 40%)
• Decrease of PMx emissions (to almost zero)

Starting point/objectives/motivation:
The main motivation for introducing dual fuel in inland waterway transport was to obtain more fuel efficiency, cost savings from the use of a less expensive fuel type and also to be able comply with future expected emissions directives in Europe.

The LNG technology has been used in the maritime sector during the last 30 years. Nevertheless, this solution is very innovative for inland navigation. Argonon is the first inland waterway vessel on dual fuel in Europe.

Before the introduction of the Argonon dual fuel vessel, Deen Shipping used vessels sailing with diesel engines.

The research project started in July 2009. The first activities were completed in the first months of 2010. After the research phase it was decided to continue the project. The Argonon ship was baptized on 25 November 2011 and operational since December 2011.

The ship operates between Rotterdam and Basel (800 km upstream and 800 km downstream).

Solution
The solution uses the following main technical elements:
• The dual fuel engine
• Tank for LNG fuel storage
• System to vapourise the LNG and get it to the right temperature (for energy consumption)
The best practice is mainly an initiative from the private sector. From the public sector Agentschap NL and the European Regional Development Fund assisted through funding schemes.

The solution can be implemented on different types of barges by changing the engine. However, one of the most important barriers of this technology is finding a safe place for the relatively large LNG tank. This can be a challenge for existing (smaller) vessels.

The dual fuel engines are already being used in other industry sectors.

http://www.deenshipping.com/Argonon.html

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Specific technical characteristics of the practice:
- The required LNG is stored in a large cryogenic tank on deck, to prevent the freezing cold LNG from heating up and vaporizing.
- In order to remain liquefied under atmospheric pressure, LNG has to be at least -162 centigrades, but since it is kept under a pressure of three bar in the tank of the Argonon, the temperature can be a little higher: 152 to 155 degrees below zero suffices.
- In addition to the engine and the tank, a system is required to vaporize the extremely cold LNG and to make sure it enters the engines at the right temperature. This system uses the heated cooling cycle water of the engine.

Transport mode:
- Inland waterway vessels

Main actors involved
Deen Shipping (owner), Argonon Shipping (subsidiary Deen shipping), PON Power (Natural gas Microturbines), Shipyard TRICO, CRYONORM (LNG storage), CBRB, Agentschap NL & European Regional Development Fund (funding)

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