

Could the Dual Ports and Channel
Projects be a driver of a hydrogen
fuelled marine transport industry?

Geoff Boerne
Celtic Cruises Ltd.

Reasons as to why collaboration between the Dual Ports and Channel projects are beneficial to both

- Share similar aims with regard to creating a sailing cargo network, or more widely, a reduced to low CO2 emissions coastal maritime transport network.
- The technology that the Channel project is wanting to test and compare, the sail system and the electric motor / combustion engine hybrid propulsion system have a huge potential to lower CO2 emissions from all sorts of vessels, sailing or not, as the system can be retro fitted easily. This in turn will allow many more vessels to consider the possibility of a low emissions option as a coastal marine transporter, but in all cases, certainly a reduction in both fuel costs and CO2 emissions.
- Most importantly, from my point of view, it not only links the two areas in terms of coastal transport projects, but provides the base technology on which to build on in designing and creating emissions free marine propulsion and energy for all types of maritime vessels.

What does each project bring if collaboration happens in terms of green technology:

- **Channel Project:**

- Electric motor for propulsion
- Hydro electric generator
- Batteries
- Electric system to enable above
- Renewable energy producers as in wind and solar energy

- **Dual Ports project:**

- Hydrogen technology that will:
- Produce hydrogen from water
- A storage method for the hydrogen
- A system to use the hydrogen as a fuel either for the combustion engine or in terms of a hydrogen fuel cell.
- Renewable energy producers as in wind and solar energy

SV Lo Entropy



Presently refitting



HYDRO POWER

36 inch 4 bladed propellor which at present operates the self steering hydraulic pump and a 24 volt alternator optimally once boat speed is 2 knots or more.



Hydro power

Simple mechanism, plumber block connected to propeller shaft via a nut link belt, which drives a hydraulic pump and a 24 volt alternator effeciently once the boat speed reaches two knots. This system worked continously for over 10 000 nautical miles most successfully without problem.



Opportunities of combining renewable energy sources of hydro, wind and solar on vessels able to sail as well as motor

- Lo Entropy rarely motors, she sails approximately 99% of the time.
- She averages 120 nautical miles a day. This average would increase dramatically if we used the propeller in windless conditions and might prove critical when offering a liner cargo service in the EU.
- BUT, as we do sail most of the time, we have the ability to produce vast amounts of hydro electricity/energy through our free spinning propeller driving the new electric motor which becomes a generator when not used as an electric propulsion motor, and further we have renewable energy production from solar and wind technology.
- If this renewable energy can be used to make hydrogen in order to store energy (as opposed to battery storage systems), we could have an emissions free marine transport mode.

TRANSPORT EMISSIONS

Transport Emissions

Recommended average emission factors

Transport Mode	grams CO ₂ per tonne-km
Road transport:	62 gCO ₂ /tonne-km
Rail transport:	22 gCO ₂ /tonne-km
Barge transport	31 gCO ₂ /tonne-km
Short sea transport:	16 gCO ₂ /tonne-km
Intermodal Road/Rail:	26 gCO ₂ /tonne-km
Intermodal Road/Barge:	34 gCO ₂ /tonne-km
Intermodal Road/short sea:	21 gCO ₂ /tonne-km
Pipelines:	5 gCO ₂ /tonne-km
Deep Sea Container:	8 gCO ₂ /tonne-km
Deep Sea Tanker:	5 gCO ₂ /tonne-km
Airfreight:	602 gCO ₂ /tonne-km

Source: Alan McKinnon

Guidelines for Measuring and Managing CO₂ Emission from Freight Transport Operations; Issue 1 March 2011
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Lo Entropy sail transport:	2.1 gCO₂/tonne-km @ 36T
	1.7 gCO₂/tonne-km @ 44T
	1.4 gCO₂/tonne-km @ 52T

KISS

- The idea of producing hydrogen onboard a sailing vessel as an energy storage method, to be used as an emissions free fuel for electricity production which in turn drives electric motors for all sorts of needs onboard the vessel: propulsion, heating, cooking, refrigeration, winching, hydraulics etc. is not that far fetched, and is already being achieved, although how efficient such systems are remains the question. See "The Energy Observer"
- By combining our two projects we have the opportunity to test these technologies comparatively cheaply.
- The ramifications on a cost basis for maritime transport should we get even a 30% efficiency ratio/ability are enormous, as it will be for a fledgling marine hydrogen industry. Reducing fuel and energy costs will be by far the greatest incentive for a change to an environmentally sustainable maritime transport industry.
- To begin with, as in our case, small is beautiful!

Low carbon littoral

P.Y. Glorennec
py.glorennec@avel-vor.fr



The present situation

- Small and medium-sized harbors see their industrial activity reduced to the benefit of seasonal activities such as tourism or pleasure craft.
- Most land transport is by truck
 - fossil fuel consumption
 - pollution
 - road maintenance ...
- Current open sea vessels are 100% diesel
 - while they must reduce their carbon footprint ...



The low carbon project

- A harbor, whatever its size,
 - is linked to local producers and consumers
 - and is connected to other ports by hybrid coasters
- The coasters
 - make maximum use of renewable energies
 - keep a modest size to access at all harbors



Our choices for Coasters

- No "old rigs" !
 - a coaster must never tack
 - wind is a random energy : need of another no carbon energy
- Renewable energies (wind, pitch) are free and
 - **necessary**, because they reduce the energy load
 - **insufficient**, because of their random nature
- Hybridization of existing boats
 - Automated auxiliary veils (already operational)
 - Parallel hybrid propulsion (already operational)
 - pitch energy (in progress)
 - H₂ energy (in progress)

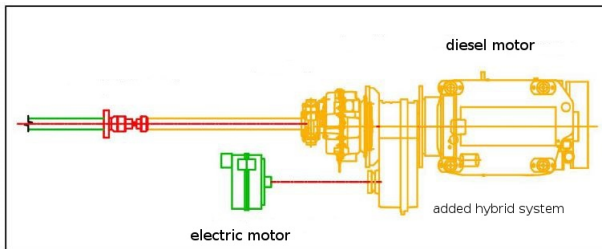


Automated Auxiliary Sails, see Grand Largue



VEL TECHNOLOGIE
OR

Parallel Hybrid Propulsion



Diesel engine and an electric motor share the same propeller shaft

New problem : how to produce electricity ? \Rightarrow pitch energy, H_2 ...

- A technically feasible project now
 - A favorable context
 - reduce CO₂ emissions in all areas
 - Importance of civil society
 - consuming local and low carbon footprint products
- ⇒ This is a concrete step towards a low-carbon coastline !
... but it's also another form of Economics

Channel project aim

The linking and utilising of coastal Ports and their area of influence

