

Hybrid Marine

Interreg 
2 Seas Mers Zeeën
European Regional Development Fund



British Guild of
TRAVEL WRITERS
Independence • Insight • Expertise



Parallel
Hybrids
for small
craft



BMF Expo 2020



Graeme Hawksley : Hybrid Marine LTD

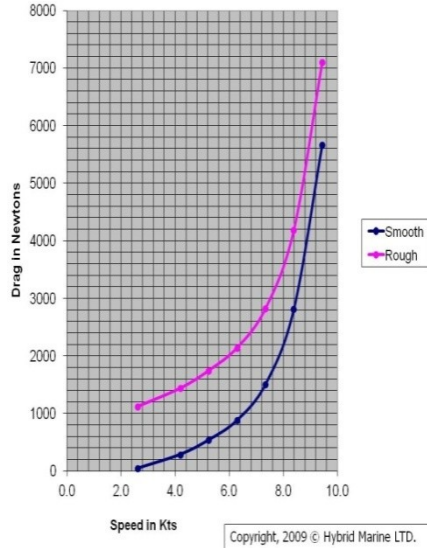
History of Hybrid Marine

- 2002 : Commenced research into the use of Hybrid technologies in the marine environment.
- 2003 : Prestigious D.T.I. SMART award funded a feasibility study.
- 2004 : Experimental Hybrid system constructed and completed sea trials.
- 2005 : First Patent for pulse charging methods (GB2417378).
- 2006 : Developed technology for a high feature/low cost parallel Hybrid system.
- 2008 : UK government award to commercialise Hybrid technology.
- 2008 : First product to market in conjunction with Beta Marine.
- 2009 : Commenced work with E.P. Barrus developing hybrids for Yanmar engines.
- 2010 : Second patent for parallel hybrid control methods (GB2447274).
- 2013 : Worldwide sales of Hybrid systems.
- 2013 : Introduction of Brushless, liquid cooled, technology.
- 2014 : UK Patent filed for Multimode Hybrid (GB1420899.5).
- 2015 : International Patent filed for Multimode Hybrid (PTC/GB2015/000318).
- 2016 : Introduction of further cost reduced systems.
- 2017 : 100th hybrid system sold
- 2017 : Commercial barges
- 2018 : British Guild of travel writers, best European project.
- 2019 : Interreg, 2 Seas, Implementation of Ship HYbridisation (ISHY)

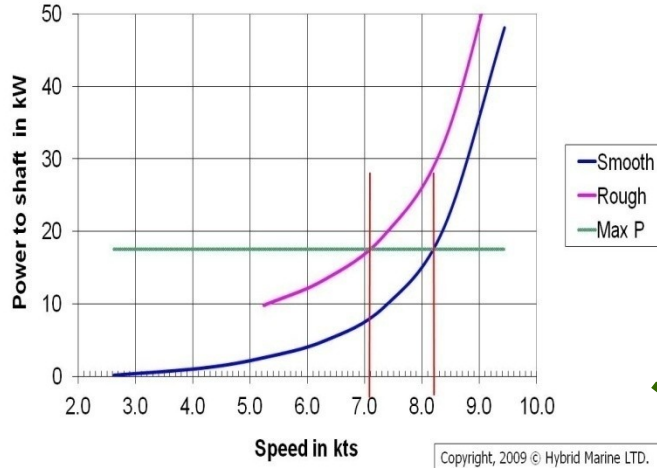


HybridMarine

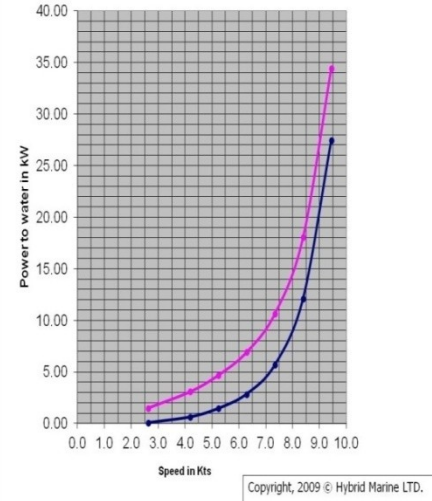
Drag for Tiki 46, loaded to 9,100kg
Rough and Smooth water



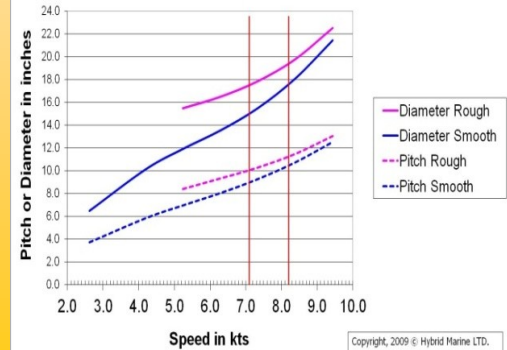
Power V speed for optimum propeller



Power for Tiki 46, loaded to 9,100kg
Rough and Smooth water

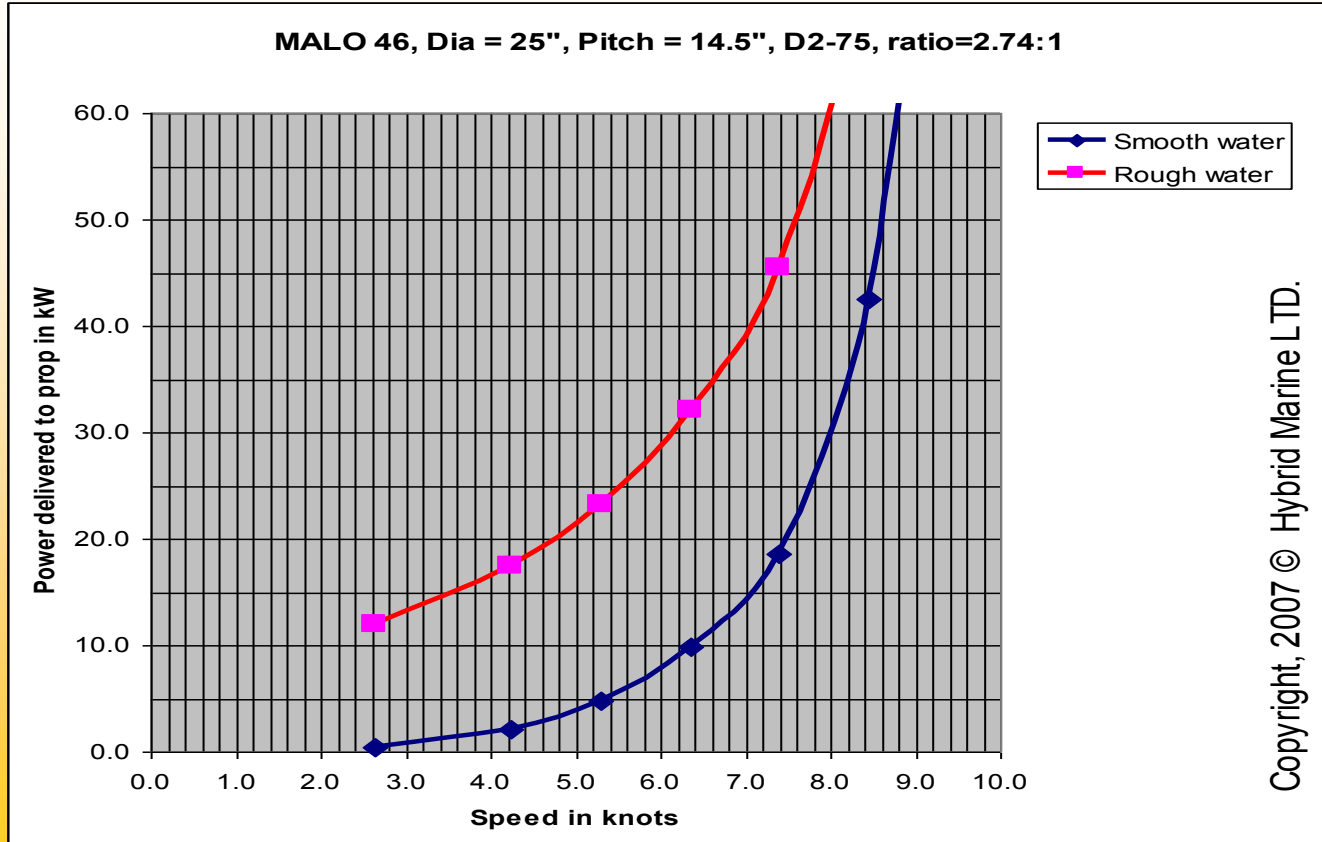


Optimum Pitch and Diameter V Speed

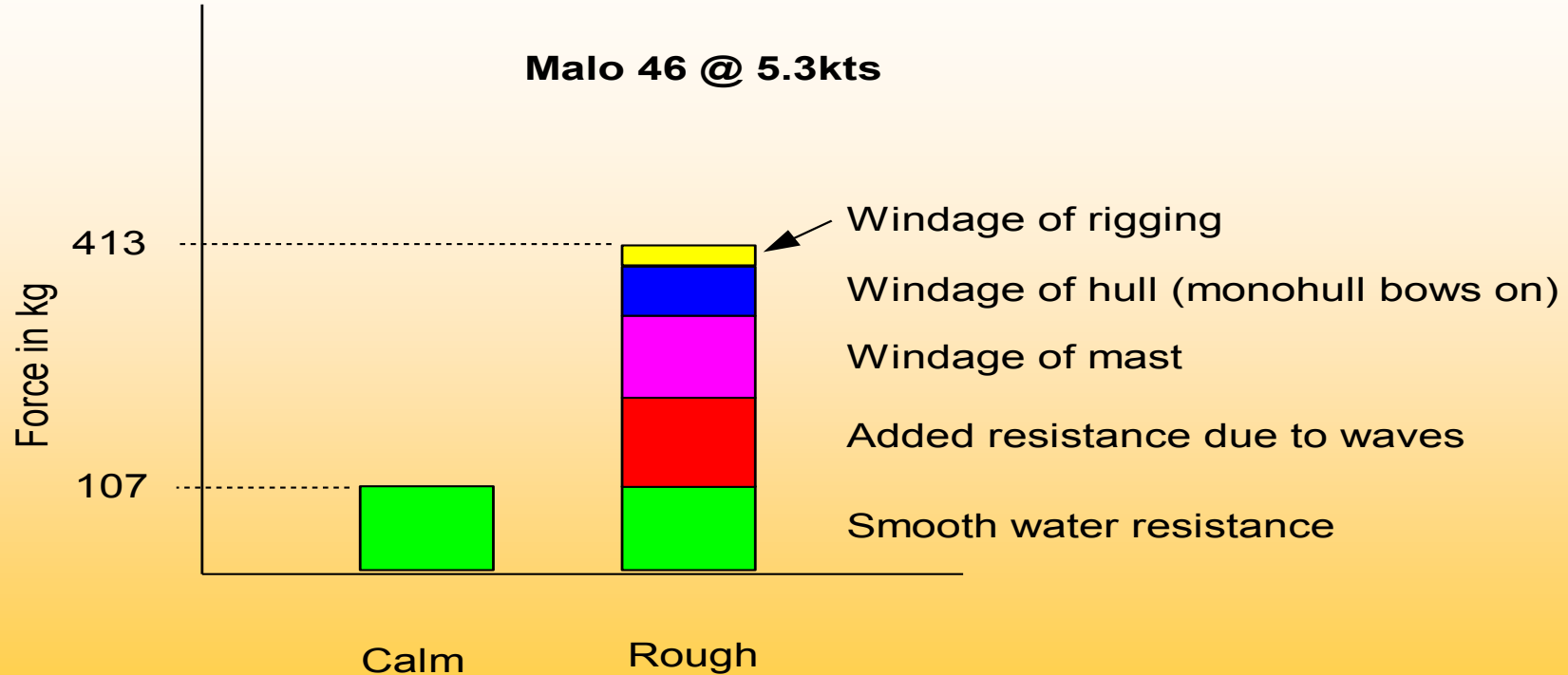


Expertise in marine propulsion

How much power do I need ?

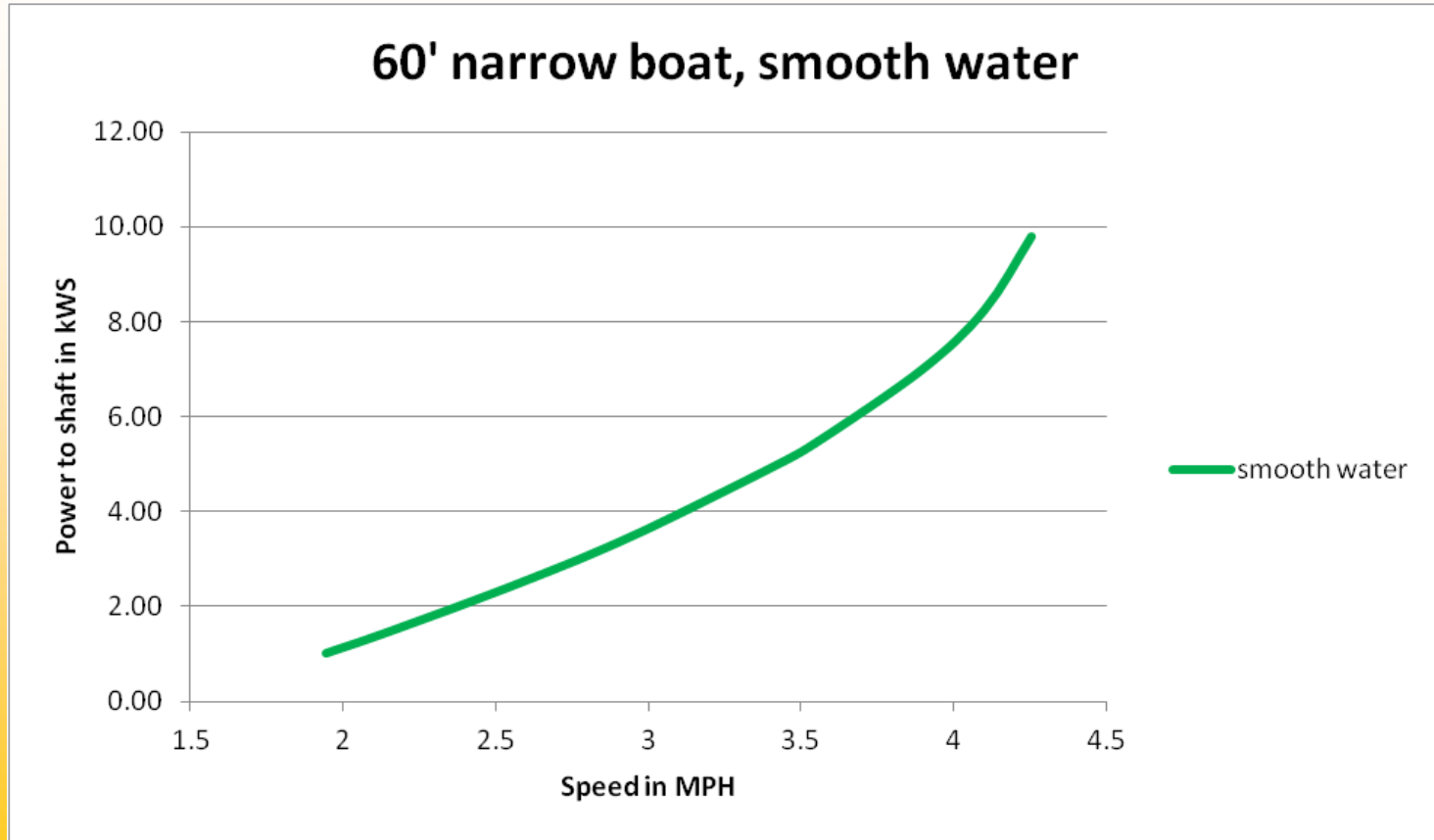


How much power do I need ?



Rough = Gerritsma Model --> North sea, Force 7, 45 degrees to wind/waves

How much power do I need ?



Can you eliminate the engine ?

Specific energy of diesel = 10kWh/kg

8 kg of diesel fuel provides 27kWh of propulsion energy

1,000kg of lead acid batteries provides 27kWh of propulsion energy

250 kg of Lithium batteries provide 24kWh of propulsion

We have along way to go before the diesel engine is replaced in offshore craft

Applications



Sail



Water taxi



Inland

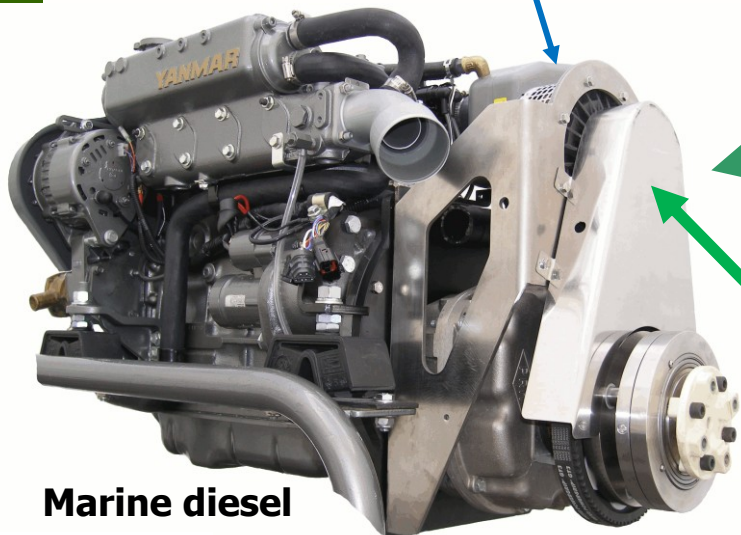


Commercial



Special projects

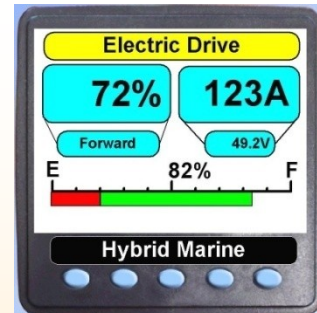
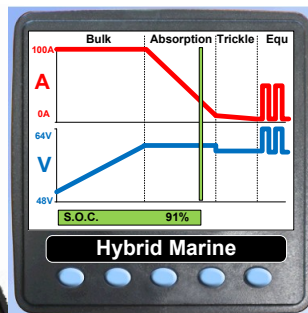
Hybrid motor/generator



Marine diesel



Control box



Display and battery monitor



Battery bank



Solar

Wind

230VAC

Shore Power



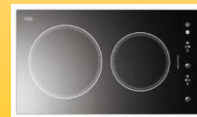
Charger/Inverter



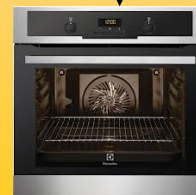
Inverter welder



Diving compressor



Induction hob



Fan oven



DC-DC

High end Catamarans

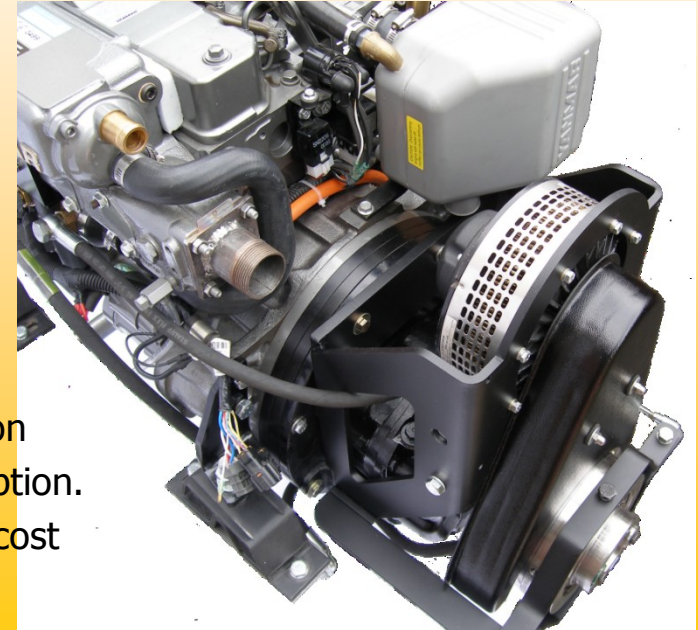


Craft profile

- 45' , 50' and 55' options
- High spec luxury craft
- Offshore use
- Weight saving is important
- High house loads, aircon, electric cooking etc
- Typically would have a generator onboard

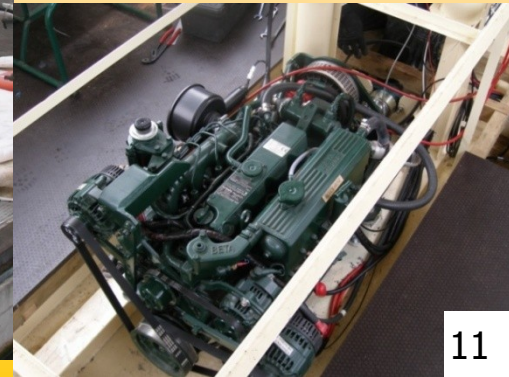
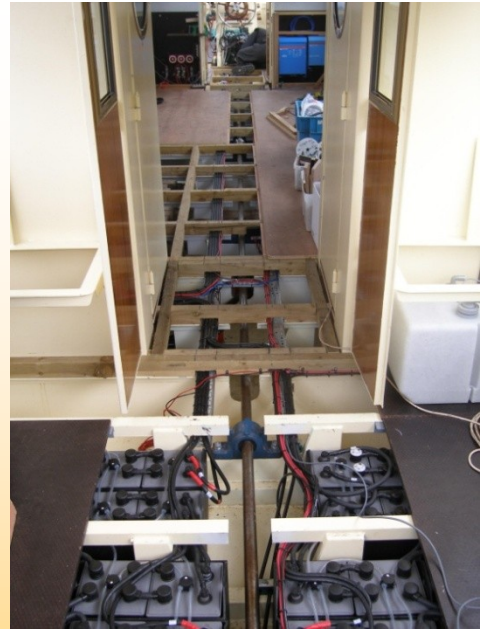
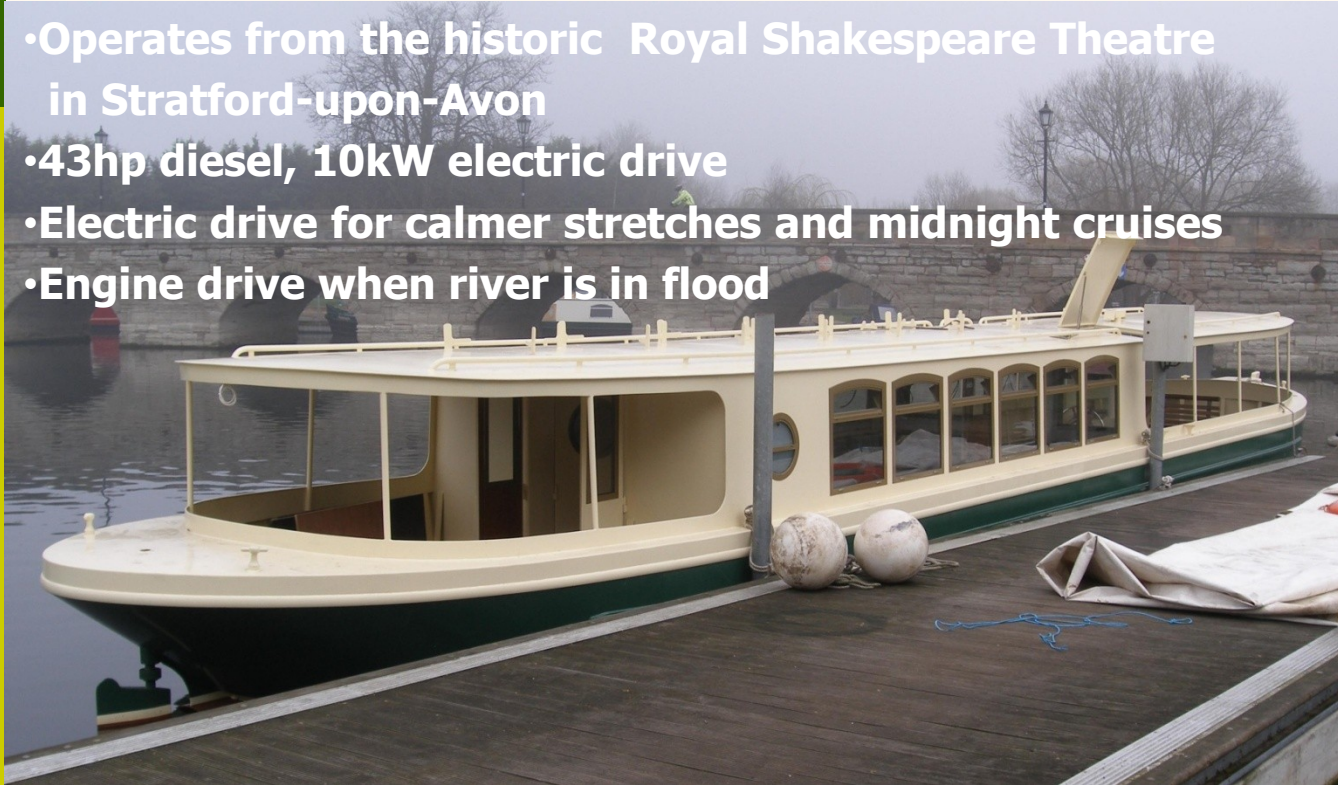
Solution

- 55hp Yanmar based Hybrid in each hull
- 10kW electric drive per hull
- 10kW generation capability per hull
- 12kWh of AGM batteries
- re-generation on passage (1kW at 8kts)
- 2* 10kW generation
- Silent overnight aircon
- Hybrid is standard option.
- Adds < 5% to build cost



40 seat passenger launch

- Operates from the historic Royal Shakespeare Theatre in Stratford-upon-Avon
- 43hp diesel, 10kW electric drive
- Electric drive for calmer stretches and midnight cruises
- Engine drive when river is in flood



Floating cinema



Thursday 17 October 6.30-9pm
at The Palm Tree Pub

Inspection launch, Amsterdam

Ook hybride was de inspectieboot van het Amsterdamse Waternet. De boot met de door Henk-Jan Kok uit Vinkeveen ingebouwde Hybrid Marine aandrijving was net de dinsdag voor dit evenement opgeleverd.



Met in het vooronder weggelgd een achttal Northstar 170 Ah 12 V NSB FT AGM batterijen, bij elkaar dus 16,3 kWh. Op vol vermogen (zie motor-display) is de belasting dus nagenoeg een 0,5C en vaart dit scheepje 9,9 km/u.



Dit is de eerste implementatie van een installatie waarvoor ASA Boot elektro het importeurschap voert. Uitermate keurig ingebouwd, al zou er wat ons betreft best ook wel een beschermkapje over de hoofdekering mogen zitten.



Strikt genomen vragen we ons wel een beetje af waarom dit schip, dat toch door professionals wordt gevaren niet werd uitgerust met een prijstechnisch veel gunstiger en qua belastbaarheid robuuster, professioneel voltractie batterijpakket?

Natalia



Freycinet gauge craft (Péniche , Spits)

Natalia



Freycinet gauge craft (Péniche , Spits)

Operating parameters

- Craft must be compliant to IWW directive 82/714/EEC.
- Freycinet gauge (< 35.5M by 5.05M).
- 60 passengers, high level of comfort , close to nature.
- Day boat, 5 hours operation in restricted canal system (5 to 6km/h).
- 10kW air conditioning.
- Silent / emission free operation.
- 15k km/h under engines and 9km/h under electric drive
- Recharge overnight where charging points are available.
- Ability to Self charge while infrastructure develops (3 phase)
- Cost effective.
- Fleet of 21 barges planed for operation throughout Europe.



British Guild of
TRAVEL WRITERS

Independence • Insight • Expertise

Features include

Best European Tourism Project Electric Hybrid Cruise Boat,

- Outside viewing deck with sun awning
- Spacious 19-metre air-conditioned lounge which can comfortably seat 60
- A galley serving drinks, including mineral water, tea and coffee available all the time
- Wine served with a light lunch, usually supplied by a local boulangerie
- A range of prestigious local wines - including Chablis, Sancerre and Crémant de Bourgogne – which can be purchased by the bottle to enjoy during your cruise
- Bikes available to hire at no charge if you're feeling particularly energetic and wish to cycle the towpath!
- Two WCs on board, including one suitable for wheelchair users
- Up to two wheelchairs users can be accommodated on board



13
backwaters

DISCOVER - EXPLORE - RELAX

Beta 105 Engine, 20kW electric drive, 13kW Generation

Beta 105 Engine, 20kW electric drive, 13kW Generation

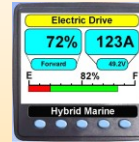


HybridMarine

©copyright Hybrid Marine LTD

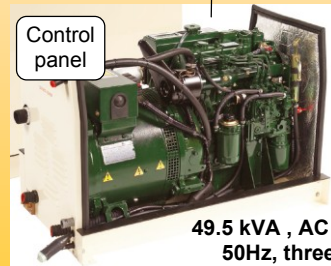
Solar Array
Twenty * 300W panels, 1M by 2M
Total area = 40²M
Maximum output power = 6kW

MPPT Controller
250V/100A



48V DC

Remote panel



Control panel

Contactor
AC control

49.5 kVA , AC generator
50Hz, three phase

Quatro
15kVA

Quatro
15kVA

Battery bank
1,920Ah

Battery bank
1,920Ah

Battery bank
1,920Ah

Battery bank
1,920Ah



Remote monitoring

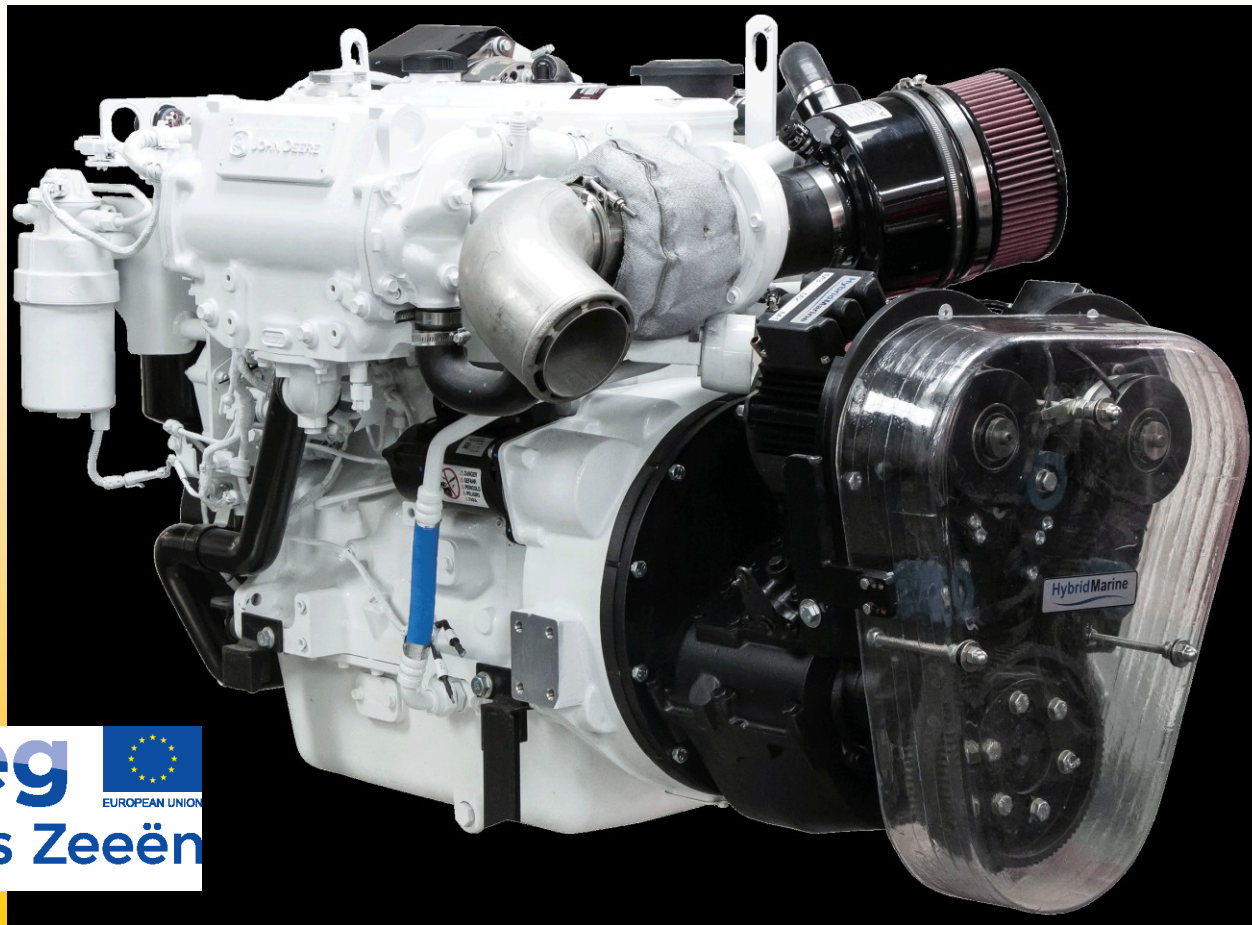
Mains in 32kW Shore power, three phase

Mains in 16A/32A Shore power, single phase

3 Phase circuits

Single phase circuits

John Deere, Powertech, 100hp to 315hp



7,680 Ah @ 48V = 368kWh = 10 Tonne



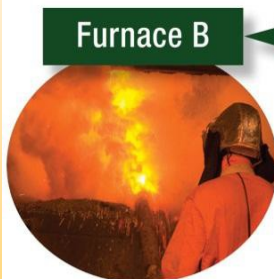
"An engineer is someone who can do for ten shillings
what any fool can do for a pound"
Nevil Shute 1899-1960



INPUT - SPENT LEAD-ACID BATTERIES

ECOBAT
BATTERY TECHNOLOGIES


99.97% Pb recycling



Ca / Fe / Si - Slag

Process

Bullion

Battery Breaking

Lead Residues

Furnace A

Lead Refining



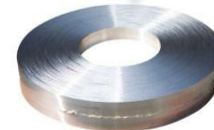
Ingot



Wire



Shot



Strip

Sulphuric Acid Treatment



Polypropylene Plant



Lithium development, system approach



$\text{LiFePo}_4(\text{LEP})$



$\text{LiFeYPo}_4(\text{LYP})$



soomme



HybridMarine



Interreg 
2 Seas Mers Zeeën
European Regional Development Fund

graeme@hybridmarine.co.uk