SISHIP ECO PROP

The ECO-friendly PROPulsion for compact ships
Electric Propulsion … not new

electric propulsion system anno 1886
What is Diesel-Electric Propulsion?

With diesel-electric, a prime mover drives a generator which feeds a propulsion motor through a switchboard and converters.
Facts
Diesel-Electric Propulsion

- Diesel-electric propulsion systems require 8-10% more primary power than diesel-mechanical systems
  → Losses in additional system components, i.e. generators, cables, converters, motors

- Diesel-electric propulsion systems have higher weight compared to diesel-mechanical systems

- Diesel-electric propulsion systems have higher investment cost compared to diesel-mechanical systems

→ Diesel-electric propulsion systems will only be used, if the a.m. facts will be compensated through other advantages
How can Diesel-Electric Propulsion be more efficient?

- Optimized overall efficiency by
  - Using Diesel Engines in the most effective operating point
  - Less total installed power
  - Combination with alternative energy sources
  - Integration of Auxilliary Systems (Ship consumers)

![Diagram of Conventional System and Advanced Diesel Electric System]
Optimization of Diesel Performance

Most flexible Optimization on
- Specific Fuel Consumption
- Emissions
Two Systems for Diesel Electric & Hybrid - Propulsion

**Industry Basis**

*SISHIP Drive LV*

- Reduction of weight
- Reduction of size
- Reduction of engineering cost

**Automobile Basis**

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**Electrical Propulsion Power**

- above 800 kW
- up to 800 kW
SISHIP ECO PROP Concept
Two configurations for Advanced Diesel Electric Systems

**Advanced Diesel Electric Configuration**
- + optimized efficiency throughout wide range of operating profile
- + high redundancy / flexible arrangement of equipment
- - higher invest
- - more losses at high power output compared to conventional propulsion

**Hybrid Configuration**
- + basically same advantages as standard diesel electric configuration
- + best overall efficiency by using Diesel- direct and Diesel-electric modes
- + optimized utilization of Diesel engines in low load condition
- + easy Integration in existing Diesel- mechanical propulsion (Refit!)

"Hybrid propulsion is the technical term for propulsion systems which are the combination of a mechanical, an electric propulsion and the service system - however holistically integrated"
Some key indicators for potential hybrid propulsion candidates

- The propulsion power is to satisfy very different operating conditions (e.g. down hill / up hill)
- Big variations in propulsion- and service power demand
- Max. power demands for prop. and service systems are not simultaneous (e.g. loading pumps)
- The max. service power demand does not justify an all electric concept

Applies all to Inland Navigation
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Advanced Hybrid configuration

- „loitering“ mode
- shaft generator mode
- „zero emission“ mode
- hybrid mode
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Components

Dimensions: 495 x 415 x 180mm

Weight: 30 kg

Output power: max. 250 kVA
Components
Permanent Magnet Motor / Generator

**TYPE A**
Motor / Generator  140 kW / 3800 rpm (cont.)
Dimensions(LxWxH): 560 x 245 x 245mm
Weight: 120 kg

**TYPE B**
Motor / Generator  180 kW / 3200 rpm (cont.)
Dimensions: 560 x 310 x 310mm
Weight: 180 kg

**TYPE C**
Motor / Generator  260 kW / 1500 rpm (cont.)
Dimensions: 660 x 510 x 500 mm
Weight: 500 kg
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Hybrid Configuration Example

140 kW E-power combined with ZF 4650
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Diesel Electric configuration

Eco Prop propulsion unit
250 kW
References

Passenger Vessel
2 x 200 kW DE Propulsion
Delivery 2008
References

40m Car Ferry
4 x 120 kW DE Propulsion
Delivery 2009
References

50m Inland Passenger Ship
2 x 180 kW DE Propulsion
3 x SISU 66 CTIM 4-V
Delivery 2012
References

50m Sailing Yacht
2 x 250 kW DE Propulsion
Delivery 2011
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Experience with technology

MAN Fuel Cell Bus II, 12/01
SBETI, 30ft Battery Bus, 06/02
FEYS, Diesel/electric Yachts

Battery Bus with Inductive Charging, 09/02
BMB 10m Hybrid Bus Aosta (ITL)
ISE, 40ft Hybrid Bus for New Jersey
ISE, 40ft Gasoline Hybrid Bus

Van Carrier
MAN, Fuel Cell Hybridbus
Purolator, Hybrid Delivery Truck
ISE, 40ft HICE Hybrid Bus
Thank you very much for your attention.