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## An Urban Fleet Turns Green

# Flotte Hamburg



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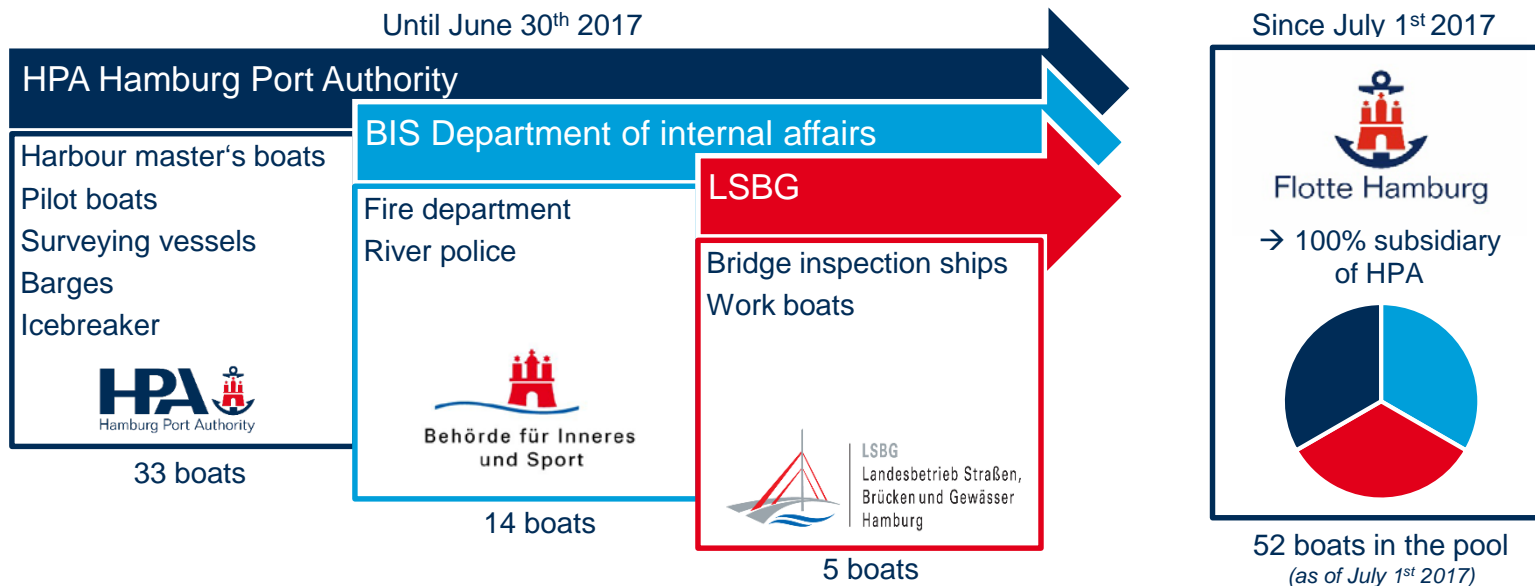


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Flotte Hamburg GmbH & Co. KG – 1<sup>st</sup> Sustainable Shipping Technologies Forum  
Graz, Austria – September 2019

# Flotte Hamburg - Civic fleet management of the city of Hamburg



- Transfer of ownership of ships from authorities and municipal companies to the Hamburg Fleet
- Everyone is focused on what he does best
- One multifunctional ship pool for all customers
- Financing on the private capital market



# Flotte Hamburg – Ship types



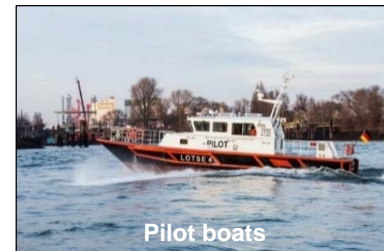
Police boats



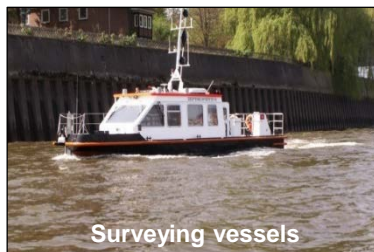
Fire-fighting vessels



Harbour Master boats



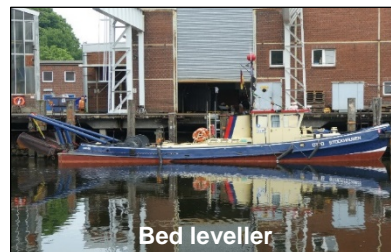
Pilot boats



Surveying vessels



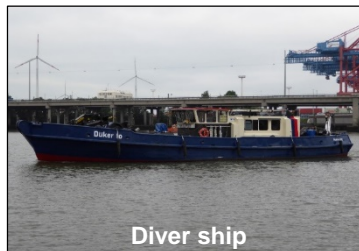
Dredger



Bed leveller



Tug boats / Icebreaker



Diver ship



Bridge inspection ships



Work boats



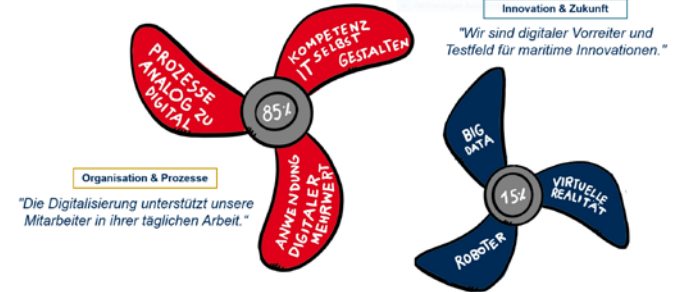
Multifunctional ships

# Flotte Hamburg – Under one flag



**Public fleet management -  
An unique concept**

**Renewal of the fireboat fleet**

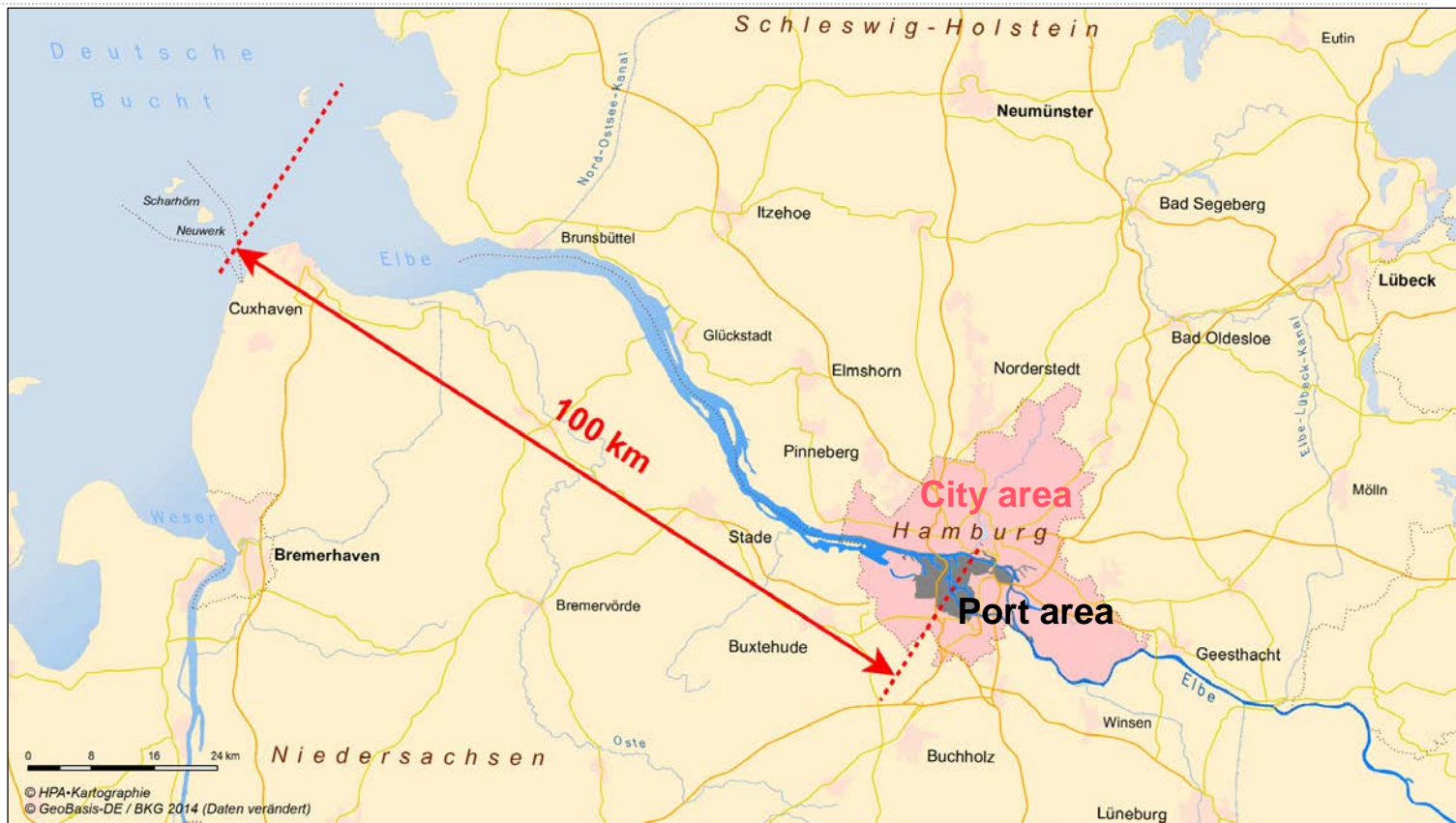


**Implementation of the  
digitization strategy**

**Setting a good example –  
The fleet is turning green**



## Port located in the city centre



The 5 pillars of the environmentally friendly urban fleet:



**Pillar 1 - Low emission fuels**

**Pillar 2 - Exhaust gas treatment for new ships**

**Pillar 3 - Retrofit solutions**

**Pillar 4 - Innovative propulsion technologies**

**Pillar 5 - Energy efficient ship operation**



## Pillar 1 - Low emission fuels

- 2009 migration of the HPA fleet of MGO (Marine Gas Oil) to low-sulfur "truck Diesel" (DIN EN 590)
- Mid 2016 trial runs with GTL (Gas to liquid)
- GTL is a synthetic fuel made from natural gas
- Alternative to diesel according to EN 590
- Unlike LNG or CNG at normal temperature and pressure liquid
- Fischer Tropsch synthesis (few refineries worldwide)
- Currently 2 providers in Germany
- Slightly higher price than diesel



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# Pillar 1 - Low emission fuels

- Paraffinic fuel (specification according to EN 15940)
- Can be used in all diesel engines (pure or as a mixture)
- „Drop-in fuel“
- Colourless and odorless
- Non-toxic, sulphur-free, aromatic-free
- Better ignition than diesel (cold start)
- Slightly lower energy density (per volume) than diesel
- Burns cleaner (flame)
- **Low emission!**

## GAS-TO-LIQUID FUELS: BENEFITS



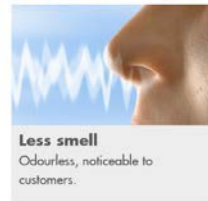
**Lower local emissions**  
(PM, NOx, CO, & HC).



**Can reduce noise**  
Engine noise reduction of 1-4 dB(A).



**Non-toxic & readily biodegradable**  
Likely to be more biodegradable.



**Less smell**  
Odourless, noticeable to customers.



**Storage stability**  
Good oxidation stability.



**Cold start**  
Excellent low temperature performance, low cloud point.



**Drop-in fuel**  
Easy to integrate with new and older diesel engines. No infrastructure investment required.

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## Pillar 1 - Low emission fuels

- The barge "Carl Feddersen" was operated in the middle of 2016 comparatively with GTL and diesel (common practice test HPA and SHELL)
- **Reduction of nitrogen oxide emissions (NOx) by 10.5%**
- **Reduction of particulate matter (PM) emissions by 52.7%**
- Increase in consumption by approx. 2%
- Problems with some engines
- Additional costs 10%
- Comparable carbon footprint (well to propeller)



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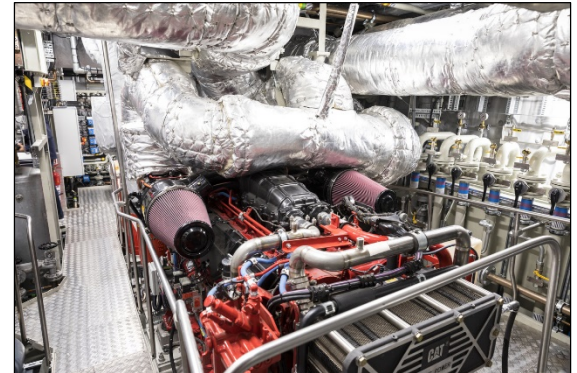
- Testing of Hydrotreated Vegetable Oil (HVO) as a GTL alternative with better carbon footprint
- Testing the use of HVO-GTL blends
- Partner of different projects with the aim of climate-neutral production of GTL (PTL Power to liquid)

## Pillar 2 - Exhaust gas treatment for new ships

- Principle: The Hamburg fleet equips all upcoming replacement purchases with exhaust gas treatment
- If technically and economically feasible, a combination of particle filters and nitrogen oxide catalysts is used
- The availability of systems for the required power range of around 500 kW has proven to be difficult
- The specific requirements of the HPA ships (vessel size, draft, deployment profiles) often limit the space available in the engine room
- The difficulties identified in the past in cooperation with the engine manufacturers are decreasing (concerns about exhaust back pressure, limited warranty, etc.)
- Lack of availability of production-ready systems drives up the costs



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## Pillar 3 - Retrofit solutions

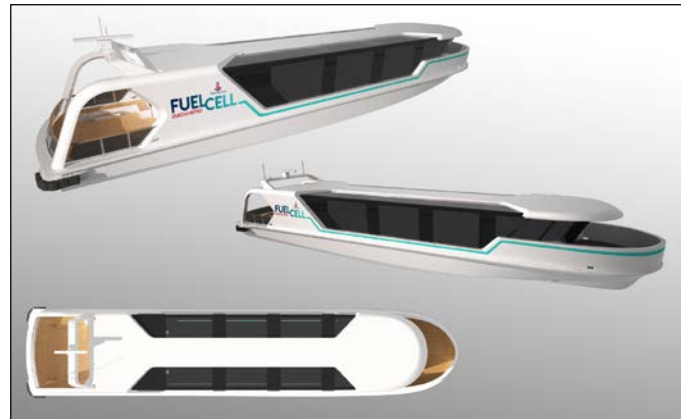
- If technically and economically sensible, the existing fleet should also be retrofitted with exhaust gas treatment
- Minimum requirement SCR + DPF (target: EU Stage V)
  - > otherwise waiving the investment and restriction to low-emission fuel GTL
- Compared to the new buildings, the restrictions / challenges are much more complex
- Estimated cost per ship in the six-digit range
- Better alternatives?
  - > Complete engine solution including exhaust gas treatment during engine replacement
  - > Subsequently hybridization



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## Pillar 4 - Innovative propulsion technologies

- The Hamburg Fleet is ready to use innovative propulsion technologies on new ships and considers itself as a promoter of these technologies
- There are discussions with different providers
- Participation in pilot projects has been initiated
- Concrete projects or favored project ideas:
  - Plug-in diesel hybrid drive (with SCR and DPF) for the fire boats of the 30 meter class (start of construction 2019)
  - Methanol fuel cell
- The feasibility of LNG propulsion was verified by a study for the construction of the island utility ship "Nige Wark". There is also a feasibility study for the propulsion of harbour ship with LNG.

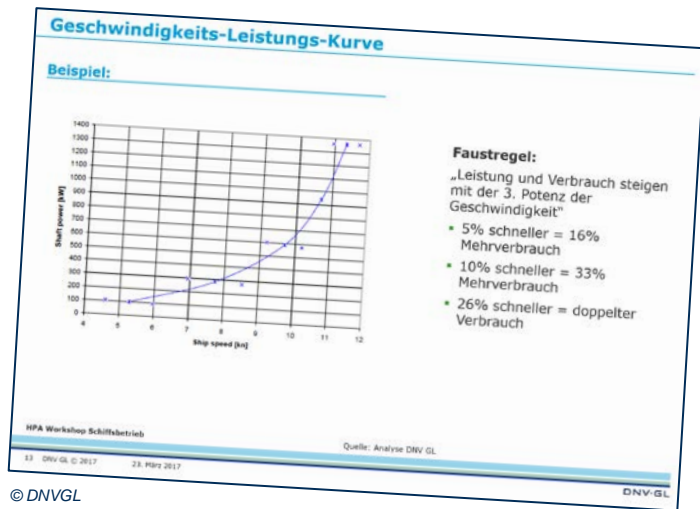


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## Pillar 5 - Energy efficient ship operation

- In the summer of 2017, selected crews from the areas of water depth maintenance and pilotage service were trained in energy-efficient ship operation at the DNVGL
- In 2018, the extension was applied to all skippers of the Hamburg fleet
- It is assumed that there are potential savings of 3 to 7% fuel consumption (according to DNVGL)





Flotte Hamburg

# Under one flag!



## Flotte Hamburg

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