Aalto University
School of Engineering

Principles of Naval Architecture

Some Project Ideas

September 2021

Assignments

- The assignments are carried out in groups of 3 - 5 students
  - *Share the work load between your group members*
  - *Analyze and discuss your work together → Learn from each other*

- You are responsible to take initiative to meet and work together to get the job done

- Schedule your work, distribute and rotate tasks within your group
  - *Leader & coordinator: coordination, work scheduling, on-time delivery*
  - *Developer: responsible for the development and checking of spread sheets and algorithms*
  - *Data collector: responsible of the required data to do the job*
  - *Reporter: responsible for reporting the work in clear and efficient way*

- Report who did what

Assignments (cont.)

- Assessment
  - *Overall assessment (0-5) based on the contents and the quality of your report*

- Importance of good reporting
  - *Your assignments are assessed solely based on your written reports → the presentation of your work is highly important*

  - *Recommended course*
    - LC-1310 Academic Communication for MSc Students
      - Learning outcomes: strategies and elements for clarity and audience-friendliness in both oral and written academic communication, formal vs. informal styles of communication, systematic development of oral and written work, proper use of sources,...

Two international competitions

https://www.ferrysafety.org/

https://www.njordchallenge.com/

Healthy & eco-friendly cruiser

Design of a zero emmisions cruiser with top quality clean and healthy solutions against the pandemic

https://eu.usatoday.com/story/travel/cruises/2020/05/19/coronavirus-how-cruise-ship-design-may-change-prevent-outbreaks/3065160001/

Zero emission Baltic icebreaker

- **Driver** : Finland and Sweden has started a design exercise aiming for the next generation Baltic icebreaker to replace the current Urho class vessels and the new sustainability requirements require innovative propulsion solutions
- **Aim** :
  - ✓ To design a next generation Baltic icebreaker, capable of operating year around on the northern Baltic Sea
  - ✓ To explore the possibilities for the future propulsion systems ie. Possible new emission free fuels and other possible solutions for zero emissions

Ammonium or Hydrogen tanker

•**Driver:** Hydrogen produced by renewable energy is most probably one of the big energy carriers in the next decades. However, transportation of large quantities of hydrogen is still undeveloped.

- •Prototype ship for transporting liquid hydrogen is in operation between Australia and Japan.
- •Combining hydrogen with nitrogen to generate ammonium for easier transportation is considered the enabler for transporting large quantities of hydrogen. Ammonium transport is established trade.
- •Huge project for clean hydrogen production (and transportation) has been agreed between Canada and Germany => attractive business case.
- •Promising developments for hydrogen production in e.g. North Sea region.

•**Aim:**

- ➢ To design a tanker to transport either hydrogen (local markets) or ammonium (global markets).
  - ➢ Hydrogen transport in liquid or gaseous form?
- ➢ To evaluate power production options for the vessel (cargo as fuel?).

Germany Taps 'Boundless' Fuel Potential in Canada Hydrogen Deal

- Scholz and Trudeau ink agreement in wind-rich coastal province
- First shipments could reach Europe's biggest economy by 2025

Germany's Uniper, E.ON to import green ammonia from Canada

Reuters

Raahe Prepares to Join the Baltic Sea Hydrogen Pipeline as a Hydrogen Producer – Hydrogen Also Planned for Export to Europe

Baltic Sea Research Vessel

•**Driver:** Research and monitoring of the Baltic Sea to promote the protection and sustainable use of the Baltic Sea is considered of high importance by the general public, as well as a legal obligation of the Baltic Sea states towards EU. However, many of the research vessels owned by the Baltic States are getting old (with a few exceptions) and will need to be replaced towards end of 2020's / beginning of 2030's.

•**Aim:**

- To design a next generation Baltic Sea research vessel which is capable operating year-round in the area, as well as conducting research missions in the North Sea area (offshore wind farm development).
  - Sufficient support facilities for underwater and aerial research, both semi- and totally autonomous.
  - Oil and chemical spill response capabilities
- To evaluate power production / fuel options for the vessel taking into consideration the relatively limited operating area and renewable energy infrastructure currently being developed.

Forestry product carrier (Roro/Storo)

•**Driver:** Baltic sea region has significant forestry/biofore company cluster and especially Bay of Bothnia area has on both sides number of pulp and packaging solutions industry

•**Aim:**

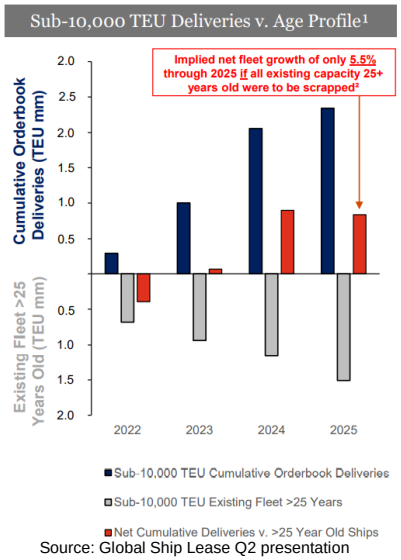
- To design a next generation sustainable Baltic Sea forestry products carrier that is capable operating year-round in the area and can deliver to destination markets via central Europe or directly.
  - Need to figure out best sustainable fuel alternative
  - How to improve transportation efficiency?
  - What is most efficient and weather protected loading method?
- To evaluate power production / fuel options for the vessel taking and design system that enables cost efficient transportation of products to markets.

Container feeder

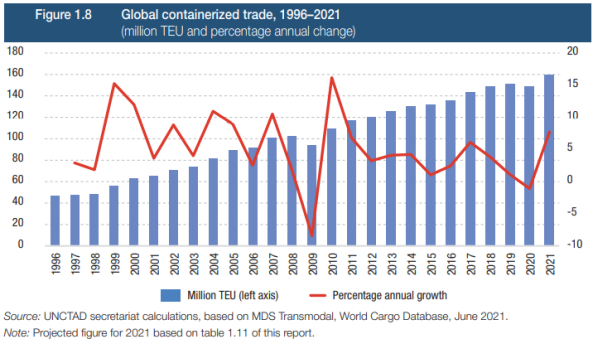
•**Driver:** Small container vessels (<10000TEU) are mostly operating as feeder vessels that distribute from local hubs to smaller ports. This size range has currently shortage of tonnage and orderbook also implies limited growth and thus low supply of tonnage in future.

•**Aim:**

- To design a either 2000TEU or 4000TEU container vessel
  - 2000TEU vessel could be intended for Baltic sea operation (ice class)
  - 4000TEU vessel could be intended for regional trade (Asia, Europe or Americas)
  - Minimized energy consumption (Flexibility for different speeds)
  - Reefer capacity as of typical to size (10%)
- To evaluate power production / fuel options for the vessel taking into consideration the relatively limited operating area and renewable energy infrastructure currently being developed. What fuels big liner operators (MSC, Maersk, CMA CGM, COSCO) are considering?



Source: Global Ship Lease Q2 presentation



Source: UNCTAD secretariat calculations, based on MDS Transmodal, World Cargo Database, June 2021.
Note: Projected figure for 2021 based on table 1.11 of this report.

Thank you