



Any questions please email [abacklund@herbert.com](mailto:abacklund@herbert.com)

# Introduction to HEC

- Ship design and consulting since 1963
- Founded in San Francisco, offices in Annapolis, Houston, Glasgow & Shanghai
- Personnel in London & Singapore
- Long term involvement at IMO supporting USCG, INTERTANKO, BIMCO & INTERFERRY



# Introduction to HEC

- Services to ship owners and operators
- Design
  - Tankers
  - Container vessels
  - Bulkers
  - LNG Carriers
  - RORO's
  - FPSO's
- Engineering consulting
  - Scrubbers
  - BWTS
  - Cargo Enhancement Modifications
  - Structural Modifications
  - Stability Analysis



# SOx Restrictions from 1/1/2020

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- ❖ Global maximum sulphur content in fuel 0.5%
- ❖ North American and North Sea & Baltic ECA: Maximum sulphur content 0.1%
- ❖ In North American ECA, also NOX limitations apply
- ❖ Also other limited ECA's in different parts of the world
- ❖ Carriage of fuel with sulphur above 0.5% will be banned for all vessels that do not have a scrubber installed
- ❖ Compliant fuel or abatement technologies only options

**Main focus in this presentation will be on successful completion of scrubber installation on existing vessels. Less on comparison between different alternatives.**

# Important questions when deciding on scrubbers vs. compliant fuel

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- ❖ Fuel price and availability in trading area (global or restricted local)
- ❖ Scrubber installation cost and operating cost
- ❖ Schedule
  - ❖ Scrubber lead time
  - ❖ Availability of drydock at trading area (BWTS will also increase drydocking need)
  - ❖ 3D scans?
- ❖ Ship characteristics
  - ❖ Age
  - ❖ Availability of electrical power (remember BWTS / UV)
  - ❖ Space
  - ❖ Engine configuration

# Main Project Steps

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- ❖ Decide on installation of scrubber as means of meeting IMO Sulphur Cap
- ❖ Trading area for vessel. ECA regulations or not? Which ECA? Resale value
- ❖ Decide on Schedule
- ❖ Feasibility study comparing different suppliers and technical solutions.
  - ❖ Space
  - ❖ Installation friendliness
  - ❖ Operating cost
  - ❖ Reliability
  - ❖ Decide on units to be connected to scrubber (ME, AE, Boiler)

# Main Project Steps

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- ❖ Decide on two solutions / makers for detailed study. Compare Total Ownership cost
- ❖ 3D scan of relevant areas on vessel
- ❖ Detailed engineering of two competing solutions to set basis for final selection of supplier and installation shipyard
- ❖ Decide on scrubber suppliers
- ❖ Decide on shipyard
- ❖ Final detailed engineering to optimise installation efficiency, possible prefabricated units, etc.
- ❖ Complete installation and start-up



# ECA Specific Issues

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- ❖ NOX requirements in North American ECA will lead to a need for SCR or EGR (for vessels built after 1.12016). SCR cannot be combined with scrubber
- ❖ The State of California does not allow the use of scrubbers without special permit (which may not be granted)
- ❖ Scrubber cleaning capacity to meet ECA requirements. Alternatively use compliant fuel
- ❖ Higher cleaning capacity will increase pumping volume and pump size (and price)
- ❖ The use of Hybrid systems is limited by tank capacity and system cost

# Scrubber Selection Factors

# Scrubber Selection Factors

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- ❖ Performance differences between scrubbers
  - ❖ Clearing capacity normally from 3.5 % to 0.5 %. If you need ECA capability, make sure scrubber cleans down to 0.1%
  - ❖ Operation at feed water failure. Running dry or bypass?
  - ❖ Alkalinity of discharge water, special requirements in US waters. Dilution or use of caustic soda
- ❖ Loop Selection – Open vs Closed Loop, or Hybrid (can operate open at sea and closed in port)?
- ❖ Number of units that can be connected to scrubber
  - ❖ Separate scrubbers for each engine or main engine only
  - ❖ Alternative is combined scrubber with separate entries for all units or a need for collection of pipes into one entry to scrubber
  - ❖ Handling of boiler backpressure

# Scrubber Selection Factors

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- ❖ Open loop scrubbers – Simpler installation, lower cost
  - ❖ Discharge all waste water to the sea with only minimal processing, best for open sea areas with salt water
  - ❖ May have issues in port areas if brackish water (will not scrub adequately), may cause oil sheen or low pH (US requires pH >6 at discharge outlet pipe)
  - ❖ Use of additional sea water dilution or caustic soda injection into the scrub wash water can allow use of open loop scrubbers in port areas.

# Scrubber Selection Factors

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- ❖ Closed loop scrubbers – Higher cost, but minimal water discharge
  - ❖ Use caustic soda to create alkaline scrub water and operate in recirculating, closed loop by cleaning wash water and recharging with caustic
  - ❖ Can operate with minimal water discharge so good for ports with restrictions on discharge
  - ❖ Caustic can be costly and difficult to handle, creates sludge that needs to be disposed ashore
- ❖ Hybrid scrubber combines open and closed loop

# 3D scan issues

# 3D Scan Issues

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- ❖ Timing of 3D scan. Do first a feasibility study based on drawings to select good candidates and lay out basic arrangement before scanning. Assure scan of all / right areas
- ❖ Not just scrubber area / stack. Also engine room / sea chest area and piping route
- ❖ Locations of new structures and casings, deck penetrations



# Other Considerations

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- ❖ Scrubber makers actively promote their product. Important to use external independent expertise with relevant experience to properly evaluate all options
- ❖ As there are several common challenges with BWTS, consider doing some work at the same time (3D scan, electric load analysis, general space considerations, etc.)
- ❖ Caustic Soda supply is not certain nor is it easy to bunker, so consider carefully capacity onboard to ensure can operate between available resupply ports without running out
- ❖ Scrubbers are complex systems so Crew training in scrubber operation after installation is critical

# Concluding Remarks

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- ❖ Scrubbers vary in performance, design, size, operation
- ❖ Time and money spent on preparations is easily gained at installation + commissioning and operation
- ❖ Scrubber installation is not just a technical issue, it is very much a business issue
- ❖ Several issues in common with Ballast Water Treatment, should be considered together

# Thank you



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