CSL's Contribution to the Development of a Successful Great Lakes Invasive Species Transfer Strategy:

Assessing Filtration to Mitigate the Risk of AIS Transfer Within the Great Lakes

Presentation to the Ballast Water Collaborative
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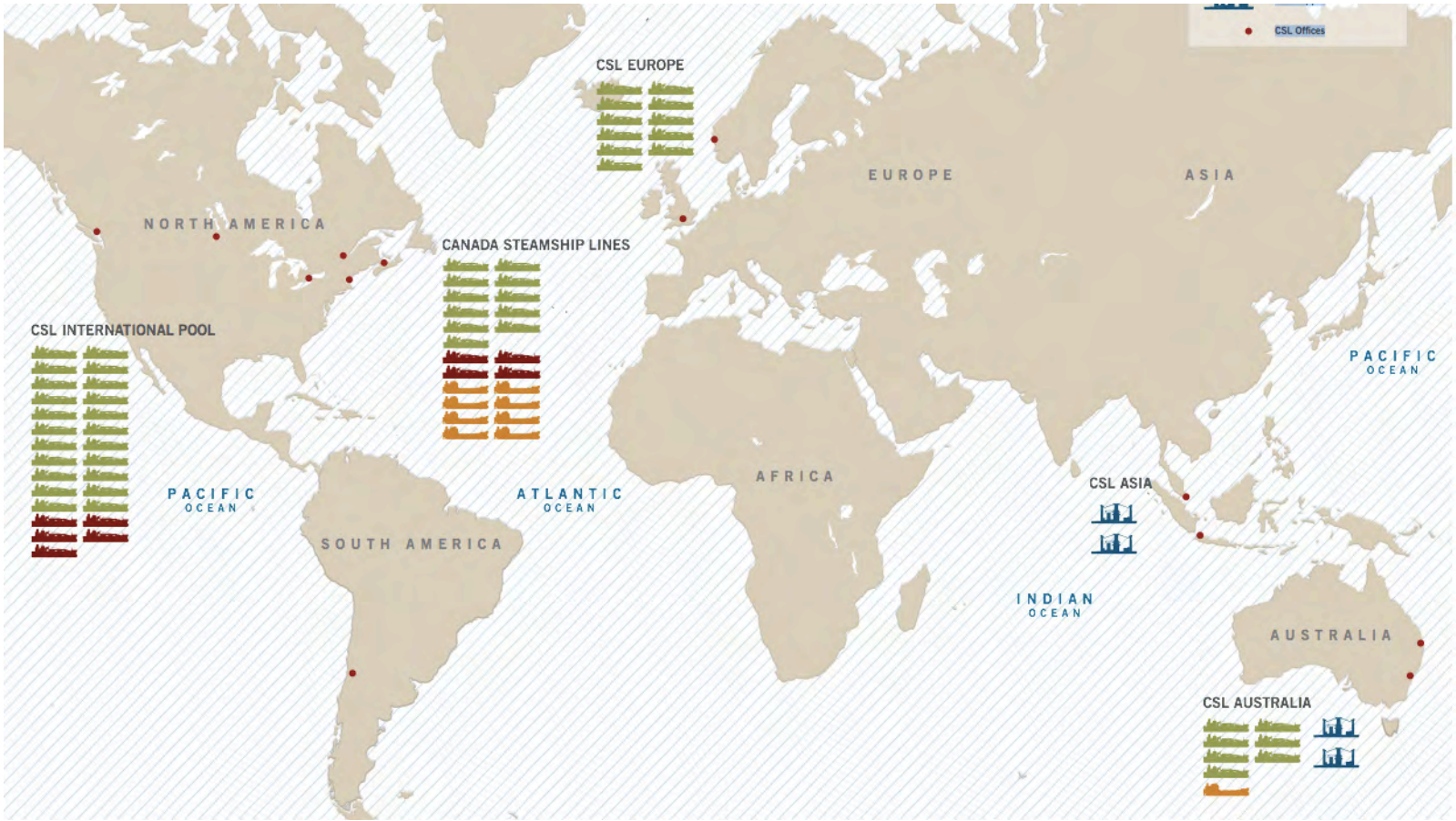
The CSL Group Offices



Two issues: Introduction and Transfer

- Introduction Issue (CSL Group Fleet operating internationally): we support a uniform IMO standard for BWT to address AIS introduction via ships' ballast water.

- Transfer Issue (CSL Group Canadian Fleet operating on the Great Lakes): we believe that advanced filtration is the solution to mitigate any risk of secondary transfer of AIS within the Great Lakes.

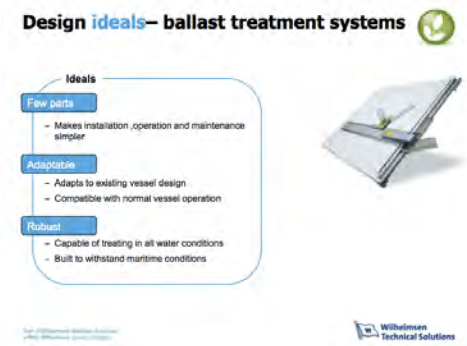
CSL Involvement

CANADA STEAMSHIP LINES

- ☑ Member of CSA Ballast Water Working Group.
- ☑ Industry observer at IMO.
- ☑ Participant in the Ballast Water Collaborative.
- ☑ Participated in the CSA's Secondary Spread Risk Mitigation Project.
- ☑ Hosted the testing of an advanced filtration system on a CSA vessel.

Seeking Solutions to Both Issues: the Unitor Experience

- After a deep assessment of best available BW technology to address AIS, CSL selected in 2011 an IMO type-approved system that claimed to work in salty /brackish/ fresh water – the UNITOR system - for installation on one of its ships: the M/V Richelieu.
- A preliminary application under the STEP programme was filled for the M/V Richelieu
- The cost range of each system unit was between 2 and 3 millions USD…



Lessons Learned

The UNITOR system provider unexpectedly decided to withdraw from the market. The primary reason given is that the system appeared to be not compliant.

"*The verification program showed that the system at this stage of development will not, in our opinion, provide our customers with an effective, fully compliant solution for the varied and dynamic water conditions encountered by a vessel engaged in global trade*".

- Lesson learned number 1: a type-approved system is not a guarantee for compliance.
- Lesson learned number 2: there are huge financial consequences associated with the installation of a BWT system that eventually is proven to be non-compliant.

Addressing the Great Lakes Fresh Water Challenge

- CSL BW technology review, which is kept updated, shows that there is currently no BW technology that is proven to perform efficiently in the Great Lakes fresh waters (+ is technically suitable for Lakers).

- This summer, CSL undertook to test the performance of the high filtration unit that was that was installed on the Richelieu as part of the Unitor system.

Why Filtration

1. Over 180 AIS are known and most of them are already common in the Great Lakes.

2. 36 AIS not common could potentially be transferred via CSL ships

1. We noted that the 3 AIS with higher potential of being transferred were of relatively large size and could be blocked through advanced filtration.

Species Name	Latin Name:	Size:	# combination of voyages for this species to move:
Fishhook Waterflea	Cercopagis pengoi	6-13 mm	35
Rudd	Scardinius erythrophthalmus	48 cm	33
Bloody Red Shrimp	Hemimysis anomala	6-13 mm	24

Investigating Filtration Performance

- Objectives of the project:

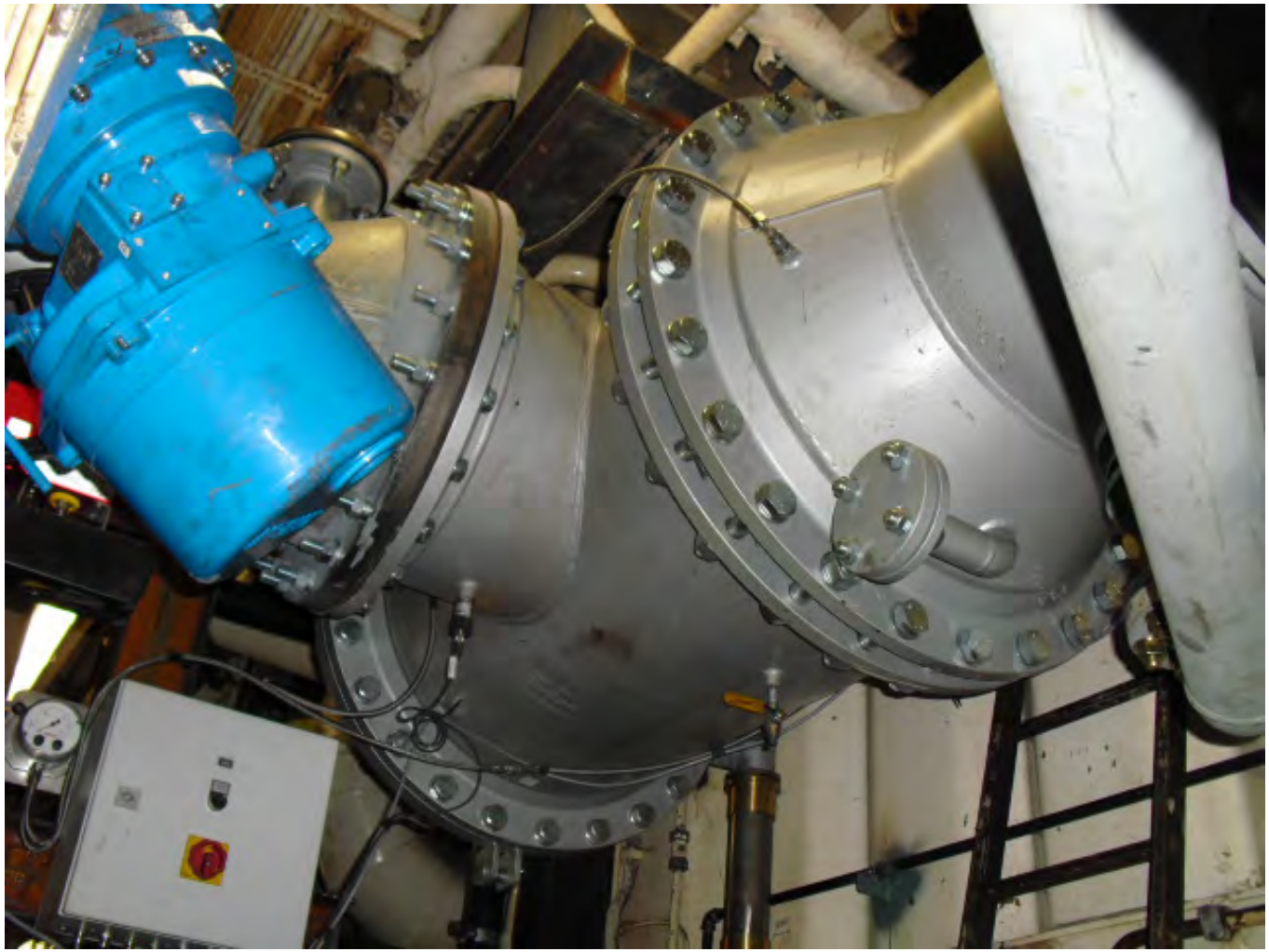
1. Assess the performance of the filter:
   - ✓ in Great Lakes real conditions (sea trial),
   - ✓ on a typical voyage,
   - ✓ during typical loading/unloading commercial operations.

2. Gain experience: installation, operation, and impacts on vessel operations with ballast treatment system.

M/V RICHELIEU

Installation Challenges

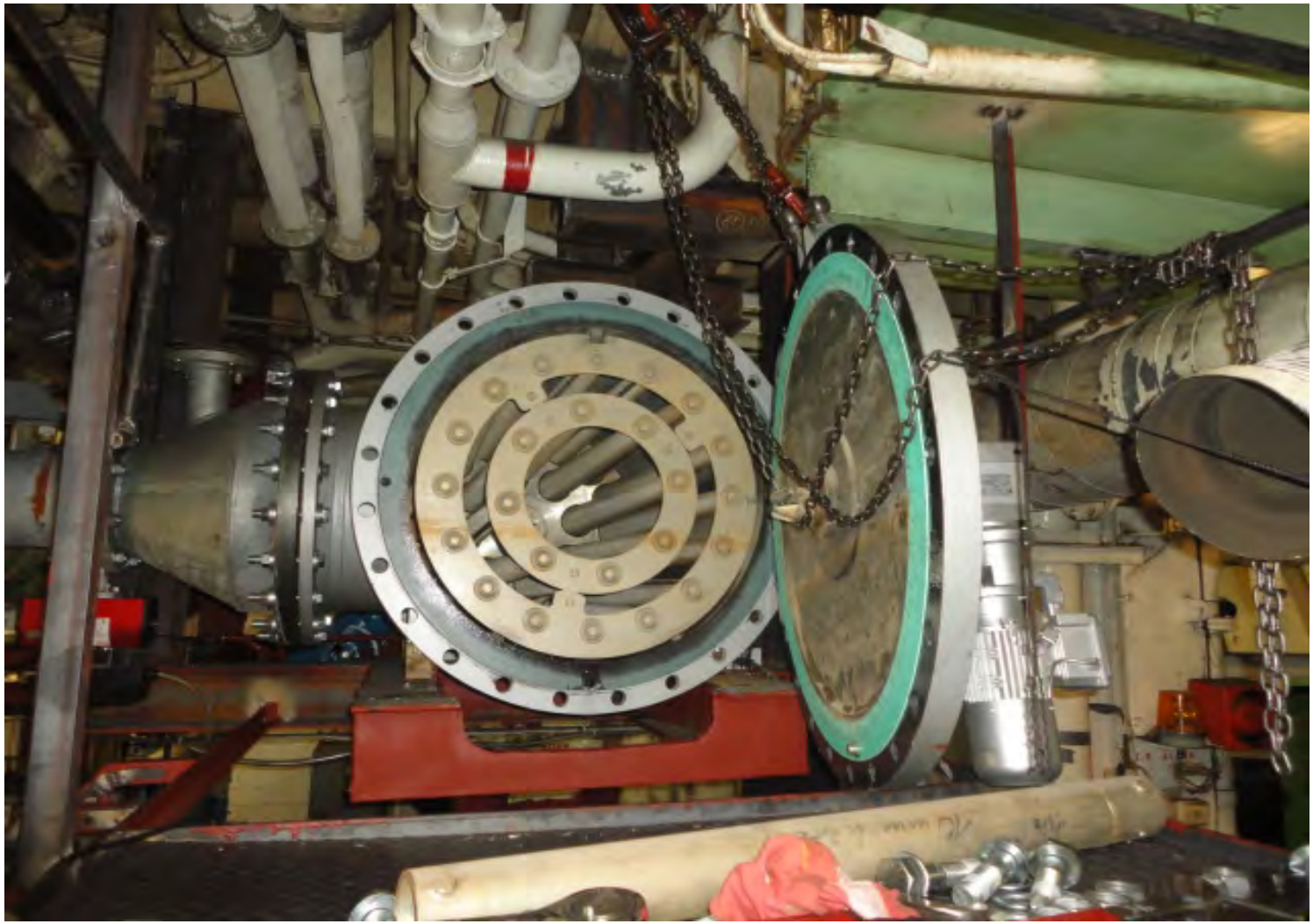
The HYDAC Filter



Every ship ballast system different

Backwash triggered by diff pressure and led overboard

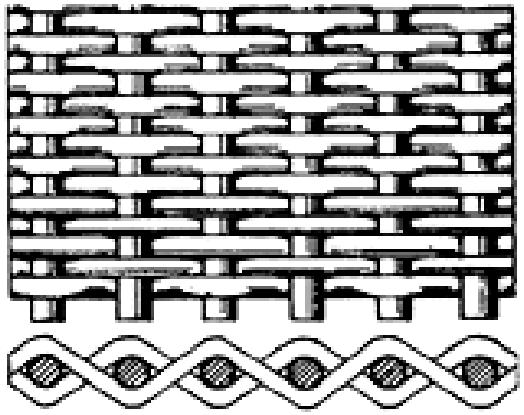
HYDAC – 24 ‘candle’ elements



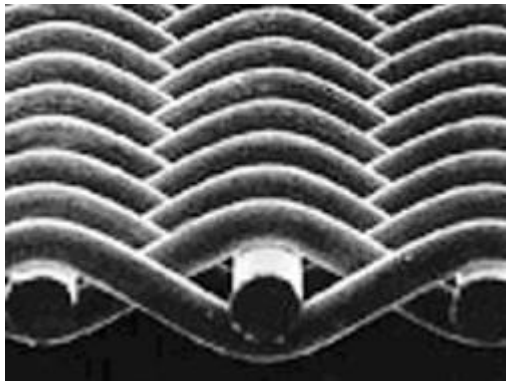
Flow from inside ‘candles’ to outside - this is the clean side

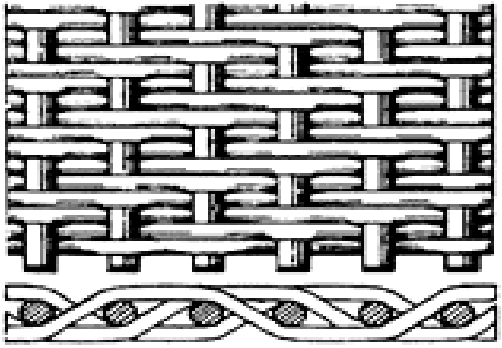
24 ‘candle’ elements, each filter

Layers of SS wire mesh

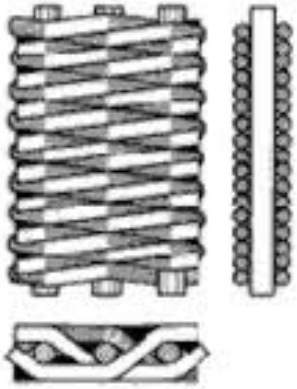


Plain Dutch Weave

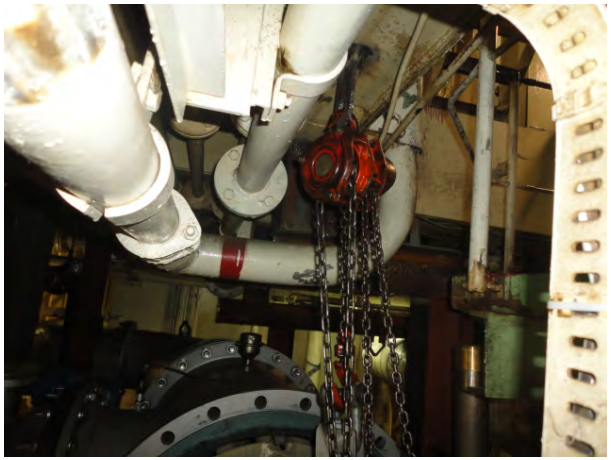


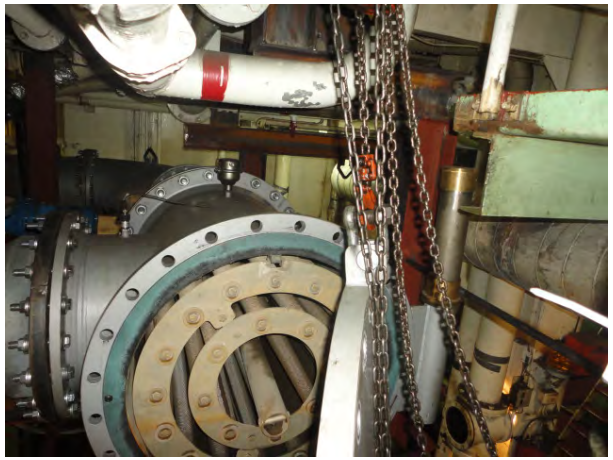


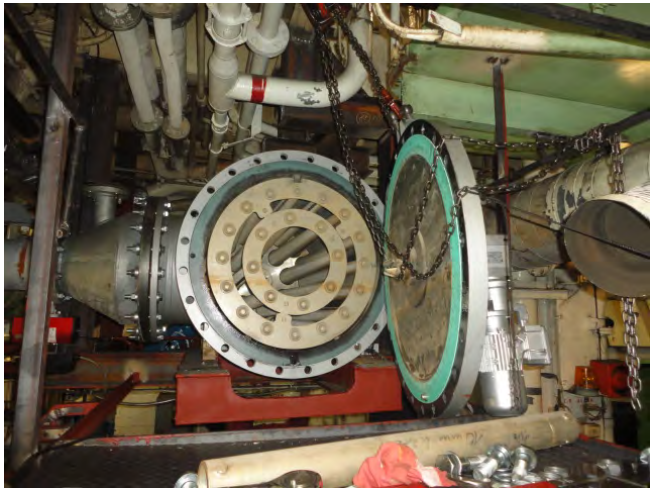
Twilled Dutch Weave



MAINTENANCE!!!!
needs to be considered

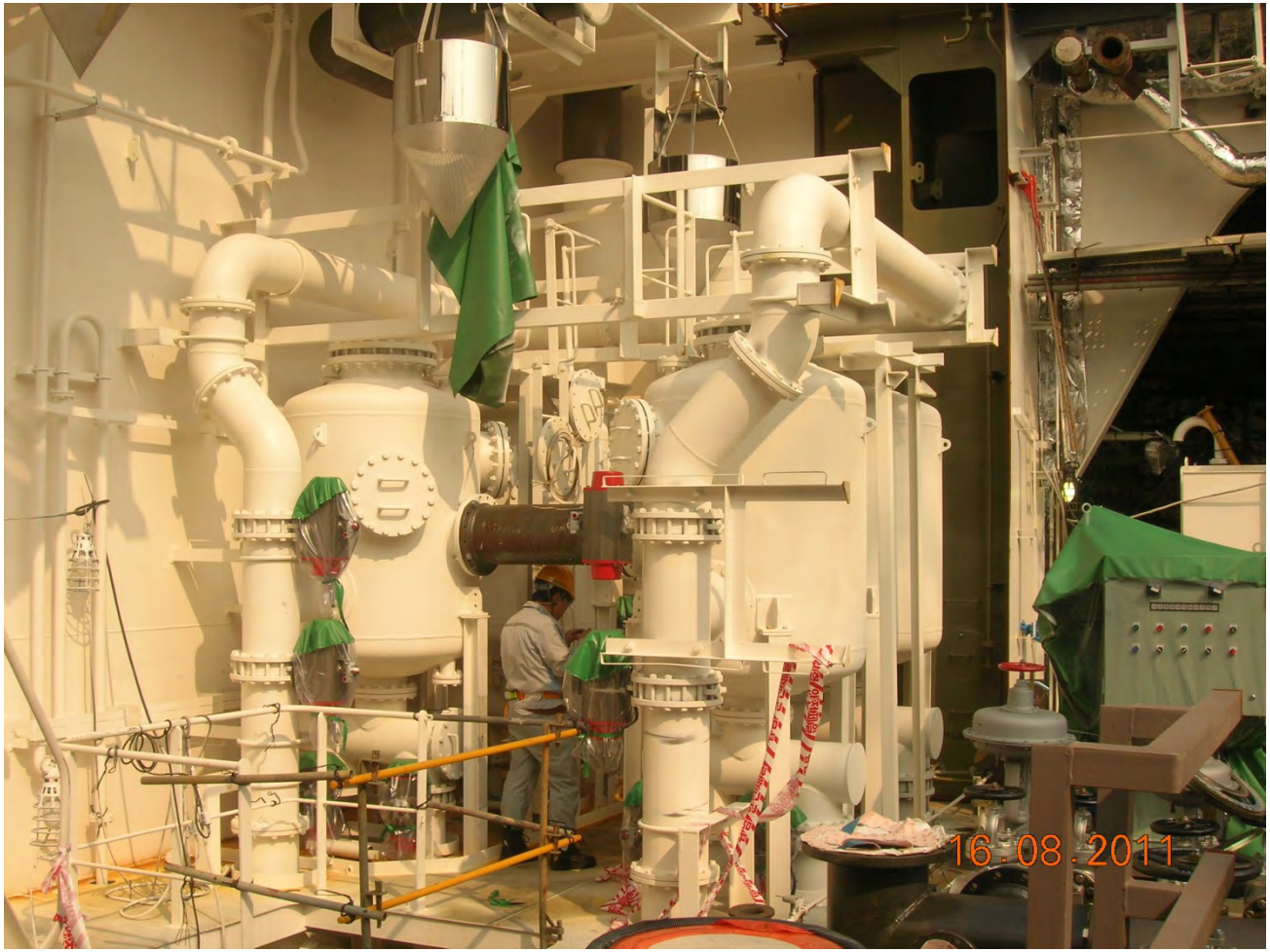






Sample Ports – not easy access if properly installed

Another filter installation



Designed into “new” ship

UV units

The Scientific Part

- CSL was approached by AIS expert scientists from the Department of Fisheries and Oceans (DFO) of the Government of Canada after the last Collaborative meeting to test the filtration system performance.

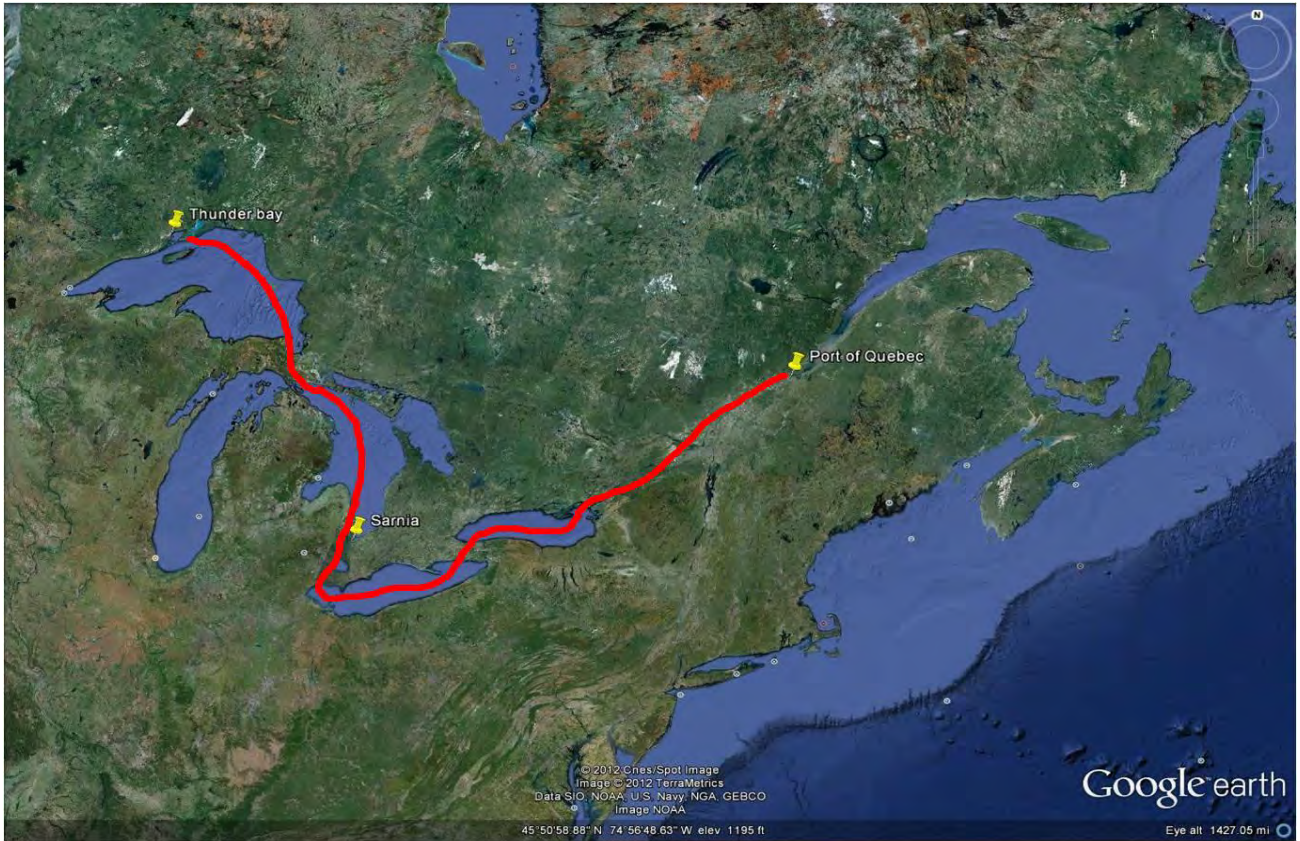
- DFO Testing Programme:

  1. At least 3 sea trials performed in various salinity locations and during the warm season; and

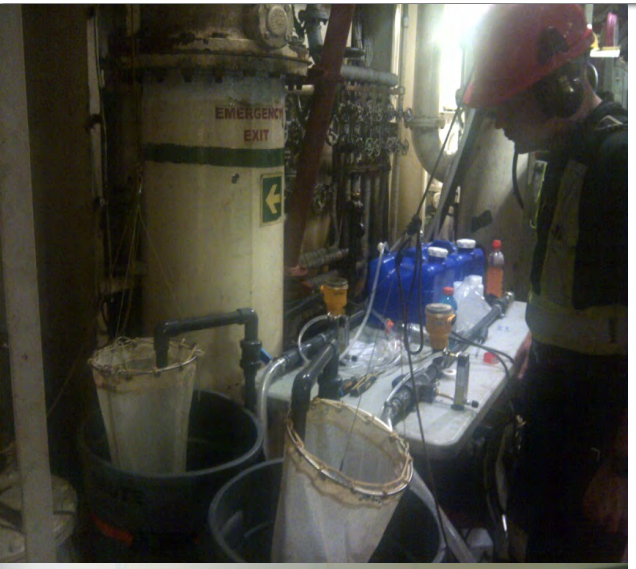
  2. DFO Sampling Protocol is consistent with ETV protocol.

Tests Location & Timeline

- ✓ Quebec (July 6 and 7)
- ✓ Sarnia (July 24 and 25)
- ✓ Thunder Bay (July 26 and 27)



Tests Conditions



- Shipboard testing requires endurance!
- The engine room in a July heat wave makes for difficult work conditions.
- Test cycle was 12 hours, plus set-up and take-down in the engine room, plus travel time.
- Overnight stay on board the ship was required.
- The team used the ship’s empty bunks, water and food, and the crew provided full assistance whenever needed.

DFO Sampling Challenges

- Have the correct plug and amperage to be able to use DFO pumps on board the ship.
- Location of pilot tubes was not optimal causing air in sample or not enough pressure to collect samples.
- Problems with flow meters installed on ballast line which made it difficult to estimate volumes.
- Ship radio frequency unknown so DFO could not use their radio to talk with crew.
- Engineers not confident about how to operate the filter for the test.
- Noise in the engine room made the communication difficult.

Hosting the Trial: What it Implied

- **Commercial challenges:** the time required (12 to 16 hours) to perform the test prior to loading cargo generated delays that pushed forward the schedule of the ship.
- **Logistical arrangements:** ever changing schedule of the ship made it difficult to arrange for the scientific team to board the ship with their equipment.
- **Human resources and expertise:** to ensure smooth preparation and testing operations, CSL had to mobilize external and internal expertise and staff.
- **Cost:** we estimated that the cost incurred by CSL for organizing this experiment amounts to approx. USD 750.000 (inc. filter installation).

What is Next

- ✓ Preliminary results should be available in one month time.
- ✓ Final results should be available by the end of December 2012.

- ► The expectation is to know, based on real testing conditions, how the filter performed with AIS found in the Great Lakes, what were the associated challenges.

What we Believe

- CSL continues to believe that the transfer issue in the Great Lakes can be adequately addressed by Best Management Practices (BMPs) + Advanced filtration.

- Learning from the Richelieu experience, we will continue investigating advanced filtration possibilities and share our findings with the community.

Acknowledgements

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CSL

Questions?