Marine coatings to improve vessel efficiency and reduce URN

Mo AlGermozi | GIT
Graphite Innovation & Technologies Inc.

- HQ: Canada with offices in Europe
- Manufacturing Facilities Dartmouth, NS
- Distribution centers across EU and APAC
Environmentally friendly coatings

- From Aerospace to Marine
- Graphite /Graphene based high performance paints for the under water of vessels
- Produced from a NetZero energy facilities
- Financially backed by a global syndicate of climate action, ocean health funds, and banks. In Canada, France and Norway
4.5 million tonnes of CO$_2$ avoided

GIT’s targets by 2030

Enable reduction of URN

1.1 million kg of copper avoided
Some of the vessels we can track E&E

LPG Tankers | Oil/Chemical Tankers | Bulk Carriers | Ro-Ro | Container | General Cargo | Ice-going | Offshore Supply | Workboats
The most feasible solution to improve efficiency

- Rudder Surf Bulb (5%)
- Mewis Duct (3-7%)
- Propeller Duct (3%)
- Grim Vane Wheel (3%)
- Air Lubrication (4%)
- Kites and Sails (10%)
- High-performance AF Coatings (6%)
- PBCF (1-3%)
- FO Homogenization (0.5%)
- Pre-Swirl Fins (2%)
- *(x%) potential fuel savings

Easy to implement:
- XGIT-PROP (3-4%)

Hard to implement:
- High cost
- Low cost
Many recognized ways

<table>
<thead>
<tr>
<th>Measure</th>
<th>Claimed Savings up to</th>
<th>Cost</th>
<th>Implementation Feasibility</th>
<th>ROI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rudder Surf Bulb</td>
<td>~5%</td>
<td>High</td>
<td>Moderate</td>
<td>&lt; 36 months</td>
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<tr>
<td>Rudder Surf Fins</td>
<td>~1%</td>
<td>High</td>
<td>Moderate</td>
<td>&lt; 132 months</td>
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<tr>
<td>Propeller Boss Cap Fins</td>
<td>~1% - 3%</td>
<td>Medium</td>
<td>Moderate</td>
<td>&lt; 14 months</td>
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<tr>
<td>Contra Rotating Propellers</td>
<td>3%</td>
<td>High</td>
<td>Hard</td>
<td>~132 months</td>
</tr>
<tr>
<td>Mewis Duct</td>
<td>~3% - 7%</td>
<td>High</td>
<td>Moderate</td>
<td>~14 months</td>
</tr>
<tr>
<td>Propeller Duct</td>
<td>~3%</td>
<td>High</td>
<td>Moderate</td>
<td>&lt; 24 months</td>
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<tr>
<td>Wake Equalising Ducts</td>
<td>~2%</td>
<td>High</td>
<td>Hard</td>
<td>&lt; 18 months</td>
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<tr>
<td>Pre-Swirl Fins</td>
<td>~2%</td>
<td>Medium</td>
<td>Hard</td>
<td>&lt; 30 months</td>
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<tr>
<td>XGIT-Prop</td>
<td>~3-4%</td>
<td>Low</td>
<td>Easy</td>
<td>&lt; 2 months</td>
</tr>
<tr>
<td>Low Friction Anti-fouling paints</td>
<td>~6%</td>
<td>High</td>
<td>Moderate</td>
<td>~9 months</td>
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<tr>
<td>Air lubrication</td>
<td>4%</td>
<td>High</td>
<td>Hard</td>
<td>&lt; 60 months</td>
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<tr>
<td>Fuel Oil homogenisers</td>
<td>0.5%</td>
<td>Medium</td>
<td>Moderate</td>
<td>&lt; 36 months</td>
</tr>
<tr>
<td>Kites and Sails</td>
<td>~10%</td>
<td>High</td>
<td>Hard</td>
<td>&lt; 60 months</td>
</tr>
<tr>
<td>CLT Or Kappel Propellers</td>
<td>6%</td>
<td>High</td>
<td>Moderate</td>
<td>&lt; 12 months</td>
</tr>
<tr>
<td>Grim Vane Wheel</td>
<td>3%</td>
<td>High</td>
<td>Moderate</td>
<td>&lt; 60 months</td>
</tr>
</tbody>
</table>

*XGIT-Prop... Easy & Fast Return*
Flat bottom and vertical sides

- Offshore Service Vessel
- Date applied: Feb 2022
- Shaft power reduction: 10.4%
- Payback period: 8 months
- Third vessel for this customer

Successful applications on all Prop types
Maintain peak propeller efficiency over time

- Efficiency Over Time
- Propeller Polishing
- XGIT-PROP
- With Polishing
- No Coating
- Fuel Savings

Propulsive Efficiency (Thrust)

Payback Period

XGIT-PROP application cost
XGIT-PROP is a proactive solution that maintains CII

- **Low one-time investment**

  - Pre-application
  - Post-application

  - 10% light slime
    - 200% ROI
    - 6 Months

  - 20% light slime
    - 400% ROI
    - 12 Months
Propeller

- 26K DWT Oil/Chemical Tanker
- Date applied: April 2022
- **Fuel savings:** 3-4%
- Payback period: 2-3 months
- By end of 2023, vessel will have saved approximately **500 t** of CO₂ (18 months post-application)
What we know

- Hull and propeller coatings are a cost-effective way to improve the efficiency of vessels
- High performance coatings serves as a tool to improve and maintain CII ratings
- Payback period is anywhere between 3-12 months
We also know
Linking Efficiency Gain to URN Reduction

• Hull Coating
  • Maintain same speed with reduced Engine Power
  • Reducing engine power lessens engine borne noise levels

• Propeller Coating
  • Maintain Same RPM with higher speed
  • Lower RPM can help vessels operate with reduced cavitation
  • Maintains a cleaner propeller
Comprehensive Coating system Strategies to reduce URN

High Performance Hull Coating
- Improve Efficiency
- Less Strain on Engine
- Faster Speed through water

Propeller Coating
Improves cavitation via lower RPM and a more polished blade surface.
XGIT-URN

- An industry first

- A primer designed to reduce URN

- Uses GIT’s proprietary technology to reduce hull borne underwater noise levels

- Compatible primer with most top coats

- Seen a 3-5 db reduction when coupled with XGIT-Prop and XGIT-Fuel tested on small vessels
Comprehensive Coating Strategies to reduce URN

**Noise Reducing Intermediate Coating Layer**
Patented Technology aimed at reducing structural and hull borne noise. Coating is applied between A/C primer and topcoat.

**High Performance Hull Coating**
- Improve Efficiency
- Less Strain on Engine
- Faster Speed through water

**Propeller Coating**
Improves cavitation via lower RPM and a more polished blade surface.
A URN coating management solution that is compatible with 100% of the global fleet

Any vessel can be coated

Many Energy Savings Devices impact a small subset of the global fleet
URN Projects & Initiatives 2023-> 2024

❖ Transport Canada Project (TR-22-33) - URN & GHG Reduction Program for Canada’s Inshore Fishing Craft (Lloyd’s Register & GIT). Results from underwater acoustic measurements from the application of XGIT coatings compared to the previous baseline conditions.

❖ Research Vessel up to 100 meters in length Underwater Radiated Noise Signatures (URNS) station to measure ambient noise and URNS of candidate ships. GIT will apply XGIT coatings to a research vessel to undergo pre/post comparison of URNS.

❖ Offshore service vessel – An offshore supply vessel has applied XGIT coatings to reduce URN impact during its operations in the Salish Sea.

❖ Chemical Tanker – A 160m Oil/Chemical Tanker will apply XGIT coatings to compare its URNS pre/post drydock
Biggest Challenges

• Shipping industry does not see value in reducing noise yet – Awareness

• Need more work quantifying URN reduction systems

• Dedicating vessels from representative categories to collect URN emissions data

• Currently we use listening stations to capture data – Availability of mobile listening

• Listening stations are limited in number, range and availability

• More research into what sources/factors contribute to URN (cavitation, engine noise, reciprocal machines...)

(cavitation, engine noise, reciprocal machines...)
Smart Coating Solutions

XGIT-FUEL
- High performance foul release coating
- Self Cleaning (>10kn)
- Proven Results
- No Biocides
- Easy to clean (soft brushes)
- 7 - 10% Improvement in fuel efficiency

XGIT-PROP
- Most sophisticated propeller coating
- 2 - 4% Improvement in fuel efficiency
- No need for propeller polishing
- Simple cleaning will remove fouling

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