

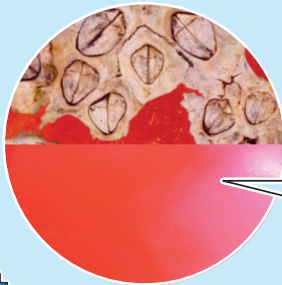


# Ways to cut maritime pollution

In a bid to clean up the world's shipping industry, the International Maritime Organisation (IMO) has ruled that the amount of sulphur allowed in bunker fuel must be reduced from 3.5% to 0.5% by 2020. Shipping accounts for 90 percent of world trade

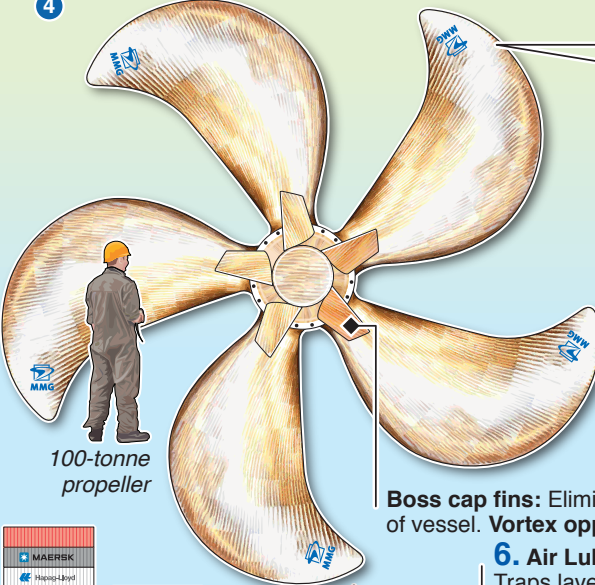
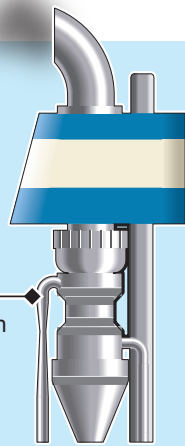
**Low-sulphur fuel:** IMO-compliant fuel will increase costs from \$450 to \$600 per tonne

**1. Slow-Steaming:** Owners can sail their fleets more slowly. **Slowing by just 1.5 knots can save as much as 35% of fuel**



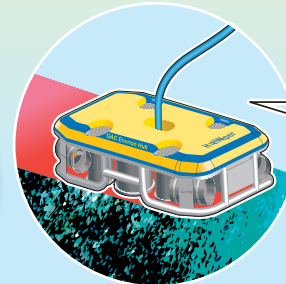
**2. Scrubber system:** Exhaust gas is sprayed with seawater. Sulphur dioxide reacts with water and forms sulphuric acid. **Natural alkalinity of seawater neutralizes acid**

**3. Smoothing hulls:** Stop barnacles with antifouling copper- and silicone-based paints. **Reducing friction can save up to 8% of fuel**



100-tonne propeller

**4. Energy-saving propellers:** Props designed to match vessel and engine can reduce torque-loss. **Increase in efficiency can cut fuel consumption by up to 14%**  
**Polishing existing propellers can trim consumption by 3% or more**



**5. Hull cleaning:** Robots blast water and suck up marine growth from hull at port during loading and unloading.

Fouling is removed without creating micro scratches on hull coating.

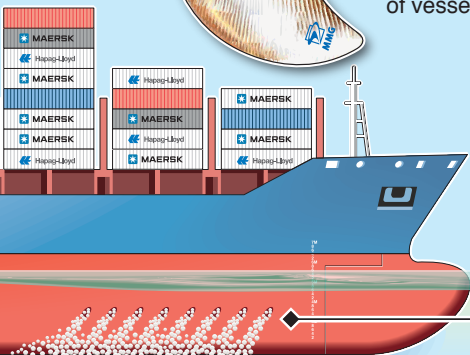
**Robots can remove over 95% of marine growth and save up to 15% in fuel costs**

**Boss cap fins:** Eliminate hard vortex in wake of vessel. **Vortex opposes forward motion of ship**

**6. Air Lubrication System (ALS):**

Traps layer of air bubbles beneath ship's hull. Air is blown at constant rate to form layer which reduces drag and resistance between ship and seawater

ALS can only be used for ships with flat bottoms – not vessels with V-shaped hulls such as warships



**7. "Nose job":** Replacing bow bulb for better performance. **Can gain fuel savings of 5%**

