In-water cleaning technologies

An overview

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Vessel In-Water Cleaning Meeting
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Ideal situation

- Biofouling completely removed
- Biofouling contained
- Paint undamaged
- No release of contaminants to water
- Widely available
- Not cost prohibitive
- Safe for divers
- Fast turn around time

Talk outline

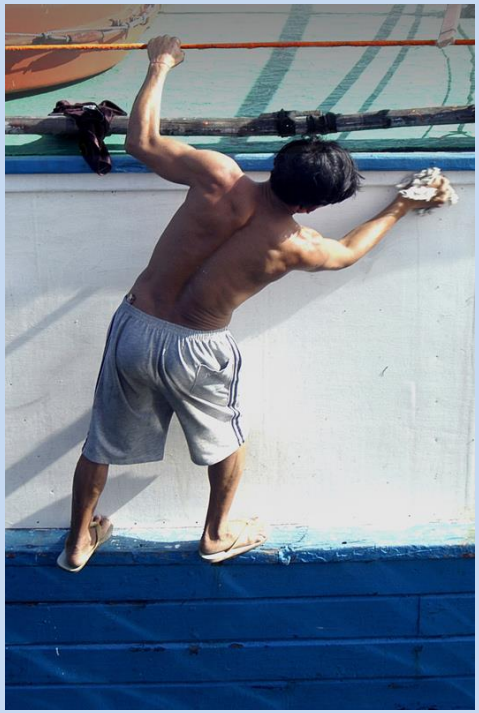
- Current technologies widely in use
- New technologies, limited use
- Technologies in development

Current technologies: ships

- Diver-driven tools (rotating brushes, blades, waterjets, etc)
- ROVs with the above

Current technologies: boats

- Hand cleaning, scrapers, brushes, soft cloths etc (owner)
- Power tools (commercial diver)



Current technologies: pros and cons

- Widely available
- Relatively inexpensive
- Removed fouling lost to environment
- Can damage paint
- Chemical contamination
- Prohibited in many jurisdictions

New technologies: ships

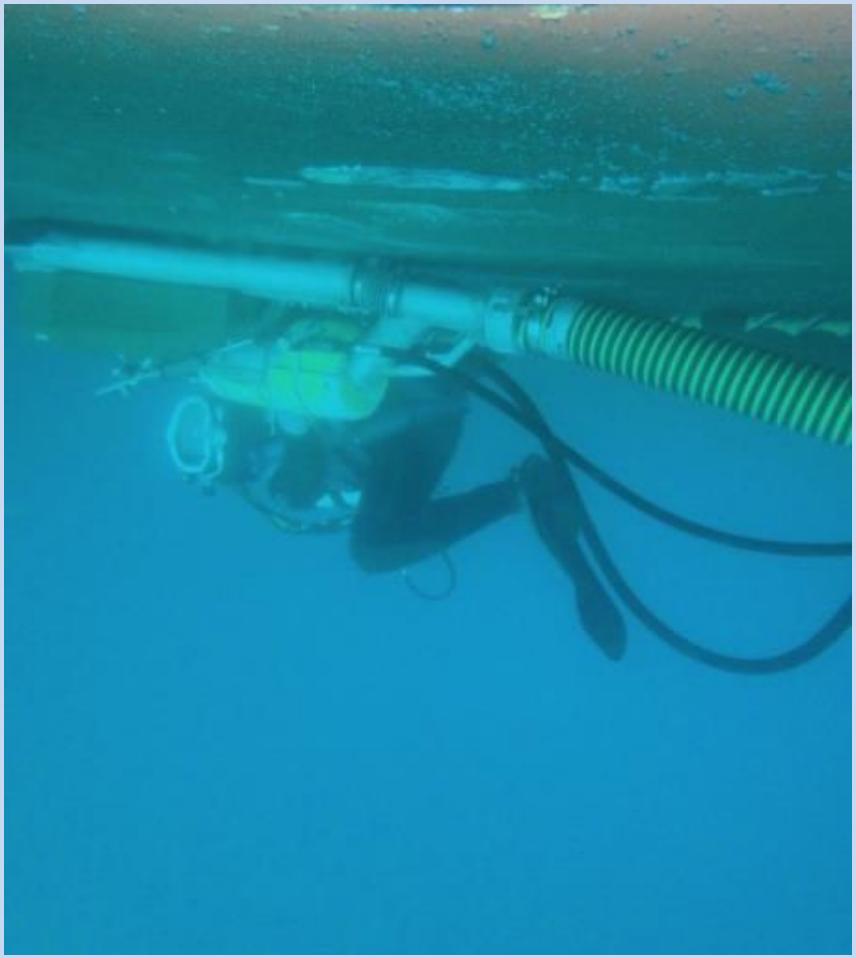
- Debris capture systems
- Coupled with brushes, blades, water blasts, cavitating bubbles

Franmarine EnviroCart (Australia)

Photo: Franmarine

- Diver-driven cleaning unit
- Can be equipped with brushes, blades
- Hand tools, high-pressure water treatment for niche areas

Franmarine EnviroCart (Australia)



- Full contained mode available
- 100% debris capture
- Filtered to 5 microns
- Waste water UV light sterilized

Photo: Franmarine

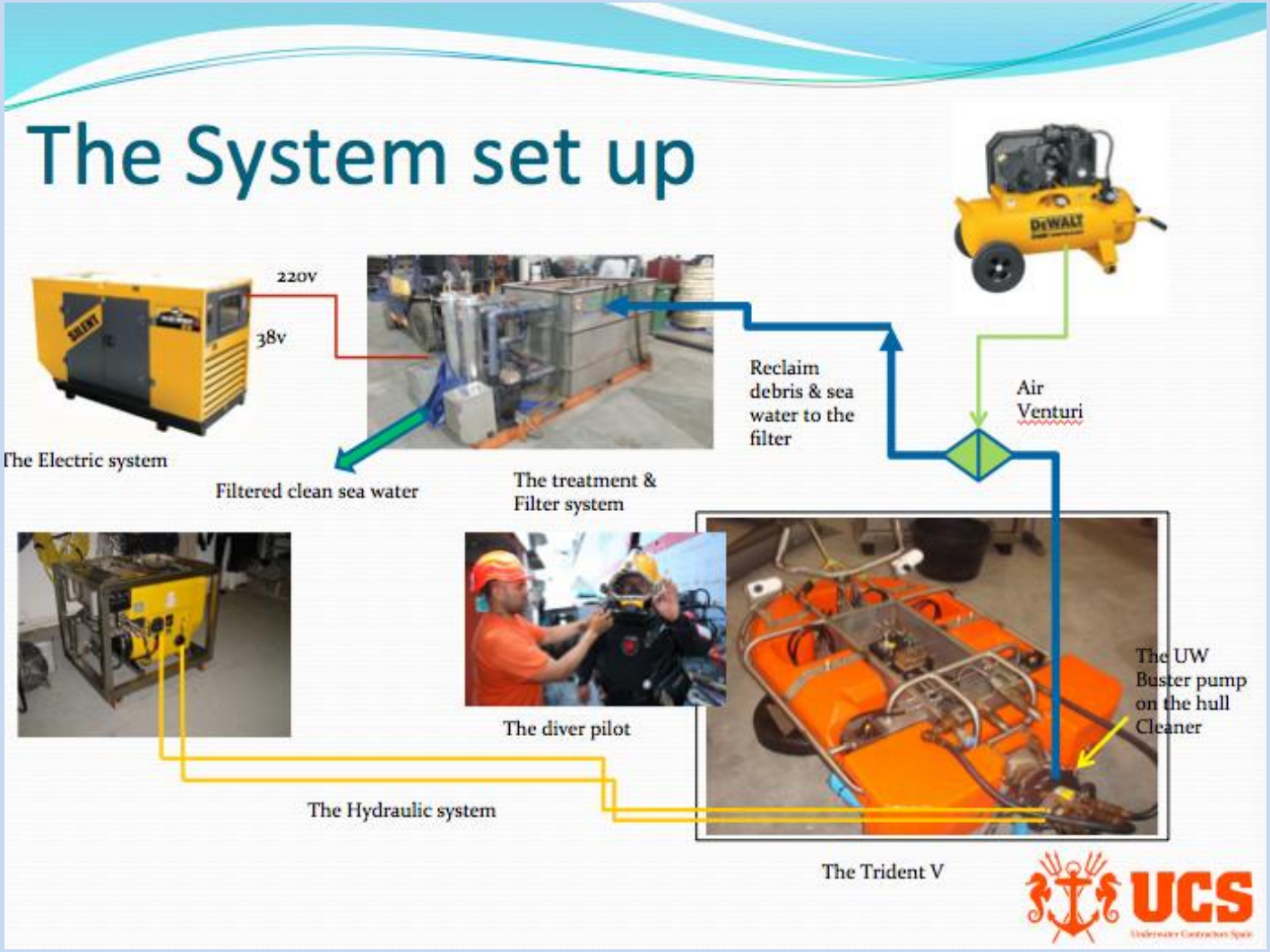
Franmarine EnviroCart

- DoF approved for multiple paint types
- Levels of biofouling
- Currently permitted to clean non-biocidal, locally traveling vessels
- Approval for copper-based paint after further tests

Photo: Franmarine

Trident V TecHullClean (Spain, Canada)

Trident, Maersk, Underwater Contractors Spain



Trident V TecHullClean

Trident V TecHullClean (Spain, Canada)

- Approved by Jotun, International Paint
- Permits for south of Spain, Vancouver
- Permits in process for Southampton UK, Rotterdam, Valencia and Barcelona

MARAD (SF Bay)

- **Developed by MARAD, Underwater Systems International, Terraphase Engineering Inc**
- **Diver-driven rotating brush cleaner with skirt for capture**
- **Suction system for debris removal**

Photos: Terraphase Engineering

MARAD/Terraphase

- **Filtered through series of screens to 5 microns**
- **Organo-clay filter for dissolved metal capture**
- **Did not meet discharge standards**
- **But approval for use by Regional WQCB with sufficient dilution**
- **Second vessel test this week**

Photo: Terraphase Engineering

Other systems/companies

- Whale Shark ROV, All-Sea, Canada
- ECOStation, ECOSubsea, UK, Sweden, Norway, Denmark
- Other companies: Cavi-Jet, Cavidyne claim can retrofit their cleaners for capture

New technologies: boats

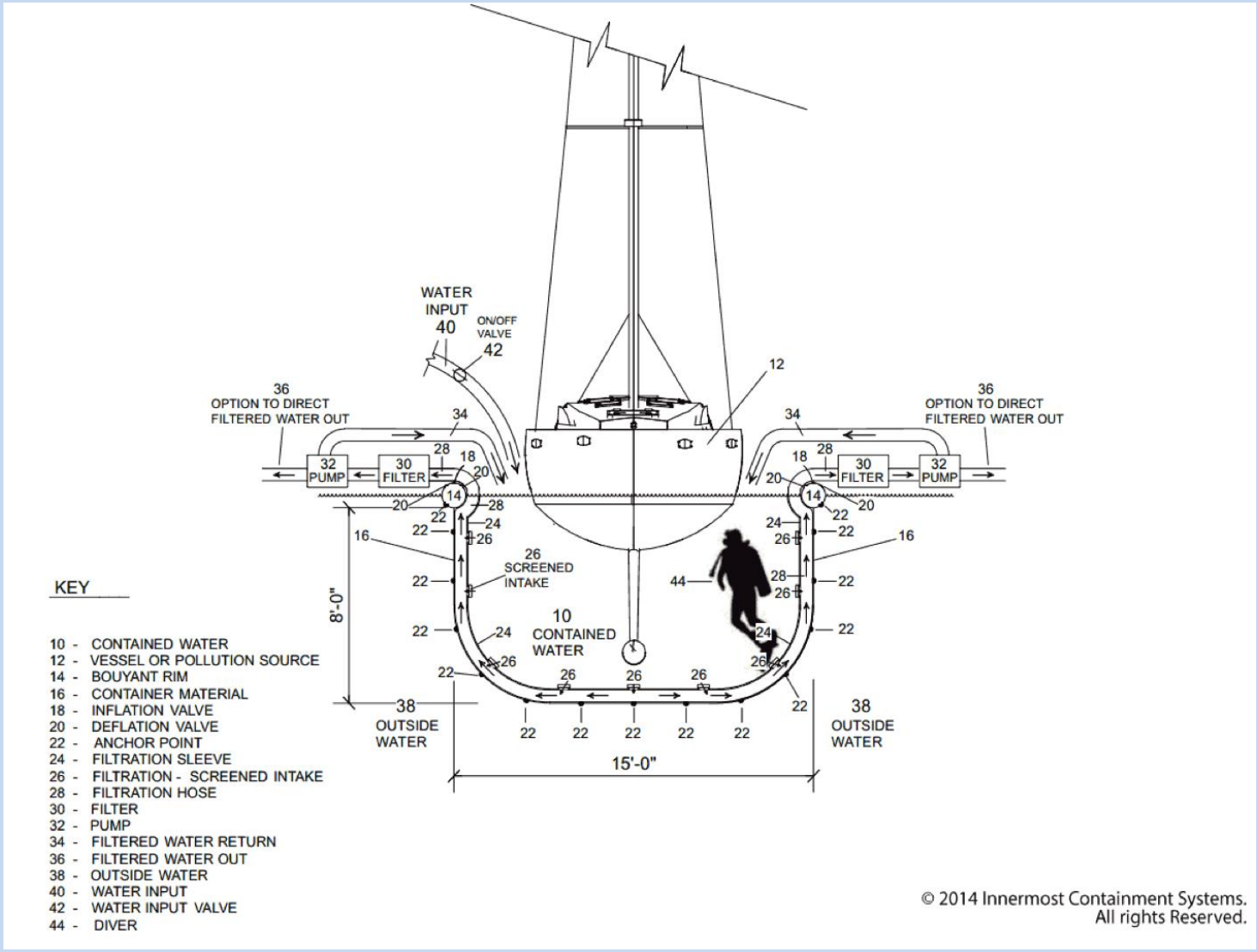
- Smaller capture systems
- Coupled with brushes, blades, cavitating bubbles

Photo: Hulltimo

Innermost Containment Systems

Photo: Innermost Containment Systems

Innermost Containment Systems



Innermost Containment Systems

- Tests of filtered water by McCampbell Analytical
- Copper ND
- Appropriate up to 40’ boats
- Based in Moss Landing, CA

New technologies: pros and cons

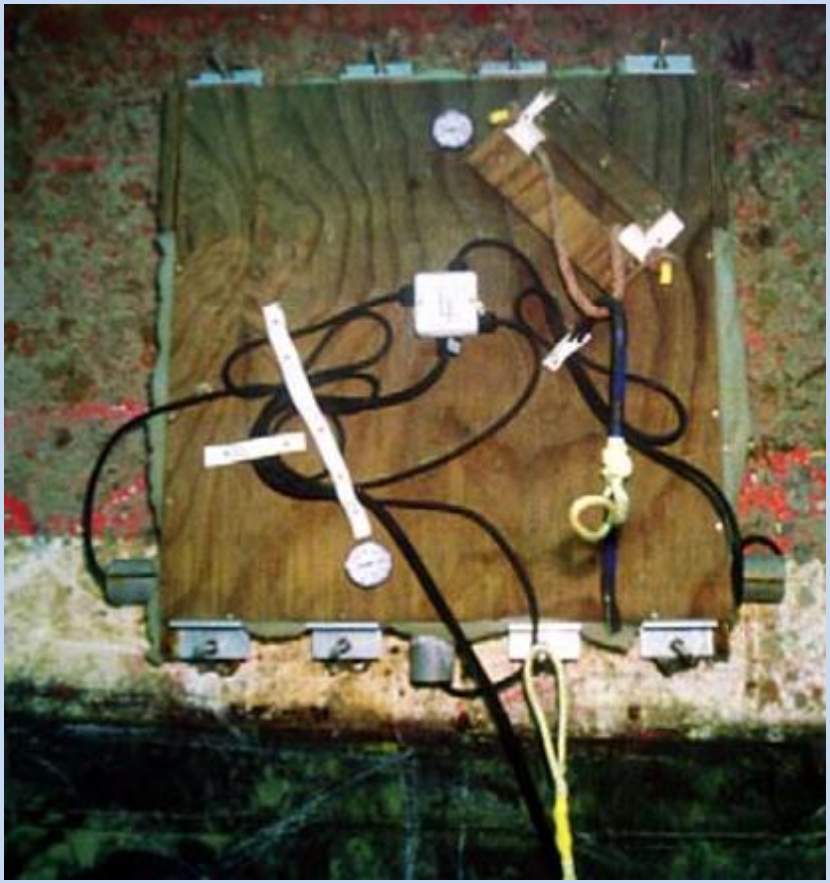
- Reduce fouling lost to environment
- Reduce chemical contamination
- Beginning to be allowed in some jurisdictions
- Not yet widely available
- Relatively more expensive than traditional
- Some not appropriate for harder fouling

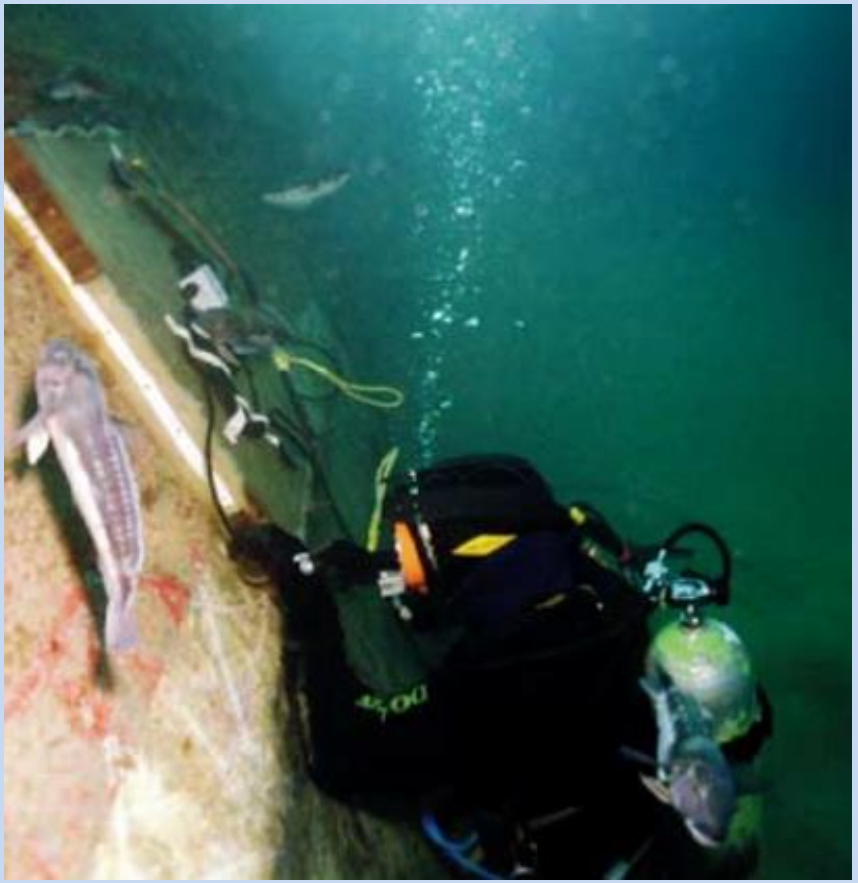
Developing technologies: Heat treatment

- Heated seawater or steam
- Biofouling killed but not removed
- Small, targeted applications
- Large-scale commercial application

Heat treatment: invasive seaweed on trawler, sea floor

Sunken vessel near Chatham Islands NZ: Recheck of vessel 18 months later, no regrowth





Photos: New Zealand Diving and Salvage LTD, in Wotton et al. 2004

Heat Surface Treatment (HST)

- **Surface tender mounted boiler**
- **Pumps hot water to applicator**
- **ROV, moves in grid along hull**
- **Niche areas treated by divers**
- **Hot-water treatment for sea chests**
- **Available Australia/NZ**

Photo: Leach 2011

Developing technologies: Encapsulation

- Wrap/encapsulate vessel
- Biofouling killed by anoxia, freshwater, chemicals

ArmoredHull

IMProtector

Encapsulation & heat technologies: pros and cons

- Reduce fouling lost to environment
- Less chemical contamination (?)
- Not yet widely available
- May be more expensive than traditional
- May not meet husbandry goals
- May not be realistic for all vessel types
- Or all types of fouling

Conclusions

- Current technologies increasingly restricted
- Several new technologies show promise
- Some in limited commercial use
- Still logistical, economic, permit hurdles to overcome
- No ideal technology – YET!