RunWell, development of fouling prevention based on UV light

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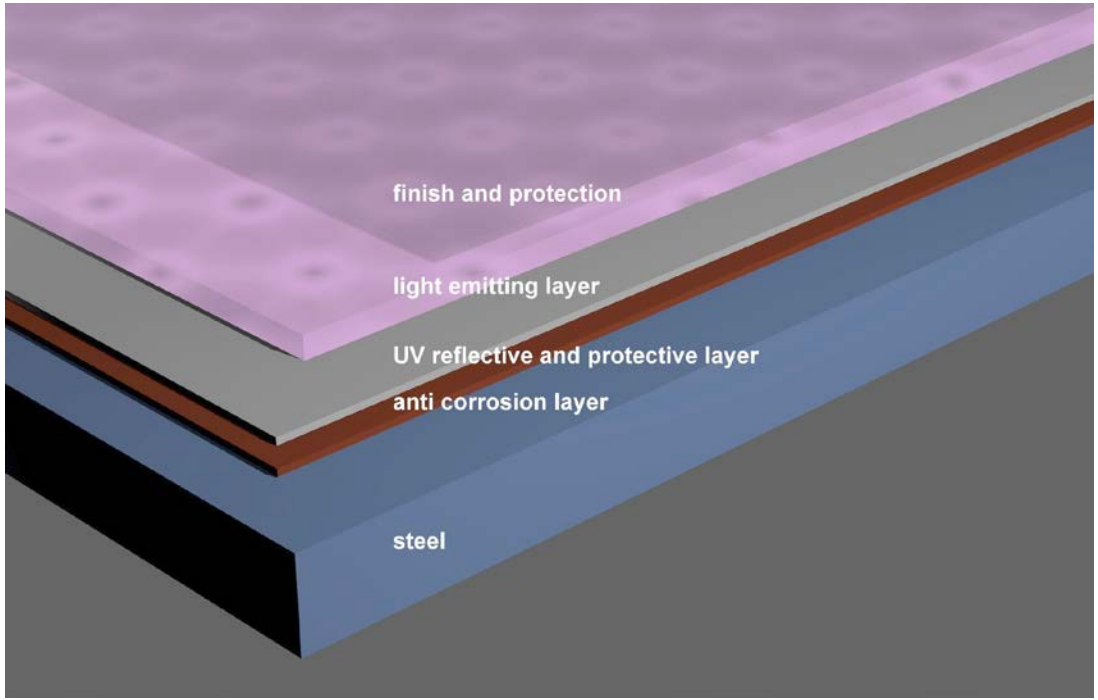
The hull fouling prevention solution based on UVC leds



Few main objectives:

- 1 – 2 mm thick
- Lifetime: 15 years
- Costs comparable to high-end paint
- Energy consumption < 1 W / m2

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Current prototypes and effect on fouling

after 9 month in Zeeland

How did it start?

- In 2013 two executives were looking at their boat, which had the wrong type of green on the hull… and they had experience with applying UV light in domestic appliances to get rid of unwanted species.
- Philips Lighting started the project
- It was a long term project with no revenues in years to come, and not quite core business…
  - So Philips Lighting did not carry on.
- I decided to look for another sponsor and Philips Intellectual Property & Standards (IP&S) was willing to fund.

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Why continue: large opportunity with huge environmental impact

- 100 ships with a perfect clean hull will save ca 650 kgTon/year CO2 emissions, about the same as the carbon neutral target of e.g. Philips Lighting.
- No longer tons of copper compounds per ship per year dissolved in the seawater.
- Not using any other active substances.
- The value on fuel savings would be about 0,5 – 1 M$ /yr / ship (depending on oil prices). The world fleet of large cargo ships 60.000.
  - The value of lost opportunity due to slower steaming is often even larger. (important for project management ships)

Since 2014 the project is managed and financed by the Royal Philips Intellectual Property & Standards. Why?

- In 2016 Philips split in Philips Lighting and Royal Philips (Health Tech). Consequently the project continued in Royal Philips.
  - Clearly Philips will not develop the technology into a product as it doesn't fit into its portfolio.
  - Still it is interesting to develop the promising technology further as IP&S has a large business in licensing out technology.
- The collaboration model:

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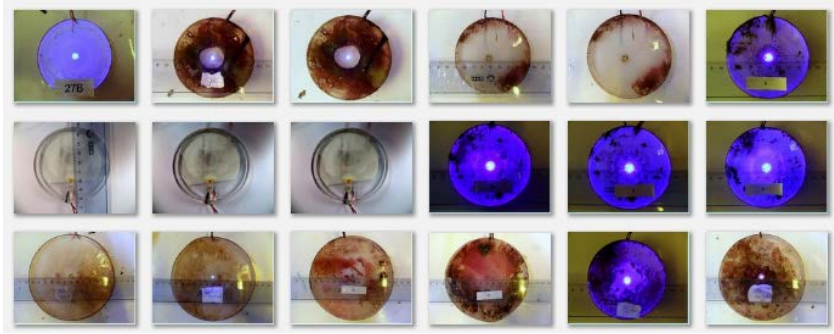
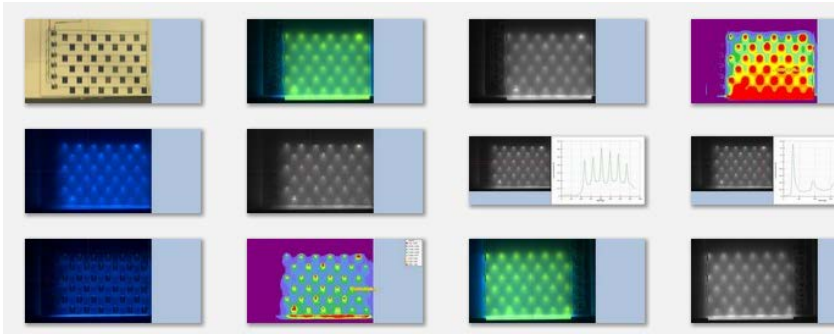
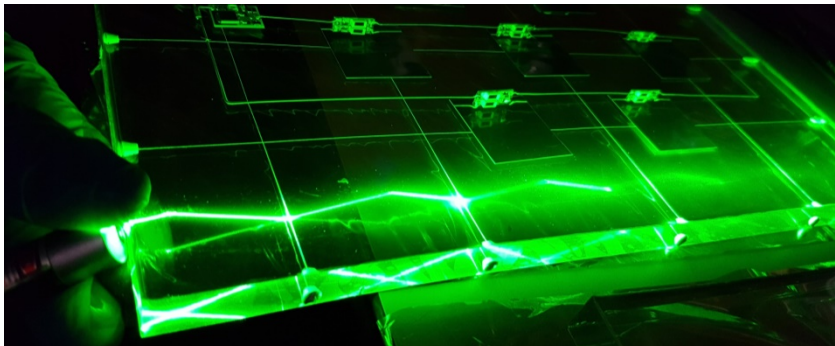
The development challenges

Research executed: concept proven!

- Proof of principle
- Optical design: led design, led placement, light guiding
- Making the tiles water tight & corrosion proof
- Creating wireless power options
- Proof of concept (Australia, Netherlands, Norway, Singapore, Florida)



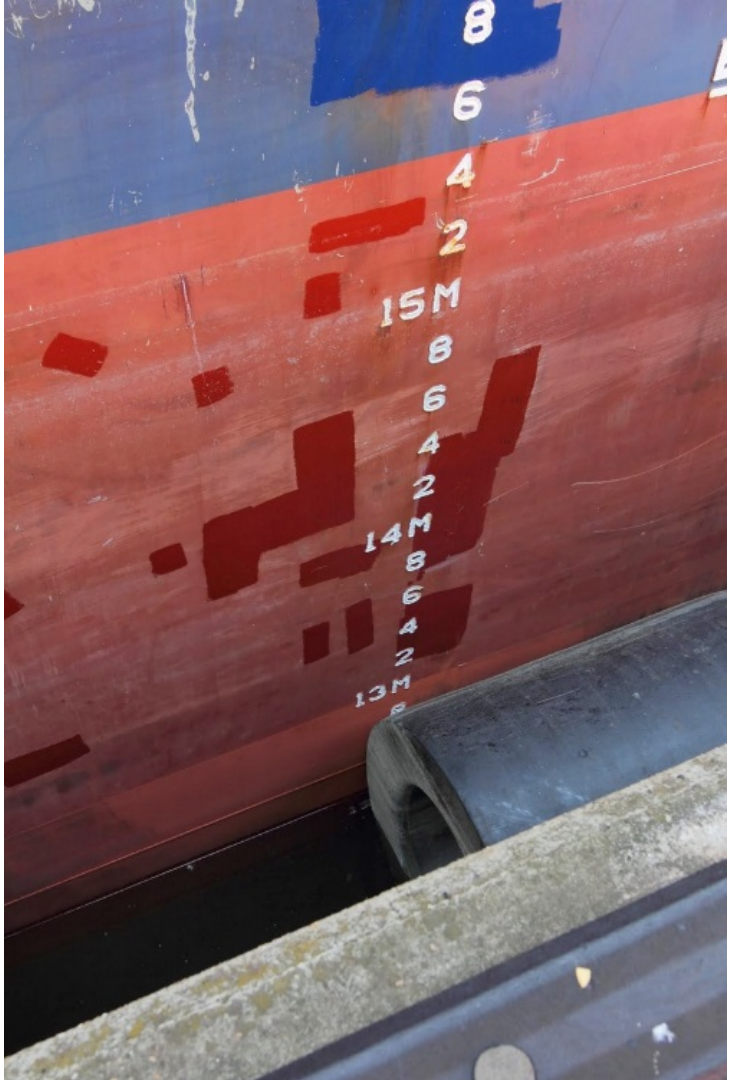




The development challenges

Current focus: shifting towards product development

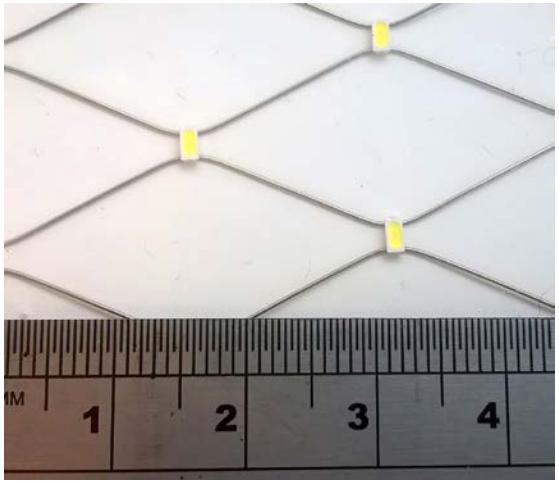
- Mechanical resistance
- Chemical setup for full stack with different layers (protection, light guide, electronics, reflective layer, adhesives)
- Define manufacturing concepts
- Refine power supply options, tiling
- Options for Led supply acc to specification (lifetime, side emitting, size, price …)
- Preparing for larger scale tests 10 and 100 M^2



The development challenges

Problems saved for near future

- Refine solutions for tailor problem for double curve surfaces
- Create (pilot) production facilities
- Full scale testing
- Installation and repair methods and tooling



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Business development challenges

Natural partners for product development

The general model

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business development challenges

Natural partners for product development

Maersk and CMA-CGM emphatically told us to involve major paint companies.

So we invited paint companies to test our samples.

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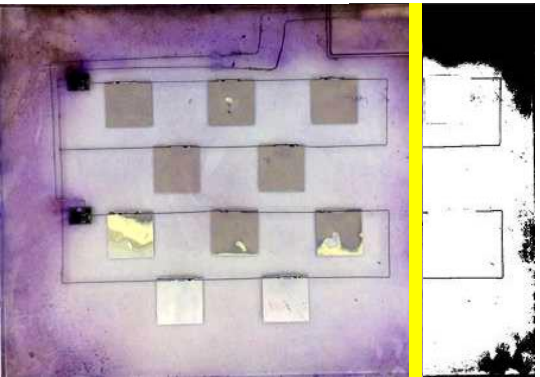
business development challenges

Natural partners for product development

- Several paint companies tested our solution
- And all concluded the technology outperformed their current paints.
- One of them is willing to invest and we are currently negotiating further steps



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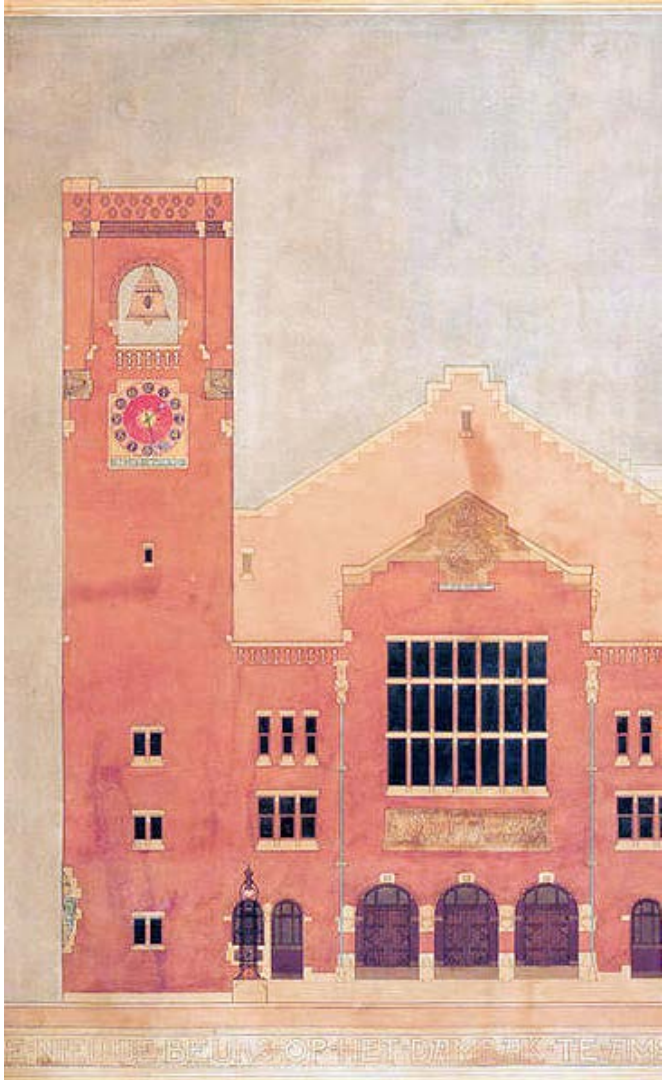
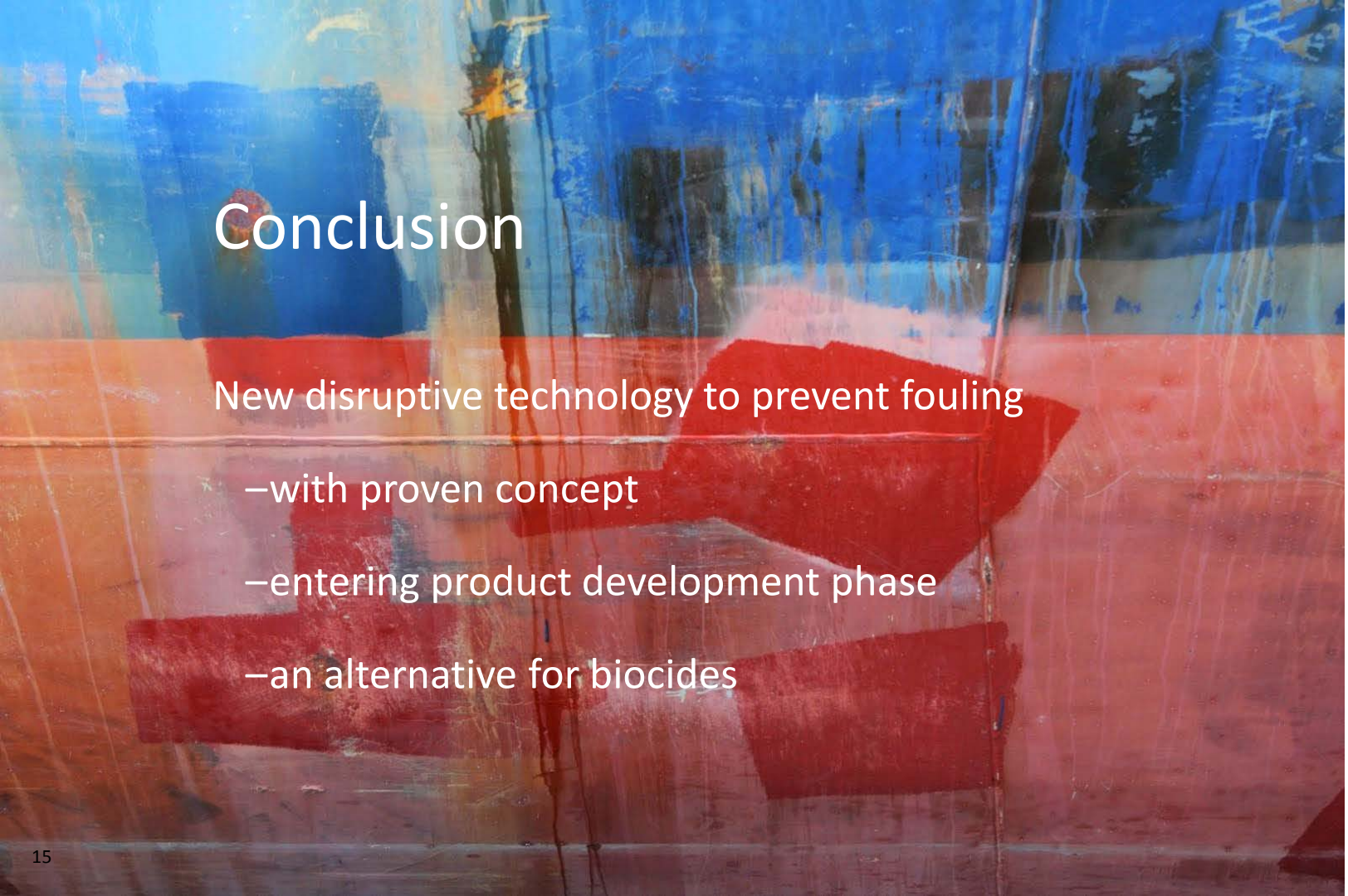
business development challenges

Our preference: open market

- Open market:
  - All companies could make use of the technology
  - Initiators / inventors rewarded for contribution of IP / knowhow via royalties
  - Comparable to the way standards are managed
- Advantages of open market approach
  - Better chances our IP / knowhow will be widely used
  - Less risk on counter forces, e.g. spoiling market with bad products
  - Environmental problem better addressed with large scale application
  - Acceptance by IMO, EU and classification societies more likely





Conclusion

New disruptive technology to prevent fouling

- –with proven concept
- –entering product development phase
- –an alternative for biocides

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