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creating essentials

PERACLEAN® Ocean Ballast Water Treatment

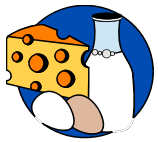
-History and Status

September 27, 2006 Cleveland, OH

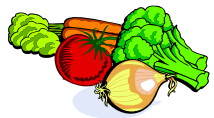
Presented by Joe Lally,
Degussa Corporation

Applications of PERACLEAN®

Laundry Disinfection / Cleaning

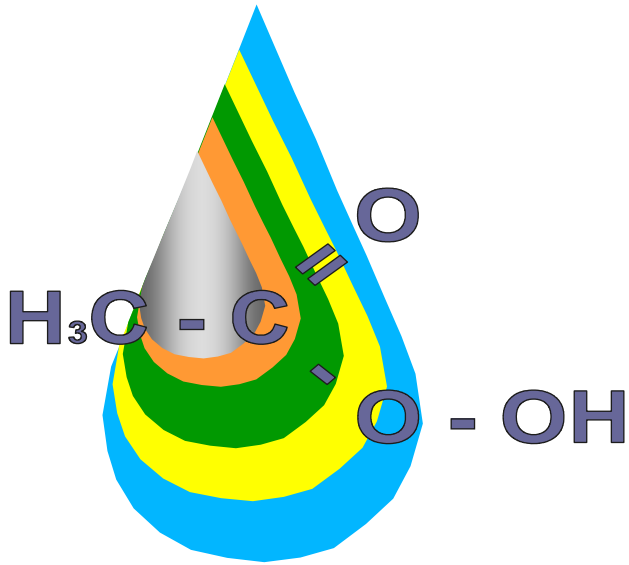


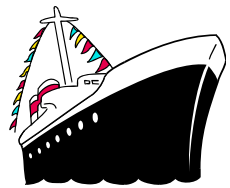
Food & Beverage Industry



Vegetables Disinfection

Animal Hygiene & Health Disinfection



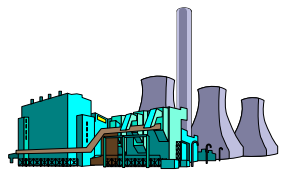


Ballast Water

Paper Industry Bleaching / Delignification Slimecontrol

Medicine / Dialysis Disinfection Sterilisation

Chemical Synthesis Oxidation / Epoxidation



Water Treatment Oxidation Slime control

Formulations of PERACLEAN®

PERACLEAN® solutions are stabilized mixtures of peracetic acid, hydrogen peroxide, water and acetic acid.

Peracetic Acid + Water  Acetic Acid + **Hydrogen Peroxide**

equilibrium

PERACLEAN® Ocean is a proprietary formulation especially created for the Treatment of Ballast Water

Development History – The Early Days

- Experience with sea side cooling water applications
- Bench Scale trials with out filtration
- USS Cape May – Testing without filtration
- Proof of concept trails with Hamann - Pre-separation/Filtration reduces chemical demand

Development History – Recent Work

- Land Based Trails conducted by NIOZ (salt water)
- Pilot trials at Quebec Aquarium conducted by Environment Canada/Transport Canada
- Canadian Prospector Trial by Environment Canada/Transport Canada
- Tank coating polymer manufacturers Relius and Jotun have tested there coatings for compatibility we PERACLEAN® Ocean

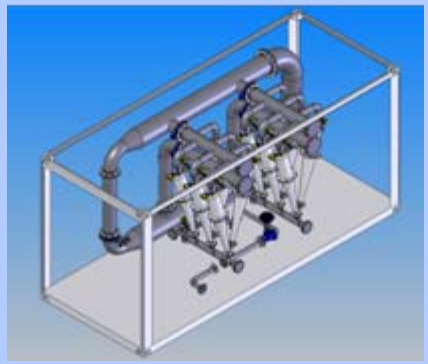
Two-stage Ballast Water Treatment

Ballast Water from the environment

HAMANN AG

SEDNA®

Physical separation
Hydro Cyclone



Fine filtration (50µm)

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PERACLEAN®
OCEAN

Ballast water tanks ⇨ Discharge over board

SEDNA = Safe Effective Deactivation of Non-indigenous Aliens

Sedna is the Inuit Godness of the Sea

Field Trial in the Parc Aquarium of Quebec City/Canada

Transport Canada/Environment Canada, March 2005

Target

-To assess efficacy under **cold temperature conditions (2 °C)**

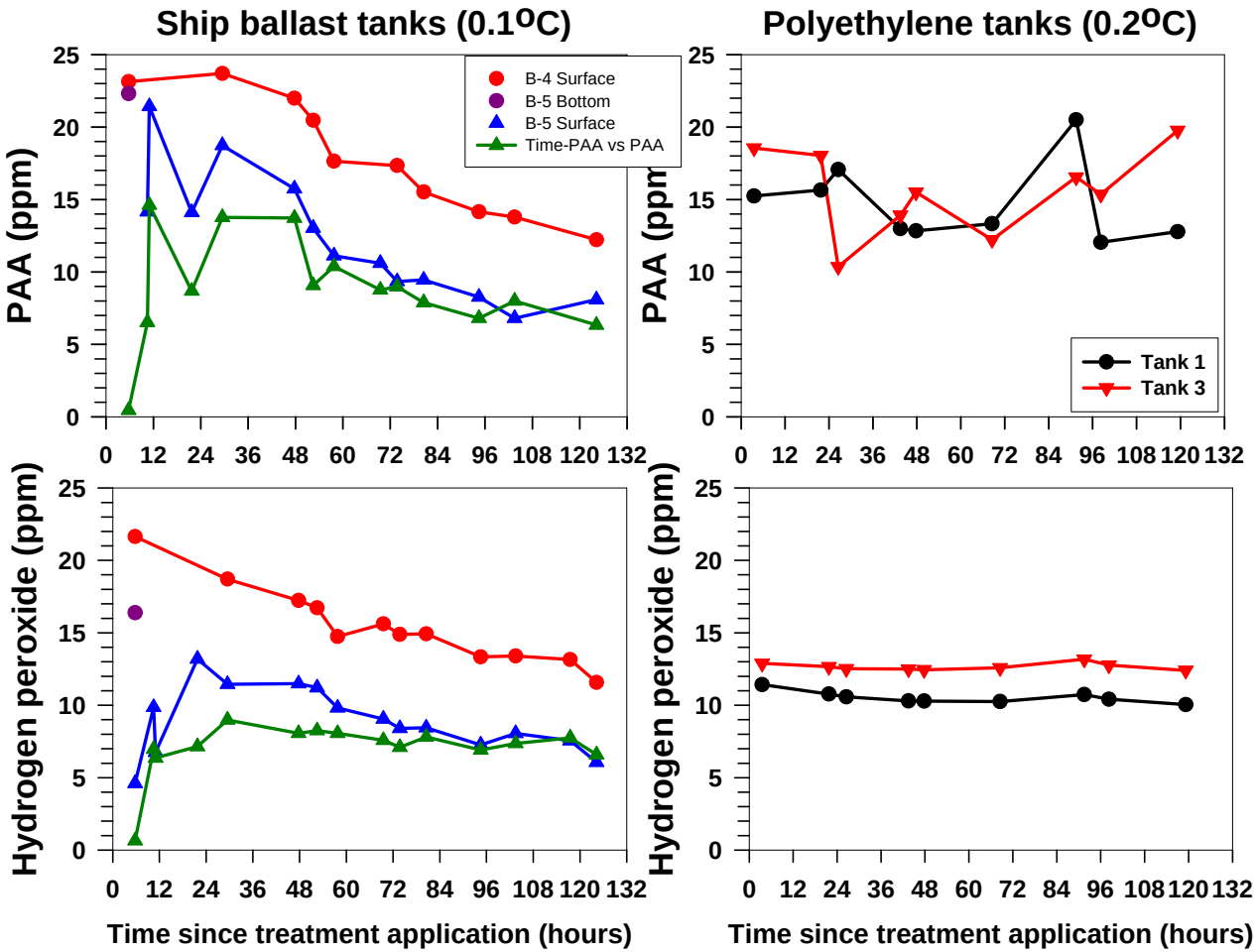
-To assess use of **catalase** to eliminate residual toxicity

4 PE tanks with 4500 l each

Results

- **High efficacy** for fresh and salt water despite of low temperature (retention time 72 h)
- **In saltwater there is no residual toxicity after 72 h**
- **In riverwater catalase removed residual peroxide completely**

The Canadian Prospector experiment – March 2006



Microtox = 68-189 TU
Fish test = 2 TU

Microtox = 116-156 TU
Fish test = 10-11 TU

Experimental Results on Corrosion

- Typically, the steel structure of a ballast tank is coated with a zinc rich primer under an epoxy top coating
- Report from BMT Fleet Technology on behalf of Ship Structure Committee (Canada) is available

  *"The presence of **PERACLEAN® Ocean** did not accelerate the damage of typical ballast water tank coatings"*

  [**30 days testing by BMT Fleetech/Ship Structure Committee, Canada**]
- Positive statements from tank polymer coating manufacturers Relius and Jotun are available, too

Accelerated Corrosion Testing Apparatus

Current Testing

- IMO Status
- Hamann Projects for IMO final Approval
- Maritime Innovations - NISOB project
- Corrosion study at the University of Südwestfalen, Iserlohn

IMO status

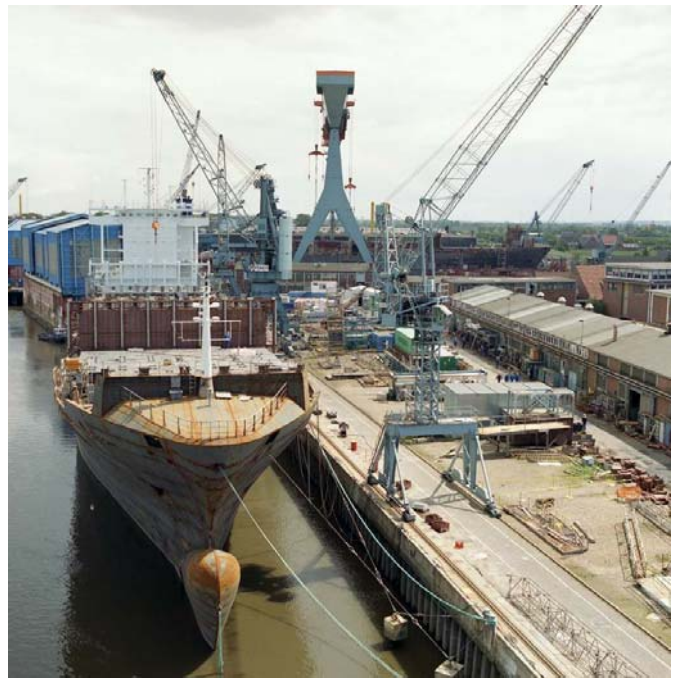
- MEPC, 53rd Session, London, 18-22 July 2005,
  Submissions by Germany :
  - Application for approval of PERACLEAN® Ocean as an Active Substance (G9)
  - Application for approval of the SEDNA® System by HAMANN (incl. PERACLEAN® Ocean) as Ballast Water Management System (G8)

- IMO Headquarters, London, 23-27 January 2006,
  Assessment by GESAMP (IMO´s group of experts) on PERACLEAN® Ocean as Active Substance : **"…the Group recommends that a Basic Approval is issued allowing a full-scale development and testing"**

- MEPC, 54th Session, London, 20-24 March 2006, Agreement to grant Basic Approval to Active Substance proposal for PERACLEAN® Ocean submitted by Germany

Work With Hamann

- **Permanent full-scale** SEDNA® System incl. PERACLEAN® Ocean storage tank installed on a newly built container vessel
- Installation approved and certified by GERMANISCHER LLOYD
- Ballast Water Management Plan approved by GERMANISCHER LLOYD
- PERACLEAN® Ocean storage tank already filled
- Vessel in regular operation since summer 2006
- Mechanical / electrical fine-tuning of the SEDNA® System successfully finished
- Shipboard Testing according IMO guidelines in preparation
- Landbased testing according IMO guidelines at two different test sites in final preparation



Field Trial at NIOZ / NL
SEDNA® System by Hamann AG

6 Containers as „25 m³ ballast tanks“

“Ballast Water“
Pump 500 m³/hour

Filtration

Hydrocyclone

NISOB PROJECT TEAM

Institut maritime du Québec
Cégep de Rimouski

Environnement Canada
Environment Canada

Fisheries and Oceans Canada
Pêches et Océans Canada

Université du Québec à Rimouski

Université du Québec à Rimouski
Institut des sciences de la mer de Rimouski (ISMER)

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KINECTRICS

Armateurs du Saint-Laurent
St. Lawrence Shipoperators

MARITIME INNOVATION
INSTITUT MARITIME DU QUÉBEC

MD TECHNOLOGIES INC.

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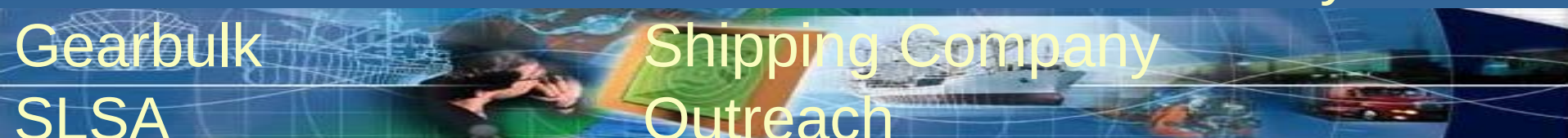
NISOB PROJECT CONSORTIUM

SDTC	Funding contribution (Subject to final contract negotiations)
IMAR	Project management, engineering
IMQ	Marine mechanical engineering
EC	Environmental fate
DFO	Biological effectiveness
ISMER	Biological effectiveness
UQAR	Corrosion and coating analysis
MBRC	Pathogen and bacterial analysis
Degussa Canada	Treatment product PERACLEAN
MD Technologies	Treatment product Ballaclean
Kinectrics	Pre-treatment-Filtration system
Gearbulk	Shipping Company
SLSA	Outreach



New Study on Corrosion

- Extensive study (duration 125 days) performed by University of Südwestfalen, Iserlohn, under supervision of GERMANISCHER LLOYD, Hamburg

- Reporting currently being in progress

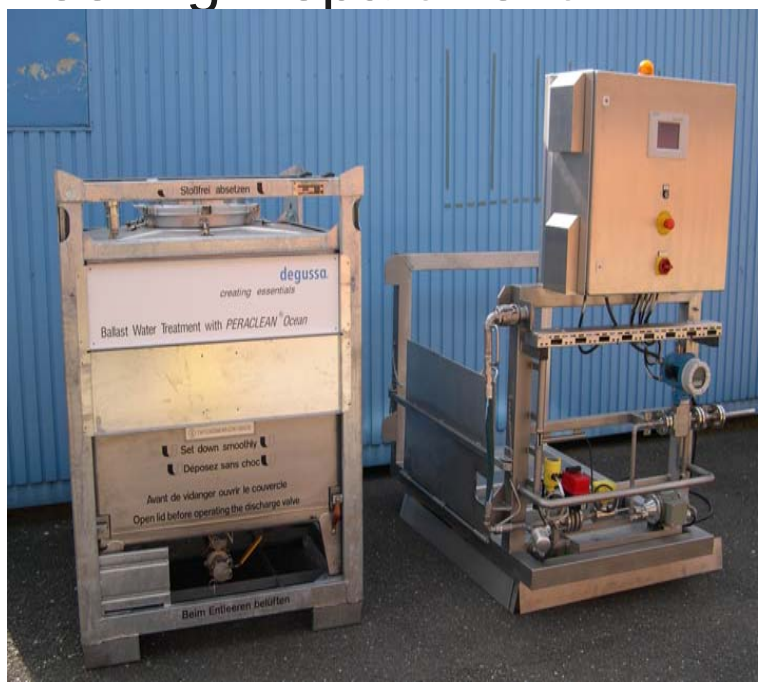
- Final Target ⟹ Certificate by GERMANISCHER LLOYD on the influence of PERACLEAN® Ocean on common ballast tank coatings

Dosing Equipment and Testing Schemes

- Tote dosing unit
- Bulk Storage
- SEDNA trial unit
- Chemical Testing

Storage Onbord of Ships - Docking Station

- Degussa developed storage concepts according to class requirements for
  - built-in tank
  - ISO container
  - and IBC docking station (1000 liters)
- Stainless steel IBC built at our Engineering Department
- Available for ship trials



Worldwide Availability

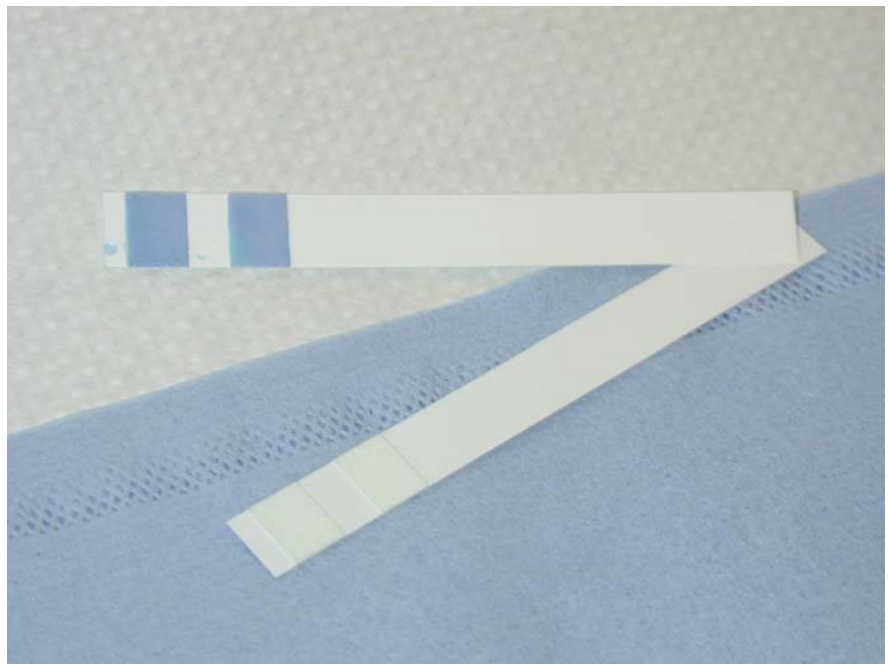
- Degussa operates 10 production plants for H_2O_2 and 3 for PAA
- Additional tank farms will be installed in selected harbors
- Cooperation with a major chemical distributor will assure just-in-time deliveries


Ballast water pump 500 m³/h
Hydro cyclones; 2 V6-modules
50µm fine filter
Dosing station Peraclean Ocean

Analytics

Easy Determination of Peracetic Acid/H_2O_2 with Test Stripes (Merck Reflectoquant®)

RQflex® pocket photometer from Merck



Blue coloration by Peracetic Acid

Measuring range : 1.0 - 22.5 mg/l Peracetic Acid
0.5 - 25 mg/l H_2O_2

Questions