A.P. Møller-Mærsk - Alfa Laval Aalborg - Hempel - MAN Diesel & Turbo - OSK-ShipTech - TORM -DBI - FORCE Technology - Teknologisk Institut - Aalborg Universitet - CBS - DTU - SDU - Propeller Control - Lyngsø Marine - Tetraplan - Transmar - Bureau Veritas - MacGregor - Claus Kruse -Vessel Performance Solutions

J. Lauritzen - Principia North - Automation Lab – SIMAC - Esvagt - A2SEA - Eltronic - LR Marine -Dansk Analyse - Lloyd's Register - Clean Combustion - Kosan Crisplant - Moving Energy - Haldor Topsøe - Danish Maritime - Controllable Pre-Swirl Fins - Dynamic propeller shaft speed control -Trailer Cat - Vessel Performance Decision Support - Monitoring & Performance - Gas Valve Train -

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Performance Solutions - J. Lauritzen - Principia North - Automation Lab - SIMAC - Esvagt - A2SEA - Eltronic - LR Marine - Dansk Analyse - Lloyd's Register - Clean Combustion - Kosan Crisplant - Moving Energy - Haldor Topsøe - Danish Maritime - Controllable Pre-Swirl Fins - Dvnamic propeller

shaft speed control - Trailer Cat - Ves Performance - Gas Valve Train - Mul Shore based small scale LNG-LBG li steaming antifouling paint - Selective – Servitization - A.P. Møller-Mærsk - / ShipTech - TORM - DBI - FORCE Tec DTU - SDU - Propeller Control - Lyng MacGregor - Claus Kruse - Vessel Pe Automation Lab - SIMAC - Esvagt - A

Project name: CPSF Controllable Pre-Swirl Fins (CPSF) Project participants: Maersk Maritime Technology Technical University of Denmark - DTU-MEK MAN Diesel & Turbo OSK-ShipTech

Register - Clean Combustion - Kosan Crispiant - Moving Energy - Haidor Topsøe - Danish Maritime - Controllable Pre-Swirl Fins - Dynamic propeller shaft speed control - Trailer Cat - Vessel

Short project description

- 1. Pre-Swirl or Stator fins in front of the propeller have been known for some time and recently tried on a number of full body ship types like bulkers and tankers
- 2. The fins act as guide vanes that give a preswirl into the propeller and thereby an increase in efficiency

Vessel targets are

- a) Bulker and tanker due to their two distinctive operating conditions ballast and design
- b) Container due to their high loaded propellers at design speed and low loaded propellers at slow steaming

The overall objective of the project

Develop a new propulsion Efficiency Improving Device into a product

Technology Readiness Level								
1	2	3	4	5	6	7	8	9
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Key features or key findings

What key features or findings would you like to highlight from your project work until now?

- 1. During the first project phase a number of ideas arose that added further benefit to its applications:
 - a) Used to cure/minimise the effect of not having the right light running (FPP)
 - b) Flap actuation instead of fin turning
 - c) Used as an active way for dynamic propeller/engine control

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Project challenges and solutions

What challenges have the project team experienced and how has the team solved them?

- 1. Finding suitable references
 - a) Container well documented
 - b) Tanker or Bulker now in place
- 2. Being attractive with the present low fuel oil price mostly retrofit
- 3. Design a reliable solution that can get market acceptance
- 4. Lack of progress in-between project meetings
- 5. Tight follow-up on partners budget and milestones is crucial

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Why should you buy our solution?

What makes your solution the preferable one compared to other available solutions?

- 1. Existing Pre-swirl fins act as stators and can as such not adjust to different vessel conditions. Controllable fins has the potential to increase the overall efficiency by an additional 3-6% the verification of these figures forms an important part of the project.
- 2. Well documented saving potential by using advanced dedicated tools (CFD routines, control algorism) and proven results from model and full scale tests
- 3. The problem of insufficient light running with FPPs over time can be reduced if not eliminated