

The Future of Ship Design

Introduction

Dear Colleague,

The Future of Ship Design is intended for naval architects, marine engineers and for professionals working with the development of newbuilding ship projects from first feasibility studies through project and contract design into planning, basic and detail design. Working and design methods are also considered.

The authors are experienced naval architects, marine engineers, mechanical engineers and electrical engineers, all working at Deltamarin Ltd on the date of publishing. The background of the is in the Finnish shipbuilding as many of them have been working at the Finnish shipyards. All the authors have international experience mainly from European shipbuilding. This experience covers consulting, design and engineering tasks for various shipping companies, shipyards and suppliers as well s supervising and commissioning tasks of newbuildings and conversions.

The Future of Ship Design sets out to inform the practising Naval Architect and Engineer of the latest design techniques at his disposal, and then puts these in context by quoting case study material. Attention is paid to the important aspects of the hydrodynamics, machinery, structure and equipment design considerations, vital parts of the ship design mix.

The tremendous technical development we have faced in ship design during the last decade issues us as designers a big challenge for the 21st century. New technology has been introduced faster than ever before in our industry.

The issue is to maximise the efficient revenue generating space at minimised investment and running costs but taking into account availability and environmental impacts as well.

The tendency is clear and promising, new products and innovations are introduced and completely new ship configurations can he developed based on new system and machinery products on the market.

It is important to understand and consider the life cycle costs but taking into account possible additional revenue when considering new configurations.

Typical case studies are handled showing the importance of a techno-economic design approach.

Finally innovative design techniques available today and signifying a quantum leap in the ship design and project coordination in the early 21st century are discussed.

I hope this book will offer a platform for further exchange of valuable information in our common effort for more efficient products: ships for the 21st century.

Yours sincerely,



Markku Kanerva

DELTAMARIN LIMITED

Introduction

Authors:

Markku Kanerva, M.Sc. (Nav. Arch.), Pertti Arkke, M.Sc. (Nav. Arch.), Juha Hanhinen, M.Sc. (Nav. Arch.), Kyösti Herrala, B.Sc. (Mech. Eng.), Matti Huhtala, M.Sc. (Nav. Arch.), Seppo Kalske, D.Sc. (Tech.), Gustav Lindqvist, M.Sc. (Tech. Physics), Janne Luukkonen, M.Sc. (Nav. Arch.), Ilkka Mikkonen, M.Sc. (Information Technology), B.Sc. (Nav. Arch.), Jan-Olof Nordling, B.Sc. (Mech. Eng.), Jari Nurmi, M.Sc. (Mech. and El. Eng.), Esa Pöyliö, B.Sc., Tage Revahl, B.Sc. (El. Eng.), Harri Salama, Tech., Kalle Senvall, Tech.

Compiled by:

Deltamarin Limited
Purokatu 1
FIN-21200 Raisio
Finland.
Tel: +358 2 4377 311
Fax: +358 2 4380 378
e-mail: deltamarin@deltamarin.com

Electronic edition compiled by:

Ilkka Rytkölä

Published by:

MPI Group
4 Hubbard Road
Basingstoke RG21 6UH, UK
Tel: +44 (0)1256 840444
Fax: +(0)1256 817877
e-mail: marine@mpigroup.co.uk
www.mpigroup.co.uk

Neither the publishers or the authors, editors and contributors and their employing organisations, nor any persons acting on behalf of them a) makes an warranty, express or implied, with respect to the use of any information, apparatus, method or process described in this publication or that such use may not infringe privately owned rights or b) assume any liabilities with respect to the use of, or for damages resulting from the use of any information, apparatus method or process disclosed in this publication, and the use of any such materials, processes or methods is solely at the risk of the user.

Data contained within this publication is protected by copyright. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means electronic, mechanical, photocopying, recording or otherwise without the prior permission of Deltamarin Limited.

1. DESIGN GUIDELINES	6
1.0 General	6
1.1 Hull Forms and Hydrodynamics	6
1.1.1 Basic parameters	6
1.1.2 Hull form characteristics	9
1.1.3 Appendages	14
1.1.4 Rudder	19
1.1.5 Seakeeping	23
1.1.6 Conclusions	32
1.2 Propulsion	34
1.2.1 Powering performance	34
1.2.2 Propeller diameter and location	37
1.2.3 Shallow water and wash effect	39
1.2.4 Air ventilation	39
1.2.5 Pod propulsion	40
1.3 Machinery Systems	42
1.3.1 Machinery selection	42
1.3.2 Fuel selection	46
1.3.3 Electric balance	49
1.3.4 Power availability	52
1.3.5 Ancillary services	58
1.4 STRUCTURES AND WEIGHT	63
1.5 DAMAGE SAFETY	70
1.6 AUTOMATION, ELECTRIC AND NAVIGATION	79
1.6.1 Machinery Automation	79
1.6.2 Electric	81
1.6.3 Navigation Bridge	89
1.7 STATISTICS, EFFICIENT TOOL FOR PROJECT DEVELOPMENT	95
2. DESIGN EXPERIENCE	104
2.0 General	104
2.1 Project Management	104
2.2 Project Control System for a Turnkey Supply	118
2.3 Project and Basic Design of 5400 m³ Chemical Parcel Tanker	122

2.4 Diesel-Electric Powered Ro-Ro Passenger Ferry with Large Lower Hold	127
2.5 Handy Size Ferries	133
3. MACHINERY CONSIDERATIONS	138
3.1 General	138
3.2 Diesel-Electric Tankers	138
3.3 Gas Turbines in Passenger Cruise Vessels	144
3.4 Fast Full Displacement Ferries	155
4. DESIGN METHODS	158