

Jan O. Fischer | Gerd Holbach

Cost Management in Shipbuilding

Planning, Analysing and
Controlling Product Cost
in the Maritime Industry

GKP Publishing

The background features a close-up, low-angle shot of a dark blue ship's hull, showing rivets and structural details. Overlaid on the bottom right is a semi-transparent screenshot of a software interface. The interface includes a table with columns for 'Item', 'Material Cost', 'Manufact. C.', 'Product Cost', and 'Notes'. Below the table, there are several checkboxes and labels for filtering and analysis options.

Item	Material Cost	Manufact. C.	Product Cost	Notes
	6,071,867	167,296	6,239,163	
	62	46,761	46,823	
	956,736	101,636	1,058,372	
	6,115,070	17,000	6,132,070	
	4,336,800	2,000	4,341,600	
	4,333,600	2,000	4,335,600	
	4,121,800		175,000	
			22,000	

View Group System
 Only groups with cost > 0
 Only groups according to
Container vessel
 Only groups according to
0000
Cost Structure Analysis
 All items

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Preface

Global competition in the shipbuilding industry, which is continuously intensifying due to the entry of developing countries into the shipbuilding market, leads to decreasing margins and enormous cost pressure in this industry. The disappearance of numerous smaller shipyards as well as the big players reducing their activities of new ship building indicate the need for measures to counteract this cost pressure.

The first oil crises in the 1970's and later oil price increases have substantially increased the importance of operating costs and the life cycle costs. Even if the significance of operating costs has sometimes temporarily waned in the face of periodic price reductions, the current state of limited resources now requires the integration of the entire life cycle of a ship into cost management.

This book was written in light of this situation. Our goal is to demonstrate how effective cost management strengthens and ensures a manufacturer's competitiveness in the maritime industry. To do so, we first provide an overview of the current state of cost management in the shipbuilding industry, showing the weak points in current methods, processes and systems. The book then shows how planning, analysis and management of costs should ideally occur with a focus on the cost management system "costfact". This system has been developed specially for the maritime industry and enables users to capitalize on the enormous potential arising from cost-oriented design and engineering.

The e-book contains the complete book as a pdf file, including the color illustrations in digital quality. For updates to the book, go to www.costfact.de/cost-management-book.htm.

We hope that this book provides all readers with many insights, and we wish them every success. If you like to suggest improvements or provide feedback then please get in touch via the costfact web site – **www.costfact.de**

Cologne and Berlin
December 2010

*Jan O. Fischer
Gerd Holbach*

Table of Contents

1	Cost Management is the Key to Competitive Shipbuilding	11
2	Current Cost Management Situation in Shipbuilding	15
2.1	Cost Management Organization and Processes	15
2.1.1	Specifications as the Basis of Cost Planning	15
2.1.2	Cost Planning in Building Group Systems	16
2.1.3	Cost Management based on Organizational Structure	18
2.1.4	Cost Planning, Analysis and Management Processes	21
2.2	Cost Management Methods and Instruments	24
2.2.1	Cost Indexes for Cost Prognosis	24
2.2.2	Life Cycle Costing	26
2.2.3	Application of the Allied Naval Engineering Publication (ANEP)	29
2.2.4	Managing Cost Information	32
3	Relevant Terms and General Methodological Foundations	37
3.1	Costs and Cost Calculation	37
3.2	Cost Prognosis based on Regression Analysis	39
3.3	Incorporating the Error Compensation Effect	44
3.4	Identifying Cost Drivers	46
3.5	Target Costing	47
3.6	Calculating the Life Cycle Cost	53
3.6.1	Financial Mathematics Principles	53
3.6.2	Incorporating Uncertainty	56

Table of Contents

4 The costfact Software System	61
4.1 System Objectives	61
4.2 System Structure and Administration	64
4.3 Calculation Structure Set-Up and Administration	65
4.3.1 Overview	65
4.3.2 Importing a new Building Group System	67
4.3.3 Building Groups System Administration	69
4.4 Project Creation and Administration	72
4.4.1 Creating a Project	72
4.4.2 Project General and Basis Data	73
4.4.3 Project-Specific Manufacturing Hourly Rate	74
4.4.4 Project Management	75
4.5 Integrating Technical Attributes	77
4.6 Analytic Cost Planning	79
4.6.1 Overview	79
4.6.2 Project-Specific Expansion of the Building Group System	81
4.6.3 Similarity Calculation	83
4.6.4 Detailed Cost Planning	89
4.6.5 Documentation of Planning Steps	91
4.6.6 Risk Analysis	91
4.7 Statistical Cost Planning	95
4.7.1 Defining the Regression Parameters	96
4.7.2 Selecting Reference Projects	97
4.7.3 Calculating the Regression Function	98
4.7.4 Applying the Regression Function	99
4.8 Integrating Specification and Calculation	100
4.8.1 Building Group-Related Specification Input	101
4.8.2 Generating and Using Text Modules	102
4.8.3 Import of Specifications from Word Documents	104
4.8.4 Outputting Specifications as Text Documents	108

4.8.5	Specification Display in Calculations	110
4.8.6	Consistency Check between Calculation and Specification	110
4.9	Target Cost Control	112
4.9.1	Project Controlling: Target Cost Attainment	112
4.9.2	Online Project Status Query	114
4.10	Cost Analysis	116
4.10.1	Integration of Actual Costs	117
4.10.2	User-Defined Cost Display	120
4.10.3	Cost Structure Analysis and Deviation between Budget and Actual Costs	124
4.10.4	Change Proposal Management	130
4.10.5	Identifying Cost Drivers	132
4.10.6	Cost Benchmarking through Project Comparison	134
4.10.7	Function Costs Calculation	134
4.11	Converting Projects into alternative Building Group Structures	138
4.12	Calculation Export	140
4.13	Cost Reporting with the costfact Basis Version	142
4.14	Life Cycle Costing	143
4.14.1	Measuring Life Cycle Costs	143
4.14.2	Project Evaluation and Comparison	148
4.14.3	Addressing Uncertainty	151
5	Appendixes	159
5.1	Glossary of Terms and Definitions	159
5.2	List of Figures	164
5.3	List of References	168
5.4	Building Group System ESWBS	170
5.5	About the Authors	196

1 Cost Management is the Key to Competitive Shipbuilding

The fierce competition in global shipbuilding and the extreme rise in costs are forcing shipyards to implement effective cost management during product development and manufacture. The term “cost management” refers to all measures affecting the cost structure at an early stage, particularly those that reduce cost. In the development and construction of new ships, these measures are primarily used to plan, control and manage product costs. However, the difficulty in shipbuilding cost management is that the majority of costs for a ship have already been defined before the start of production. An analysis of the degree to which costs in the product creation process can be influenced indicates that approximately 90% of the total costs for a ship are established through decisions made in the initial design and design engineering phases (see Fischer and Holbach 2008 (b), p. 58). At the same time, the processes involved in these two phases make up only a small portion of the total costs (see **Figure 1**). Therefore, a cost management system implemented during the early phases in shipbuilding is especially effective. The information about estimated costs for the ship and its elements, such as components or systems, should be obtained and incorporated into the decision-making process in order to capitalize on its potential. In reality, however, the available cost information at the beginning of the project is usually incomplete and imprecise, making cost management during the initial design and engineering phases highly complex and elaborate. For this reason, the potential of many cost reduction measures cannot be fully utilized.

Cost Management is the Key to Competitive Shipbuilding

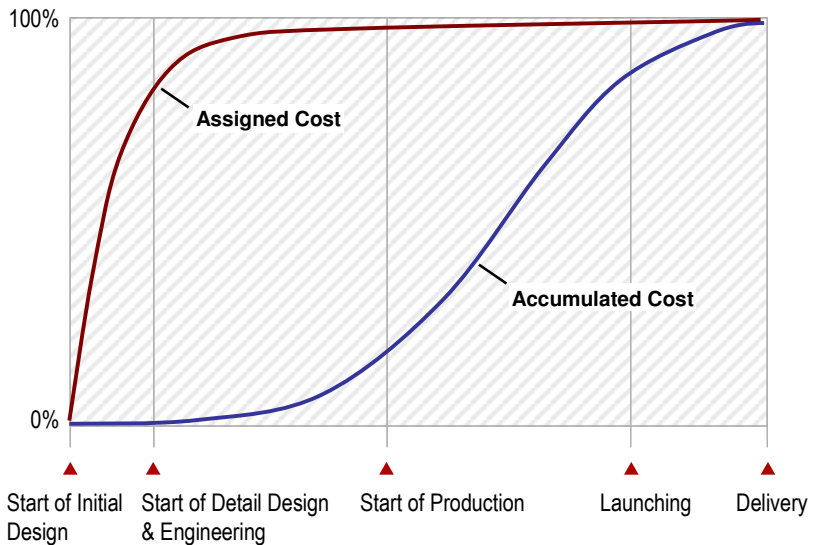


Fig. 1: Cost definition during project process

Cost prognoses play an important role during the bidding process, since offers must be generated quickly and accurately. The accuracy of calculated offers has a significant influence on the chances of winning the bid and the economic success of a customer order. On the one hand, the bidder does not want to lose the project to a competitor due to excessive price demands; however, if they are awarded the contract, the bidder must make sure that the offer price sufficiently covers all costs incurred and still contains a profit margin. Since bids must often be submitted on short notice, bid generation should be quick and uncomplicated, especially since not all of the bids submitted free of charge lead to an order.

Another important reason for generating cost prognoses is to evaluate design options: in cases where the options are equal from a technical standpoint, project leadership can select and offer the least expensive variant. Cost prognoses are also absolutely necessary for comparing the actual project status with targets. This, in turn, is the prerequisite for cost management measures during the project process (see Fischer 2007, p. 233).

Cost Management is the Key to Competitive Shipbuilding

In addition to optimize production costs incurred before the ship is operational, managing life cycle costs is also key in shipbuilding. Life cycle costs are the various costs the product user incurs through the purchase and utilization of the product (see Section 4.14). Since, a ship's purchase price often (depending on the ship type) comprises only a small portion of the total life cycle costs for the customer, it is not enough to only optimize production costs. When evaluating design concepts, shipbuilding companies should also take the sometimes contradictory effect on production costs vs. life cycle costs into account as well as how any adjustments will be perceived by the customer.

The next section provides a brief overview of the current state of cost management in the maritime industry. The relevant terminology and methodological principles necessary for understanding the cost management system “costfact” will then be presented. Section 4 describes costfact. The diagram in **Figure 2** will be visible on every left-hand page to make navigating the book easier and to show where various topics fit into the overarching cost management concept and which aspect of cost management the respective chapter addresses.

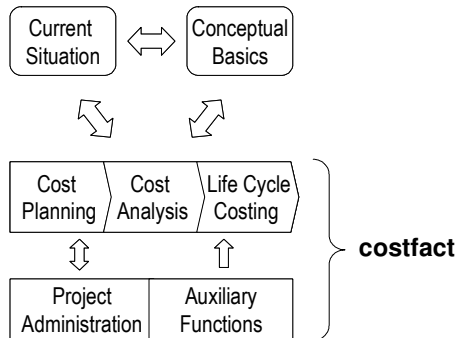


Fig. 2: Book navigation aid

The two top boxes (“Current Situation” and “Conceptual Basics”) represent the next two chapters. The lower portion of Figure 2 represents the costfact system, whose core functions are cost planning, cost analysis and life cycle costing. The bottom two boxes

represent project administration and information as well as further auxiliary functions that are also part of the costfact system.

Since the focus of this book is on the potential of cost management in the design and engineering phases, topics such as production optimization, procurement management or ship financing are not addressed here.

2 Current Cost Management Situation in Shipbuilding

2.1 Cost Management Organization and Processes

2.1.1 Specifications as the Basis of Cost Planning

A shipbuilding contract establishes the framework and extent of services a shipyard contributes during the construction of a ship. The specifications for the ship are an important part of this contract. Specifications are a formal description of the ship that is to be constructed and formally define and quantify the ship's features. Specifications are usually structured according to the building group structure of the ship itself (see Section 2.1.2); in other words, the required features are categorized and listed by the ship's components.

The scope of a complete set of specifications depends primarily on the type of ship it describes, whereby the scope has increased substantially in recent years. **Figure 3** demonstrates this change through the comparison of a current set of model specifications with one from 1960.



Fig. 3: Specifications from a model merchant ship in 1960 vs. today

The customer also communicates specifications as part of their request for a bid. In general, shipyards respond to requests for bids and generate cost prognoses using an extremely general specification set based on the superordinate building group level. The level of detail then increases during subsequent bidding phases (see Section 2.1.4).

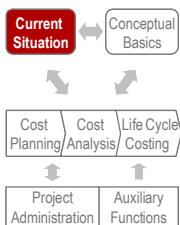
The following section presents the principle of building group systematics on which specifications are based. In shipbuilding, these systematics play a significant role during cost forecasting and in subsequent cost analysis and management.

2.1.2 Cost Planning in Building Group Systems

Cost planning in the early project phases is the prerequisite for the selection and implementation of cost management measures. In shipbuilding, cost planning is generally carried out in numeric building group systems specific to the shipyard. These systems could also be structured differently. For example, they could be based on the life cycle, e.g. on the chronological order in which costs are incurred. In practice, however, cost planning based on building groups predominates. These systems are based at least partially on the component structure of a ship. The group numbers themselves reflect the position of the different building groups in the construction hierarchy.

In addition to their own systems, shipyards utilize additional structuring systems at the same time, usually at the customer's request, such as NATO's ESWBS (Expanded Ship Work Breakdown Structure), see also Section 2.2.3. **Figure 4** shows the major groups in this system. A complete diagram of this system can be found in the Appendix (see NATO 2006, pp. 3-5).

The "SFI Group System" is another building group system. This system is a function building group oriented classification system for subdivision of ship technical and economic information. SFI Group System is constructed as a 3-digit decimal classification code and divides the ship into main groups, groups and sub-groups (see **Figure 5**).



0000 – GENERAL GUIDANCE AND ADMINISTRATION
1000 – HULL STRUCTURE, GENERAL
2000 – PROPULSION PLANT, GENERAL
3000 – ELECTRIC PLANT, GENERAL
4000 – COMMAND AND SURVEILLANCE
5000 – AUXILIARY SYSTEMS
6000 – OUTFIT AND FURNISHINGS
7000 – ARMAMENT
8000 – INTEGRATION/ENGINEERING
9000 – SHIP ASSEMBLY AND SUPPORT SERVICES

Fig. 4: ESWS (Expanded Ship Work Breakdown Structure) main building groups

The system can be broken down further into a 6-digit detail code and ultimately, into a 20-character code that provides specific information down to the equipment/component level.

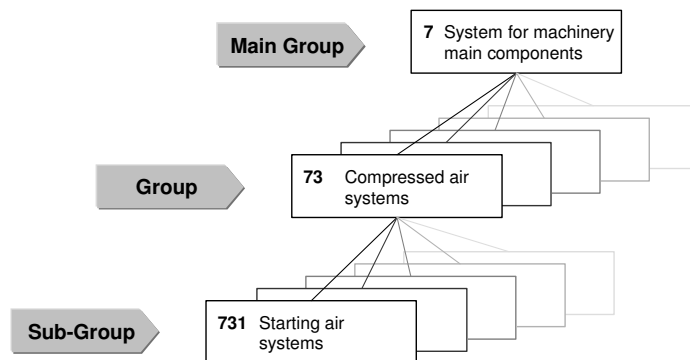


Fig. 5: SFI Group System: Example of the subdivision of main group 7 (see The Ship Research Institute of Norway, 1994, p. 6)

The German Navy Building Group Catalogue for German Military Ships published by the Federal Department of Defense Technology and Procurement is a further example of a building group system. It is also based on building group levels; its four levels are main groups, groups, main building groups and building subgroups.

Fischer | Holbach Cost Management in Shipbuilding

Cost pressure in shipbuilding has substantially intensified over the past few years. As up to 90% of the total costs are fixed at the start of production, it is obvious that cost optimization approaches should be considered in design and engineering. However, this is complicated by the fact that in these early phases cost information is insufficient. Therefore, the ship building process requires special cost management procedures. Against this background, the book describes the methods, processes and systems necessary for efficiently planning, analysing and controlling a ship's costs in all building phases. A main focus is on the software system 'costfact'. This system was developed especially for cost management in the maritime industry. costfact supports cost planning in the early design and engineering stages, cost analysis of already concluded projects and life cycle costing, including the in-service phase. The development of costfact is based on knowledge, which the authors gained by more than 10 years experience in industrial cost management respectively at Flensburger Schiffbau shipyard in leading positions and with responsibility for cost estimation and budgetary control. The book is intentionally very practice-oriented and addresses specialists confronted with the practical challenges of cost management in everyday business.

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