



Market Analysis and Strategic Concept to Launch Automatic Boat Handling and Storage Systems in Marinas

Diploma Thesis
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Abstract

It is a significant challenge for a company to launch a new product on the market. None of these projects will be undertaken without a comprehensive study to evaluate the market conditions. It is even more complicated to enter a new and underdeveloped, as is the case for an automated boat handling and storage system. This product is comparable with an indoor car park with the difference however that the boats are transferred by an automated process between water and storage space. The system is suitable for pleasure boats in particular motor boats as well as smaller yachts.

This diploma thesis offers an overview about pleasure boating especially focused on dry storage and handling both in and out of the water. Furthermore it illustrates the customer benefits, Kuenz's situation in competition and the potentials for the product in Europe, United States and Middle East and proposes finally a coordinated approach for the introduction of the product.

To complete the overview about boat handling, there are some interesting general facts about leisure boating and costs of boating.

Kurzfassung

Ein neues Produkt auf den Markt zu bringen bedeutet für ein Unternehmen eine sehr große Herausforderung. Begleitet werden solche Projekte immer durch eine ausführliche Machbarkeitsstudie, um die Bedingungen des Marktes zu evaluieren und bewerten.

Noch schwieriger ist die Situation wenn sich das Unternehmen dazu entschließt in einen neuen und noch nicht entwickelten Markt einzutreten, wie es bei automatisierten Boothandlings und Lagerungssystemen der Fall ist. Man kann solch eine Anlage mit einem Indoor Parkhaus vergleichen, mit dem Unterschied, dass Boote in einem automatisierten Prozess zwischen Wasser und Lagerplatz bewegt werden.

Firma Kuenz überlegt diese Herausforderung anzunehmen und entwickelte ein System, passend für Freizeitboote, genauer gesagt für Motorboote sowie kleine Yachten.

Diese Diplomarbeit bietet einen Überblick über Trockenlagerung und Boothandling in- und außerhalb des Wassers. Außerdem werden die Vorteile des Kunden, die Situation von Kuenz im Vergleich zur Konkurrenz und das Potential des Produktes für den Markt in Europa, USA und dem Mittleren Osten dargestellt.

Um den Überblick über Boothandling zu schaffen werden auch einige interessante allgemeine Fakten zur Freizeitbootsfahrt und die „Total Costs of Ownership“ für einen Bootsbesitzer aufgezeigt.

Abschließend bietet diese Arbeit ein strategisches Konzept für die Einführung des Produktes am geeigneten Markt.

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1 Introduction

This first chapter gives an overview of the company Hans Kuenz GmbH who initiated this diploma thesis, and their background for their interest in the topic. This is followed by the objectives, scope of the study and the chapter overview which form part of this introduction.

1.1 Hans Kuenz GmbH

Hans Kuenz GmbH was founded in 1932 in Hard at the Lake of Constance as a small metalworking shop. The company is 100% privately owned with currently about 400 employees at 4 locations worldwide. In addition to headquarter in Hard (Vorarlberg) the company has additional locations in Grosz-St. Florian (Styria), Kechnec (Slovakia) and in Raleigh (United States). Figure 1-1 shows the product portfolio of the company:¹

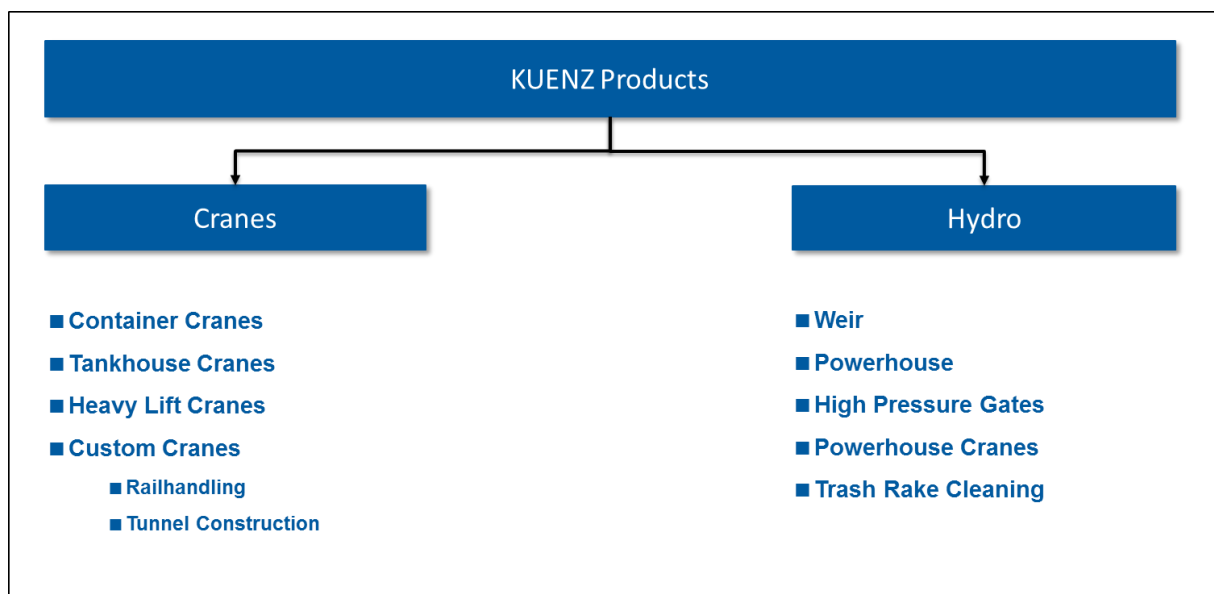


Figure 1-1: Kuenz Current Product Portfolio

Kuenz offers in house engineering and manufacturing and is market leader for inter-modal Container Cranes in Europe and North America. Furthermore they are also leading supplier for automated tank house cranes worldwide and specialist for equipment of hydropower plants as well as trash rake cleaning machines.²

Furthermore Kuenz provides comprehensive after-sales-services to support the customers beyond delivery and installation of the products. Professional and well trained engineers and staff offer support during the entire product life cycle. This covers inter alia the maintenance support, repair service, upgrades and provision of spare parts

¹ Compare 'Hans Kuenz GmbH' <<http://www.kuenz.com>> [accessed 20 November 2014].

² Compare 'Hans Kuenz GmbH'.

for all Kuenz products. Training classes and seminars for operational and maintenance issues are also provided. Hans Kuenz GmbH is well known for first class products and services covering a wide range of customers from different industries and sectors.³

The company has focused on the following core competencies⁴:

All from one source

The entire process is provided by Kuenz from design, production, installation and commissioning although to after sales support.

High number of qualified engineers

More than 25% of all employees are qualified engineers to support the customers with competence and excellent knowledge.

Continuous Improvement

Kuenz is well known as a very innovative company that focuses on customer needs and requirements. As such the extension of its product portfolio is to be expected and desirable which is background of this diploma thesis as explained in this chapter.

1.2 Background - Problem Statement

With automated boat handling and storage systems Kuenz GmbH complement its existing product portfolio combining their knowledge from the crane and hydro power sectors. These systems are products for the pleasure boat industry to put motorboats in and out of the water and dry store them automatically (or with only a few manual manipulations).

There have already been two offered proposals for marinas (yacht ports) in France where a company offered a whole boating infrastructure for customers. They involved Kuenz for the development of the both electric and automatic delivery systems for storage and retrieval of boats. In these cases, neither won any contract so far but the interest in the topic has led to this diploma thesis for gaining deeper knowledge about the market and potential business opportunities.

The demand in this market segment is estimated to be high as there are increasing numbers of boats and limited space in marinas for pleasure boats. In addition to the capacity there is a trend that boat owners don't want to take care about fulfilling "bothersome" obligations like putting the boats in and out of the water, store, maintain

³ Compare 'Hans Kuenz GmbH'.

⁴ Compare 'Hans Kuenz GmbH'.

and look after the boat to protect it against weather influences, damages through manipulation by hand as well as theft and vandalism. They want to use their boat if required as soon as possible even better completely maintained, refuelled, cleaned and in optimum condition.

In addition to the advantages for the boat owner the capacity of manpower in the marina can be reduced. The design of the building and special features of the whole complex can also force the development of the tourism in this area (advertising for pleasure boating for tourists).

There are already several storage systems operating world-wide. It must however be observed that boat handling and storage is generally done by standard techniques like slip ways, trailers, lift trucks, travel lifts, cranes and hoists which is very time-consuming.

The advantages of automated systems are as follow:

- Efficiency
- Faster availability of the boats
- Less expenditure of work
- Fewer human errors

A lot of know-how about a system with such a high level of automation as well as experience with development of cranes considering the tide may be a benefit for Kuenz to stand out from the competition in the market. Kuenz products are characterized mainly through uninterrupted manipulation.

1.3 Objectives

From a general point of view the objective of this thesis is to understand the customer needs and the market. The customer-oriented marketing strategy to launch this market will be generated from it in a later stage.

First of all it is important to gain knowledge about the leisure boating industry and to identify potential customers and current situation to manipulate boats in and out of the water to derive out their needs in terms of boat handling and storage. To get a better understanding of the market an overview about the total costs of boat ownership is required.

The aforementioned points will form the basis for a general validation of the automated Kuenz system, with respect to customer value and competitors. The goal is to make the practical use, aesthetics, image, product strengths and weaknesses and

the unique selling points more transparent. It is necessary to identify the company's potential position in the market.

A further objective of this thesis is to determine the target market including market access conditions and potential in Europe, North America and in Middle East (Gulf Cooperation Council).

Finally a strategic concept to launch automatic boat handling and storage systems will be derived from the market analysis.

The market analysis and the strategic concept are the basis for a marketing program, the creation of permanent profitable customer relationships and for gaining an equivalent value from the customer. However, this does not fall within the scope of this thesis.

1.4 Scope of Study (Demarcation)

The study focuses on analysis of European countries depending on the availability of data about pleasure boating. Further key markets analysed are those of the United States of America and Middle East. Middle East is defined as the Gulf Cooperation Council which consists of United Arab Emirates, Oman, Qatar, Kuwait, Saudi Arabia and Bahrain.

The estimated demand for boat handling and storage systems is the basis for setting the geographical scope of the study.

1.5 Structure

The "**Introduction**" gives an overview of Hans Kuenz GmbH, the company who initiates the thesis. This is followed by the motivation behind the topic, the objectives and the scope of study.

Chapter 2, "**Related Literature and Theoretical Focus**", shows the important steps out of theory to carry out a market analysis and develop a strategy concept to launch a product on the market. The theoretical background to the total cost of ownership calculation is included.

The third chapter "**Leisure Boating Market and Classification**" is also a theoretical section outlining the necessary technical knowledge about leisure boating as well as boat handling and storage, which helps to understand the practical part of the work.

The theoretical chapters are followed by the practical part which is structured in three chapters.

Chapter 4, “**Analysis Automatic Boat Handling and Storage System**”, covers inter alia the evaluation of the existing Kuenz product models according to past submitted proposals with respect to the customer value and in comparison to the competitors. Furthermore the chapter provides an overview of the market situation and potentials in Europe, United States and Middle East.

For the evaluation of the new Kuenz product, “**Cost and Fees**” of leisure boating are very important and analysed in Chapter 5. The total costs of ownership for boat owners and several statistics about financial burdens should also highlight the comparative advantage of the automated boat handling and storage system.

The last practical part is the “**Strategic Concept – Methodology**” which is a guideline for Kuenz to step into the market. The strategic concept will be derived out of the previous chapters.

Finally the “**Summary and Conclusions**” give a statement of the results and the prospects for the product launch.

2 Related Literature and Theoretical Focus

The aim of this chapter is to explain definitions from specific marketing literature in order to analyse the market for boat handling and storage systems and to define an appropriate strategy to launch the product.

2.1 Marketing in General

One common and popular definition of Marketing by Philip Kotler is:

*“Marketing is a social and managerial process by which individuals and groups obtain what they want and need through creating, offering, and exchanging products of value with others.”*⁵

Marketing is a management process, which is planned and carried out by the entrepreneur. The goal is it to identify the customer needs and wants, and satisfy them through the offer and exchange of products, services and experiences on the target market.

The aim of marketing is to create exchanges. Exchange describes obtaining a product from someone by offering something. Therefore should be at least two parties and each of them has something valuable for the other one. Each party is indeed willing to enter into a deal with the other respectively has the opportunity to decide to accept or reject the deal. Additionally each party should be able to communicate and deliver. This precondition makes exchange possible.⁶

2.2 The Process of Marketing

Figure 2-1 illustrates the simple 5-stage model of the marketing process.



Figure 2-1: Simple Model of the Marketing Process⁷

In the first four steps the entrepreneur aims to understand customer needs and desires, tries to create a benefit for them and build stable relationships to them. In the last step they get a reward for their efforts consisting of revenues, profits and long-term customer value.

⁵ Kotler, *Marketing Management: Analysis, Planning, Implementation, and Control*, 1994, p. 6.

⁶ Compare Kotler, *Marketing Management Millenium Edition*, 10th edn (Pearson Custom Publishing), p. 7.

⁷ Compare Kotler and others, *Grundlagen Des Marketing*, 5th edn, p. 39ff.

Step 1: Understand the market place, customer needs and wants

In the first step to introduce a new product it is important to understand the customer needs and wants and which market has to be satisfied. Therefore the benefits of the product, the competition and the country specific conditions have to be analysed.

Step 2: Design a customer-driven marketing strategy

The development of a successful marketing strategy requires finding out the relevant target market and the target customer to deal with. Moreover, it should be clear which benefits you promise to the customer with the product.

Step 3: Construct an integrated marketing program that delivers superior value

Based on the marketing strategy a marketing program can be derived. This program shows all the steps for an entrepreneur to step into the market. The core of this marketing program is the marketing mix with its four p's product, price, place and promotion which has to be clarified in this step.

Step 4: Build profitable relationships and create customer delight

The first three steps of the marketing program lead to most important part of building profitable relationships to customers. Customer Relationship Management (CRM) is maybe the most important concept for modern marketing. It is the whole process winning, retaining and developing new customer groups. For companies the customer benefit and service is more than a series of guidelines to process. It is more a company-wide attitude which is an important part of the whole company culture. Some entrepreneurs seek to delight customers by exceeding expectations.

Step 5: Capture value from customers to create profits and customer quality

Good customer relationship management is important to secure customers' loyalty. Nowadays it is more and more important to keep the existing than just attract new potential customers. Sometimes a small decrease in product satisfaction leads to huge decline in loyalty. It is the goal to have long-term customers to exploit their customer lifetime value. This value measures the profit a company can generate with a customer over its entire life cycle.

2.3 Market Research as Part of the Marketing Process

Just having a good business idea and growing total market is not enough for the entrepreneur's future success. Market research is a systematic collection, analysis and interpretation of relevant information to various marketing decisions. Knowledge can be gained on customer requirements about the product and possible variations including services, customer target groups and the differentiation of an entrepreneur to

the competitive companies. The two main doing parts of research are data collection and data analysis.⁸

The derived strategies as mentioned in chapter 2.2 step two can be an important influence for the profitability of the entrepreneur.

2.3.1 Analysing Needs and Trends in the Macroenvironment

Trends are directions or sequences of an event which have some momentum and durability. Therefore, products have a better chance to succeed if it is in line with a strong trend. These trends result from major macro environments including:

- **Demographic environment forces** like population, size and growth rate of population in different countries, cities, regions, the distribution of age and ethnic mix, the education levels, household patterns and regional characteristics and movements
- **Economic environment forces** or rather purchasing power which includes income, prices, savings and debt as well as credit availability.
- **Natural environment forces** like increased pollution levels, shortage of raw material, increased energy costs, changing role of government in environmental protection
- **Technological environment forces** include accelerating pace of technological change, unlimited opportunities for innovation, size of research and development budgets and regulation of technological change.
- **Political/legal environment forces** which means laws, government agencies and pressure groups which influence investigations by reputation and power
- **Social/cultural environment forces** depend on the beliefs, values and norms of the people. This consists of their view of themselves, of others, of organizations, society, nature and also the universe.⁹

2.3.2 Methods for Data Collection

It is possible to use existing or new data material for analysing the product, the competitors and the market. This distinction about new or existing data material is an important factor of the collection method. If new information is obtained, processed or developed, than it is called primary research. In the case of using existing information, secondary research is used.¹⁰

⁸ Compare P. Hague, N. Hague and Morgan, *Market Research in Practice* (Kogan Page Limited, 2004), p. 11ff.

⁹ Compare P. Hague, N. Hague and Morgan.

¹⁰ Compare Hammann and Erichson, *Marktforschung*, 3rd edn (Gustav Fischer Verlag), p. 60.

2.3.2.1 Primary Data

Primary data is information which is collected for the first time. This data is used to answer specific research questions regarding the problem under investigation which a secondary data cannot answer. In general gathering primary data is more expensive and time consuming than secondary data. Surveys, observations and experiments are the typical techniques for collecting primary data.¹¹

2.3.2.1.1 Survey Research

Survey research is the most popular way for gathering primary data. There are a few types of surveys with special characteristics listed below in Table 2-1. In-home personal interviews provide high quality information and customized questions. This type of survey is often very expensive because of travel costs and expenses.¹²

The mall intercept interview is a method that involves interviewing people in the common area of shopping malls. Probes for the interviewed people are common to visualize the product if possible. The costs and the time span are lower than for personal interviews because you reach more people and just need to pay for the place. It is very important to keep the interview as brief as possible, because the respondents have other different reasons for their presence in the shopping mall than answering time-consuming questions.¹³

Telephone interviews compared to the personal interview costs less but the costs increase rapidly due to the respondent refusals to participate.

Mail surveys benefits range from relatively low costs to elimination of anonymity for respondents. Mail questionnaires offer the respondent to answer more thoughtfully compared to telephone surveys where they have to answer immediately. In principle there are two common types of mail survey, the one-time mail survey and the mail panel survey. Mail panel surveys are a type of longitudinal study in which the unit of analysis is followed at specified intervals over a long period sometimes over years. The key feature of panel studies is that they collect repeated measures from the same sample at different points in time. One-time mail surveys take place once, generates little costs in less time. On the other hand the disadvantage is that the one-shot version of the survey produces low response rates, due to suspicion of spam or mail abundance.¹⁴

Executive interviews mean interviewing business people at their offices regarding industrial products or services as prospective users. It is a very expensive type of

¹¹ Compare Lamb, *Marketing*, 5th edn (Cengage Learning, 2011), p. 205.

¹² Compare Lamb, p. 207ff.

¹³ Compare Lamb, p. 208ff.

¹⁴ Compare Lamb, p. 207ff.

interviewing. After identifying and locating potential customers the qualified person has to agree to be interviewed to set a time for the survey. Interviewer must go to a special place at the appointed time. For using this method of survey the best interviewers are required because they are often interviewing on topics they know very little about. Essentially the same advantages and disadvantages as for in-home interviewing are valid.¹⁵

The focus group is a type of personal interviewing and consists of seven to ten people who participate in a group discussion led by a moderator. Incentives for participation of qualified consumers are typical for this type of survey. The place for the meeting is operated with audiotaping and maybe videotaping equipment. Sometimes a one-way mirror is used so that manufacturer or retailer of a product can watch the interview. It is an interview often used to brainstorm new product ideas or to show concepts for new products by asking a lot of questions to the focus group.

¹⁵ Compare Lamb, p. 207ff.

| Characteristic | In-Home Personal Interviews | Mall Intercept Interviews | Telephone Interviews | One-Time Mail Surveys | Mail Panel Surveys | Executive Interviews | Focus Groups |
|---|-----------------------------|---------------------------|------------------------|-----------------------|--------------------|----------------------|--------------|
| Cost | High | Moderate | Moderate | Low | Moderate | High | Low |
| Time span | Moderate | Moderate | Fast | Slow | Relatively slow | Moderate | Fast |
| Ability to show concept to respondent | Yes | Yes | No | Yes | Yes | Yes | Yes |
| Management control over interviewer | Low | Moderate | High | N/a | N/a | Moderate | High |
| General data quality | High | Moderate | High to moderate | Moderate to low | Moderate | High | Moderate |
| Ability to collect large amounts of data | High | Moderate | Moderate to low | Low to moderate | Moderate | Moderate | Moderate |
| Ability to handle complex questionnaires | High | Moderate | High if computer-aided | Low | Low | High | N/a |

Table 2-1: Survey Types with Characteristics¹⁶

2.3.2.1.2 Observation Research

Observation research relies on what people do. It is a systematic process of recording the patterns of people regarding behaviour, objects and occurrences. There is no questioning or communication and it can be distinguished between people watching people, people watching an activity and machines watching people.¹⁷

¹⁶ Compare Lamb, p. 207ff.

¹⁷ Compare Lamb, p. 211.

2.3.2.1.3 Experimental Research

Test subjects are divided into comparable groups. Every group takes part in a particular investigation the other group does not participate. The purpose of the experiment is to find out different reactions of groups and analyse them. In general assumptions on certain cause-and-effect relationships are possible.¹⁸

2.3.2.2 Secondary Research

Especially for the beginning of a study it is common to use secondary data like the database of a company. Beyond this there is a wide range of possible information sources starting from company's digital library, public or university libraries as well as economic or governmental publications.¹⁹

Online data base and internet data sources are a common way for collecting secondary data. Beside commercial websites, offering information for a fee there are associations, government agencies, business magazines and news providers who offer information for free. However, these are often quite hard to find in the World Wide Web.²⁰

It is quite easy, fast and cheap to get secondary data in relation to primary data but there are limitations in gathering secondary data. It is possible that some information still not exists so far and requires a special prove regarding relevance, accuracy and objectivity.

2.3.3 Advantages of Internet Surveys

The popularity of the internet is growing very fast and therefore the internet survey offers great advantages based on the following factors:

- real-time reporting tool that can be distributed to thousands of potential respondents simultaneously
- significantly reduced costs
- short timespan for survey
- various types of possible questions (personalized questionnaire)
- data are available immediately (also shareable)
- high quality data and long-term comparable
- International surveys easy to proceed

¹⁸ Compare Kotler and others, p. 379.

¹⁹ Compare Kotler and others, p. 375f.

²⁰ Compare Kotler and others, p. 375f.

2.3.4 Disadvantages of Internet Surveys

Internet surveys can have limited sampling and respondent availability. This is possible e.g. through population with no internet access or availability to respond to online questionnaires. It is also possible that the email reaches the wrong person, who does not forward the email to the correct recipient. Other weaknesses are possible cooperation problems due to suspicion of spam or mail abundance.²¹

2.3.5 Interpretation and Communication of Market Research Results

The interpretation is one of the most important stages of marketing. The best market research is useless without the right conclusion.

2.4 SWOT Analysis as a Strategic Analysis of the Situation

SWOT is an abbreviation for the four assessment components strength, weaknesses, opportunities and threats and is a widespread accepted strategic tool intended to evaluate a company's strategic focus and competitive advantage. This tool is a simple way to carry out and offers in addition an inexpensive possibility for analysis.²²

2.4.1 SWOT Matrix

Table 2-2 shows the main structure of the SWOT analysis²³:

| Internal Analysis | |
|-------------------|------------|
| Strength | Weaknesses |
| | |
| External Analysis | |
| Opportunities | Threats |
| | |

Table 2-2: SWOT-Matrix Template

²¹ Compare Cvent, 'Advantages and Disadvantages of Online Surveys' <<http://survey.cvent.com/blog/market-research-design-tips-2/advantages-and-disadvantages-of-online-surveys>> [accessed 24 January 2015].

²² Compare Ferrell and Hartline, *Marketing Strategy*, 6th edn (Cengage Learning, 2012), p. 39f.

²³ Compare Lamb, p. 25.

2.4.1.1 Strength and Weaknesses

Strength and weaknesses belong to the internal analysis of the organization and focuses just on properties of the company, which are relevant for success or failure of the product.

2.4.1.2 Opportunities and Threats

The opportunities and threats in the SWOT analysis apply to the external facts, which influence the future situation of the company. They should be listed and mentioned ranked according to the importance and the main focus.²⁴

2.4.2 Major Advantages of SWOT Analysis

The SWOT analysis has the following advantages:

- Relatively simple method to determine the company's position derived from the internal and external view
- Lower costs (no extensive training or technical skills to be used successfully)
- Recurring analysis to represent the changes (e.g. annually)
- Flexibility of adapting new information into SWOT framework
- Organization of secondary as well as primary data in the same framework
- Wide diversity of information sources possible
- Potential for change clearly apparent
- Simple illustration for potential of change possible through graphic illustration with fever charts
- Force of collaboration and information exchange between different functional areas.²⁵

2.4.3 Major Disadvantages of SWOT Analysis

The most common criticism against the analysis is the simplicity which often leads to narrowly focused analysis. Furthermore, only the internal view about the strength, weaknesses, opportunities and risks are represented. In addition it is important to do the analysis periodically e.g. annual to keep the information up to date.

2.5 Strategic Concept

Having a good idea is not enough to be successful on the market nowadays. After analysing the market for customer needs, competition and other product variants with

²⁴ Compare Kotler and Bliemel, *Marketing Management: Analyse, Planung Und Verwirklichung*, 10th edn (Schäffer-Poeschel Verlag Stuttgart).

²⁵ Compare Kotler and Bliemel.

strength and weaknesses it is necessary to define concepts which fits to the requirements based on this knowledge.

2.5.1 Decision on Customer Type

For segmenting consumer markets background characteristics, attitudes and behavior of customers are crucial. Customer background characteristics include the demographic characteristics like gender age, geographic location, subculture, socio-economic characteristics like income, occupation, terminal education age and social class, personality characteristics and at least the lifestyle characteristics. Segmentation on the basis of attitudes gets closer to the reasons for behavior to a product particularly perceptions and preferences. Purchase-, consumption- and communication behavior are also components for segmenting customer groups.²⁶

The low-end customer is defined as a user of mainstream products who seems to be not interested in offers for products with improved performance. They are not willing to pay higher prices to get them.²⁷

The new-market customer is also called nonconsumer. This kind of customer is very difficult to reach because they have to demonstrate the advantages for them to consume the product.²⁸

2.5.2 Growth by convincing Low-end Customer

The best way to convince this kind of customers is to offer them further more developed products with cost benefit. This is a profitable and innovative solution for the consumer as well.²⁹

2.5.3 Growth by convincing New-market Customers

There are 4 steps for entrepreneurs to extract growth from nonconsumption. These are³⁰:

- Simple and inexpensive solution (“only good enough”)
- The potential customer compares the product with having nothing at all because they are excited about having a solution, even if it is not as good as other products. Therefore, it is quite easier to convince them
- The technology should be challenging but also foolproof

²⁶ Compare Hooley, Piercy and Nicoulaud, *Marketing Strategy & Competitive Positioning*, 5th edn, p. 189ff.

²⁷ Compare Hooley, Piercy and Nicoulaud.

²⁸ Compare Hooley, Piercy and Nicoulaud.

²⁹ Compare Christensen and Raynor, ‘Exec Summaries The Innovators Solution’, p. 4 <<http://de.slideshare.net/rajeshsundararajan/exec-summaries-the-innovators-solution>>.

³⁰ Compare Christensen and Raynor, p. 4.

2.5.4 Product Strategy

Attractive ideas must be refined into testable product concepts. The marketing mix is a guideline to provide a framework for the marketing program to launching the product on the market. Additional conclusions gained from the SWOT Analysis and the direct comparison to the competition with its strength and weaknesses forces the success of the entrepreneur.

2.5.4.1 Strategy inspired by the Marketing Mix

The four famous components to define a strategy for a product launch are product, price, promotion and place. It is evident that the decision on each component of the mix cannot be considered isolated from the others.³¹

2.5.4.2 Possible Strategies of SWOT Analysis

The possible strategies of a SWOT analysis are as follow³²:

S/O-Strategy (Strengths/Opportunities): The Strength of the company will be used to take advantage of the possible chances for the company environment. It is a targeted use of the own strengths to successfully realize the opportunities

S/T-Strategy (Strength/Threats): Neutralize or at least to mitigate the risks for the company through the targeted use of the own internal strength. The goal is to cope with the foreseeable risk better than the competition.

W/O-Strategy (Weaknesses/Opportunities): Take the advantages of the business chances to thereby eliminate or mitigate weaknesses.

WT-Strategy (Weaknesses/Threats): Reduce of internal weaknesses to reduce the dangers of the business environment.

2.5.5 Competitive Differentiation and Positioning Strategy

After analysing the potential competitors as well as their strength and weaknesses, the next step is to make a competitive differentiation and positioning. The goal is to combine chosen market targets and competencies and assets of the company to fulfil these chosen targets more efficient and differentiated than the competition.

³¹ Compare Hooley, Piercy and Nicoulaud, p. 45f.

³² Compare Deltl, *Strategische Wettbewerbsbeobachtung*, 1st edn (Betriebswirtschaftlicher Verlag Dr. Th. Gabler, 2004), p. 93f.

Differentiation is designing differences to distinguish the offer of the company from competitors while positioning focus on designing the offering and image to occupy a meaningful and distinct position in comparison to competitors in the target customer market.³³

Figure 2-2 illustrates the six main dimensions for positioning which are price, grade, service, customization, benefit differentiation and innovation.

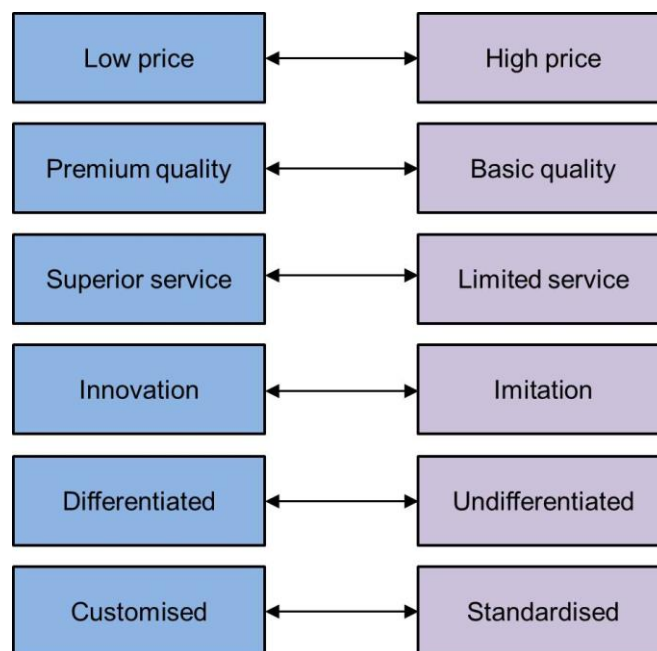


Figure 2-2: Six Dimensions of Positioning³⁴

2.5.5.1 Price Positioning

The low-price and the high price positions are two basic directions for price positioning. Costs should be at least as low as or better lower than competitors to survive with a low-price strategy. For the low-price suppliers and the company's own operations effective cost-control systems are necessary. Costs should be kept to a minimum for internal efficiency. In addition, to keep the price at the lower potential limit still carries a very high risk, that the competitors in the higher price category offer a product with better quality or product image comparable to the offered low-price product. High price positions occur generally in combination with higher quality and clearly superior image. These companies have to be effective and creative in promotional campaigns to survive on the market by finding customers which are willing to pay a premium price for the product.³⁵

³³ Compare Hooley, Piercy and Nicoulaud, p. 516ff.

³⁴ Compare Hooley, Piercy and Nicoulaud, p. 517.

³⁵ Compare Hooley, Piercy and Nicoulaud, p. 518.

2.5.5.2 Quality Positioning

For providing high quality products effective internal control systems technical competence, particularly in engineering and manufacturing are required. Beyond them the supply-chain management to provide high quality delivery from suppliers is an important issue for quality positioning.³⁶

2.5.5.3 Innovation Positioning

The core strategic focus of innovation positioning is to be first to step into the market and continuously improve the product.³⁷

2.5.5.4 Service Positioning

Offering superior or rather customized service to the target market is becoming increasingly popular but it is very difficult to find the required level or type of service. Therefore a close relationship to the customer is required. These customers are more service than price-sensitive. The operating employees have to be skilled and motivated to fulfil the requirements.³⁸

2.5.5.5 Differentiated Benefits Positioning

The goal of this positioning element is to reach segment leadership by finding alternative benefit segments within the markets and provide it to the customers. To fulfil this positioning it is important to identify the customer preferences to satisfy their needs.³⁹

2.5.5.6 Customised Positioning

The goal is to offer products tailored to the needs of individual customers. Therefore, customer bonding and relationship building are necessary to ensure success in terms of customised positioning. The most important skill for the entrepreneur is a combination of outside-in competencies, which means to force advantages out of customer requirements.⁴⁰

2.5.6 Geographical Strategy

There are several factors to consider for entering the international market. The company has to decide on the countries to consider. Challenges in international marketing are as follow⁴¹:

³⁶ Compare Hooley, Piercy and Nicoulaud, p. 518.

³⁷ Compare Hooley, Piercy and Nicoulaud, p. 518.

³⁸ Compare Hooley, Piercy and Nicoulaud, p. 519.

³⁹ Compare Hooley, Piercy and Nicoulaud, p. 519.

⁴⁰ Compare Hooley, Piercy and Nicoulaud, p. 520.

⁴¹ Compare Kotler, *Marketing Management: Analysis, Planning, Implementation, and Control*, p. 404.

High foreign indebtedness - many countries are not able to pay even the interest because they have difficult financial problems.

Unstable governments - in several countries indebtedness, inflation and high unemployment lead to the risk of expropriation, nationalization and limits on profit repatriation. This risk can be minimized through buying political-risk-assessment reports

Foreign-exchange problems – the value of country's currency is decreasing due to high indebtedness and economic and political instability. To minimize the risk the payment in hard currency with profit –repatriation rights is usual in such countries.

Foreign-government entry requirements and bureaucracy – Foreign companies are getting limited by the government through regulations on them.

Tariffs and other trade barriers – the government often establish high tariffs to foreign companies to protect their own industries. Invisible trade barriers are a common example for preventing international transaction.

Corruption –bribes to cooperate are usual in many countries.

Technological pirating – to avoid copying of products and stealing of core competitive advantage is a common challenge. This applies to branches like machinery, electronics, chemicals and pharmaceuticals.

High cost of product and communication adaption – each foreign market has to be studied carefully before launching the product abroad. Laws, economics, culture and politics have to be evaluated and therefore, the product has to be adapted to the country specific market requirements.

Shifting borders – there are a lot of changes of international boundaries It is important to know the existing conditions for dominating and shaping of economic behaviour within the borders of the country.

2.6 Total Cost of Ownership

Total cost of ownership (TCO) is an instrument of strategy-based cost management which takes several cost factors of an ownership into account. This definition includes the timeframe between starting to own something until not owning the product anymore. The calculation considers the costs over a certain period. The TCO applies to the direct and indirect costs, to analyse the whole costs from acquisition and use to the disposal of a good which also considers the service costs. The various cost fac-

tors depending on the type of product, the relevant department of the company that performs the analysis.⁴²

2.6.1 Areas of Application

The calculation of total cost of ownership is common for the departments of purchase, logistics, supply chain management, manufacturing, maintenance, sales, controlling and research and development. Especially for the sales department the calculation is getting more and more important because the end customer is also interested in these costs for the timespan of use.

2.6.2 Approach for this Thesis

Kuenz's definition of total cost of ownership is congruent with the definition of the literature with the exception of limiting the timeframe. The calculation includes, identifies and considers all costs during a given period instead of the whole lifetime, which means that the purchase price and the costs of disposal is not part of this diploma thesis. The cost of the annual interest rate for a loan is included.

⁴² Compare Geißdörfer, *Total Cost of Ownership (TCO) Und Life Cycle Costing (LCC)* (LIT Verlag, 2009), p. 14f.

3 Leisure Boating Market and Classification

This chapter outlines basic information and definitions on watercrafts and the leisure boating industry especially in terms of boat handling and storage with general facts and figures.

3.1 Leisure Boating in General

Leisure boating contains all types of boating for pleasure or recreational purpose. As such the leisure boat is a non-commercial vessel of any size, which is designed for non-commercial use. At least one person operates the boat and is carried within the confines of the hull. Windsurfers, surfboards, rafts and tubes are not included in the definition of a leisure boat.⁴³

The world boating market shrank between 2007 and 2011 because of the economic crisis but in comparison to other branches it was quite resilient. Since 2011 the market has been slowly recovering and the trend seems to be positive. Especially the market for second hand boats is booming.⁴⁴

Leisure boaters prefer boats which are easy to handle and operate and their environmental awareness is growing (judging by more hybrid engines). In addition increased price sensitivity can be observed.

The main importing countries of the leisure boat industry are Spain, the United States of America, France, Canada and the United Kingdom. The leading country in exporting leisure boats is USA followed by United Kingdom, Italy, Cayman Islands and France.⁴⁵

3.2 Basic Information on Watercraft

A watercraft is used or capable of being used for transportation on the water and consists of the following categories:

- 1.) A vessel operated by machinery temporarily or either permanently
- 2.) A sail boat (excluding sail boards)
- 3.) An inflatable, manually propelled boat
- 4.) A canoe or rowboat⁴⁶

⁴³ Compare Westlawn Institute of Marine Technology, 'Maritime Definitions'

<http://www.westlawn.edu/student_center/definitions.asp> [accessed 4 January 2015].

⁴⁴ Compare Ubifrance - French Trade Commission, *Rapport Nautique 2013*, 1 October 2014.

⁴⁵ Compare Ubifrance - French Trade Commission.

⁴⁶ Compare Ohio Laws and Rules, 'Definition Watercraft' <<http://codes.ohio.gov/orc/1547.01>> [accessed 1 February 2015].

There are a few important classifications regarding different factors on watercraft. There is a distinction regarding size, propulsion system, hull type and purpose of use. In terms of size watercrafts can be divided into ships, boats or yachts.

3.2.1 Classification by Size

The **Length overall (LOA)** denotes the length from forward most point of the bow to the outermost end of the stern of a vessel's primary hull structure and is an important unit for dimensions of a vessel.⁴⁷

Anchor rollers, bowsprits, push pits and railings, transoms as well as any swimming platforms are not included in the length overall because they are not fixed parts of the hull structure.⁴⁸

A **boat** describes any vessel or conveyance which floats or operates on the water. The size of a boat is under 197 feet (60 metres) length overall (LOA). The purpose using a boat can be for pleasure commercial or residential issues. Another definition of a boat is a small craft. The size of a ship is equal or above 60 metres length overall.⁴⁹

A **yacht** is defined as vessel that floats on the water which is used for pleasure, not for commercial purpose with the exception of a charter yacht which is operated by a professional crew and paid by passengers who use the yacht for pleasure. There is no real cut-off for the size of a yacht but in the United States of America a yacht is bigger than 30 feet (9.1 metres) LOA. Below this size it usually called pleasure boat or recreational boat. It should be noted that the definition yacht is often associated with luxury and wealth so that sometimes a luxury pleasure boat smaller than 30 feet is also called yacht.⁵⁰

Very large luxury vessels for private pleasure are called mega or super yachts. **Mega yachts** are generally over 100 feet (30.5 metres) LOA while **super yachts** are vessels over 150 feet (45.7 metres). As mentioned for the difference between boats and yachts there is also no firm cut-off point for group this large vessels.⁵¹

Personal watercrafts (PWCs) are small vessels with a LOA commonly below 15 feet (4.6 metres) with no interior. The driver rides the PWC by sitting on top of it.

⁴⁷ Compare Westlawn Institute of Marine Technology.

⁴⁸ Compare Westlawn Institute of Marine Technology.

⁴⁹ Compare Westlawn Institute of Marine Technology.

⁵⁰ Compare Westlawn Institute of Marine Technology.

⁵¹ Compare Westlawn Institute of Marine Technology.

The PWCs have engines propelled by jet drives therefore they can reach high speed levels.⁵²

3.2.2 Classification by Propulsion System

In general the propulsion system has to be distinguished between human, wind or engine powered boats in different varieties. Rowing or paddling boats are set in motion by human power while a sail boat is driven by wind energy. Some sail boats have an engine additionally. Engine powered boats occur in different varieties, operated e.g. by inboard or outboard engine, paddle wheel, water jet or air fans. Boats operated by inboard or outboard engine are called motor- or powerboats.⁵³

3.2.3 Classification by the Number of Hulls

Monohull boat consists of only one hull. The line of intersection of the water surface and the boat forms a single closed curve. Multihull boats like catamaran, trimaran or pontoon boats have more than one or a special type of hull.⁵⁴

3.2.4 Classification by Purpose of Use

In general you can distinguish between pleasure and commercial but also between civil and military use. Sometimes the boat shape is adapted to the intended use like for fishing boats.⁵⁵

3.3 Classification of Leisure Boats and Yachts

Leisure vessels, also known as pleasure or recreational boats, are vessels used for sport or recreational purposes and do not operate for financial gain⁵⁶. Yachts are used exclusively for pleasure as already mentioned in chapter 3.2.1. **In this thesis there is no distinction between motor boat and motor yacht (except super yacht, mega yacht or yacht operated by a professional crew) because there is no real cut-off for the size of a yacht and the degree of luxury is not relevant for the Kuenz product.**

The system which is proposed by Kuenz is suitable for motor boats. The following subordinated chapters therefore depend on this demarcation and focus on engine powered boats and yachts.

⁵² Compare Westlawn Institute of Marine Technology.

⁵³ Compare Westlawn Institute of Marine Technology.

⁵⁴ Compare Cornell University Law School, 'Definition Number of Hulls' <<http://www.law.cornell.edu/cfr/text/33/183.3>> [accessed 5 January 2015].

⁵⁵ Compare Westlawn Institute of Marine Technology.

⁵⁶ Compare Virtual Expo Company, 'Online Boating and Maritime Exhibition' <<http://www.nauticexpo.com/>> [accessed 2 January 2015].

The motorboats which are relevant for the Kuenz product can be classified as follow:

- Motor boats with cabin
- Open motor boats
- Offshore powerboats
- Inflatable motor boats

3.3.1 Motor Boats with Cabin

Cabin boats are power boats with a cabin that have living accommodations. Figure 3-1 shows the Faeton 300 Fly, a type of cabin cruiser destined to be a family sports cruiser. This type of a boat is often used for one or more overnight stays on the sea or lake.⁵⁷



Figure 3-1: Motor Boat with Cabin

There are several variants belonging to this group of motor boats. This includes popular boats like Day-, Cabin-, Sport Fishing, Canal-, Flybridge- and Express cruisers as well as a Runabout and Cuddy boats.⁵⁸ Further details about the types are mentioned in chapter 3.3.5.

3.3.2 Open Motor Boats

The open motor boats differ from the cabin boats by the deck layout which is entirely open. The open deck is also ideal for fishing and is very often combined with an outboard engine like the Centre Console boat 39 Cigarette Racing Top Fish shown in Figure 3-2. Open motor boats with cabins are also a variant on the market but the typical one is not commonly used for an overnight trip.⁵⁹

⁵⁷ Compare Virtual Expo Company.

⁵⁸ Compare Virtual Expo Company.

⁵⁹ Compare Virtual Expo Company.



Figure 3-2: Open Motor Boat

The main types of open motorboats are Centre Console boats, Open cruisers, Runabouts, and Jon-, Bass, and Bay boats.⁶⁰ Further details about the types are mentioned in chapter 3.3.5.

3.3.3 Offshore Power Boats

Offshore power boats develop very high speeds and have a Spartan interior. Figure 3-3 shows the 43 ZR offshore power boat from Donzi Marine, a manufacturer of recreational power boats.⁶¹



Figure 3-3: Offshore Power Boat

Offshore power boats are available inter alia as a Centre Console boat, Runabout or Express cruiser with as well as without cabin. There are also inflatable boats designed as offshore power boats.⁶² Further details about the types are mentioned in chapter 3.3.5.

3.3.4 Inflatable Motor Boats

The main characteristics of inflatable boats are the buoyancy of the existing air chambers. Very popular is the use of inflatable boats as a tender but also cabin inflatable motorboats are available on the market. The structure of the boat can be rigid (RIB) as shown in Figure 3-4 with the ABSOLUTE-55-FLY1 from Sirocco Marine`s

⁶⁰ Compare Virtual Expo Company.

⁶¹ Compare Virtual Expo Company.

⁶² Compare Virtual Expo Company.

BRIG-inflatable boats or foldable. Further details about the types are mentioned in chapter 3.3.5.⁶³



Figure 3-4: Inflatable Motor Boat

Inflatable motor boats are very popular by offering a low centre of gravity and low user-maintenance costs. Their weaknesses are the high purchase cost and limited spaces due to the volume occupied by the balloon.

3.3.5 Explanation of Boat Types

The length of **Day-, Cabin- or Express cruisers** ranges from 21 – 45 feet (6.4 – 13.7m) in length. They have a cabin in the bow of the boat. The cabins of these cruisers are designed for one or more overnight stays and have enough space for a small galley and several berths.⁶⁴

Two typical variants are Center- and Dual **Console boats**. The typical length of a Center console boat is 13 – 45 feet (4 – 13.7m). Their control is on a console in the centre of the boat. Dual Console boats consist of two dashboards as well as windshields and have a typical length of 16 – 30 feet (4.9 – 9.1m).⁶⁵

Runabouts are very popular motor boats. It is a small power boat with 14 – 24 feet (4.3 – 7.3m) in length. Runabouts are multipurpose boats mostly used for water sports, cruising and fishing and driven by an outboard or stern-drive engine.⁶⁶

In general Cuddy cabins refer to the cabins in boats that are of smaller size. **Cuddy boat** sizes vary between 18 – 28 feet (5.5 – 8.5m). The design of a cuddy boat has significant characteristics. The bow is covered in a way that the place above can be utilized and specific bunks provide sleeping possibilities.⁶⁷

⁶³ Compare Virtual Expo Company.

⁶⁴ Compare Boat U.S., 'Types of Powerboats and Their Uses' <<http://www.boatus.com/newtoboating/types-of-boats-powerboats.asp>> [accessed 16 January 2015].

⁶⁵ Compare Boat U.S.

⁶⁶ Compare Boat U.S.

⁶⁷ Compare Marine Insight, 'Definition Cuddy Boat' <<http://www.marineinsight.com/sports-luxury/boating/what-are-cuddy-boats/>> [accessed 2 October 2014].

A **Walkaround boat** is generally between 20 – 30 feet (6.1 – 9.1m) in length and is a mixture between a Center Console and a Cuddy boat. This type is often used for anglers because they can walk around the cabin for fishing.⁶⁸

Flying Bridge boat is a designation for a motor cabin featuring bridge and double cockpit. It is often used as a fishing boat.⁶⁹

Jon boats are typically from 10 -18 feet (3 – 5.5m) in length and used for boating in shallow water. It's an inexpensive variant perfect for boating beginners.⁷⁰

Bass boats are used for freshwater fishing and have a usual size range between 14 – 23 feet (4.3 – 7m). They are more expensive than Jon boats because of special gears and high horsepower motors. Significant characteristics of Bass boats are low freeboard and a v-shaped hull.⁷¹

Bay boats have low profiles and they are 18 – 24 feet (5.5 – 7.3m) in length. The material of the boat is fiberglass because it is used in salt or brackish waters in shallow bays, estuaries or near shore.⁷²

A **Rigid Inflatable boat** (RIBs) hull consists of fiberglass or aluminium beside inflatable outer tubes. In comparison to Inflatable boats the RIBs are typically faster, larger, and can carry more weight.⁷³

3.4 Definition of Harbours, Ports and Marinas

The definition of a harbour is as follow:

*A harbour can be defined as a sheltered area of the sea in which vessels could be launched, built or taken for repair; or could seek refuge in time of storm; or provide for loading and unloading of cargo and passengers.*⁷⁴

Harbours are classified as natural, semi-natural or artificial Harbours. Natural Harbours have natural formations offering safe discharge facilities for boats and ships on sea coasts, in the shape of creeks and basins while semi-natural Harbours requires man-made protection only at the entrance because of inadequate natural formations.

⁶⁸ Compare Boat U.S.

⁶⁹ Compare Boat U.S.

⁷⁰ Compare Boat U.S.

⁷¹ Compare Boat U.S.

⁷² Compare Boat U.S.

⁷³ Compare Boat U.S.

⁷⁴ S.P. Bindhra - VSA Educational and Charitable Trust's Group of Institutions - Department of Civil Engineering, 'Harbour Engineering', p. 1 <<http://eryuvaraja.weebly.com/uploads/2/1/3/4/21344826/unit-v.pdf>> [accessed 20 September 2014].

Natural facilities at artificial Harbours (also called man-made Harbours) are not available and have to be constructed.⁷⁵

*The term port is used to indicate a harbour where terminal facilities, such as stores, landing of passengers and cargo, etc. are added to it.*⁷⁶

There are 2 distinctions for ports. Referring to the location there are inland ports at rivers, canals or lakes or sea ports at the coast to the ocean/sea.

Another differentiation is the intended use of the port. This includes

- Commercial port for good handling
- Passenger port like Ferry ports or marinas
- Naval base
- Shipyard, Dock
- Fishery port
- Port of construction
- Port of refuge

Marinas are also known as yacht ports. The docks, berths and facilities are aligned to the sector of recreational boating. They accommodate particularly sail- and motor boats. The service of marinas, depending on the size and popularity can consist of security services, parking spaces for vehicles owners and visitors, shopping facilities, restrooms, information services, restaurants, maintenance and repair service for boats, gas stations, boat lifting devices as well as boat storage.⁷⁷

3.4.1 Approach for this Thesis

The proposed Kuenz product is focused on the recreational boating market with the result that marinas, shipyards and docks are relevant ports for this thesis.

3.4.2 Types of Marinas

In general marinas can be distinguished between commercial and club marinas. A **club marina** operates in a traditional committee or membership manner and contains marina berths and moorings. Additionally a club house with amenities, food and beverage, with or without repair facilities, are available. **Commercial marinas** are not

⁷⁵ Compare S.P. Bindhra - VSA Educational and Charitable Trust's Group of Institutions - Department of Civil Engineering, p. 1ff.

⁷⁶ S.P. Bindhra - VSA Educational and Charitable Trust's Group of Institutions - Department of Civil Engineering, p. 6.

⁷⁷ Compare S.P. Bindhra - VSA Educational and Charitable Trust's Group of Institutions - Department of Civil Engineering.

bound to sailing or other boat clubs but it should be noted there is some overlap because commercial marinas often have some operating clubs within their marina.⁷⁸

3.4.2.1 Classification of Marinas by Ownership

Public marinas are owned by a country, region, public association, municipal city or city. For building new marinas, changes in infrastructure or other constructional changes an open tender is required. The relevant authority establishes the requirements for the construction.⁷⁹

Private marinas are owned by one or more private companies or persons. The investments and constructional changes are decided by the owner of the private marina. The person or company has to satisfy all requirements of the constructional authorities.⁸⁰

Investment by several private persons (companies) is usual in some well situated regions like in Southern France (Cote d'Azur). Private boat owners buy fix berths for their boats in a marina as real estate. In addition a small annual fee for service and maintenance as well as for equipment is demanded. The marina is operated with the entire investor capital. Additionally this type of investment is increasing also for boat builders, boat charting agencies or other appropriate industry players.⁸¹

The mix of **private and public marinas** is another variant of ownership. This regulation depends strongly on individual agreements between public authorities and private companies. In many cases, especially in Italy the private persons or companies obtain concessions for a certain period of time (typically between 20 and 50 years). The private owner is responsible for managing the marina with more or less power of decisions, which also depends on the contract between the public institution and investor. After the concession expires the ownership goes back to the public institution or a new concession will be agreed.

3.4.2.2 Classification of Marinas by Use

There are a lot of different types of marinas with respect to this thesis some important ones should be mentioned:

Guest marinas are quite small and usual in Scandinavian countries. There are no fixed berths for boats and it is used for boat users and renters who are spending their holiday for boating in the region of the guest marina for a certain time span. They

⁷⁸ Compare Marina Industries Association of Australia, *Size and Characteristics of the Australian Marina Sector*, 2010, p. 9f. <<http://www.marinas.net.au/documents/item/74>>.

⁷⁹ Compare Interview Marina Stella, Marina Types in Italy <24.09.2014>.

⁸⁰ Compare Interview Marina Stella.

⁸¹ Compare Interview Bernard Piquet Directeur du Port de la Rague (Mandelieu), Typical Marina Types <06.10.2014>.

bring their boats from landside by trailer or from seaside. Usually the marinas are equipped with moorings, showers, restrooms, electricity supply, restaurants or small shops.⁸²

Home marinas are also a specific classification particularly in Scandinavian countries. The boat owners pay a periodic fee (e.g. monthly, annual) for having their fix berth in water. Some marinas have offers with dry storage in winter terms.

Camping marinas are used especially in Italy for summer tourists. The main issue for staying there is to live on the boat like campers with cooking and sharing activities with other boat users. They are commonly very small and close to other camping marinas so that the typical summer tourist can move quickly to another camping area. The facilities are similar to guest marinas but the owners of the marinas often count on frequenters by offering special service like swimming pools, dry storage and tailored cheap holiday offers to ensure the utilization.⁸³

The most **common type of a marina** is a combination of home and guest marinas. They offer designated guest berths and fix berths for long term accommodation.

3.4.3 Shipyards and Docks

Shipyards are enterprises or companies for the construction and repair of boats and ships. Many shipyards additionally offer water berths as well as dry storage facilities, particularly in Austria and Switzerland.

Docks or also called **dry docks** can be drained of water to enable the inspection and repair of a boat's hull. Figure 3-5 illustrates the Versadock Modular Dock system a simple way of a swimming dry dock.



Figure 3-5: Model of Swimming Dry Dock⁸⁴

⁸² Compare Interview Marina Stella.

⁸³ Interview Marina Stella.

⁸⁴ Versadock Wales, 'Dry Dock System' <http://www.versadockwales.co.uk/boat_dock.htm> [accessed 30 September 2014].

3.5 Boat Handling and Storage

Boat handling and storage describes all the manipulation steps for moving the boat in and out of the water putting it in and out of a storage facility.

3.5.1 Background of Boat Handling and Storage

There are many reasons why boats are lifted in and out of the water and respectively stored outside the water. The most important reasons are as follows:

Usual motives for moving boat in and out of the water:

- Moving in the water for maiden voyage
- Transportation (another waters, another owners, storage, exhibitions and fairs)
- Repairing, maintenance and service

Usual reasons for storage:

- Protection from wind and weather conditions (storms, cold, sunlight)
- Reduction of repair, maintenance and service (antifouling, osmosis, cleaning, damage)
- Offering new welcoming capacities
- Permitting to recover berths in wet marinas
- Security issues (theft, vandalism)
- Value retention - resale value

3.5.2 Boat Handling (Waterside Handling)

What waterside handling equipment is most suitable depends on the weight and size of the boat as well as on the currents and tides of the water. Additionally the availability of human and capital resources have to be taken into account.

3.5.2.1 Boat Handling Equipment

Chapter 3.5.2.1.1 to 3.5.2.1.5 shows the description of the known waterside handling equipment with their strength and weaknesses.

3.5.2.1.1 Trailer/Hydraulic Trailer

A trailer is attached to and towed by a motorized vehicle (car, truck or tractor) to move small boats in and out of the water ⁸⁵. Figure 3-6 illustrates such a water handling equipment.

⁸⁵ Compare Atout France, *Les Ports À Sec, Une Offre Innovante - Guide Technique 2010*, p. 63ff.



Figure 3-6: Trailer

Hydraulic trailers are quite similar to trailers mentioned above. They can be used for larger boats than standard trailers by having additional hydraulic force to raise and lower the boat (as in Figure 3-7).

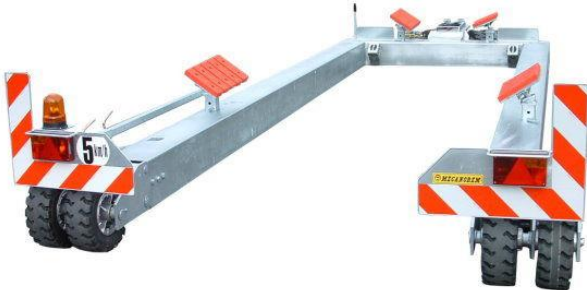


Figure 3-7: Hydraulic Trailer

Table 3-1 demonstrates the Strength and Weaknesses of trailers and hydraulic trailers as a boat handling equipment.

| Advantages | Disadvantages |
|--|--|
| Simple and cheap solution | Boat slip at seaside mandatory |
| Simultaneous storage facility | Small boat sizes for trailers (also limited size for hydraulic trailers) |
| Transportation in and out of the water as well as further transport with a tractor | Manual handling (leads to human mistakes, damages) |
| Small boats handled by one person possible | Fork lift necessary for dry stacks |
| Sail boat handling possible | Increase of manpower and cycle times |

Table 3-1: Strength and Weaknesses of Trailers and Hydraulic Trailers

3.5.2.1.2 Fork Lift

Fork lift is the most common and versatile handling equipment. The performance has evolved over the last 10 years, allowing a great variety of movements. The number of

necessary fork lifts depends strongly on the number of boats to handle. For an active port the number of lifts is approximately

- 2 for 200 berths
- 3 for 200 – 500 berths
- 4 for over 500 berths ⁸⁶

Some fork lift manufacturers offer special vehicles with fork extension, negative offset, adjustable forks (suitable for the boat's hull) and special fork coatings to avoid damages. The quality of boat manipulation depends on the quality of the driver, which plays a key rule for the functionality of the fork lift. Additionally important regulations regarding the location of the marina are valid (currents and tides) ⁸⁷. Figure 3-8 illustrates a typical boats fork lift.



Figure 3-8: Boat Fork Lift

Usual properties for a standard and a high performance model are as follows⁸⁸:

| | Standard model | High performance model |
|-------------------------------|---|--|
| Lifting capacity | < 5t (lifting height max. 10m) | approx. 15t |
| Performance | < 10m lifting height -3m negative offset | 15m lifting height) -8m negative offset |
| Additional information | Axle blocking | requires wider aisles |

Table 3-2: Properties of Standard and High Performance Fork Lifts

Table 3-3 demonstrates the strength and weaknesses of trailers and hydraulic trailers as a boat handling equipment.

| Advantages | Disadvantages |
|---------------------------|---------------------------------|
| Simple and cheap solution | Problems with large tidal range |

⁸⁶ Compare Atout France.

⁸⁷ Compare Atout France.

⁸⁸ Compare Atout France.

| | |
|--|--|
| Combination of in and out of water manipulation and transportation to or from storage facility | Limited in size and weight of boats (small boats) |
| Free to move (individual transportation to all destinations) | Manual handling (leads to human mistakes, damages) |
| Few adaptations for infrastructure needed (no construction permit) | Limited in negative offset |
| | Adapted waterside location for fork lifts |
| | Increase of manpower and cycle times |
| | Odour and noise |
| | Oil leaks |

Table 3-3: Strength and Weaknesses of Fork Lifts

3.5.2.1.3 Boat Lift

Boat lifts are often used in combination with fork lifts for further transportation to the storage facility. Typical applications for them are regions with a very high tidal range.

Two common designs of boat lifts are the following:

- Inclined rail system to cross obstacles (rock fills)
- Vertical lift with platform for fork lift manipulation ⁸⁹

In general the lifting process will be activated by an operator but there exists systems with self-service too. Figure 3-9 shows a boats lift with inclined rail system.



Figure 3-9: Boat Lift

| Advantages | Disadvantages |
|----------------------------------|---|
| Reliability and high performance | Fork lift or conveyor system is necessary |

⁸⁹ Compare Atout France.

| | |
|---|--|
| | for further transport (just lift in and out of water) |
| Can also be used for large tidal range | Limited type and size of boats (depending on the model of lift) |
| Automated lifting (less human mistakes and damages) | Expensive investment for the whole system (lift + fork lift or lift + conveyor system) |
| Frame adaptable to boats hull (improved boat lifts) | |
| Self-service possible | |

Table 3-4: Strength and Weaknesses of Boat Lifts

3.5.2.1.4 Travel Lift

A travel lift consists of 4 pneumatic tires with a square steel beam structure and is operated via remote control. Additionally there are 4 to 6 lifting belts depending on design of the travel lift ⁹⁰. Figure 3-10 shows an example of a travel lift.



Figure 3-10: Travel Lift

| Advantages | Disadvantages |
|---|---|
| Ships and boats lifting up to 1000t | Docks need to be adapted to travel lift |
| Also lifting of boats with superstructures (e.g. sail boats) | Expensive solution |
| Combination of lifting in and out of the water and transportation to storage | Possible damages caused by wrong positioning of the belts |
| Operation through remote control creates diversity regarding the transport path | Possible paint damages caused by dirty or scratchy belts |
| | Danger to the environment (persons, buildings, material assets) |

⁹⁰ Compare Atout France.

| | |
|--|--------------------------------------|
| | Increase of manpower and cycle times |
|--|--------------------------------------|

Table 3-5: Strength and Weaknesses of Travel Lifts

3.5.2.1.5 Column-mounted Slewing Crane

With these types of cranes the boats are lifted directly from the water to a transportable vehicle or in the opposite direction. The boats are carried by lift belts like for travel lifts. Column-mounted slewing cranes as illustrated in Figure 3-11 can lift very large and heavy boats.⁹¹



Figure 3-11: Lifting Crane

| Advantages | Disadvantages |
|--|---|
| Lifting of very large and heavy boats (up to 5000t) | Expensive solution |
| Also lifting of boats with superstructures (e.g. sail boats) | Hydraulic trailer or similar equipment is necessary for further transport (just lift in and out of water) |
| Directly lifting onto the transport vehicle | Possible damages caused by wrong positioning of the belts |
| | Possible paint damages caused by dirty or scratchy belts |
| | Danger to the environment (persons, buildings, material assets) |
| | Increase of manpower and cycle times |

Table 3-6: Strength and Weaknesses Lifting Cranes

⁹¹ Compare Atout France.

3.5.3 Boat Storage

The main reasons for boat storage are already mentioned in chapter 3.5.1. There are many different ways to store the boats out of the water. The various options are described in the following sub chapters.

3.5.3.1 Horizontal Dry Storage

Horizontal dry storage is a common way to store the boats on racks or trailers which are directly connected to solid ground. The way of storage is suitable for all types of boats (also sail boats), indoor as well as outdoor⁹². The benefits of horizontal dry storage are, as already mentioned in chapter 3.5.1.



Figure 3-12: Horizontal Indoor Dry Storage

3.5.3.2 Vertical Dry Storage (Dry Stack)

Vertical dry storage originally comes from the United States of America and then spread throughout Europe and the rest of the world. Dry stacking development is different on each continent, depending on local conditions, boating history, and markets. The boats stored in dry stacks are limited in size and type. The way of storage is typically used for motorboats. Sail boats can be stored only in outdoor dry stacks on the top floor. Vertical dry storage is often combined with fork lift operations (Figure 3-13).⁹³



Figure 3-13: Vertical Dry Storage

⁹² Compare Atout France.

⁹³ Compare Atout France.

There are four different designs of dry storage facilities:

1. Storage on outdoor metal structures (racks) equipped with wooden supports to fix the boats.
2. Covered storage with cover on the top of the racks or single covered boxes
3. Storage indoor (storage hall with racks)
4. Integration of dry storage in a marina complex with tourist services and/or trade⁹⁴

The common motorboat which is stored in a dry stack is preferably smaller than 8m of length. Sizes up to 12m of length are possible (more for industrial installations).

It has to be mentioned that dry stacks also include the possibility of storing more boats on less space in comparison to the horizontal dry storage

3.5.3.3 Mixed Form of Dry Storage

Dry storage as a combination of vertical and horizontal storage is typical for marinas with a strong demand for storing motor as well as sail boats out of the water.

3.5.3.4 Swimming Inflatable Dry Storage

A new technology is swimming inflatable dry docks. One advantage of this system is that it can be inflated anywhere so that the boat owner is not depended on a specific land facility or handling equipment to move the boat in or out of the water.⁹⁵

3.5.3.5 Automated Systems based on High-Bay Storage Industry

Automated storage systems can be distinguished between cranes systems with rails on top of the hall roof and on the ground floor.⁹⁶

Crane systems with rails on top are usually located indoor (hall). Currently known systems are stacking cranes with forks or with a transportation box. Typical crane systems with rails on the ground floor have forks or a mobile carriage.⁹⁷

3.5.4 Combined Systems

The combination of systems which operates by moving the boat out of the water into the storage (waterside handling and boat storage) is the main focus of this thesis. Industrial systems with that goal have increased demand at the leisure boating mar-

⁹⁴ Compare Atout France.

⁹⁵ Compare Atout France.

⁹⁶ Compare Atout France.

⁹⁷ Compare Atout France.

ket and actually there are various possible variants depending on the number of system handovers. This diploma thesis is moreover focused on these systems.⁹⁸

3.5.5 Classification in Automation

In general the grades of automation reaches from completely automated to manually operated systems.

3.5.5.1 Fully Automated Systems

Fully automated systems are operated without intervention of human labour. The order for storage and retrieval is granted by the boat owners and the crane gets the job done. There is only one realized system all over the world. This system is named Phar'O and is located on the coast of Marseillan in the South of France. More information about Phar'O is shown in chapter 4.2.1. The main strength of the system is the availability of the boats 24 hours 7 days a week as well as no need of any marina staff. Nevertheless, it is possible that the system comes to a standstill and no personal is immediately available for repair service.⁹⁹

3.5.5.2 Semi-Automated Systems

This kind of system refers to some processes done by human power. This includes e.g. the positioning of the boats before placing the order to the crane. There exist different concepts of semi-automated systems, but just a few of them are on the market. The competition on these systems is described in chapter 4.2.2.¹⁰⁰

3.5.5.3 Manually operated Systems

Marina personnel operate the crane to store the boat in the racks. The handling equipment is comparable with fork lift operations or similar systems also with their strength and weaknesses.¹⁰¹

3.5.6 Benefits of Semi- or Fully Automated Solutions

In comparison with other boat handling and storage equipment the automated solutions (semi- or full) offer a lot of benefits to the marina.

- Secure handling of boats by boat frame
- Personal reduction (with fully automated no staff)
- Efficient use of space
- Faster accessibility and retrievability of boats
- Minimization of failures (human error)

⁹⁸ Compare Atout France.

⁹⁹ Compare Atout France.

¹⁰⁰ Compare Atout France.

¹⁰¹ Compare Atout France.

- Process safety
- No contamination of the environment (oil, gasoline)
- Noise reduction (e.g. fork lift)
- No unpleasant odours
- Lower operating costs (electric)

3.5.7 Disadvantages of Automated Solutions

Automated solutions have also some disadvantages to consider:

- Maturity (little experience on sustainability)
- Long-term investment (change in the ownership rights)
- Operating fault may impede the boat manipulation (especially for fully automated systems)

4 Analysis of Automatic Boat Handling and Storage System

In this chapter the potential products of Kuenz GmbH will be analysed as well as the competition in the market of semi- and full automated boat handling and storage systems. This is followed by the analysis of the Market in Europe, United States of America and Gulf Corporation Council.

4.1 Product Analysis

The product analysis shows the existing product concepts of Kuenz in detail with its strength and weaknesses.

4.1.1 Cooperation Dock Services

Collaboration between Kuenz GmbH and a previous customer involved in the crane sector, Gérard Giroud, led to the idea of launching a boat handling and storage system.¹⁰²

Docks Services SAS, founded by Gérard Giroud, develop the “port of the future” based on an innovative patent for an automated dry-dock and its associated services for boats. Dock Services is compatible with all possible governance types: Concessionaire for a public service delegation, partner in a public-private contract, engineer under private funds, etc.¹⁰³

Special benefits for a Customer:

- Patented innovation
- Boat hull preserved
- Availability of the boat in less than 5 minutes
- Rinsed and protected as soon as out of the water¹⁰⁴

4.1.2 Scope of Delivery

The concept „Dock Services“, based on the patent of Mr. Giroud assumes the infrastructure and services as mentioned in the following subchapters.

¹⁰² Compare Dock Services SAS, ‘Dock Services’, 2014 <<http://www.dockservices.fr/>> [accessed 15 September 2014].

¹⁰³ Compare Dock Services SAS.

¹⁰⁴ Compare Dock Services SAS.

4.1.2.1 Spatial Infrastructure

The concept includes the following spatial infrastructure:

| | |
|------------------------|---|
| Storage building | <i>Depending on the use of boat capacity or according to available ground surface. (adaptable to the topology and geometry of the available land)</i> |
| Boat handling system | <i>for loading and unloading of boats</i> |
| Dry docks and pontoons | |
| Club house | <i>waiting area, bar, restaurant</i> |
| Maintenance area | <i>Cleaning, repairing and maintenance of boats</i> |
| Parking space | <i>For boat owners exclusively (Access via chip)</i> |

Table 4-1: Spatial Infrastructure for the Concept "Dock Services"

4.1.2.2 Scope of Service

The concept includes the following service scope:

| | |
|----------------------------------|--|
| Manipulation of the boats | <i>Loading and unloading of boats through employees on site (The order for manipulation is done by the boat owner on the reception via chip)</i> |
| Local Maintenance of boats | |
| Boat surface treatment | <i>Washing service, corrosion protection, ...</i> |
| Video surveillance & security | |
| Fire protection | <i>Fire alarm systems, monitoring and combating</i> |
| Boat insurance | |
| Modular energy efficient systems | <i>Rainwater treatment Photo-voltaic</i> |
| PMR Standards | |

Table 4-2: Scope of Services for Concept "Dock Services"

4.1.2.3 Scope of Supply Kuenz GmbH

Kuenz GmbH offer automated boat handling cranes with all features for the dock service concept which includes double girder bridge cranes, overhead trolley with hoist units, control system, warehouse management system, power supply as conductor security system, and a transfer carriage depending on the product variant.

4.1.3 Boat Handling and Storage System Kuenz

2 similar proposals have been offered by Kuenz. For both projects no orders have been placed so far. The major difference between them was the number of cranes, price range and the speed of manipulation. It was planned to equip each hall with a crane for the first project in Les Sables d'Olonne to guarantee a high frequency of boat handling within a short time span. The second offer in Sérignan was more focused on costs than the previous project. In comparison to Les Sables d'Olonne a transfer carriage was planned in Sérignan to handle more halls with one crane.

4.1.3.1 Crane System

The crane system depends strongly on the project, which is described in chapter 4.1.5 and 4.1.6.

4.1.3.2 Boat Support Frame

Every frame has an upper and a lower part, which belongs to the same boat. The lower part is standardized for all boat types (same length, width, height and structure) and includes fork lift pockets. The adjustment of the sensors is adapted to this lower part (e.g. switching flags).

The upper part is the actual boat support and is individually adjusted to the structure of the boat and has its symmetry in length direction. For each boat own boat frame is adapted. This frame was patented by Mr. Giroud from Dock Services SAS.

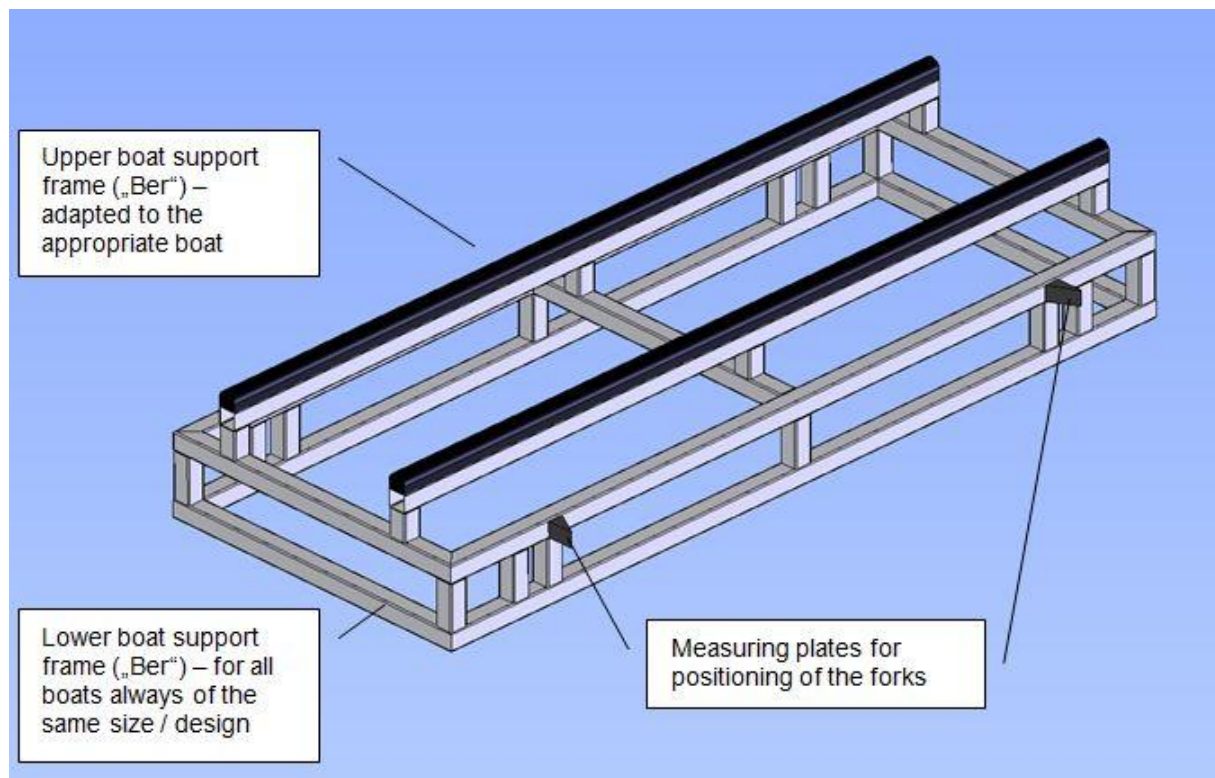


Figure 4-1: Boat Support Frame

4.1.4 Process Description

There are a few scenarios to describe the functionality of the boat handling and storage system.

4.1.4.1 Boat Storage from Landside (Initialization)

If a boat owner is interested in boat storage, he comes to the marina office for initialization of the boat. He gets a chip to identify the boat for loading and unloading and get access to car parking as well. For the first delivery of the boat, the trailer brings the boat in the rear hall area, which is separated by light barriers to allow normal operation in the front area of the hall. In this area the crane is operating manually.

The boat will be lifted manually from the trailer by stacking crane and belts. The empty trailer can now be removed from the safety area and the frame can be placed on the marked spots of the hall floor. Afterwards the boat is placed on the frame with the crane. The centre of gravity is marked on the boat for positioning in terms of boat handling from seaside.

Afterwards the following data will be entered to a terminal:

- Boat owner
- Position of the storage place
- Length, Width, Height
- Mass
- Overlap bow compared to centre of gravity
- Overlap rear compared to centre of gravity

After positioning of the boat to the frame and entering the data the fully automated operation (initialization) can start. This operation has to be done only for the first storage of the boat and is the base for all the subsequent loading and unloading operations.

4.1.4.2 Boat Storage from Seaside

The boat owner brings the boat to an upstream floating dock and grants the storage order via chip at the marina office. The order is stored in the waiting list for storage and the manipulation staff can read out all the important information from the terminal.

The employee activates the storage process at the terminal and the crane moves automatically to the required storage place. Now it carries the empty frame (ber). The position of the right frame is kept the same throughout the whole storage period. The

sensor on the bottom of the measuring arm on the fork carriage recognizes the top edge of the rack allowing additional control by calculating the height of the fork lift pockets. The laser sensors on the inner side of both measuring arms detect the distance to the measuring tags on the boat frame to get the right horizontal position of the forks. Further sensors are on the front side of the measuring arms to position the crab at the boat frame and guarantee - if these sensors measure the same value - that the frame is exactly parallel to the fork carriage.

The crane brings the empty frame to the boat storage facility at seaside and positions it under water on the defined place. Existing water level instruments measure the water level at the moment and the frame will be positioned about 1.5 m below water level ensuring that the frame cannot collide with the boat. In the meanwhile the employee brings the boat and drives the boat after release by traffic light manually lateral to the pilot fendering. The empty frame is below the boat under the water.

As mentioned in capture 4.1.4.1 Boat Storage from Landside (Initialization), the centre of gravity is marked on the boat. There is another sensor on the hall structure, which develops a laser beam, showing the middle of the boat frame and marks the centre of gravity line for the longest boat. With these parameters the boat can be positioned manually in longitudinal direction and after finishing this process the employee can drive the empty frame via wireless remote control up to the boat.

After a short visual inspection of the boat position the employee confirmed and leaves the danger zone. The fork carriage with the boat hangs on two ropes. The boat is loaded properly if there are two identical rope forces determined by load measuring pins. This is an additional way to secure a stable position.

After confirmation outside the danger zone the crane drives the boat in the hall automatically and stores it on the designated place (previously the place from the empty frame).

There is a Safety Light Grid at the border from water area to the rest of the hall, which provides an additional measurement of the boats length.

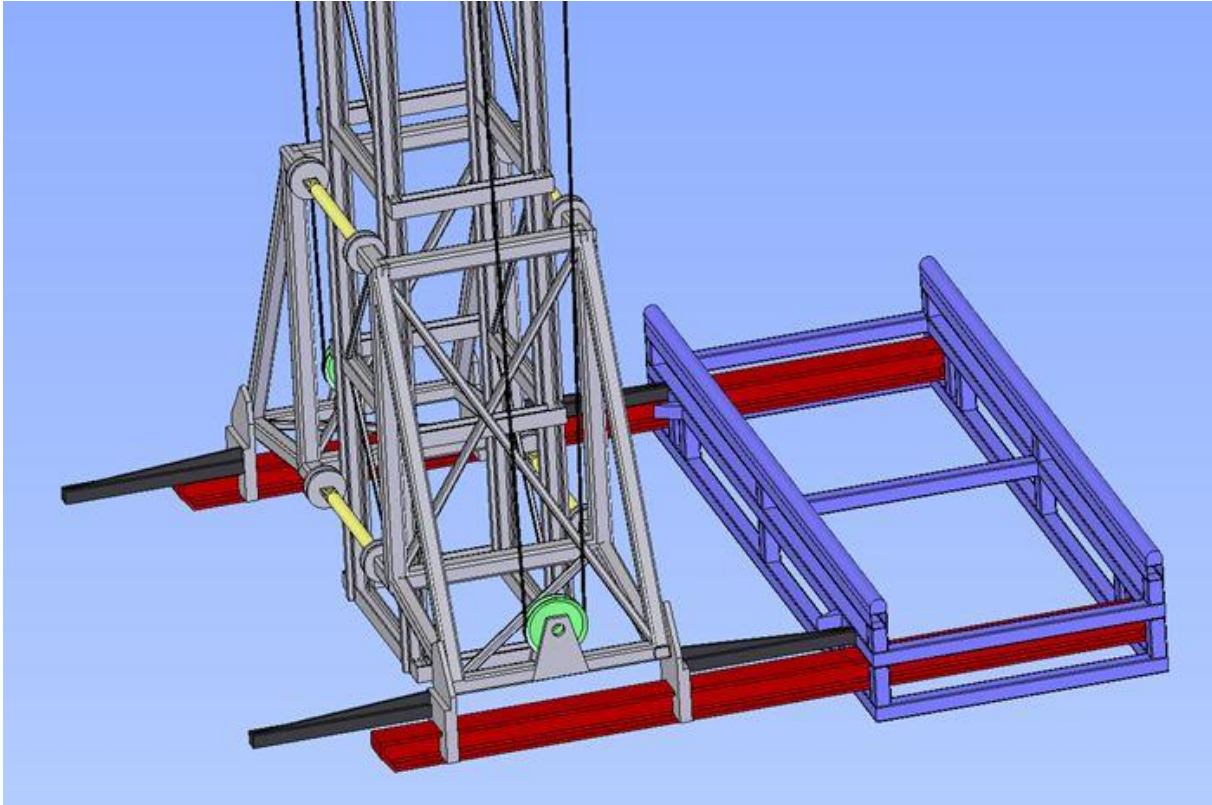


Figure 4-2: Lifting System¹⁰⁵

4.1.4.3 Remove from Boat Storage to Seaside

The boat owner either instructs the unloading order via chip at the marina office or he/she writes an email or gives a call for it and the staff can activate the unloading process at the terminal.

This process is analogue to the relocation processes of the empty boat frame (see 4.1.4.2 Boat Storage from Seaside). After manipulation of the boat it is next to the pontoon to get inside and outside much easier for the boat deliverer to bring it to the boat owner afterwards. The water level is known through water level instruments and the frame will be positioned about 1.5m below water level before the boat leaves the pontoon.

4.1.4.4 Emergency Storage

Boats without a reserved boat frame in the hall can also be stored from waterside if required. Empty standardized emergency boat frames are available in this case. Smaller boats can be stored in the centre aisle while the bigger ones need a free boat space.

¹⁰⁵ Compare Hans Kuenz GmbH, 'Proposal Les Sables d'Olonne', 2012.

4.1.5 Previous Project - Marina of Les Sables d'Olonne

Les Sables d'Olonne was the first project of boat handling and storage cranes for Hans Kuenz GmbH. More information about the project is shown in chapter 4.1.4.1 to 4.1.4.4.

4.1.5.1 General Information

French marinas have a deficit of places afloat while the country has the largest European water space with about 5500 km of coastline and about 4.5 million French boat drivers (sail or motor). The FIN (Federation French Nautical Industries) had estimated a deficit of 54.000 places for boats with approximately 13.000 on the Atlantic Coast.¹⁰⁶

The town of Les Sables d'Olonne is located on the Atlantic coast in France about 200 km north of Bordeaux and is affected by this issue. Particularly the waiting list for getting a place in the marina counts between 400-450 places for several years. Figure 4-3 shows the marina of Les Sables d'Olonne.¹⁰⁷



Figure 4-3: Bird's Eye View Marina of Les Sables d'Olonne

4.1.5.2 Main Objectives of the Public Tender

The city Sables d'Olonne tendered a project for construction of a dry port in May 2008. The overarching goal of the program was to build an automatic dry port to store pleasure boats (motor- and/or sail). The minimum capacity of 420 boat spaces was required. Land area of approx. 15.000m² and a buffer zone for the boats before storage of approx. 2000m² was available for this project. The automation of the port should be without reloading, which means that no temporary storage should be essential, as well as avoiding manual operations with the boats. The frequency should reach 30 boats per hour for a minimum capacity of 420 places and the boats should

¹⁰⁶ Compare Atout France.

¹⁰⁷ Compare Hans Kuenz GmbH, 'Proposal Les Sables d'Olonne'.

be storable on different platforms. The loading and unloading as well as transport operation had to operate with automated programmable control devices (e.g. gripper system adapted to the boat hull). There should be also a parking space for the boat owners. Natural activities like wind, seismic factors and tides shouldn't have any influence on the building & storage system.¹⁰⁸

4.1.5.3 Concept of the Project

The boat handling and storage processes are described in chapter 4.1.4.

3 unified halls were planned with approx. 120 boat spaces in the first stage of the project. With 2 additional halls in a later stage the boat house could accommodate 625 boats. There were 5 storage levels and the boats are stored in length direction.¹⁰⁹

The boats are stored in 5 different floors with a distance of about 0.5m between the boats. The cranes of the individual facilities operate independently. That it can all cranes on or outsource the same time either boats. An extension for 2 more halls was planned in a later stage of the project.¹¹⁰

Each hall is about 100m long and 15m wide. The centre aisle is 7 m wide and the left and right has 4 m wide shelves. There are 5 storage levels including the shop floor. The boats are stored in the longitudinal direction parallel to the centre aisle. Each boat always maintains the same storage space normally.¹¹¹

The contract for boat storage or boat outsourcing is done by the owner at the front desk by chip. There, the current order list is then displayed on a screen at the expected waiting time (similar to the display at the airport).¹¹²

4.1.5.4 Main Technical Data Crane

Kuenz offered a double-girder bridge crane with overhead crab for every building. Find the main technical data in the following table.

| | |
|--|------|
| Crane gauge: | 14m |
| Lifting capacity (boat + storage frame): | 6,1t |
| Total lifting height | 23m |
| Lifting height above floor level | 15m |

¹⁰⁸ Compare Hans Kuenz GmbH, 'Proposal Les Sables d'Olonne'.

¹⁰⁹ Compare Hans Kuenz GmbH, 'Proposal Les Sables d'Olonne'.

¹¹⁰ Compare Hans Kuenz GmbH, 'Proposal Les Sables d'Olonne'.

¹¹¹ Compare Hans Kuenz GmbH, 'Proposal Les Sables d'Olonne'.

¹¹² Compare Hans Kuenz GmbH, 'Proposal Les Sables d'Olonne'.

| | |
|---|-------------------|
| Lifting height below floor level | 8m |
| Hoisting speed load | 20/40m/min |
| Hoisting speed mast | 40m/min |
| Crane travel speed | 120m/min |
| Cross travel speed | 30m/min |
| Fork movement | 20m/min |
| Ambient temperature | 0 to 40°C |
| Number of storage level (including floor level) | 5 |
| Boat capacity/crane | approx. 120 boats |

Table 4-3: Technical data for boat handling crane¹¹³

The crane was designed in accordance with the maximum boat length of approximately 12 metres and a weight of 5.5 tons.

4.1.5.5 Cycle Times

The cycle times for the manipulation of the crane, starting with the frame in the water is shown in the appendix A.3.

4.1.5.6 Benefits for the Share- and Stakeholders

The city benefits for introduction are as follow:

- Image as Innovator - One of the first automated dry ports
- Efficient space occupancy: 400 - 600 places over 1 hectare, or a ratio of 17-25m² per boat (4-9 times less space consumed)
- Makes Sables d'Olonne a destination for nautical visitors
- Provides connection between rail, road and marina in the heart of the city
- Generates jobs

4.1.6 Previous Project - Marina of Sérignan

In 2013 another demand for a boat handling and storage system in France arose. As in Les Sables d'Olonne the number of boats and the waiting list for a fix berth is very long in the marina of Sérignan. This was the main reason for the commune to initiate this project. Kuenz submitted a first budget proposal so far which means that the level of detail has not been as deep as for the project of Les Sables d'Olonne.¹¹⁴

¹¹³ Compare Hans Kuenz GmbH, 'Proposal Les Sables d'Olonne'.

¹¹⁴ Compare Hans Kuenz GmbH, 'Proposal Sérignan', 2013.

4.1.6.1 General Information

Sérignan is a commune in the Languedoc-Roussillon region in southern France. The marina of Sérignan is a service managed by the Chamber of Commerce Béziers on the edge of the Orphelieres nature reserve. Figure 4-4 shows the marina of Sérignan.¹¹⁵



Figure 4-4: Bird's Eye View Marina of Sérignan

4.1.6.2 Concept of the Project

As for Les Sables d'Olonne the general boat handling and storage processes is described in chapter 4.1.4. The concept includes boats stored in 5 halls up to 3 levels. The boats are stored in length direction on the right and left side of the hall. In the middle of the building is the stacking crane. In comparison to the previous project a transfer carriage exists to handle the boats with two cranes in all halls. The carriage is moving on a flapped drive-over bridge. The two crane strategy with the transfer carriage is a backup strategy for continuing boat handling and storage even if one crane is out of function. Figure 4-5 illustrates the general concept of Sérignan with both stacking cranes and the transfer carriage.¹¹⁶

¹¹⁵ Compare Hans Kuenz GmbH, 'Proposal Sérignan'.

¹¹⁶ Compare Hans Kuenz GmbH, 'Proposal Sérignan'.

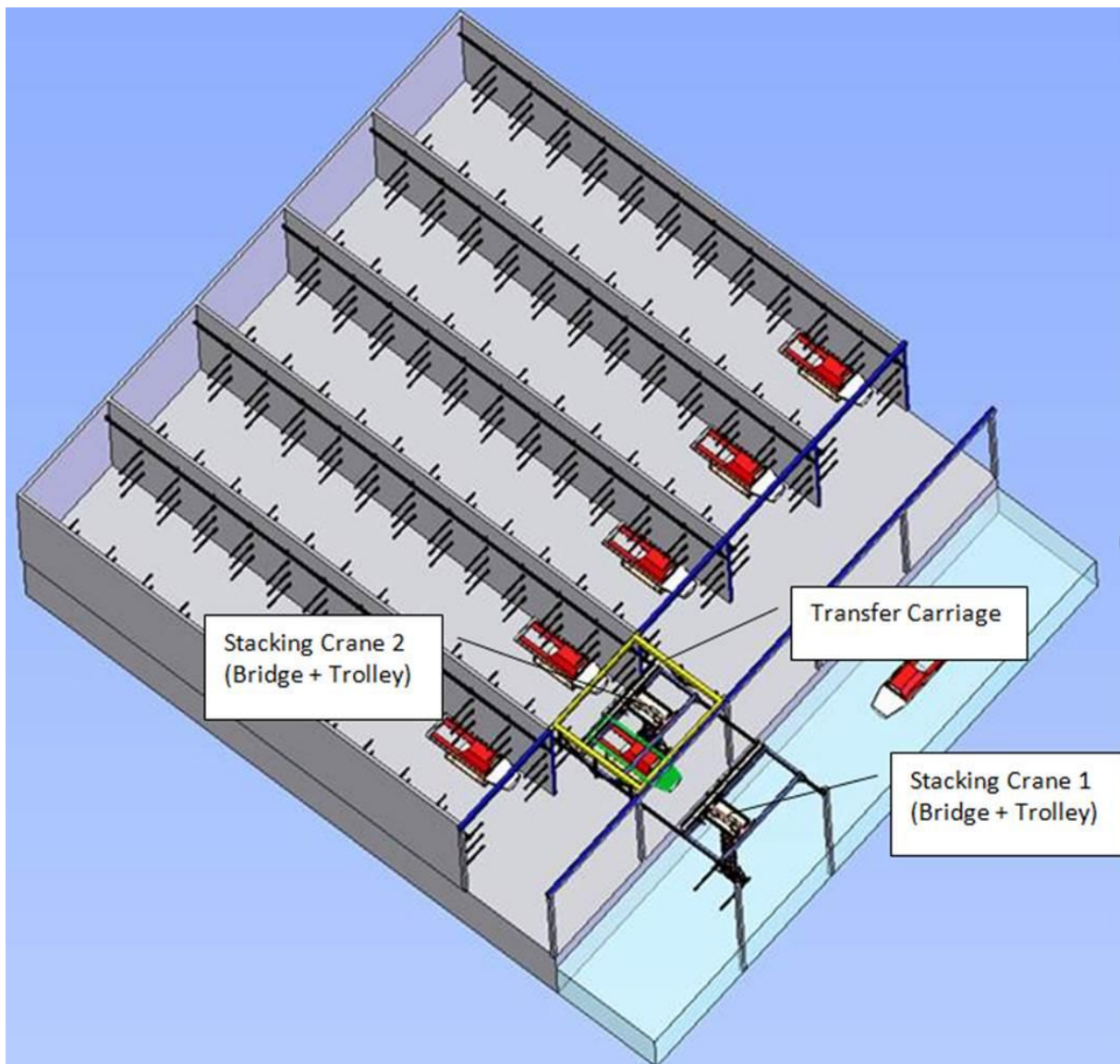


Figure 4-5: General Concept Sérignan

Each storage hall of Sérignan was designed for a length of 90 and a width of 15 metres. The number of boats in a hall is about 70 boats in average.

4.1.6.3 Main Technical Data Crane

Kuenz offered 2 double-girder bridge cranes with overhead crab and a transfer carriage. The main technical data are shown in the following table.

| | |
|--|--------|
| Crane gauge: | 13m |
| Lifting capacity (boat + storage frame): | 4,6t |
| Total lifting height | 12,15m |
| Lifting height above floor level | 9,75m |
| Lifting height below floor level | 2,40m |

| | |
|---|------------------------------|
| Hoisting speed load | 20/40m/min |
| Hoisting speed mast | 40m/min |
| Crane travel speed | 120m/min |
| Cross travel speed | Not part of budget quotation |
| Fork movement | 20m/min |
| Ambient temperature | 0 to 40°C |
| Number of storage level (including floor level) | 3 |

Table 4-4: Technical Data for Boat Handling Crane¹¹⁷

The crane was designed in accordance with the maximum boat length of approximately 10 metres and a weight of 4 tons.

4.1.7 Comparison of Previous Projects

The planned boat handling and storage system of Les Sables d`Olonne is intended to offer more space for the boats and simultaneously an embellishment for the landscape. The building was planned to be illuminated for the night and the club house represents a meeting point for boaters and other people who are fascinated by pleasure boating. It is important to improve the image as a visible premium marina. For operating the system Dock service calculated a lot of staff to guarantee the boater a fast, convenient storage and retrieval. With one crane in each hall a high number of boats can be handled within a short time span.

Sérignan is rather an additional storage facility than an enhancement of the landscape. The building is not planned directly on the coast. A small channel leads the boater to the marina. The dry storage facility is smaller than in Les Sables d`Olonne and there is no planned club house. The number of boats, handled in a certain period is smaller than in the first project because the cranes have to move between more halls via transfer carriage. The Sérignan project is cheaper and has the additional benefit of continuous operation in all halls even if a cranes operation is disturbed. The disadvantage of this installation is the longer time span for boat handling. The crane needs more time for moving between the halls.

¹¹⁷ Compare Hans Kuenz GmbH, 'Proposal Sérignan'.

4.2 Competition in Boat Handling and Storage Systems

Competitors in this market reaches from producers of traditional equipment like fork, travel or boat lifts, trailers and hydraulic trailers until automated industrial systems for boat handling and storage. This diploma thesis covers the competition in combined automated systems as mentioned in chapter 3.5.4.

4.2.1 Fully Automated Systems Competitors

Phar'O is the only automatic dry stack system in the world. It is based in Marseillan-Plage in the south of France. It was opened in 2007 and is operated without the need for personnel. The project was financed by an active network of property investment companies called Groupe Financière Duval.¹¹⁸

With the fully automated process a capacity of 300 additional berths are available. The system is designed for motor boats from 4.50 to 9 metres in length. Leisure boats are available 24 hours a day, 7 days a week in less than 4 minutes. Figure 4-6 illustrates the Phar' O System.¹¹⁹



Figure 4-6: Phar'O Fully Automated Boat Handling and Storage System

4.2.1.1 Process Description

The boat owner brings their boat to the specified position at the dry port. At the next step he gives the order to the terminal for storing. After release with the personalized chip 6 centring bars brings the boat in the right position for lifting. The crane system operates without any human support. The retrieval process is also confirmed by the chip.

4.2.1.2 Strength and Weaknesses

Figure 4-7 shows the strength and weaknesses of the Phar'O system.

¹¹⁸ Compare Phar'O Marseillan, 'Phar'O Dry Storage System' <http://www.pharoport.com/Marseillan_eng.html> [accessed 2 October 2014].

¹¹⁹ Compare Phar'O Marseillan.

| Competitor Phar'O | |
|---|--|
| Strength | Weaknesses |
| <ul style="list-style-type: none"> + Fully automated system (self service) + Availability of boats: 24 hours/7 days a week (with chip at the terminal) + Frequency boat handling: no limitations (as often as required) + Tidal range: no limitations + Staff: Not necessary + Reference facility in France + No building permits required (no foundation) + Price: annual costs similar to water berths + Local displacement of the system possible | <ul style="list-style-type: none"> - Several handovers in the system (complex and prone to error) - Not suitable for luxury boats - Just boats up to 9 m in length - Outdoor storage (weather influence) - Just 1 crane (no replacement if crane has a defect) - No bottleneck regulation |

Figure 4-7: Strength and Weaknesses Phar'O System

4.2.2 Semi-Automated Systems Competitors

There are several concepts and realized semi-automated systems on the market. In the following subchapters the main competitors will be shown.

4.2.2.1 Vertical Yachts

Vertical Yacht is one of a few concepts which have been realized for boat handling and storage. The system operates with an overhead bridge crane transporting a secure cradle with air cushions on steel ropes. The air cushions protect the boat against damages through transportation by adapting to the shape of the boat hull.¹²⁰

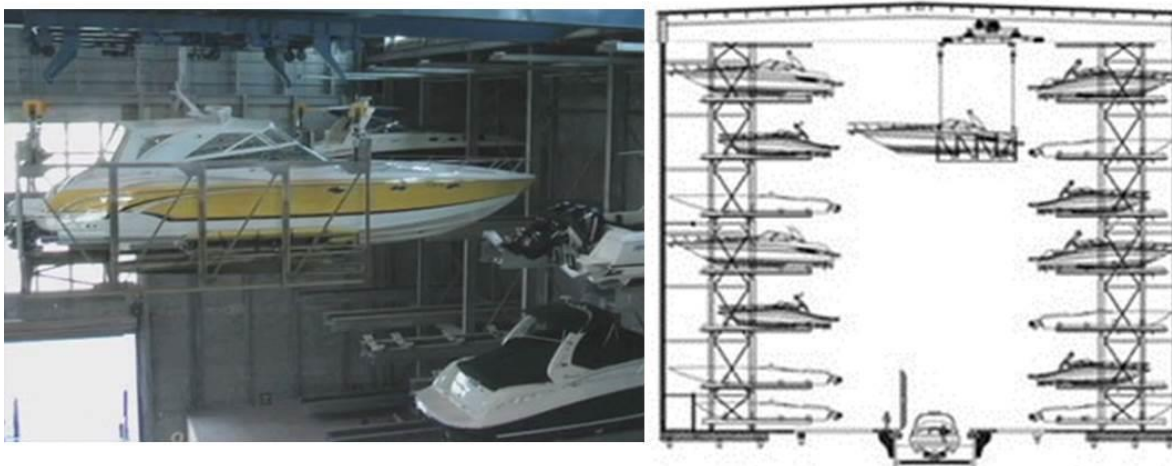


Figure 4-8: Vertical Yacht System

¹²⁰ Compare Vertical Yacht Club, 'Vertical Yacht Dry Storage System' <<http://www.verticallyachtclub.com/thunderalley/>> [accessed 14 October 2014].

Additionally there is a concept of Vertical Yachts to satisfy the niche market of storing mega yachts but this has not yet been realized.

4.2.2.1.1 Process Description

The centring of the boat for lifting process is done with support of human power. After release the crane system is lifting the boat automatically and stores it in the racks. For the retrieval process it is also necessary to have staff members for putting the boat into the water. Cleaning service is included in the process.

4.2.2.1.2 Strength and Weaknesses

Figure 4-9 shows the strength and weaknesses of the Vertical Yacht system.

| Competitor Vertical Yacht | |
|---|---|
| Strength | Weaknesses |
| <ul style="list-style-type: none"> + Reference facility in USA (FL) + Special luxury system for mega yachts + Standard concept: boats up to 20 metres in length possible (20 tons) + Tidal range: no limitations + Duration: 3-7 minutes/boat + Simple, cost-effective solution for boat frame (air cushions) + Protection against weather influences (indoor) | <ul style="list-style-type: none"> - No fully automated centering of the boat at waterside (centered by human power) - Support by manpower required (to put boat into the water) - No bottleneck regulation - Just 1 crane (no replacement if crane has a defect) |

Figure 4-9: Strength and Weaknesses Vertical Yacht System

4.2.2.2 Blue Ring

The Blue Ring concept represents a large capacity dry boat storage concealed beneath the Blue Ring marina basin. Blue Ring includes a car parking facility based on the idea of a circular car park. This concept can be integrated into every site. It's a modular solution and can be applied to any development of a marina.¹²¹

The ring-shaped design allows projects from simple to complex scenarios. The vertical structure of the storage facilitates marina extensions while respecting the coastal environment. Repair and maintenance unit within the Blue Ring facility is a potential use.¹²²

¹²¹ Compare Bluering, 'Blue Ring Dry Storage' <<http://www.bluering.fr/en/>> [accessed 20 October 2014].

¹²² Compare Bluering.



Figure 4-10: Blue Ring Concept

4.2.2.2.1 Process Description

The Blue Ring concept was not yet fully developed so that the crane system was not further specified. Designs on the website of Blue Ring System indicate equipment comparable to a column-mounted slewing crane but operated with automation.

4.2.2.2.2 Strength and Weaknesses

Figure 4-11 shows the strength and weaknesses of Blue Ring system.

| Competitor Blue Ring | |
|--|---|
| Strength | Weaknesses |
| <ul style="list-style-type: none"> + Subterranean use of the area for storage (visible area for Flächen für infrastructure like shops or restaurants) + Protection against weather influences (indoor) + Parking space for cars also below the groundfloor + Possible boat length: 12 metres | <ul style="list-style-type: none"> - No existing reference (just concept) - Very expensive project (98 million €) |

Figure 4-11: Strength and Weaknesses Blue Ring System

4.2.2.3 Aero Docks

Aero Docks is a company in USA specialized in dry dock solutions. There are 5 patented system concepts and one facility has been realized in Fort Lauderdale yet. The third concept is the most versatile and cost effective concept. Aero-Dock systems comprise automation components that are built by the strategic partner Rockwell Automation, which is a well-known and successful company.¹²³

Figure 4-12 illustrates the centring and storage of the boat.

¹²³ Compare Aero-Docks, 'Aero Docks Dry Storage' <<http://www.aero-docks.com/>> [accessed 15 October 2014].



Figure 4-12: Aero Docks Concept III

System IV is also worth mentioning as a competitive product. In comparison to the concept III this system offers the highest density possible. Additionally the carousel design is better suited to handle larger heavier vessels. This system has no aisle inside the building.¹²⁴



Figure 4-13: Aero Dock System IV

4.2.2.3.1 Process Description

The systems are theoretically able to be a fully automated system. Due to the complexity it is intended to give the command for storage by staff members of the marina.

At system III there are 4 hydraulic arms for positioning the boat for lifting. The lift cradle catches the boat out of the water and a travelling rack moves beneath the boats hull. There are twin tugs on each side of boat. The whole system is equipped with rails. A computer system adjusts for lifting stroke via sensors at the travelling rack and measures the contours. After moving the boat in the hall, the automated cleaning process starts. This wash street removes all the salt and surface dirt from all sides of the vessel. The elevator transporter is made out of structural steel I-beams which avoids vibrations. The elevator simultaneously moves horizontally and vertically and stores the vessel to the computer assigned storage level and slot location.

¹²⁴ Compare Aero-Docks.

System IV is an evolution in terms of space efficiency. The boat enters the dock boat lift area as with the system III. The centring is done by the hydraulic arms as well. In comparison to the system III there is a single large travelling tug with an empty special designed carrier (Figure 4-13). The same type of an elevator transporter moves the boat to the selected floor level where the boat will be stored and inserted onto an indexing and rotating carousel.

4.2.2.3.2 Strength and Weaknesses

Figure 4-14 visualizes the strength and weaknesses of Aero Docks system.

| Competitor Aero Docks | |
|---|---|
| Strength | Weaknesses |
| <ul style="list-style-type: none"> + Fully automated centering of the boat at waterside (no human power) + 1 existing reference in Fort Lauderdale + Duration: 2-3 minutes/boat + Optimal use of space (up to 90%) + Automated overnight sorting of boat dry berth + Corporation with Rockwell Automation (many references all over the world) + Tidal range: no limitations + Protection against weather influences (indoor) + Boats up to 23 metres in length possible (80 tons) + Efficient use of space (flexible boat sizes in the rack) + Flexible in terms of boat types (no adjusted frame) + Also suitable for luxury yachts | <ul style="list-style-type: none"> - Several handovers in the system (complex and prone to error) - railsystem is complex and expensive (additionally rails at racks) - Building permits required (foundation) - Just 1 crane (no replacement if crane has a defect) |

Figure 4-14: Strength and Weaknesses Aero Docks System

4.2.2.4 Automated Marine Technologies

Automated Marine Technologies (AMT) offers a large variety of boat handling and storage concepts ranging from fully automated to manual operated systems. AMT is cooperating with Loedige Industries, which is a world leader in materials handling solutions. Their product range consists of automated air cargo systems, automated car parks and industrial elevators.¹²⁵

The concept is a crane system with rails on the ground floor. There are no realized projects for AMT so far and the level of detail in the concept for the fully automated system is very low. Additionally there is just a concept for an outdoor facility on the

¹²⁵ Compare AMT, 'Automated Marine Technologies' <<http://www.automatedmarinetechologies.com/aboutus.html>> [accessed 20 October 2014].

website of Automated Marine Technologies. Therefore the outdoor semi-automated system will be explained in more detail over the course of this thesis.¹²⁶

The demarcation of the modes is visible in the following table.

| Fully Automated | Semi-Automated | Manual |
|--|---|---|
| The operator does not ride in the cabin. They manage an inventory control system from the marina office or over the web using secure log-in. | The operator rides in the cabin. 1 button takes the operator to the rack. | The operator controls all movements from the cabin. |

Table 4-5: Demarcation of Automation Modes¹²⁷

The Loedige and AMT partnership offers design and consultancy, manufacture, installation, project management and servicing. The focus of customers lies on the larger marinas. Figure 4-15 illustrates the concept of Automated Marine Technologies with its elevating transfer vehicle system.¹²⁸

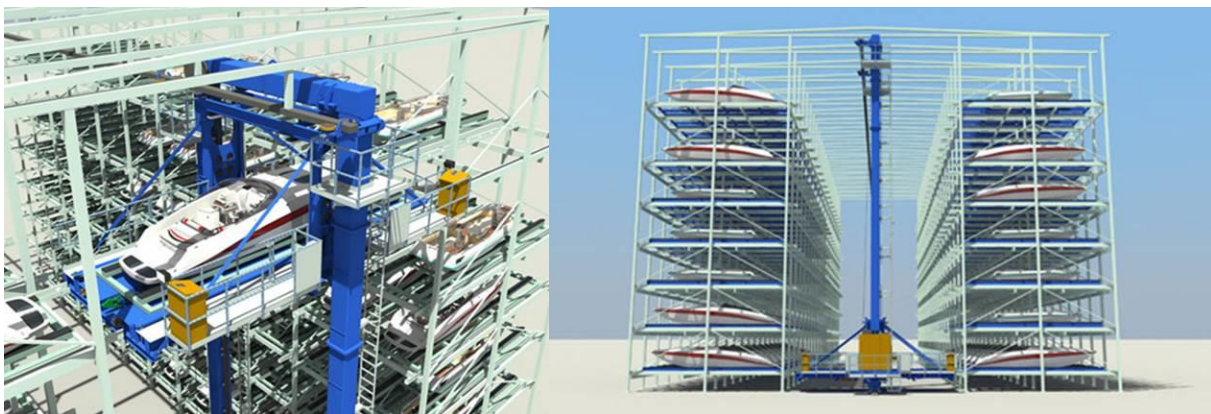


Figure 4-15: Automated Marine Technologies System

The scope of services is provided for the customer by AMT¹²⁹:

- Local marina market research
- Existing site assessment
- Concept design
- Detailed design
- Procurement and Manufacturing
- Installation

¹²⁶ Compare AMT.

¹²⁷ Compare AMT.

¹²⁸ Compare AMT.

¹²⁹ Compare AMT.

4.2.2.4.1 Process Description

The system of AMT includes 2 main components, the lift and run system and the elevating transfer vehicle system. The lift and run system is a product by Loedige Industries to move the boats automatically in and out of the water. After reaching the required level they will be delivered to the elevating transfer vehicle system. This second component is an automated boat storage platform that moves vertically and horizontally simultaneously (horizontally at 120 metres/minute and vertically at 60 metres/minute).

The automated sections of the system are as follow:

- Automated Car Parking
- Automated Boat Wash
- Automated on Land Boat Queuing
- Automated Boat on Water Queuing
- Automated Boat Lift
- Automated Boat Service Areas

Automated Car Parking

The concept was planned with an additional automated car parking lift system. This additional parking lift brings the car of the boat owners to the assigned free space in the boat storage while he is out on the water with his boat.

Automated Boat Wash

The automated boat washing facility is equipped with photo eye sensors and high powered spray systems like in car washing facilities to guarantee premium cleaning of the boat.

Automated on Land Boat Queuing

For high frequencies at the storage facility AMT offers a concept for an automated on land bottleneck queuing system with conveyors. The scheme of the queuing system is shown in the following figure.

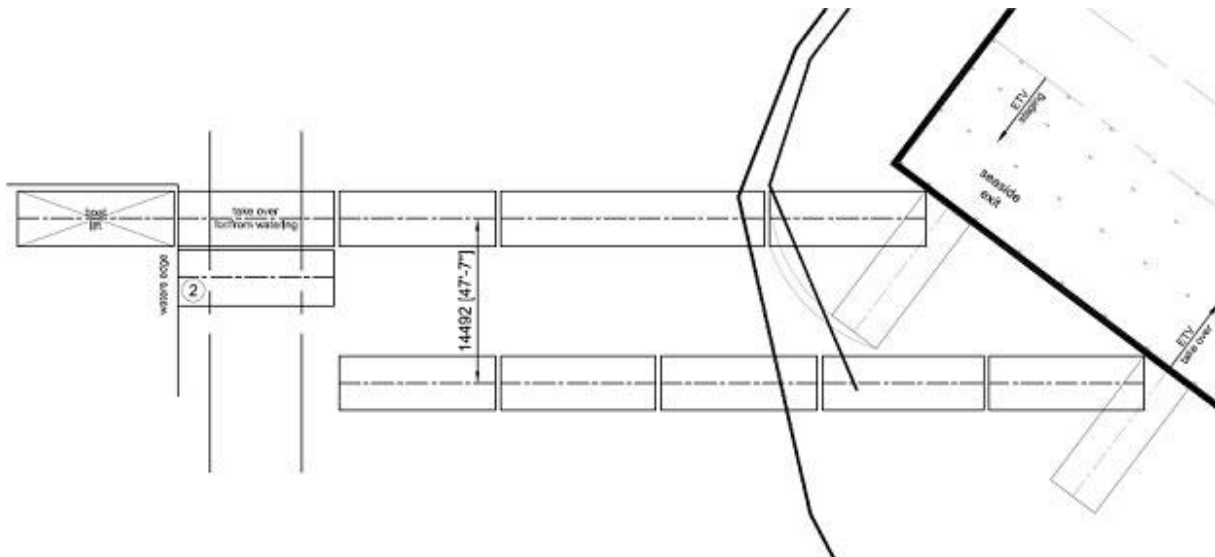


Figure 4-16: Scheme of on Land Boat Queuing System

Automated Boat on Water Queuing

Additionally to the on land queuing system the concept includes offshore boat spaces in the water.

Automated Boat Lift

The automated boat lift reduces the throughput times and is a simple design which can move just vertically.

Automated Boat Service Areas

The concept offers options for retail, commercial, residential and dining purposes.

4.2.2.4.2 Strength and Weaknesses

Figure 4-17 shows the strength and weaknesses of Automated Marine Technologies system.

| Competitor Automated Marine Technologies | |
|--|---|
| Strength | Weaknesses |
| <ul style="list-style-type: none"> + Duration: 1-3 minutes/boat + Cooperation with Lodge Industries (many references all over the world) + Tidal range: no limitations + Boats up to 18 metres in length possible (20 tons) + Also suitable for luxury yachts + Bottleneck regulation available (landside) + Space efficient (simultaneously storage space of boats and parking space for cars) + Back up redundancy system (second integrated engine) + No height restriction for installations outdoors in the top level (in comparison to gantry cranes) | <ul style="list-style-type: none"> - No fully automated centering of the boat at waterside (centered by human power) - Several handovers in the system (complex and prone to error) - No existing reference (just concept) - railsystem is complex and expensive (additionally rails at racks) - Building permits required (foundation) - Outdoor storage (weather influence) |

Figure 4-17: Strength and Weaknesses AMT System

4.2.3 SWOT-Analysis Kuenz System

The last step in this competition analysis is the determination of strength, weaknesses, opportunities and threats of the Kuenz products. To get these findings it was necessary to compare the Kuenz product from chapter 4.1.3 with competitor's products from chapter 4.2.

The related literature of the SWOT analysis is shown in chapter 2.4. The derived strategies out of the SWOT analysis will follow in chapter 6.1.

Figure 4-18 shows the results of the SWOT Analysis.

| Internal Analysis | |
|---|--|
| Strength | Weaknesses |
| <ul style="list-style-type: none"> + 1 equipment for all process steps (waterside and landside) + Unified lower frame part for crane sensory (less prone to error) + Modular construction + Lower costs than for rail systems + No comparable product on the market + Minimized width of the hall by longitudinal storage of boats + Flexible designs (several cranes and or transfer carriage) + Many years of experience in crane construction (references all over the world) + Many years of experience in hydro power segment (aggressive substances) + Adaption of the upper frame part protects the boat against damages | <ul style="list-style-type: none"> - No fully automated centering of the boat at waterside (centered by staff members) - Suitable infrastructure required (Height of the building, ..) - Customized upper frame parts (1 specific frame for a boat) - Time delay due to customized frame part (additional step for the crane) - High investment costs - No existing reference (just concept) - Lack of knowledge for assembling a full installation - Transfer to general contractors creates higher costs |
| External Analysis | |
| Opportunities | Threats |
| <ul style="list-style-type: none"> + Fully automated centering of the boat (at waterside) + Standardized frame system (simplification process) + Expandable system as desired (in crane moving direction) + Green System (rainwater collection, photovoltaic, ...) + Creation of a reference project + Customized versions + Possible optional business (options for retail, commercial, residential and dining purposes) | <ul style="list-style-type: none"> - Break off business relations (Long-term realization) - Changes in legislation (political risks) - Lack of financial resources (economic risks) - Decrease in demand of pleasure boating - Lack of information on possible projects - Situation potential landscape (price / availability) - Lack of acceptance (Boating Culture - Life on the Water) - Better price/ performance ratio of competitors |

Figure 4-18: SWOT Analysis Kuenz Concept

4.3 Market Analysis for Automated Boat Handling and Storage Systems in Europe

After analysis of the Kuenz products and the competition in automated boat handling and storage systems the next important step is to focus on the demand, needs and circumstances on the international market. As part of the diploma thesis a closer look has been taken at the situation in Europe.

This includes inter alia the marina utilization, ownership structures, the number of dry or wet berths, typical boat sizes and types, requirements of the boat owners, plant operators, investors and importance as well as values of boating within a European country. The focus in this thesis is placed on vertical dry storage (dry stacking).

4.3.1 Data Collection for European Marinas

Primary data has been collected by an online survey. A total of 350 online surveys were sent out to marinas all over Europe. 29 surveys have been answered from European marinas, representing a response rate of 8.3%. The blank online survey is shown in the attachment A.1. Additionally to the English document the survey has been translated into German, Italian, Spanish, French and Portuguese. Other primary has been obtained by phone calls or mail conversations which are mentioned in the appropriate chapter.

Secondary data has been collected through different internet sources. The appropriate sources are visible in the concerning chapters of the market analysis.

4.3.2 Facts and Figures European Pleasure Boating

The European pleasure boating industry includes 36 million boaters, 6 million boats in European waters and 48 million people enjoying water sport activities. The whole segment has a turnover of 20 billion€ and 280.000 direct employees. 97% of the pleasure boating business is small- or medium-sized enterprises.¹³⁰

The industry consists of boat builders, engine manufacturers, equipment manufacturers, and trade or service providers and is build-up by approximately 32.000 companies.¹³¹

Figure 4-19 shows the difference between the statistics of boat types in the European Union in comparison to the answered online surveys. It is important to mention

¹³⁰ Compare European Boating Industry, 'Facts and Figures European Boating Industry' <<http://www.europeanboatingindustry.eu/>> [accessed 1 November 2014].

¹³¹ Compare European Boating Industry.

that the statistic of the European Union is derived out of boat registration data, where all kind as well as small sizes of power boats are recognized while at marinas the number of small powerboats are not typically owners of fix berths or storage spaces.

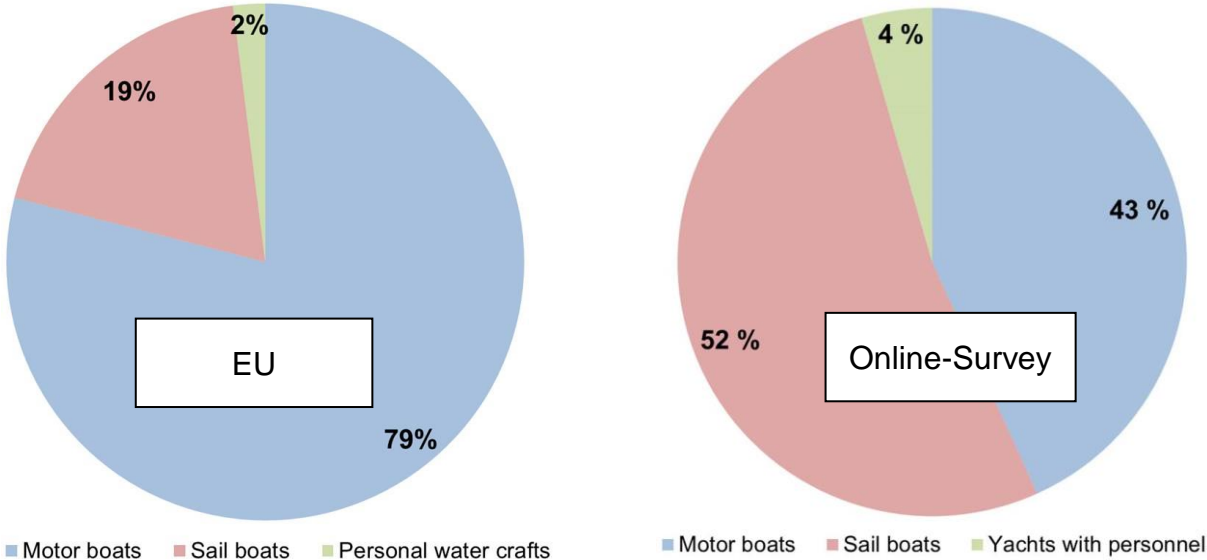


Figure 4-19: Boat Types EU in Comparison to the Online Survey

The importance of the sector significantly varies by country. Figure 4-20 shows the ranking on capita per boat of countries considered in the online survey. The average number of capita per boat compared with official numbers of the European Union shows that the online survey achieved similar results. Additionally it can be derived that boating in Scandinavian countries is more common than in other countries while the industry in Greece and Czech Republic is not mature yet.

The market of leisure boating in Europe recorded a little decrease in the last 10 years. There is clear increased demand for boat rental services.

The share on typical boat sizes in Europe based on the online survey is shown in Figure 4-21.

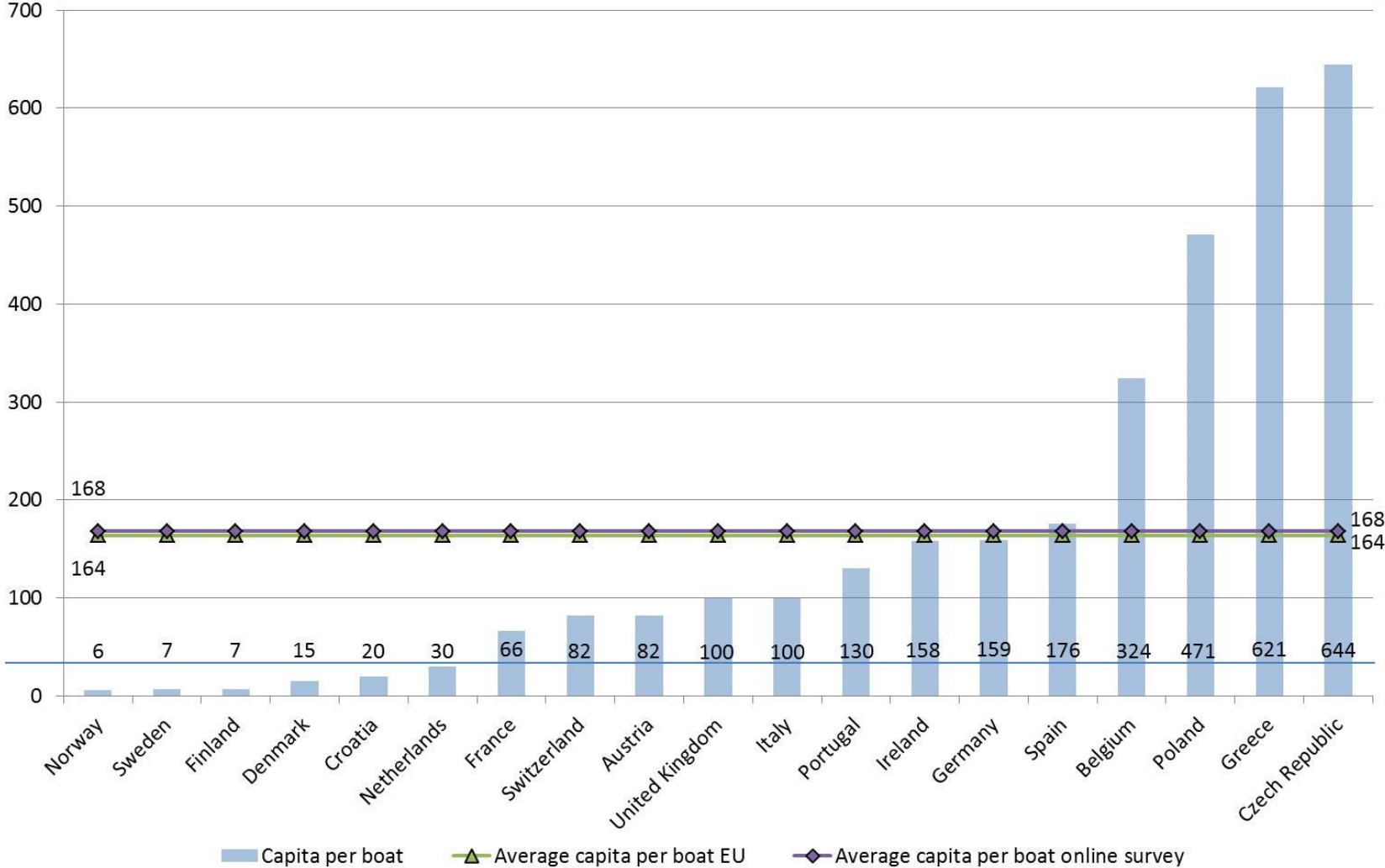


Figure 4-20: Capita per boat¹³²

¹³² Compare European Boating Industry.

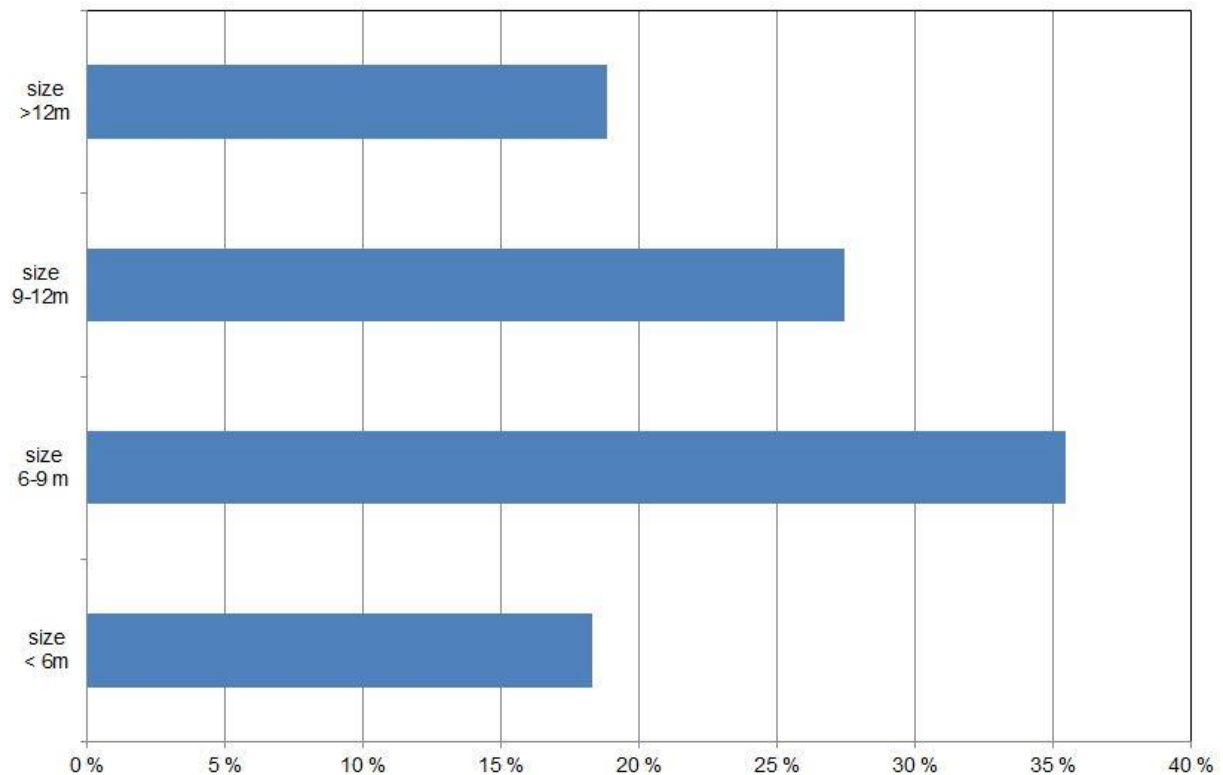


Figure 4-21: Typical Boat Sizes in European Marinas

4.3.3 General Situation of Vertical Dry Storage in Europe

Vertical dry storages or rather dry stacks have been developed and multiplied in the USA and diffused later to European countries. Dry stacking development varies on each continent, which depends on the local conditions and the boating history.¹³³

In Europe there are the following groups to mention

- Class 1: European countries with developed boating markets and saturated marinas
- Class 2: European countries with developed markets and no lack of capacities
- Class 3: Southern Europe - pleasure boating in development
- Other European countries¹³⁴

Vertical dry storage facilities refer in particular to a specific segment of customers.

- Boaters, who are living far away from their boat which means that they cannot assure appropriate supervision
- Boaters, with a low exit rate of their boat (no permanent availability necessary)

¹³³ Compare Creocan Pole Economie et Développement du Littoral, *Survey and Comments about Dry Stacking in the World* (Nantes, 2010), p. 19 (p. 2).

¹³⁴ Compare Atout France, p. 22.

Nevertheless, the dry stack facility has to enable high frequent use of boats even daily. The exit rate ratio influences the design as well as the functional conditions and profitability of the dry port. Increased automation supports the fulfilment of these requirements.

People in Europe are not used to store their boat in racks. Brittany (France) started a project with a dry stack system a few years ago. The boat owners avoided to store their boats in the racks. That's why the marina offered them a lot of benefits and a cheaper storage space than in the water. After the testing period about 80% of the boat owners were satisfied with the system and decided to continue dry storage.

4.3.4 European Countries with developed Boating Markets and saturated Marinas

France, Italy, Spain and Great Britain are part of the class 1 countries with developed boating markets and saturated marinas.

Despite the satisfied demand the class 1 countries are fighting to obtain the marina. The common reasons are:

- Overcrowding of marinas
- High develop costs for new facilities
- High tariffs and regional taxes
- High costs for boat handling and storage equipment and rigorous protective regulations¹³⁵

Marinas are more or less dependent on the quality of their offer. In general there is a missing or poor fulfilment of the demand. The status and perspectives for each class 1 country is shown in the following subchapters 4.3.4.1 to 4.3.4.4.

4.3.4.1 France

France is one of the countries where dry stacking is more common than in other European Countries. There are about 40 projects of dry stack facilities which is a progressive development. The reason for this progressive development is the high saturation and the bottlenecks with respect to the growth and demand.¹³⁶

| Region | Number of dry stacks | Number of berth in dry stacks | Capacity [%] |
|----------------|----------------------|-------------------------------|--------------|
| Channel coast | 0 | 0 | 0 |
| Brittany coast | 4 | 639 | 10 |

¹³⁵ Compare Atout France, p. 23.

¹³⁶ Compare Atout France, p. 33.

| | | | |
|---------------------|-----------|-------------|------------|
| Atlantic coast | 2 | 170 | 2 |
| Mediterranean coast | 18 | 5839 | 88 |
| Total | 24 | 6648 | 100 |

Table 4-6: Dry Stack Facilities in France¹³⁷

The need in France is approximately 40.000 additional berths.

4.3.4.1.1 Feedback received from the Online Survey

A total of four questionnaires have been answered by the French marinas. Three of them are located on the Mediterranean and one on the Channel coast. All together 46% of boats are motor boats, 52% sail boats and about 2% are yachts with personnel. The sizes of motor boats are mainly between 6 to 12 metres in length. Except one marina all of them have waiting lists for fixed berths up to ten years. Half of them are public and the other ones are operated by private investors with concessions. Boat handling and storage equipment is typically the travel lift, crane or a boats lift. There is just one marina with a planned expansion in the near future.

4.3.4.1.2 Techniques of Dry Stacks

Dry stacks represent about 4% of French marina capacity and they are operated using basic techniques. The fork lift operation is the most common technique. The quality of the handling depends on the quality of the fork lift operator. The main problem for basic equipment like fork lifts is the tidal range e.g. in Brittany, North Channel or Atlantic Coast. There are regulations about the necessary equipment according to the location of the dry stack:

- For flood or uneven access: boats lift
- Slipways or trailers
- Combined systems

4.3.4.1.3 Popular Vertical Dry Storage References

Phar'O is the only realized automated boat handling and storage system in France. Further details to the system are shown in chapter 4.2.1. Several special boat lifts are in operation in regions with high tidal range.¹³⁸

Port de Dieppe has a dry stack capacity of 300 boats across 4 levels. The facility was a conversion of an unused dry dock. The racks are below water level enclosed by a

¹³⁷ Compare Atout France, p. 33.

¹³⁸ Véronique Tourrel Déléguée Générale UPACA Ingénieur en Environnement, Boat Handling and Storage in France, 2014.

new gravity wall. The boat handling and storage is done using a boat lift and a special manually operated special crane.¹³⁹

Dry stack is part of the marina complex Arzon – Le Crouesty with a capacity of 148 boats. The marina offers full services and a large sea-side resort for boaters. The region typically has large tidal range therefore a fixed boat lift is installed. Fork lifts move the boats from the fixed boat lift to the open racks.¹⁴⁰

Lorient was the largest U-boat base in the Second World War. Inside the submarine base a dry stack facility was built to use the space for boating.

4.3.4.1.4 Main Problems for creating Vertical Dry Storage Facilities

- Site availability: It is very difficult to find sites with direct access to water at a reasonable cost and permit to build
- Regulation: Building on the French coast is limited to urban, and harbour or industrial areas. Natural sites are all protected
- Tide: Tidal range reaches 12 m in Brittany and 6 to 8m in a large part of the Western coast. This leads to more complexity in construction
- Market: Except on Mediterranean coast where dry stack begins to be well known, boat owners have to be convinced of dry stack benefits and new developments take some years to be filled¹⁴¹

4.3.4.1.5 Marina Organization in France

Most of the French marinas were built in the early 70s and they are 75-80% public operated. In Mediterranean locations there are private investors who buy their boat places and become shareholders. Many marinas are operated by investors with concessions over 50 years (45% under private and 55% under public concessions). After this time the marina under private concession belongs to the public sector. There are around 350 marinas in France. In the western part of France about 90% of marinas are under public concessions.¹⁴²

4.3.4.1.6 Typical Boats

In the north the boats have an average length of 7.5 metres while in the south they reach about 9 – 10 metres average length. In the Channel and Atlantic coast the boats are mainly smaller than 6 metres. Mediterranean coast listed bigger boats up to 12 metres. The most common boat types are open boats particularly Runabouts. The

¹³⁹ Jean-Michel Gagné Director North Bretagne - Saint-Quay Portrieux, Phone Call - International Dry Storage Facilities, 2014.

¹⁴⁰ Jean-Michel Gagné Director North Bretagne - Saint-Quay Portrieux.

¹⁴¹ Compare Creocan Pole Economie et Développement du Littoral, p. 11.

¹⁴² Véronique Tourrel Déléguee Générale UPACA Ingénieur en Environnement.

trend is moving towards longer and higher boats while the width is consistent due to transportation standards.¹⁴³

4.3.4.1.7 Typical Customer

The type of customers depends strongly on the local conditions. There are a high proportion of inhabitants who use their boats partly every year. Another high percentage of customers have their second domicile in the region (especially in tourist areas). The average number of trips of in France is 20-30 trips/year. The usage of dry stacks just for storage in winter is not as common as in Scandinavian countries.¹⁴⁴

The exit rate of boats depends on the type of marina. In tourist zones the exit rate is important but mainly concentrated on the summer season. In the proximity of urban centres the exit rates depends strongly on the weather conditions and is more or less contributed all over the year. Home marinas have almost local customers. They note a high exit rate also outside the summer season for inhabitants (fishing boaters). The largest shares are day boats for a few hours used for fishing or sport activities.¹⁴⁵

The ratio of customer satisfaction is generally very good. The main advantage of dry stacks is mentioned in chapter 3.5.1. The unavailability of boats outside the opening times (not for fully automated handling) and the lack of usability of the boat in comparison to water berth (life on the boat like for cabin boats) are recognized disadvantages.¹⁴⁶

4.3.4.1.8 Prices for Dry Stacks

The fee for a dry stack berth is similar or cheaper than for wet berth (up to 20% cheaper depending to the region)¹⁴⁷. The standard contracts are valid for a year with unlimited number of manipulations. Seasonal variants are also possible, but they are not as common as annual contracts. They are offered in tourist marinas where the short term use is very popular and frequent.¹⁴⁸

In the south of France there are special offers for boat users. They have the option to buy a space as real estate with an additional fee for maintenance or to hire a place. In locations at the Atlantic coast or Channel coast there are mainly public investors. Boat places will be hired there.¹⁴⁹

¹⁴³ Bernard Piquet Directeur du Port de la Rague, Boat Handling and Storage in France, 2014.

¹⁴⁴ Bernard Piquet Directeur du Port de la Rague.

¹⁴⁵ Bernard Piquet Directeur du Port de la Rague.

¹⁴⁶ Bernard Piquet Directeur du Port de la Rague.

¹⁴⁷ Compare Creoccean Pole Economie et Développement du Littoral, p. 10.

¹⁴⁸ Bernard Piquet Directeur du Port de la Rague.

¹⁴⁹ Bernard Piquet Directeur du Port de la Rague.

The standard annual contract includes the storage, handling and customer care. The preparations of boats for winter are paid separately.

4.3.4.2 Italy

In Italy there are 30 dry stack facilities with a total number of 2000 dry berths. This is about 1% of all registered boats. The average number of dry berths in dry stacks is 100 and they are mainly in private ownership offering additionally a variety of services. These facts show that dry stacking is not really developed in Italy. As in France there is also a high saturation in some popular areas of Italy.¹⁵⁰

4.3.4.2.1 Feedback received from the Online Survey

A total of five questionnaires have been answered by the Italian marinas. Three of them are located on the Mediterranean and two on inland water ways. All together 55% of boats are motor boats, 45% sail boats. The sizes of motor boats are mainly between 6 to 12 metres in length but there are also an essential number bigger than 12 metres. They have no waiting lists for fixed berths and are operated by private companies. The ownership however is regulated through concessions in most cases. The boat handling is done by cranes and travel lifts and their use is not completely exhausted. Dry storage is offered from most of the asked marinas, but commonly horizontal dry berths are available.

4.3.4.2.2 Techniques of Dry Stacks

Boat handling and storage in Italy is done mainly with fork lifts. The tidal range is less than 1 metre. There is no real application of automated systems yet, even if some ideas are in progress.

4.3.4.2.3 Popular Vertical Dry Storage References

There is just one known dry stack facility in Palermo.

4.3.4.2.4 Main Problems for creating Vertical Dry Storage Facilities

- Site availability and land cost (legal issues and complexity of permits, administrative expenses)
- Environmental and landscape impacts (permissions)
- Low fees in comparison to investment costs for marinas
- Lack of knowledge about dry stacks and advantages in comparison to water berths (just one popular dry stack in Palermo)¹⁵¹

¹⁵⁰ Compare Creoccean Pole Economie et Développement du Littoral, p. 11.

¹⁵¹ Compare Creoccean Pole Economie et Développement du Littoral, p. 11f.

4.3.4.2.5 Marina Organization in Italy

There are a lot of quite small marinas in Italy which are owned by private investors with a concession of public institutions (country, region...). There are approximately 210 marinas including several camping marinas.¹⁵²

4.3.4.2.6 Typical Boats

The usual range of boats in dry stacks is 4 to 8 metres in length. The proportion of boats over 8 metres is less than 5%.

4.3.4.2.7 Typical Customer

The boat owners still prefer wet berthing to have their boat ready to use at any moment. Also the foreign boaters have the preference to use camping marinas to “live” on the boat and join activities with other campers. The users of dry stack facilities are often inhabitants or boaters with a second domicile in the region. The foreign customer is mainly concentrated on trips in the summer season.¹⁵³

4.3.4.2.8 Prices for Dry Stacks

A dry berth in Italy is cheaper than a water berth. Reductions of up to 60% are possible. Investments for marina owners are cost intensive due to land costs.¹⁵⁴

4.3.4.3 Spain

Spain counts seven dry stack facilities with about 1500 dry berths 100% on salt water. A further 3 facilities are planned in the next few years. In comparison to total berths the share of dry berth in such dry stacks is about 1%¹⁵⁵. The average number of boat berths per facility is smaller than 100 and it varies between public and private ownership (three are private and four are public). The organization is independent of water berths.¹⁵⁶

4.3.4.3.1 Feedback received from the Online Survey

Three questionnaires have been returned by Spanish marinas, one from the Atlantic and two from the Mediterranean coast. The share of motor boats lies at 33%, sail boats 53% and yachts with personnel at 15%. The motor boat size at the Atlantic marina is commonly smaller than 9 metres in length while the typical size at the Mediterranean coast is between 6 and 12 metres. There is just one marina with a waiting list for fix berths and the period for waiting varies between one month and a year. The ownership of the marinas is different but in all of the cases the public institutions (country, city, region...) are responsible for decisions about expansions. One marina

¹⁵² Interview Marina Stella.

¹⁵³ Compare Atout France, p. 23.

¹⁵⁴ Compare Atout France, p. 23.

¹⁵⁵ Compare Creocan Pole Economie et Développement du Littoral, p. 12.

¹⁵⁶ Compare Atout France, p. 24.

does not offer any dry storage facility while the others have vertical respectively horizontal dry storage. The common way to handle the boats at the marina is fork lifts and travel lifts.

4.3.4.3.2 Techniques of Dry Stacks

The usual hoisting is done by fork lifts. The recent development introduces a gantry crane combined with a launcher to cope with the tidal range on the Atlantic coast. Fork lift operations at the Mediterranean Sea have better conditions due to the low tidal range.

4.3.4.3.3 Popular Vertical Dry Storage References

There is an indoor boat storage system at Marina Coruna offering in addition a complete repair workshop. The handling equipment is a 50 tons travel hoist and a special automated mechanism for moving the boats from the docs to the storage or workshop area.¹⁵⁷

Port Forum is located in Barcelona. It was the first dry dock in Spain and operates all over the year. It has a capacity for motor boats of up to nine metres in length. The dry dock offers all the economic and preservation-related advantage of dry storage including repair and maintenance service.¹⁵⁸

4.3.4.3.4 Main Problems for creating Vertical Dry Storage Facilities

- Site availability and costs of land
- Impacts on environment and landscape as well as legal issues
- Lack of knowledge of dry stacks and their advantages
- Politically impacts¹⁵⁹

4.3.4.3.5 Marina Organization in Spain

Spain has excellent marinas (more than 361) with about 130.000 moorings. 61 % of all the ports can be found in the Mediterranean area. 10 % to 15% of the marina berths are reserved for transitory clients. These boat users are navigating from one marina to another along the coast.¹⁶⁰

4.3.4.3.6 Typical Boats

The usual range of boats in dry stack facilities is between 8 and 10 metres in length. The largest share has boats with 8 metres.

¹⁵⁷ Compare 'Dry Stack Marina Coruna', *North West Marinas* <<http://www.northwestmarinas.com/en/marina-seca/winter-storage/>> [accessed 18 November 2014].

¹⁵⁸ Compare Port Forum, 'Port Forum Dry Stack' <<http://www.portforum.com/cms/?lang=en>> [accessed 15 December 2014].

¹⁵⁹ Compare Atout France, p. 24.

¹⁶⁰ Compare Atout France, p. 24.

4.3.4.3.7 Typical Customer

The Spanish people are used to spend their leisure time on the coast but boating for pleasure is more or less a luxury activity which is not affordable for most of the Spanish population. Local boaters commonly have cheap boats which are in the water all year round. The maintenance and repair service is often done by themselves. Therefore the dry stack customers are mainly foreign visitors who are loyal to their holiday destination in Spain. Boat renting is increasing for foreigners as well as for locals.¹⁶¹

4.3.4.3.8 Prices for Dry Stacks

The fees for berths in dry stack facilities are less than in wet marinas (up to 25%). Profitability is estimated to be positive according to the market and expenses conditions. Investment costs for marina owners are generally quite high due to land costs and political impacts.¹⁶²

4.3.4.4 Great Britain

There are 4 recent dry stack facilities identified with 600 berths. This is about 1% of all water and dry berths. All vertical dry storages are privately owned and part of a marina complex.¹⁶³

4.3.4.4.1 Feedback received from the Online Survey

No questionnaires have been returned from marinas in Great Britain. Therefore all the information about the country is secondary data.

4.3.4.4.2 Techniques of Dry Stacks

The common boat handling is done by fork lifts. Particularly in regions with a high tidal range up to 4.8 metres high performance fork lifts are used (Wiggins, Neptune). Beside the tidal range there are no actual or planned automated systems in Great Britain.

4.3.4.4.3 Popular Vertical Dry Storage References

Saxon Wharf Marina is situated on Southampton's river Itchen, north of Shamrock Quay and offers a dry stack facility with launching and lifting for boats up to 13 metres.¹⁶⁴

Cobbs Quay Marina is another popular dry stack situated at Hamworthy (Holes Bay). The facility offers 240 dry stack berths with a maximum LOA of 10 metres.¹⁶⁵

¹⁶¹ Compare Atout France, p. 24.

¹⁶² Compare Creoccean Pole Economie et Développement du Littoral, p. 12.

¹⁶³ Compare Creoccean Pole Economie et Développement du Littoral, p. 13.

¹⁶⁴ Compare 'Saxon Wharf Marina Homepage' <<http://www.mdlmarinas.co.uk/mdl-saxon-wharf>> [accessed 12 December 2014].

4.3.4.4.4 Main Problems for creating Vertical Dry Storage Facilities

- Availability of suitable land
- Land is more expensive than water
- Environmental regulations (landscape impacts, approval procedures)
- High tidal range (especially drop on the south coast)¹⁶⁶

4.3.4.4.5 Marina Organization in Great Britain

Great Britain has a lot of high quality marinas. The costs for a berths, whether wet or dry are commonly higher than in other countries in Europe due to a great variety of available services and higher operational costs for marina operators (labour).¹⁶⁷

4.3.4.4.6 Typical Boats

The usual range of boats in dry stacks is 5 to 11 metres. One third of the boats are larger than 8 metres in length. The trend is moving to larger boats.

4.3.4.4.7 Typical Customer

Dry stacks are relatively new in UK and are still growing. It is very popular on the South coast of England, where marinas are full (Solent area).¹⁶⁸

4.3.4.4.8 Prices for Dry Stacks

The fee for a berth in a dry stack is about 10% higher than a wet berth. Boat owners have to pay approximately 9.000€ for a wet berth (equipment and surface treatment).¹⁶⁹

4.3.5 European countries with developed Markets and no Lack of Capacity

The leisure boating market in Scandinavia and Netherlands is well developed, but there is no lack of berth availability. Scandinavian countries are used to store their boats outside the water due to weather especially the cold winters. The other fact is that there are commonly a lot of water berths available so that bottlenecks in terms of marina utilization are not a problem in these countries. The water berths capacity in the Netherlands is also not fully utilized.¹⁷⁰

¹⁶⁵ Compare 'Cobb's Quay Marina' <<http://www.mdlmarinas.co.uk/mdl-cobbs-quay-marina>> [accessed 12 December 2014].

¹⁶⁶ Compare Creoccean Pole Economie et Développement du Littoral, p. 14.

¹⁶⁷ Compare Atout France, p. 27.

¹⁶⁸ Compare Creoccean Pole Economie et Développement du Littoral, p. 14.

¹⁶⁹ Compare Creoccean Pole Economie et Développement du Littoral, p. 14.

¹⁷⁰ Compare Creoccean Pole Economie et Développement du Littoral, p. 15.

4.3.5.1 Netherlands

The Netherlands counts 800 marinas with a total of 140.000 berths. There are large (more than 350 berths) as well as small marinas. The number of large marinas strongly increased since 2000. In many of the ports repair and maintenance service, yacht hire and winter services are offered. There are about 250.000 boats registered in the Netherlands.¹⁷¹

One questionnaire has been answered by a Dutch marina located at the Meuse River. The share of motor boats is approximately 70% and of sail boats the rest. The most common size of motor boats in this marina is 9 to 12 metres in length. There are also a significant number of them in the category 6 to 9 metres. There exists a waiting list for a berth with a waiting span between 2 and 6 month and the extension of the marina is already planned. Dry storage is not part of the offer for the boaters.

In Netherlands, dry stacking is not developed yet. The small motorboats are typically in sheltered waters. Possibilities for berthing or moorings are large and also cheap. Land costs are higher than water. That's the reason why marina owners have not yet invested in vertical dry storage facilities. The advantage of special services at dry stacks like maintenance and repair is not essential for dry stacks because the season for leisure boating is quite short. There are no automated systems of dry storage in the Netherlands.¹⁷²

Boaters in the Netherlands are used to store their boats on trailers. Theft of boats is a common problem in the Netherlands which makes the service of monitoring in dry storages more interesting for boat users.

Most boats in marinas have a length between 6 and 10 metres (approx. 65%). 20% are between 10 and 15 metres and about 12% are less than 6 metres. Just 1% of the boats are bigger than 15 metres. About 80% of the motor boats are cabin boats and the rest are open boats and barges.¹⁷³

The size and location of a type of water sports determines especially the popularity of a marina and the occupancy rate. Marinas on larger waterways are generally popular than ports with smaller (inner) lakes. Pricing at marinas differ from variety of facilities such as cranes and opportunities for storage, maintenance and repair.¹⁷⁴

¹⁷¹ Compare Atout France, p. 27.

¹⁷² Compare Creoccean Pole Economie et Développement du Littoral, p. 15.

¹⁷³ Compare Creoccean Pole Economie et Développement du Littoral, p. 15.

¹⁷⁴ Compare Atout France, p. 27.

4.3.5.2 Scandinavia

Scandinavia comprises the countries Finland, Sweden and Norway. For those countries the situation of dry stacking is quite similar. Scandinavia offers large berth capacities with low rates. Dry stacking is commonly used for winter season, but not as a marina full service.¹⁷⁵

A total of five questionnaires have been answered by Scandinavian marinas, three from Swedish and two from Norwegian marinas. There is no available list of Finnish home marinas so that there was no questionnaire sent to this country. The share of motor boats is about 61%, sail boats 31% and yachts with personnel approximately 8%. The most common size of motor boats is between 6 and 9 metres in length. There is just one marina with a planned expansion.

The Scandinavian marinas store the boats in dry outdoor facilities. It has to be mentioned that all the marinas with answered questionnaires have a waiting list. The boat owners have to wait up to eight years for a fix wet berth. That is contradictory to the statement that Scandinavian marinas have a lot of free capacity. A reason for this difference is the widespread area and more or less popular regions and therefore different utilization. As opposed to Swedish marinas the Norwegian have a berth limitation. Dry storage is done with standard equipment like trailers, crane, hydraulic trailers, travel lift and fork lift. The ownership varies between private with concession, public and a special type of member based boating association with elected board.

Finland

Finnish Maritime Administration estimates about 737.500 privately owned boats in Finland in 2004 including canoes, kayaks, personal water crafts, etc. The major part of all boats is motor boats. About 400 sea shore marinas and 730 fresh water marinas are counted 2005 while many of the marinas have very small single dock mooring places. Only 103 are classified as guest harbours. The maintenance is usually done by municipalities or yacht clubs.¹⁷⁶

Boats smaller than 6 metres in length are typically stored in the owner`s home yard. For larger boats up to 10 metres the storage is arranged by a boat club or similar party. Boats larger than ten metres in length are usually stored in chargeable facilities. The average boat size has increased slightly in the last decade, which results in increasing demand for maintenance and repair services. High service prices in relation

¹⁷⁵ Compare Creocan Pole Economie et Développement du Littoral, p. 15.

¹⁷⁶ Compare Tommi Laaksonen, *A Market Analysis on the Global Boating Industry*, May 2012, p. 38 (p. 10ff.).

to the average income level of boat owners keep the amount of services used at a low level.¹⁷⁷

Sweden

Sweden has more pleasure boats per capita than almost any other country in the world. There are no exact numbers about pleasure boats in Sweden but a survey done in 2010 shows about 881.000 pleasure boats (\pm 83 000) with a motor boat share of 65%. The boat was used in 25 days on average and it had two to three people on board. Day and fishing trips is the common way of using the boat.¹⁷⁸

There are about 1.500 marinas in Sweden. 430 of them are classified as guest harbours which offer extended services. As in Finland there are also a lot of boat clubs in Sweden.¹⁷⁹

Norway

Norway has the highest number of boats per capita. The number of leisure boats in Norway is approximately 380.000. 273.000 of them are motor and sail boat (88.7% motor boats). Prices of berths in public owned marinas are quite low. Norway has much smaller amount of marinas than Finland and Sweden.¹⁸⁰

4.3.6 Southern European Countries – Pleasure Boating in Development

Class 3 Countries have 2 features in common regarding pleasure boating:

- Stage of development in national pleasure boating: the demand for berth at marinas from local people is limited because of high fees
- Main customer is the external/international tourist, who is interested in pleasure boating and forces the development of marinas¹⁸¹

No development regarding vertical dry port (except one in Portugal), because of the inadequacy of the supply and demand. This can be explained by the following facts:

- Domestic demand for small motor boats is popular, cheap and mainly for fishing (local owners look for cheap moorings and harbours and don't want to buy fees for dry stacks.
- External/international customers prefer cabin boats and often sail boats¹⁸²

¹⁷⁷ Compare Tommi Laaksonen, p. 10.

¹⁷⁸ Compare Sweboat - Swedish Marine Industries Federation, *Boating in Brief - in Sweden*, 2012, p. 4.

¹⁷⁹ Compare Sweboat - Swedish Marine Industries Federation, p. 4.

¹⁸⁰ Compare John Martin Dervaig and Tore Olafsen, *Samfunnsøkonomisk Analyse Av Gevinster Ved et Obligatorisk Småbåtregister*, 2010, p. 57.

¹⁸¹ Compare Atout France, p. 27.

¹⁸² Compare Creocan Pole Economie et Développement du Littoral, p. 15.

4.3.6.1 Greece

Greece has 22 organized marinas and about 80 tourist havens with a total capacity of 14.400 wet berths. There are no dry stack facilities or automated boat handling and storage systems.¹⁸³

Greek marinas have answered three online questionnaires. One is located on the Aegean and two on the Ionic coast with a sum of 2.095 water berths. Motor boats have a share of 22%, sail boats of 70% and bigger yachts with personnel 8% of all berths. Motor boats at these Greek marinas are significantly bigger than in other European countries. Here are about 40% yachts bigger than 12 metres in length. Boat handling is done with crane and travel lift. Two of the Greek marinas offer outdoor horizontal dry storage. Due to not fully developed utilization there is no existing waiting list for fix wet berths and no planned extension of the marina.

The maritime area of Greece is divided into the regions Attica, North Greece, Ionian Sea & Peloponnese, Aegean Sea-Dodecanese and Crete. Attica is the most important area with the highest revenue and occupancy between 2009 and 2012 (see Figure 4-22).¹⁸⁴

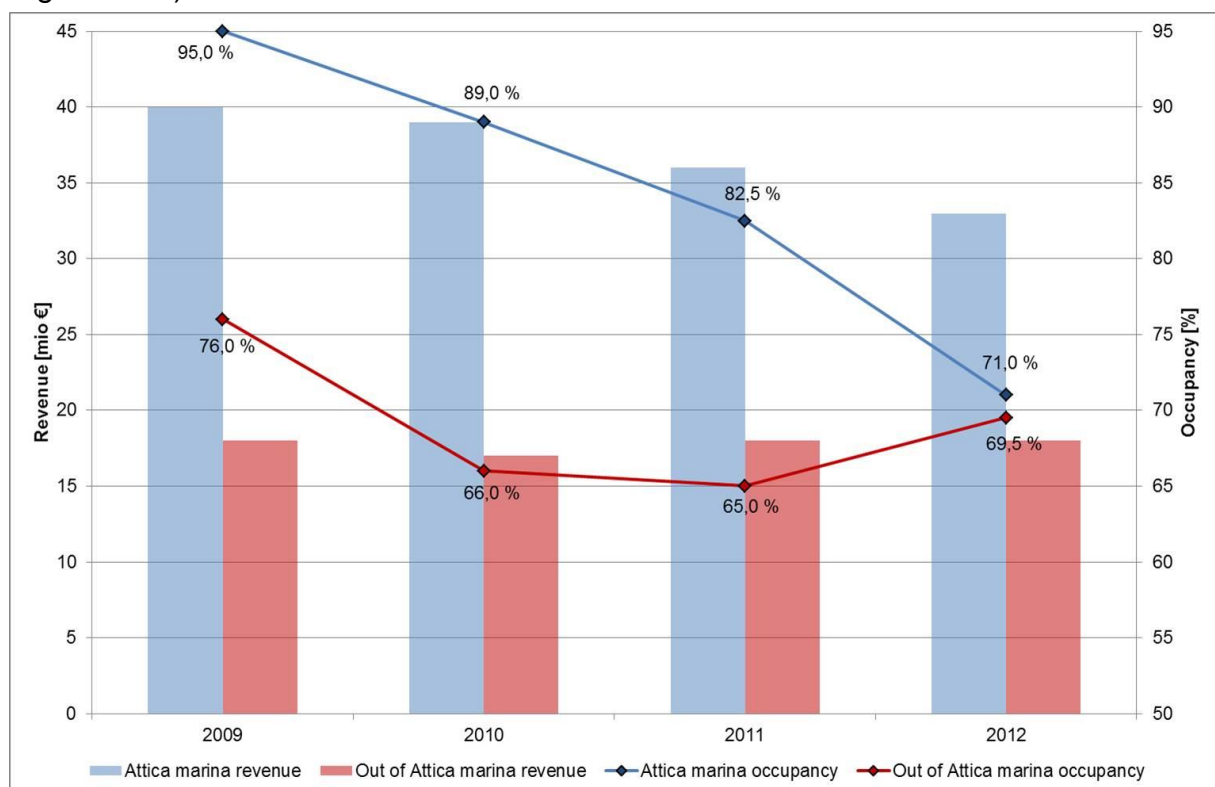


Figure 4-22: Greece marina revenue and occupancy

¹⁸³ Compare Universität Piräus, *Forschung zur Förderung der Bedeutung von Freizeitschifffahrt im Wassertourismus und in der Nationalen Wirtschaft*, November 2012, p. 199.

¹⁸⁴ Compare Universität Piräus.

The contribution of boat types depends strongly on the size of the boats. Figure 4-23 illustrates the share.¹⁸⁵

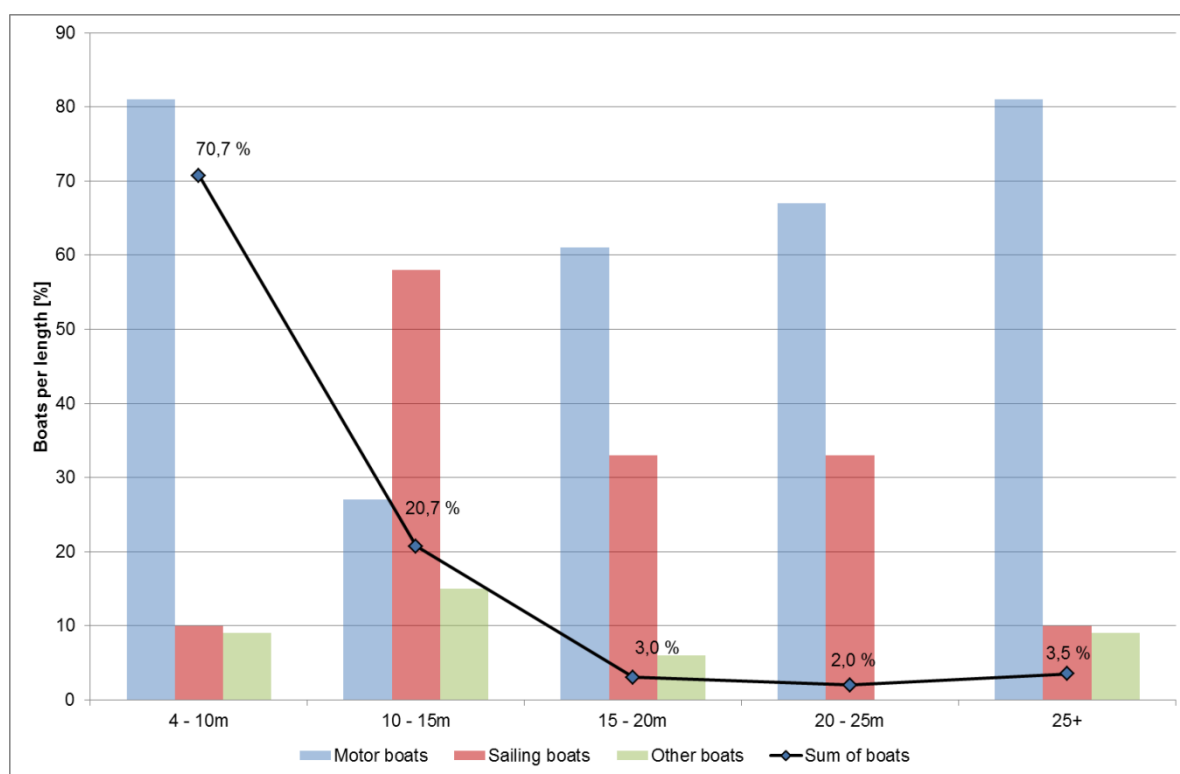


Figure 4-23: Contribution boat types per length

Companies who sell or rent boats usually provide service and storage of boats. The so called “Parking Boat” offer special services like winter maintenance, repair, power fuel, cleaning as well as lifting and launching into dry storage.¹⁸⁶

It is important to mention that Greece is a country with massive financial problems, which is a main reason why there is no planned expansion of marinas.

4.3.6.1 Croatia

Croatia is a maritime country with a long history and tradition of shipping industry and tourism. Croatia counts 70 marinas with about 21.020 berths. 5185 of them are berths on land. There are 33.655 planned berths up to 2015. Beside reception of boats, marinas offer other services as part of their offer like gastronomy, sports, repair...). According to the boat type the permanent moorings at sea are used 45% for motor, 50% for sail and 5% for other boats.¹⁸⁷

One online survey has been received from a Croatian marina located on the Mediterranean coast with a capacity of 220 wet and 150 outdoor dry berths. The dry storage

¹⁸⁵ Compare Universität Piräus.

¹⁸⁶ Compare Universität Piräus.

¹⁸⁷ Compare Ministry of the Sea, Transport and Infrastructure Ministry of Tourism, *Nautical Tourism Development Strategy of Croatia 2009 - 2019*, December 2008, p. 48.

is done by horizontal storage with fork lift and travel lift. The share of motor boats is 60%, sail boats 40% and there are no bigger yachts with personnel. The utilization of the marina is far away from being exhausted. The motor boats are typically smaller than 9 metres in length. The marina is owned by the country.

Croatia is a country with a lot of foreigners in the leisure boating segment. Especially the summer period is highly frequented. Renting of boats is going to be more important in Croatia.

4.3.7 Other European countries

This category includes all the other considered European countries. The operation and organization of leisure boating are very different.

4.3.7.1 Portugal

Portugal has approximately 40 marinas with about 10.100 berths. Algarve und Lisbon are the most frequented regions of the country (Algarve 37%, Lisbon 29%). There are approximately 80.000 registered pleasure boats in the country. In some areas of Portugal the marinas have full utilization and many of them are looking for dry stacks development, even if the service is commonly unknown by the clients. Currently there is just 1 operating dry stack. The trend shows a significant increase of small motor boat units.¹⁸⁸

One marina located on the Atlantic coast of Portugal answered the online questionnaire. The whole capacity of water berths is 462. The contribution of the berths is as follow: 27% motor boats, 67% sail boats and 6% yachts with personnel. There is no dry storage facility and therefore no handling equipment. The owner is a private institution with a public concession and an extension is already planned.

It must be mentioned that Portugal is a country with financial problems.

4.3.7.1 Germany

The marinas in Germany varies greatly in size and offers, from small harbours to larger marinas with several hundred spaces. In general there is no lack of berths in Germany but there are some regions like at the Lake of Constance with limited berths and a high demand. There are just a few simple dry stack facilities in Germany so far. For motor boats the average length is 8.50 metres and only 10% of them are 12 metres or longer.¹⁸⁹

¹⁸⁸ Compare Grupo de Trabalho da Náutica de Recreio, *Náutica de Recreio em Portugal*, 2012, p. 116.

¹⁸⁹ Compare INBDP – Arena Fritidsbåt, *Leisure Boating Germany*, November 2010, p. 56.

A sum of six questionnaires has been answered by private and public German marinas located at the Nord Sea, Baltic Sea, Lake Constance and Lake Chiemsee. There are 31% motor boats, 69% sail boats and no yachts with personnel in average of all answering marinas. The common size of boats varies strongly due to the location. The marinas generally have horizontal dry storage facilities with standard boat handling equipment like, trailer, hydraulic trailer, travel lift, crane and fork lift. There are no automatic systems available in Germany.

The situation at the Lake of Constance has to be specially mentioned. The wet berths are limited by the authorities of the lake and the waiting list for permanent wet berths is very long. Nevertheless, there is a strong demand of local marinas to expand the capacity of boat berths. Dry storage facilities are a gap in the arrangement of the authorities but the environmental regulations have very complex and long-term approval procedures.¹⁹⁰

4.3.7.2 Austria

There is no official data about inland water marinas in Austria. The main locations for boating are the Lake of Constance, Danube River and the Lake Wörthersee. Dry storage is commonly done with horizontal storage at the marina, boat yard or at the boat owner's home. The complicated situation of limited number of berth, long waiting lists and environmental regulations as well as the interest in dry storage at the Lake of Constance is similar to Germany (see 4.3.7.1).

The shipyard Hartmann in Hard at the Lake of Constance shows strong interest in the Kuenz boat handling and storage system. Therefore, a meeting was convened in December to discuss possible strategies for initiating a pilot project.

4.3.7.3 Switzerland

There are a lot of lakes for boating in Switzerland but they have no official data about inland water marinas as in Austria. Dry storage is commonly offered by boat yards. The utilization of indoor boat storage (horizontal) is fully exhausted. The situation at Lake of Constance is the same like in Austria and Germany (see 4.3.7.1).

4.3.7.4 Ireland

Ireland counts 23 marinas with a capacity of 3.648 berths. The estimated number of berths is about 2.636. There are about 26.000 leisure boats in Ireland with a major part of motor boats (approximately 20.000). Dry storage is usual due to cold winters. There are more than 3.600 dry berths in Ireland marinas. The segment of leisure

¹⁹⁰ Sonja Meichle, Marina Meichle & Mohr, Marina Situation am Bodensee, 2014.

boating has not yet fully exploited its full potential. Special niche opportunities exist for salmon angling, fly to sail holidays and water-sports linked to seaside resorts.¹⁹¹

4.3.7.5 Czech

Czech Republic is the least important boating country of Europe with a lowest number of capita per boat. The boat market is small but still growing. There are approximately 16.000 registered boats in the country with the motor boats as a majority. There are 15 marinas with about 1.430 berths. It exist no valid information about storage in Czech Republic.¹⁹²

4.3.7.6 Denmark

Leisure boating in Denmark is quite popular due to the capita per boat ratio. They count 320 marinas with 57.000 boats. There are approximately 375.000 pleasure boats in whole Denmark. The number of sail boats is a little higher than motor boats (57% sail boats). A total of 12.500 people are on the waiting list for a permanent marina wet berth. There is no specific information available about dry storage in Denmark but it is estimated to be similar as in Scandinavian countries (mainly winter storage).¹⁹³

4.3.7.7 Belgium

The Belgian maritime pleasure industry market is relatively small and still recovering from the economic crisis. The country counts approximately 34.300 pleasure boats and 80 marinas with about 8000 berths. The significant majority of boats are motor boats (about 23.000).¹⁹⁴

The future growth potential of the leisure boating sector is somewhat obscured by infrastructural shortcomings. Most marinas on the Flemish coast cannot fulfil customer demands due to shortage of berths. Consequently, a lot of Belgian pleasure-boat owners keep their boats in marinas in countries such as the Netherlands and France. Additionally there is a demand for larger piers and marinas because there is a trend towards larger and more luxurious boats.¹⁹⁵

4.3.7.8 Poland

Poland has a lot of natural conditions for developing sailing and boating activities. The country has over 10.000 lakes, including the popular Mazury Lake region. The number of pleasure boats in Poland lies at approximately 60.000 boats. About 290 inland ports and marinas located on different waterways and lakes can accommodate

¹⁹¹ Compare Irish Marine Federation, *Marine Leisure Tourism*, 2013, p. 34.

¹⁹² Compare Tommi Laaksonen, p. 26ff.

¹⁹³ Compare National Marine Manufacturers Association (NMMA), *Pleasure Boat International Resource Guide*, 2014, p. 89 (p. 25f.).

¹⁹⁴ Compare National Marine Manufacturers Association (NMMA), p. 8f.

over 60,000 boats (number of registered boats in Poland is estimated to be 25.000). 60 of the marinas are located on the Baltic Sea, with capacity to accommodate 3.600 boats.¹⁹⁶

Motorboats represent 80 percent of all pleasure boats registered in 2010. The majority of boats are more than 10 metres in length. The demand for motorboats is negligible. During the last several years, with funds available from EU infrastructure cohesion program, Poland has witnessed development of marinas and yacht ports. Plenty of new marinas, docks, ports are being built in waterways and lakes.

¹⁹⁶ Compare National Marine Manufacturers Association (NMMA), p. 61f.

4.4 Market analysis for Automated Boat Handling and Storage System in USA

Approximately 88 million people participate in recreational boating in the United States of America. There are about 20 million boats in the whole country. Figure 4-24 shows the registration of new boats from 2001 to 2009 in ten of the most important maritime States of the USA. The graph shows that the number of boats is relatively consistent over a certain period despite economic crisis.¹⁹⁷

4.4.1 Techniques of Dry Stacks

Dry storage is as old as leisure boating in USA. The technique of vertical dry storage has evolved towards real dry marinas particularly in Florida. Florida is the state where dry stacks are most developed. It is estimated that the USA consists of over 50.000 vertical dry berths. The variety reaches from basic solutions with outside racks (with or without roofs) up to indoor storage solutions. Especially in areas with limited waterfront space for new wet slip marinas, dry stacking is getting more and more important.¹⁹⁸

US dry storage facilities have evolved in many different directions over the last decade.

- Larger capacities and more levels of dry stacks
- Larger and heavier boats
- More attention on customer service and more integrated projects (with restaurants, shops, hotels, shipyard...)
- More attention to environmental issues (automated systems, electrical engines of boats, protection of landscape, stricter conditions in terms of environment)

In general the dry stacks are operating with standard equipment like travel lift, cranes, fork lifts and trailers. There are a lot of facilities at the sea side but also in areas of inland water. Particularly the US is surely on the lead for technical research and solutions, regarding hoisting devices and larger fork lifts (Wiggins).

¹⁹⁷ Compare Richard Graves & Associates Marine Industry - Independent Consulting Company for Marine Industry Business Development, 'Rack Storage', *Richard Graves and Associates*, 2013 <<http://rgassoc.com/rack-storage/>> [accessed 12 December 2014].

¹⁹⁸ Compare Creoccean Pole Economie et Développement du Littoral, p. 3ff.

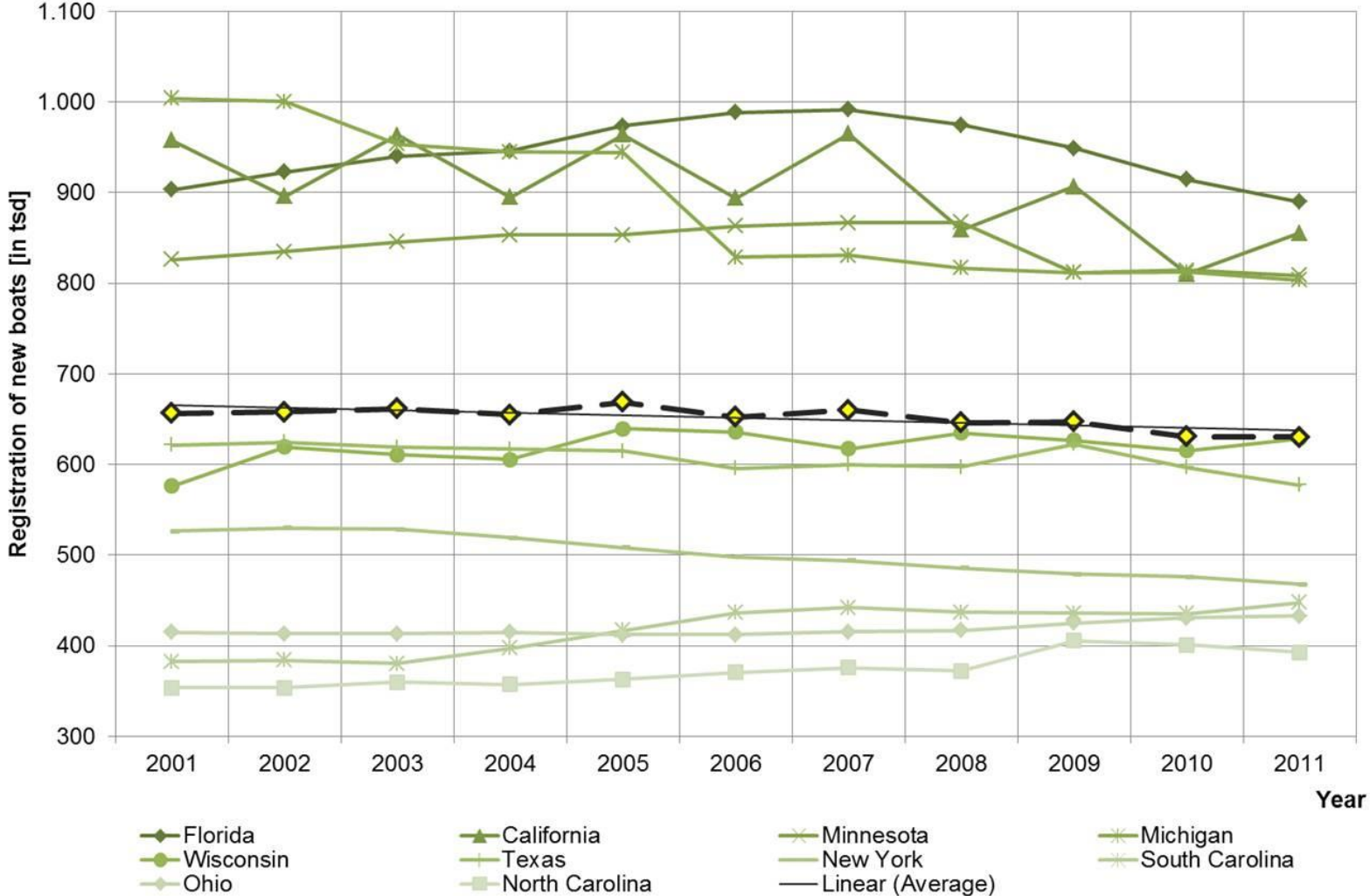


Figure 4-24: Registration of new US Boats per year¹⁹⁹

¹⁹⁹ Compare National Marine Manufacturers Association, *Recreational Boating*, p. 240 (p. 138).

4.4.2 Popular Vertical Dry Storage References

USA has numerous dry stack facilities throughout the country. Some of them will be mentioned in this chapter.

The Port Condominium

The Port Condominium Marina facility is located in Fort Lauderdale and is a redevelopment of Everglades Marina. It is operated with the patented Vertical Yacht Storage System (chapter 4.2.2.1). In comparison to fork lift based operations, the marina owner is able to store boats up to 90 feet (27.4 metres) in length in less than three minutes.²⁰⁰

New Port Cove Marine Center

The marina features a dry stack storage system accommodating 300 vessels up to 40 feet (12.2 metres) in length. The offer includes additionally concierge services, wireless, laundry and shower facilities, gas and diesel floating fuel docks, onsite repairs, yacht maintenance and detailing specialists.

Aquamarina Hidden Harbour

The special feature of the dry port at Aquamarina Hidden Harbour is the category 4 hurricane-resistant storage for approximately 384 boats up to 50 feet (15.2 metres) in length. Amenities include dry stack storage, high speed gas and diesel pumps, floating dockage, and ethanol-free marine fuel. The marina is just minutes from the Hillsboro inlet with no fixed bridges and fast, easy access to the Atlantic Ocean.

Aquamarina Hidden Harbour

The special feature of the dry port at Aquamarina Hidden Harbour is the category 4 hurricane-resistant storage for approximately 384 boats up to 50 feet (15.2 metres) in length. Amenities include dry stack storage, high speed gas and diesel pumps, floating

Port Sanibel Marina

Port Sanibel Marina is a marina with dry stacks integrated in a large complex with paved parking space, lush park-like landscaping, marble bathrooms with showers, laundry, lighthouse restaurant, and adventures in paradise cruises. The dry stack offers space for up to 100 boats. The boat handling and storage is done by large fork lifts (Wiggins).

²⁰⁰ Compare International Marina Institute, *Dry Stack Conference 2013 Fall Event*, 2013, p. 13 (p. 7ff.).

4.4.3 Main Problems for creating Vertical Dry Storage Facilities

Main problems for new projects:

- Sites availability and land cost,
- Competition on sea side sites with residential developments (high occupancy required due to high fixed costs)
- Environmental integration

4.4.4 Marina Organization in USA

United States of America have approximately 12.000 marinas excluding the private clubs. Several hundreds of marinas have capacities from 100 to over 500 boats. Depending on the marina's geographic location the cash flow can be strongly seasonal. Building and maintenance costs can be high due to weather and water characteristics as well as soil conditions. Ocean marinas with heavy tides are typically more expensive than lake marinas.

Public marinas have lower rental rates and have their operations subsidized. Mega yacht marinas are a new niche market which is continuing to grow. Demand for marina services are tightly bound to new boat sales. Marinas are subject to different state and federal environmental regulations. This regulations concern directly water pollution from boats and contaminated storm water runoff. Marinas in USA have high fixed costs, so the high occupancy is crucial to financial success.

4.4.5 Typical Boats

In the USA most of the registered boats in use are below 30 feet (9.1 metres) in length e.g. 76% of 50.000 registered boats in Broward County (Florida) are less than 26 feet (7.9 metres). The variety of boat sizes in dry stacks depends strongly on the performance of the facility.

4.4.6 Typical Customer

Rack storage is a perfect form of storage for the casual boater, people who travel regularly, seasonal residents and residents of condominiums as well as rental apartments.

4.4.7 Prices for Dry Stacks

Keeping small boats in wet slips at a marina is more expensive as compared to rack storage.

4.5 Market Analysis for Automated Boat Handling and Storage Systems in GCC

The Cooperation Council for the Arab States of the Gulf or also known as Gulf Cooperation Council (GCC) was founded in 1981 and consists of the following countries along the coastline on the Arabian Gulf

- Bahrain - or Kingdom of Bahrain
- Kuwait
- Oman - or Sultanate of Oman
- Qatar
- Saudi Arabia - or Kingdom of Saudi Arabia (KSA)
- United Arab Emirates (UAE)²⁰¹

An overview of some main facts and useful nautical information about the Gulf Cooperation Council is shown in Table 4-7. In relation to Europe with an average inhabitant number per boat ratio of 164 the ratio for GCC is significantly lower (1.119 inhabitants per boat). Boating in GCC is getting more popular and people buy boats.

| Gulf Cooperation Council | |
|--|-------------------|
| Population | 49.225.388 |
| GDP [USD/capita] | 43.313 |
| Area total [km ²] | 2.422.567 |
| Land area [km ²] | 2.422.567 |
| Water area (inland) [km ²] | 0 |
| Coastline [km] | 7.273 |
| Number of marinas | 65 |
| Number of pleasure boats | 44.000 |
| Sail boats | 880 |
| Motor boats | 43.120 |
| Capita/boat | 1.119 |
| Water berth | 12.000 |
| Dry berth | just a few places |

Table 4-7: Data Overview Gulf Cooperation Council (GCC)²⁰²

4.5.1 Techniques of Dry Stacks

In GCC there are no dry stack (vertical boat storage) facilities. The reason is that waterfront land is too precious to build a dry stack and is kept for luxurious properties.

²⁰¹ Compare Cooperation Council for the Arab States of the Gulf, 'Gulf Cooperation Council' <<http://www.gcc-sg.org>> [accessed 19 November 2014].

²⁰² Bruno Meier, Chief Operating Officer and Head of Marina Division of GCC countries, Boat Handling and Storage in GCC Countries, 2014.

The typical way to “store” boats in UAE/GCC is at a wet berth at marinas. When boats are less than 8-9 metres long, they are also sometime kept on trailers, often in front of the boat owner`s house or at a dry storage area at a marina (horizontal storage). There are no specific laws, no automated dry storage and there are currently not enough marina berths available.²⁰³

4.5.2 Main Problems for creating Vertical Dry Storage Facilities

- Unclear ownership conditions (government, sheiks)
- Lack of knowledge about dry stacks and their advantages
- Image of luxury should be visible (typical dry storage racks are not suitable for this region)²⁰⁴

4.5.3 Marina Organization in GCC Countries

The ownership of the marinas varies. Many are part of mega-development done and owned by semi-private companies (The Palm, Dubai Marina, The Pearl, Durrat, Lussail, The Wave etc...) and some belong to the government (e.g. in Kuwait most of the marinas belong to the government). Maintenance is usually done at boatyards or marinas having a travel lift and which are able to take the boat out of the water for a short period.²⁰⁵

There are no general restrictions about building marinas on the seashore but it is important to fit into the master plan and get the usual approvals. In countries like UAE it is all controlled by the Sheikh.²⁰⁶

4.5.4 Typical Boats in GCC Countries

The GCC countries have 40.000 boats bigger than 5m (15.000 boats in Kuwait). The share of motorboats is about 98% particularly with outboard engine. Local boat builders have 50% market share. The best trade market is Qatar, Kuwait and the United Arabic Emirates.²⁰⁷

4.5.5 Typical Boat Owner

The boat owners in GCC can be divided in two categories:

- Locals
- Expats

²⁰³ Bruno Meier, Chief Operating Officer and Head of Marina Division of GCC countries.

²⁰⁴ Bruno Meier, Chief Operating Officer and Head of Marina Division of GCC countries.

²⁰⁵ Bruno Meier, Chief Operating Officer and Head of Marina Division of GCC countries.

²⁰⁶ Bruno Meier, Chief Operating Officer and Head of Marina Division of GCC countries.

²⁰⁷ Bruno Meier, Chief Operating Officer and Head of Marina Division of GCC countries.

In Dubai (capital of UAE) a vast majority of the boats are owned by expats while in places like Kuwait most boats are owned by locals.²⁰⁸

Customers average age is getting older in the west, but younger in the east. The main preferences for boat users at marinas in GCC are

- Prestige
- Entertainment and groups
- Fishing
- Diving
- Speed
- Paid crew, little do it yourself (DIY) maintenance or repairs
- Marinas need life style around them²⁰⁹

²⁰⁸ Bruno Meier, Chief Operating Officer and Head of Marina Division of GCC countries.

²⁰⁹ Bruno Meier, Chief Operating Officer and Head of Marina Division of GCC countries.

5 Costs and Fees

This chapter about costs and fees related to pleasure boating is additional information of the thesis. This shows the main costs for a boater over a year, month or per sea mile. Additionally it is shown how boat size influences the costs and the destination for boating. Afterwards the total costs of ownership are calculated with an example of indoor and outdoor storage. Finally the facts of automated systems are shown in terms of costs.

5.1 Costs for Pleasure Boat Owners

Figure 5-1 shows the scatter diagrams for the fixed costs for a boat owner depending on the size of the boat. The fixed costs include costs like maintenance, spare parts, insurance covering and licenses which are all unavoidable. As you can see the dispersion increases with the size of the boat. The bigger the boat the more individuality is recognized. The average fixed costs of €12.035 are therefore not valid for all boat users.²¹⁰

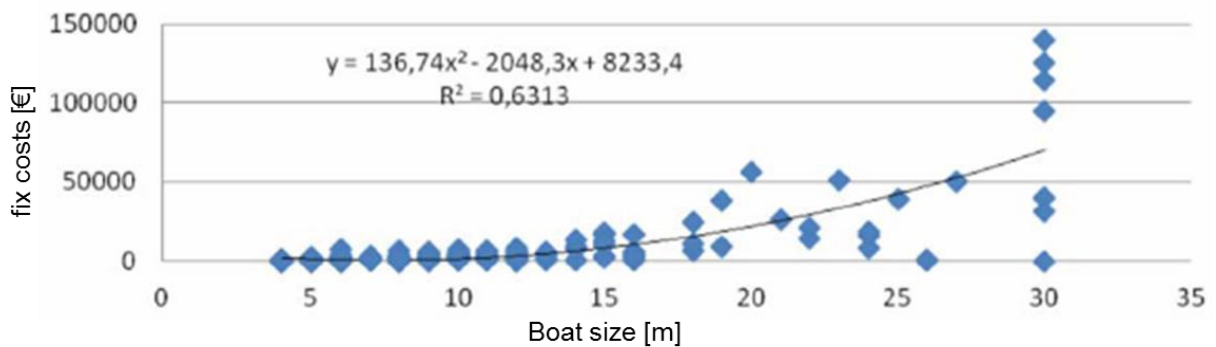


Figure 5-1: Scatter diagram fixed costs for pleasure boat owners

The scatter diagram of variable costs illustrated in the following figure shows a similar curve.

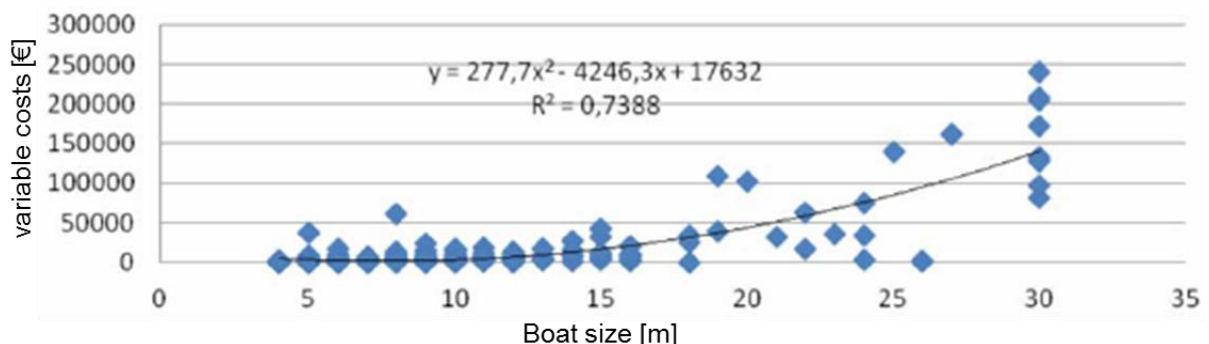


Figure 5-2: Scatter diagram variable costs for pleasure boat owners

The annual average total costs of € 34.307 doesn't include the costs for charter and purchase price.

²¹⁰ Compare Universität Piräus, p. 10ff.

5.2 Destination of Boating and Variable Costs depending on Boat Size

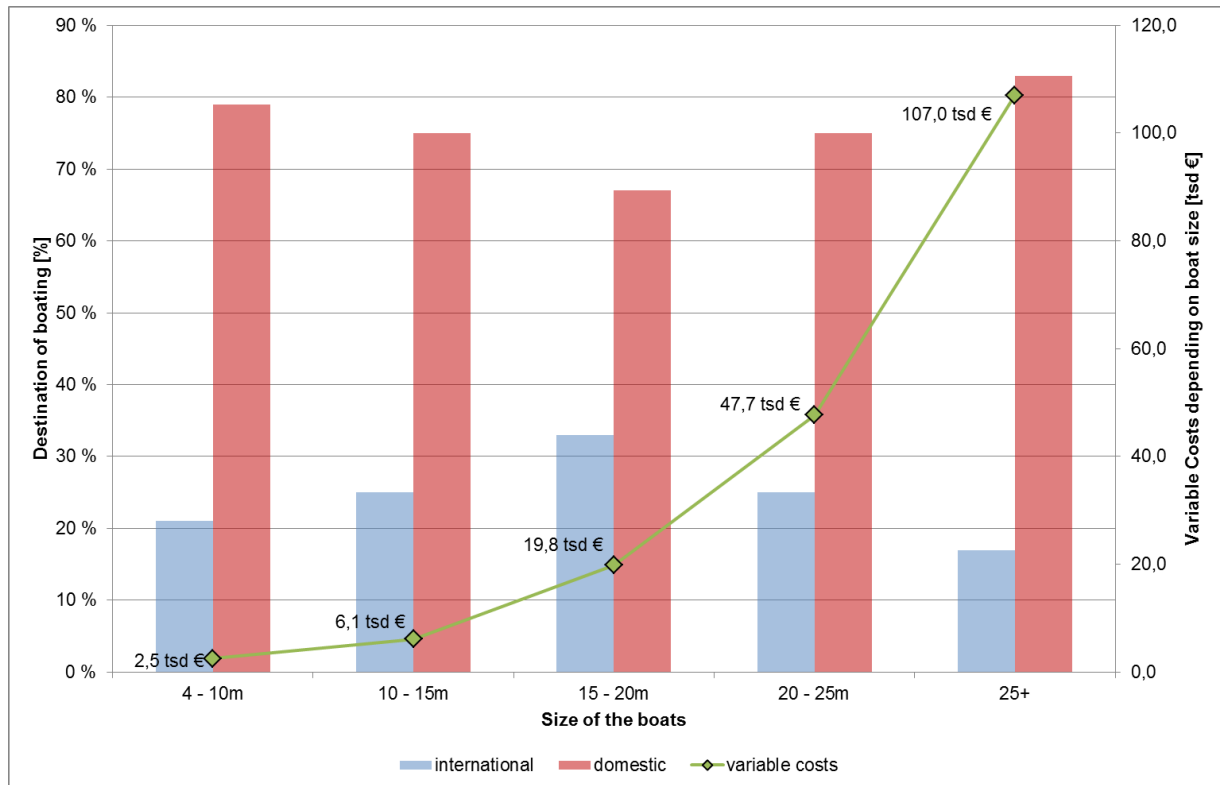


Figure 5-3: Variable costs depending on the boat size (domestic or international destinations)

As illustrated in Figure 5-3 you can draw the following conclusion:

| Curve | Interpretation |
|--|---|
| Destination of boating in % | 15 – 20m boats often go international while the biggest and smallest boats are nearby 80% in domestic areas |
| Variable costs depending on boat size in tsd € | Variable costs increase strongly for boats over 25 metres in length due to the fact that boats in this category have personnel costs. |

5.3 Total Costs of Ownership

The calculation of the total costs of ownership is carried out using an example of a 100.000 USD boat with a 25 feet (7.6 metres) length over all.²¹¹

Figure 5-4 shows the difference between the costs for a boat with a water berth and indoor storage in comparison to a boat with a water berth and outdoor storage. The prices for the storage facility are derived from cost tables of Ultramarin Meichle & Mohr, a German Marina at the Lake of Constance.²¹²

Figure 5-4 shows the result of the calculations. The main difference between both variants in terms of costs is the winter preparation of the boat as well as the home berths fees.²¹³ The repair service was not taken into account because this topic strongly depends to the conditions of the water and the accuracy of maintenance as well as the weather conditions of the region. Finally it can be noted that the prices are nearly the same. Despite the minimal higher costs for indoor storage the boat user has the main advantage of weather protection for the boat.

The costs for trailers and transportation are not considered in the calculation of the total costs of ownership.

5.4 Automated Boat Handling and Storage System in Terms of Costs

Facilities with automated boat handling and storage systems are quite different to typical storage systems. In general the boaters need no wet berths. The dry storage facility accommodates the boats over the whole year with the exception of the boat usage in terms of pleasure. Additionally the boat owner saves money for bottom paint, security service if required and covers for weather protection for indoor facilities.

The Kuenz system prices for boat handling and storage are as follow.

| | |
|--------|--|
| 4.500€ | one-time payment for the individual frame |
| 3.000€ | annual payment for the operation of moving in and out of the water and storage. ²¹⁴ |

²¹¹ Compare Sea Skills, 'Template Total Cost of Ownership Calculator' <<http://www.seaskills.com/Download.html>> [accessed 10 December 2014].

²¹² Sonja Meichle, Marina Meichle & Mohr.

²¹³ Karl Hartmann, Hartmann Bootswerft, Storage costs Shipyard, 2014.

²¹⁴ Vincent Pelletier Kuenz, Prices for Boat Storage Les Sables d'Olonne, 2014.

| TCO (Total Cost of Ownership) | | | | | | | |
|---|----------|--|-----------|---------------------------------------|-----------|------------------------|--|
| | | Water berth + Storage Space Outdoor | | Water berth + Storage Space Indoor | | Comments & Assumptions | |
| User-Entered Data | | | | | | | |
| Purchase price | \$ | € | \$100,000 | € 80,820 | \$100,000 | € 80,820 | Assumption including first painting |
| Length over all - LOA | ft | m | 25 | 7,62 | 25 | 7,62 | Assumption |
| Slip Fee (\$/ft/mo) | \$/ft/mo | €/m/mo | \$11,02 | € 2,71 | \$13,58 | € 3,35 | Prices Ultramarin Meichle & Mohr |
| Assumed Interest Rate | % | % | 0,00% | 0,00% | 0,00% | 0,00% | |
| Nautical miles per year | sm | km | 1.500 | 2.778 | 1.500 | 2.778 | Average is 1000-2000 miles per year. Seattle to Florida is 6000 miles for example 1 week motor boat approx. 500 miles |
| Gasoline Cost per gallon | \$/gal | €/l | \$9,13 | € 1,949 | \$9,13 | € 1,95 | Super/l € 1,949 Mizu Konstanz Seerhein 22.08.2014 |
| Performance | | | | | | | |
| Engine Hours (single engine displacement) | h | h | 263,2 | 263,2 | 263,2 | 263,2 | calculated (nautical miles/speed factor) |
| Speed factor | | | 5,7 | 9,2 | 5,7 | 9,2 | from database seaskills.com |
| Fuel (total gallons burned) | gal | l | 548,0 | 144,8 | 548,0 | 144,8 | from database seaskills.com |
| Gallons per hour | gal/h | l/h | 2,08 | 7,88 | 2,08 | 7,88 | calculated (fuel/engine hours) |
| Miles per gallone | sm/gal | km/l | 2,74 | 19,19 | 2,74 | 19,19 | calculated (nautical miles/fuel) |
| Fixed Costs (annual) | | | | | | | |
| Annual Capital Cost (or opportunity cost) | \$ | € | \$1.000 | € 808 | \$1.000 | € 808 | 20 year loan, assumes 80% salvage value |
| Annual Insurance Costs | \$ | € | \$700 | € 565,74 | \$700 | € 565,74 | Nammert Insurance: Liability insurance, Fully comprehensive insurance, Legal expenses insurance, Accident insurance |
| Home Berth Fees | \$ | € | \$3.306 | € 2.672 | \$4.074 | € 3.293 | calculated (slip fee*LOA*12 month) |
| Electricity | \$ | € | \$600 | € 485 | \$600 | € 485 | from database seaskills |
| Protection against Winter | \$ | € | \$681 | € 550 | \$378 | € 305 | Interview Bootswerft Hartmann GmbH |
| Wash/Wax | \$ | € | \$250 | € 202 | \$250 | € 202 | \$2.50/foot, four times per year from database seaskills |
| Bottom paint | \$ | € | \$525 | € 424 | \$525 | € 424 | \$ 21/feet |
| Variable Costs | | | | | | | |
| Fuel (\$) | \$ | € | \$5.003 | € 4.044 | \$5.003 | € 4.044 | calculated (gallons/h * engine hours * gasoline cost per gallon) |
| Engine Service | \$ | € | \$1.754 | € 1.418 | \$1.754 | € 1.418 | Main(s) and generator - \$1000 every 150 hours for single, \$1500 for twin |
| Guest Berth Fees | \$ | € | \$156 | € 126 | \$156 | € 126 | One guest berth every 300 miles - \$1.25/foot/night on average |
| SUM | | | | | | | |
| Annual | \$ | € | \$13.975 | € 11.295 | \$14.441 | € 11.671 | TOTAL COSTS OF OWNERSHIP (without trailer & transport) |
| Monthly | \$ | € | \$1.165 | € 941 | \$1.203 | € 973 | TOTAL COSTS OF OWNERSHIP (without trailer & transport) |
| Cost per mile | \$ | € | \$9,32 | € 7,53 | \$9,63 | € 8 | TOTAL COSTS OF OWNERSHIP (without trailer & transport) |

Figure 5-4: Total Cost of Ownership - Calculation Tool

6 Strategic Concept – Methodology

Based on information about the product-, competitor- and market analysis it is important to derive a strategic concept for launching the product on a potential market. At the beginning of this chapter the results from the strength, weaknesses, opportunities and threats are formulated in a useful concept. The sizes and segments of boats are also part for a product view. Based on the proposed product concept the differentiation from competitors is another topic of this chapter followed by potential markets in Europe, USA and GCC countries. Finally the strategic concept for initiating business and order processing concludes the chapter.

6.1 Strategic Concept due to the Product

Based on the previous proposals of Les Sables d'Olonne and Sérignan (chapter 4.1.5 and 4.1.6) the product concepts has been analysed in chapter 4.2.3 in consideration of competitive advantages.

6.1.1 Use of Opportunities through Strength

One of the strategies out of the SWOT analysis is to use the opportunities for the product concept through the advantages of Kuenz products.

Strength:

Long-term knowledge of Kuenz in crane sector particularly automated solutions.

Opportunity:

Increase of automation with an automatic centering of the boat at the entrance of the storage facility. As a consequence the staff requirements decrease.

Strength:

Long-term businesses and positive image in Vorarlberg offers a well-based contact to shipyards at the Lake of Constance.

Opportunity:

Establishment of a reference installation at the Lake of Constance in corporation with adjacent municipalities and shipyards.

Strength:

Kuenz offers a wide range of different product models (crane with or without transfer carriage).

Opportunity:

Development of a customized product variant

Strength:

A main advantage is the long-term knowledge of Kuenz in crane and hydro power segment particularly for automated solutions. This includes also the experience to operate in terms of environmental issues.

Opportunity:

The Kuenz product can easily be customized with a lot of possible optional businesses. The system enables the introduction of a “green” system, with rain water collection, photovoltaic...).

6.1.2 Reduction of Risks through Strength

Another possible strategy derived from the SWOT analysis is to reduce the risks of the concept through strength of Kuenz.

Strength:

The vertical storage system with storage of boats in a longitudinal direction offers flexibility in the space of the facility. It is possible to extend to more levels and the longitudinal storage brings flexibility in storing different sizes of boats.

Threat:

Expensive properties respectively few available landscape for building a facility.

Strength:

Kuenz offers a wide range of different product models from winter storage to annual permanent storage depending on customer preferences. It is possible to combine the facility with water berths.

Threat:

Lack of acceptance due to the culture of boat users who prefer “living on the boat”.

6.1.3 Reduction of Weaknesses through Opportunities

With the analysed opportunities of the Kuenz product the existing weaknesses can be reduced.

Weakness:

The previous projects of Les Sables d’Olonne and Sérignan have been planned with manual centering of the boat at the entrance of the storage facility. As a consequence personnel staff has to be trained for this requirements and human errors may happen at this important step of boat handling.

Opportunity

The automated centring of the boat decreases the weaknesses of manually work as mentioned.

Weakness:

The upper part of the boat frame adapted to the boat hull as previously offered in cooperation with Dock Service requires an additional manipulation step for the crane. The crane is obliged to pick up the special adapted frame to store the boat. The automation of the crane is also more complicated than with standardized frames.

Opportunity:

Planning of a simple process to adapt the frame to the boat hull forces the reduction of complexity in automation. One possibility is to enable adaption through air cushion elements.

Weakness:

Lack of knowledge to assemble a full installation with all infrastructure elements except of the boat handling and storage system.

Opportunity:

Establishment of a reference installation at the Lake of Constance provides a basis to estimate a bigger industrial concept with all the laws, regulations and costs to consider.

Weakness:

The transfer of full installation including the whole infrastructure (except boat handling and storage system) to general contractors creates higher costs.

Opportunity:

For projects with a high proportion of structural enhancements or changes compared to the size of boat handling and storage system it is useful to transfer the competence to general contractors. This enables faster project execution through routine and knowledge of general contractors.

6.1.4 Reduction of Weaknesses for Minimization of Risks

Through reduction of the product weaknesses it is possible to minimize the risk for Kuenz.

Weakness:

The previous projects of Les Sables d'Olonne and Sérignan have been planned with manually centering of the boat at the entrance of the storage facility. As a conse-

quence personnel staff has to be trained for this requirements and human errors may happen at this important step of boat handling.

Threat:

Better price or performance ratio of competitors with less need for manual work (and costs for personnel staff and training) or higher risk of human errors can lead to project contracts with competitors.

Solution:

The automated centring of the boat reduces the possibility of human failure due to manually work.

Weakness:

The transfer of full installation including the whole infrastructure (except boat handling and storage system) to general contractors creates higher costs.

Threat:

Long-term realization due to the size of the project or lack of knowledge about building a whole infrastructure at the marina can lead to loose customer relationships. This may happen through changes in legislation (political risk) and lack of financial resources (economic risk).

Solution:

Shorten the time for realization through transfer to general contractors. In addition the transfer offers Kuenz to focus on the core competence for the automated boat handling and storage system.

Weakness:

Information about marina extension or construction projects is commonly communicated to building or general contractors through public tenders. It is very difficult for Kuenz to get this knowledge without the transfer of projects to general contractors.

Threat:

Lack of knowledge about new marina extensions or constructions

Solution:

Transfer of complete marina projects to general contractors.

6.1.5 Relevant Boating Segments

The Kuenz boat handling and storage system has been designed for motorboats with sizes from 4 to 12 metres in length for previous projects. Related to the typical boat sizes as already mentioned in chapter 4.3.2 the product is suitable for approximately 82% of the boats.

Additionally there is no limitation in type of motor boats and in the purpose of use. Boat rental services are also potential customers beside private boat owners. This kind of additional storing can ensure the utilization of the berths.

6.1.6 Differentiation from Competitors

The uniqueness of the Kuenz system is the simple and flexible system. Particularly the handling of boats with just 1 crane and the storage on simple racks offers a main technical and price benefit to the competitors. In addition is the storage in longitudinal direction another big different and in terms of boat size flexibility a main advantage to transverse storage (loss of valuable space).

6.2 Strategic Concept for Entering the European Market

After analysing the situation in Europe some important conclusions can be taken. This subchapter shows the suggestions for Kuenz to step into the European market.

To step into this new market it is recommended to initiate a pilot project as a reference including calculation of all costs. The suitable area for this project would be for example the shipyard Hartmann in Hard at the Lake of Constance. Despite the critical situation with limited berths at this Lake the shipyard shows interest in building a facility as offered by Kuenz. The main advantage is an existing building which is ideal to reduce the realization time and costs. Additionally the construction permits in comparison to a new building could be simplified. Another great opportunity could be shipyards in Switzerland. The indoor storage facilities are mainly utilized and a lot of boat owners have to move their boats to far destinations in winter season.

The main focus should be on marinas with more than 1000 berths and a high number of motor boats and long waiting lists for a fix berths. Camping marinas are not particularly suitable for the Kuenz boat handling and storage system due “life on the boat” culture which is a strong preference for the boat owner.

The ownership of marinas is another main issue to decide for a strategic concept. Public marinas of emerging countries or other economic problems should be avoided for a project due to the long-term realization. This includes countries like Greece, Spain, Portugal or Italy. Private marinas commonly at popular holiday destinations with a high utilization ratio have a great potential for automated systems like the offered Kuenz system (e.g. Cote d’Azur).

6.2.1 Class 1 Countries

France is a potential country for the Kuenz system because there is a strong need for additional berths and high saturation of the marinas. The situation of possible projects depends strongly on the ownership of marinas. Public facilities as already proposed in Les Sables d'Olonne and Sérignan requires long-term planning and good knowledge of the political situation in the region.

The commonly high saturation of marinas in some regions of Italy is a key fact for Kuenz to force business in this country. Due to financial problems of the country it is recommended to do further research on potential businesses with private owned marinas.

Saturation of Spanish marinas is a motive for a positive trend too. To start businesses in Spain it is important to impart knowledge about the main advantage of dry storage and automated systems. The lack of knowledge can be caught up by customized product presentations for Spanish marinas. It has to be noted that Spain is one of the countries with financial problems since the economic crises. Especially business with public marinas requires thoroughly investigation.

The demand for boat handling and storage systems at the south coast of Great Britain is quite high. In comparison to other class 1 countries the authorization to build an automated boat handling and storage facility is not as difficult as to increase the number of wet berths.

For all class 1 countries it is recommended to offer a large range of comprehensive services around the marina including maintenance and reception area.

The following suggestions regarding the six main dimensions for positioning of Class 1 countries are generally as follow:

Price: premium level

Grade: premium quality

Service: superior services

Customization: depending on country requirements

Differentiation: goal to reach segment leadership

Innovation: no similar product as Kuenz system on the market

These dimensions of positioning are valid as a general consideration. Every potential business has to be analysed in a separate feasibility study.

6.2.2 Class 2 Countries

Scandinavian countries commonly use dry storage for winter periods. This fact should be considered as an additional customer type who is not interested in boat manipulation all over the year. This influences particularly the price and service range. A segment for potential customers is boat rental services, especially for fishing or cruising agencies.

The Netherlands are known for storing their boats on trailers but for larger boats the use for dry storage facilities increases particularly in regions with larger water ways. The main focus should be at larger marinas with repair and maintenance service, yacht hire and winter services.

The following suggestions regarding the six main dimensions for positioning of Class 2 countries are as follow:

Price: premium level

Grade: premium quality

Service: superior services (seasonal models)

Customization: depending on country requirements

Differentiation: goal to reach segment leadership

Innovation: no similar product as Kuenz system on the market

These dimensions of positioning are valid as a general consideration. Every potential business has to be analysed in a separate feasibility study.

6.2.3 Class 3 Countries

The saturation of Greek marinas is not as exhausted as in other European countries. In addition the financial problems of Greece stops further investment also in the maritime sector. These facts decrease the use of dry storage facilities and should not be considered in the near future. It should also be noted that the tidal range in Greek coastal areas have not as high levels as at other sea regions. So boat manipulations can be performed with standard and simple methods. The labour costs at marinas are also very low which supports the manual boat handling

Croatia`s marinas are not fully occupied so the demand for investments of dry storage is not as high as required to force businesses in this country in the next years.

The following suggestions regarding the six main dimensions for positioning of Class 3 countries are as follow:

Price: standard level

Grade: standard quality

Service: standard services (seasonal requirements)

Customization: depending on country requirements

Differentiation: goal to reach segment leadership

Innovation: no similar product as Kuenz system on the market

6.2.4 Other European Countries

The utilization of Portuguese marinas depends strongly on the region. Their lack of knowledge about the main advantages of dry storage and automated systems is similar to Spanish marinas. Therefore it is recommended to force promotion about the product for these marinas. It has to be noted that Portugal is an emerging nation also with financial problems. Especially business with public marinas requires thoroughly investigation.

Germany has generally no lack of berths due to the number of boats in the whole country. Nevertheless in some areas like the Lake of Constance exists long waiting lists for a fix berths. The respondents of the online survey showed interest in the Kuenz boat handling and storage system. Customized presentation about the system and the benefits is recommended.

Austria and Switzerland is especially interesting for introducing a pilot plant as a reference for Kuenz. There are quite good relationships to shipyards in Austria, who showed interest in the project. The neighbourhood is a benefit to work in corporation for a customized product solution. Swiss shipyards have a lot of fully occupied indoor storage facilities. Customized presentation to marinas is recommended.

Ireland is a country where dry storage is especially used for winter storage as in Scandinavian countries. The segment of leisure boating has not yet fully exploited its full potential. Demand for investments of dry storage is not as high as required to force businesses in this country in the next years.

Czech Republic`s boat market is very small and as in Ireland the demand for investments of dry storage is not as high as in other European countries.

Denmark`s dry storage situation is quite similar to Scandinavian countries. There are some horizontal winter period solutions but also large waiting lists for permanent water berths. Dry stacking is not typically so far. The main focus should be at larger marinas with repair and maintenance service, yacht hire and winter services as in Scandinavian countries.

In some Belgian marinas customer demands cannot be fulfilled. This leads to the fact, that boat owners store their boats in neighbouring countries like France or Netherlands. There is a significant potential for business in Belgium especially for larger marinas.

Poland`s boating market is increasing and also the number of boats. The facilities are not fully occupied so far therefore the demand for dry storage is not relevant for the Kuenz system so far. Further increase of boating activities can lead to business in the future.

The suggestions regarding the six main dimensions for positioning of other European countries are as follow:

| Country | Price | Grade | Service | Customization | Differentiation | Innovation |
|-------------|---|---------------------|--------------------|--------------------|----------------------------------|--|
| Portugal | Depending on region | Depending on region | | | | |
| Germany | Premium | Premium | Premium | Is required | Goal to reach segment leadership | No similar product as Kuenz system on the market |
| Austria | Potential for pilot facility (shipyard) | | | | | |
| Switzerland | Potential for pilot facility (shipyard) | | | | | |
| Denmark | Premium | Premium | As for Scandinavia | As for Scandinavia | As for Scandinavia | No similar product as Kuenz system on the market |
| Belgium | Premium | Premium | Premium | Is required | Goal to reach segment leadership | No similar product as Kuenz system on the market |

Figure 6-1: Six main Dimensions for Positioning of Other European Countries

6.3 Strategic Concept for Entering the Market of the United States of America

The market for dry storage in the USA is very popular. The advantages of dry stacks are well known by marinas and end customers. The variety of boat handling and storage systems are manifold although automated systems are also still a rarity. As an entrepreneur in the US market it is important for Kuenz to get knowledge about all the previous and future developments. The country offers a lot of famous conferences like the dry stack conference in Fort Lauderdale regarding dry stacking. These events would provide an appropriate opportunity for Kuenz to get this knowledge.

Regarding environmental issues, in particular the water pollution, it is recommended to design with a “green” concept: This concept should focus mainly on an environmental solution for boating. This includes for example rain water usage for cleaning of boats as well as photovoltaic to use sun power for electricity. Automated systems as offered from Kuenz operate in sense of the environment anyway.

USA projects are commonly integrated marina developments. This means additional services for pleasure and boat handling are offered beside dry storage facilities. To get information about actual project developments it is useful to cooperate with a general contractor.

Price: premium level

Grade: premium quality

Service: superior services

Customization: depending on country requirements

Differentiation: goal to reach segment leadership

Innovation: no similar product as Kuenz system on the market

6.4 Strategic Concept for Entering the Market of the Middle East Countries

GCC countries are in an early stage of development for dry storage facilities. There are no vertical solutions so far and boats stay commonly in the water. The contact with Mr. Bruno Meier Chief Operating Officer and Head of Marina Division for GCC countries offers a great opportunity for Kuenz to step into the market. Mr. Meier promise high demand for the automated boat handling and storage system in this region.

Luxury and prosperity are a visible standard for GCC countries. The object has to fit into the landscape. The dry storage is especially demanded for small to middle size yachts. It is recommended to transfer the implementation of a project to a general contractor due to lack of knowledge about constructional permits and regulations.

Price: premium level

Grade: premium quality

Service: superior services

Customization: strongly demand for specialities like visual appearance

Differentiation: goal to reach segment leadership

Innovation: No dry stack facilities in GCC countries

7 Summary and Conclusion

Leisure boating is becoming increasingly important all over the world. The typical boaters invest a lot of love and commitment in their property. Many of them have no possibility to store their boat at home marinas or they are obliged to leave it far away from their home in the water, which offers no protection from adverse weather conditions, theft or vandalism. In addition the water forces damages to the boat hull over time. Should the boat owner still be lucky to get a dry storage for their boat, the manual manipulation can also lead to failures with damages. Moving boats in and out of the water as well as in and out of storage is commonly a quite expensive and complicated operation.

For Kuenz, as a company whose core competence is automated crane systems it is perfectly reasonable to think about entering this market. With an automated boat handling and storage systems they offer the boat users a simple solution with possible options for multiple service features.

The analysis of the product proposals from previously offered solutions, the competition in automated solutions as well as the market situation in Europe, USA and Gulf Corporation Council Countries were the main issues of this master thesis. Finally strategic concepts for entering the market with an appropriate product solution should be derived out of these analyses. This includes also the type of potential marinas and boats.

Kuenz have not had any experience with leisure boating so far. For a better understanding of the mentioned market situation and products the thesis additionally shows basic information about pleasure boating as well as costs and fees.

Demand for automated boat handling and storage systems can be clearly identified in this thesis. This document could be used for creating a specific marketing program as the next step in the marketing process.

The analysis of competitive strategies should be done once a year in combination with a SWOT analysis to recognise new potential customers with their performances. Moreover it is recommended to force participation on conferences for dry storage and keep contact with specialists, marinas and responsible public authorities which have been contacted as part of this work. This offers the possibility to monitor the leisure boat market.

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List of Abbreviations

| | |
|-----------------|---------------------------------------|
| \$ | US Dollar |
| € | Euro |
| °C | Celsius degree |
| AG | Aktiengesellschaft |
| AMT | Automated Marine Technologies |
| approx. | Approximately |
| CRM | Customer Relationship Management |
| Dipl.-Ing. | Diplom Ingenieur |
| DIY | Do it yourself |
| Dr.techn. | Doctor of Technic |
| e.g. | exempli gratia |
| etc. | et cetera |
| EU | European Union |
| EUR | Euro |
| FL | Florida |
| ft | Feet |
| Gal | Gallon |
| GCC | Gulf Cooperation Council |
| GmbH | Gesellschaft mit beschränkter Haftung |
| h | Hour |
| km | Kilometre |
| km ² | Square kilometres |
| KSA | Kingdom of Saudi Arabia |
| l | Litre |
| LOA | Length over all |

| | |
|----------------|--|
| m | Metre |
| m ² | Square metre |
| Mag. | Magister |
| min | Minute |
| mo | Month |
| Mr. | Mister |
| N/a | Not available |
| O.Univ.-Prof. | Ober Universitätsprofessor |
| PMR | Professional Mobile Radio |
| PWC | Personal Water Craft |
| RIB | Rigid Inflatable Boat |
| SAS | Société Anonyme |
| sm | Nautical mile (sea mile) |
| St. | Saint |
| SWOT | Strengths Weaknesses Opportunities and Threats |
| t | tons |
| TCO | Total Costs of Ownership |
| tsd | Thousand |
| UAE | United Arab Emirates |
| US | United States |
| USA | United States of America |
| USD | US Dollar |

A. Appendices

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A.1 Online Survey Form

The next two pages illustrate the online survey I have sent to marinas all over the world. It should be noted that the survey is available in 6 different languages.

- German
- English
- French
- Spanish
- Portuguese
- Italian

1. Informations survey participant

Name of Marina/Port:

City*:

Country*:

E-Mail:

2. Number of boats at the port/marina? (only water berth)**3. Distribution of boat berth at the marina/port (approximately)**

| | 0 - 20 % | 20 - 40% | 40 - 60% | 60 - 80% | 80 - 100% |
|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Motor boats | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Sailing boats | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Bigger sized yachts with staff | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Numbers if available

4. Which size do the motorboats in your marina/port have in general? (approximately - no sailing boats or bigger yachts with staff)

| | 0 - 20% | 20 - 40% | 40 - 60% | 60 - 80% | 80 - 100% |
|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| < 6 m (< 20ft) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 6 - 9 m (20ft to 30ft) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 9 - 12 m (30ft to 40ft) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| >12 m (> 40ft) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

If you can give me a rough estimation - it would be great. Other Comments:

5. How many boat places are dedicated to guest visitors? (if there are fix berths)**6. Storage facilities out of water (approximately). Fill in "0" if no facilities available**

Indoor (Hall)

Outdoor (Open Air)

7. Do you have a waiting list for fix berths? (in case that you have fix berths) Yes No

If Yes - Average waiting time for a fix berth:

8. Is there any planned expansion of the marina/port to increase the capacity?

- Yes
 No

If yes: Have you already consulted a company with regard to automated handling & storage system? Are you interested in a fully automated handling & storage system?

9. Owner structure of the marina/port - Responsibility infrastructure

| | | | |
|-------------|--------------------------------------|--|---|
| Marina/Port | Who is the owner of the marina/port? | Who is authorized to decide about an extension of the marina/port? | Are there any limitations about the number of berths from the city/country? |
| | <input type="text"/> | <input type="text"/> | <input type="text"/> |

Describe briefly the Corporation if selected

10. Please describe briefly your motor boat handling operation/system.

How do you handle the transport of the motor boat?

Example: Ponton crane, forklift, conveyor system, automated handling system, other systems...

Done

Figure A-1: Online Survey Form

A.2 Overview of the Returned Questionnaires

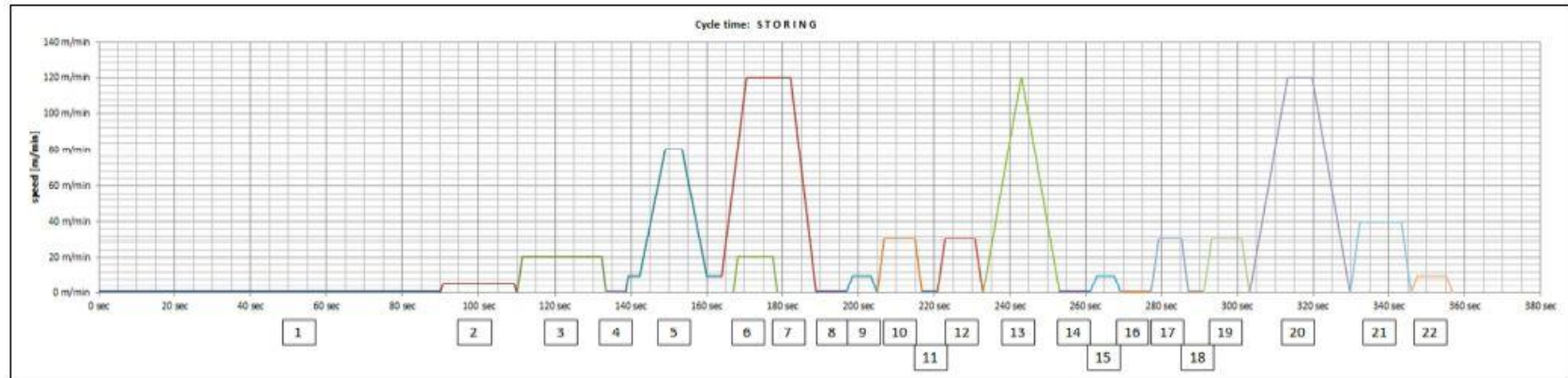
Figure A-2 shows a general overview of all returned questionnaires from European marinas. The summary of all answers, including the contact details have been provided to Kuenz for internal use. The contact details will not be published in this diploma thesis because the marinas anonymity was promised in the online survey.

| # | City of marina | Country | Type of sea/inland water | Water berths | Motor boats | Sail boats | Yachts with personnel |
|----|------------------------|--------------|--------------------------|--------------|-------------|------------|-----------------------|
| 1 | Neustadt i. H. | Deutschland | Baltic Sea | 1400 | 700 | 700 | 0 |
| 2 | Kressbronn | Deutschland | Lake of Constance | 1500 | 450 | 1050 | 0 |
| 3 | Kiel | Deutschland | Baltic Sea | 900 | 90 | 810 | 0 |
| 4 | Hamburg | Deutschland | North Sea | 170 | 68 | 102 | 0 |
| 5 | Niesgrau | Deutschland | Baltic Sea | 447 | 45 | 402 | 0 |
| 6 | Prien am Chiemsee | Deutschland | Lake Chiemsee | 277 | 83 | 194 | 0 |
| 7 | Herten | Niederlande | Maas River | 600 | 420 | 180 | 0 |
| 8 | Kalamaria | Griechenland | Aegean Sea | 240 | 120 | 120 | 0 |
| 9 | Lefkas | Griechenland | Ionian Sea | 620 | 186 | 434 | 0 |
| 10 | Korfu | Griechenland | Ionian Sea | 1235 | 165 | 905 | 165 |
| 11 | El Puerto Santa Maria | Spanien | Atlantic Ocean | 842 | 337 | 505 | 0 |
| 12 | Alicante | Spanien | Mediterranean Sea | 751 | 250 | 400 | 101 |
| 13 | Matarò | Spanien | Mediterranean Sea | 1080 | 288 | 504 | 288 |
| 14 | Lagos | Portugal | Atlantic Ocean | 462 | 123 | 308,0154 | 31 |
| 15 | Moniga del Garda | Italien | Lake Garda | 220 | 176 | 44 | 0 |
| 16 | Monfalcone | Italien | Adriatic Sea | 180 | 90 | 90 | 0 |
| 17 | Palazzolo dello Stella | Italien | Stella River | 89 | 45 | 44 | 0 |
| 18 | Ancona | Italien | Adriatic Sea | 1382 | 829 | 553 | 0 |
| 19 | Ravenna | Italien | Adriatic Sea | 495 | 150 | 345 | 0 |
| 20 | Le Grau du Roi | Frankreich | Mediterranean Sea | 5000 | 2000 | 3000 | 0 |
| 21 | Mandelieu La Napoule | Frankreich | Mediterranean Sea | 423 | 282 | 113 | 28 |
| 22 | Grimaud | Frankreich | Mediterranean Sea | 700 | 373 | 233 | 94 |
| 23 | Fécamp | Frankreich | Channel | 800 | 560 | 240 | 0 |
| 24 | Tribun | Kroatien | Mediterranean Sea | 220 | 132 | 88 | 0 |
| 25 | Nedstrand | Norway | North Sea | 1230 | 902 | 164 | 164 |
| 26 | Mandal | Norway | North Sea | 850 | 738 | 56 | 56 |
| 27 | Torekov | Schweden | North Sea | 450 | 300 | 120 | 30 |
| 28 | Malmö | Schweden | Baltic Sea | 1050 | 420 | 630 | 0 |
| 29 | Ängelholm | Schweden | Baltic Sea | 570 | 190 | 304 | 76 |

Figure A-2: Overview Returned Questionnaires

A.3 Cycle Time Study Kuenz Boat Handling and Storage Crane

Figure A-3 shows the calculated Cycle Time for the boat handling and storage system in Les Sables d'Olonne



| No. | Movements | Mode | Speed | Time | Note |
|-----|--|------------------|-----------|----------------|--|
| 1 | Positioning of the boat in the basin (by operator of the boat warehouse) | Manual operation | ----- | 90 sec | Assumption! Can't be influenced by KUNZ |
| 2 | Slowly lifting of the boat (1,5 m lifting height) | Manual mode | 5 m/min | 20 sec | |
| 3 | Lifting of the boat to level + 4 m over 0,00 m | Manual mode | 20 m/min | 24 sec | |
| 4 | Switching time to the automatic mode | Manual mode | ----- | 5 sec | |
| 5 | Crane travelling (horizontal movement = 15m) → to measure the length of the boat | Automatic mode | 80 m/min | 26 sec | |
| 6 | Crane travelling (horizontal movement = 35 m) | Automatic mode | 120 m/min | 25 sec | |
| 7 | Lifting of the boat to the 2 nd level (+ approx. 3,5 m) | Automatic mode | 20 m/min | ----- | 12 sec → Simultaneously to horizontal travel |
| 8 | Positioning of the crane in front of the rack | Automatic mode | ----- | 8 sec | |
| 9 | Slowly starting of trolley (storing in the rack) | Automatic mode | 10 m/min | 8 sec | |
| 10 | Storing the boat in the rack | Automatic mode | 30 m/min | 12 sec | |
| 11 | Putting down of the boat in the rack | Automatic mode | ----- | 4 sec | |
| 12 | Driving back to the middle aisle (unloaded drive) | Automatic mode | 30 m/min | 12 sec | |
| 13 | Crane travelling (horizontal movement = 20 m) | Automatic mode | 120 m/min | 20 sec | |
| 14 | Positioning of the crane in front of the rack | Automatic mode | ----- | 8 sec | |
| 15 | Slowly starting of trolley (taking out the frame) | Automatic mode | 10 m/min | 8 sec | |
| 16 | Measuring of the position of forks in relation to the boat frame | Automatic mode | ----- | 8 sec | |
| 17 | Driving in the rack to lift the frame | Automatic mode | 30 m/min | 10 sec | |
| 18 | Lifting the boat frame | Automatic mode | ----- | 4 sec | |
| 19 | Driving back to the middle aisle (unloaded drive) | Automatic mode | 30 m/min | 12 sec | |
| 20 | Crane travelling to the basin (horizontal movement = 30 m) | Automatic mode | 120 m/min | 27 sec | Manual confirmation by the operator required |
| 21 | Lowering of the frame from level + 4 m to 1,5 m above sea level | Automatic mode | 40 m/min | 16 sec | Manual confirmation by the operator required |
| 22 | Slowly lowering the frame into the water | Automatic mode | 10 m/min | 11 sec | Manual confirmation by the operator required |
| | Total time | | | 358 sec | Approx. 10 cycles per hour |

Figure A-3: Cycle Time