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**HOW PORTS BENEFIT FROM A
HOLISTIC APPROACH TO FENDER
SYSTEM DESIGN**

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PIANC APAC – September 6, 2022

1

TABLE OF CONTENTS.

- ▶ INTRODUCTION
- ▶ INFLUENCES ON THE PERFORMANCE OF FENDER SYSTEMS
- ▶ TYPICAL PROBLEMS OF POOR FENDER SYSTEM DESIGN, RESULTING CONSEQUENCES AND CORRECTIVE MEASURES
- ▶ APPLICATION OF FENDER SYSTEM DESIGN
- ▶ THE IMPORTANCE OF A HOLISTIC APPROACH

2

1

INTRODUCTION.

3

WHAT IS A HOLISTIC APPROACH ABOUT AND WHY IS IT IMPORTANT?

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- ▶ Many different aspects need to be considered when designing a fender system
- ▶ If the focus is only on a few of those aspects, the quality, durability and the **guaranteed safety** that is expected from a fender are lacking
- ▶ A holistic approach
 - ▶ takes all aspects into account
 - ▶ values them equally, sees them as interconnected and as one single process
- ▶ Incorrect designs or low-quality products can lead to severe cost in terms of repair, downtime or even accidents
- ▶ *A holistic approach to fender system design is important for the industry to ensure reliable, safe and efficient operations for ports.*

4

2

INFLUENCES ON THE PERFORMANCE OF FENDER SYSTEMS.

1. PROJECT CONDITIONS
2. THE DIFFERENT COMPONENTS OF A FENDER SYSTEM AND THEIR INTERACTION
3. THE MANUFACTURING PROCESS

5

INFLUENCES ON THE PERFORMANCE OF FENDER SYSTEMS.

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1. PROJECT CONDITIONS

- ▶ **Project conditions**, such as berthing energy or local weather, are very individual
- ▶ Different characteristics of various fender types are also to be incorporated in the fender design process

SHIPS



STRUCTURE



APPROACH



LOCATION



ENVIRONMENT



MATERIALS



A holistic approach considers all the many conditions to design a unique fender system.

6

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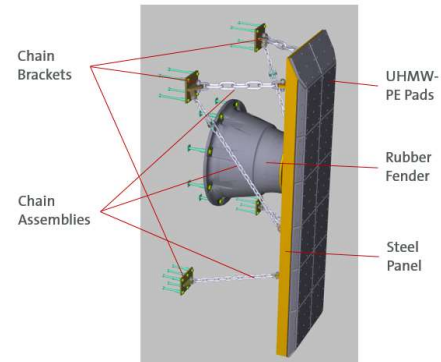
INFLUENCES ON THE PERFORMANCE OF FENDER SYSTEMS.

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2. THE DIFFERENT COMPONENTS OF A FENDER SYSTEM AND THEIR INTERACTION

- ▶ Made of different components: rubber unit, steel panel, chains, anchors, fixings and PE plates
- ▶ Different components and their interaction should be seen together.

A holistic approach makes sure they are all designed in the correct balance and work together properly.



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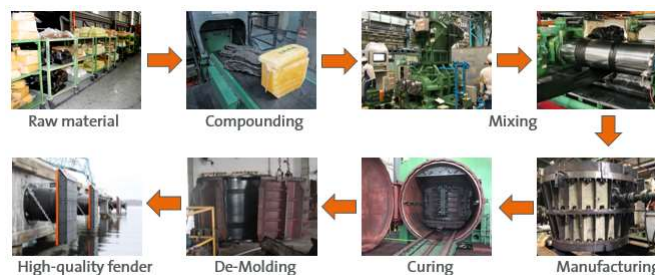
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INFLUENCES ON THE PERFORMANCE OF FENDER SYSTEMS.

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3. THE MANUFACTURING PROCESS

- ▶ Vital part in the ultimate performance of a fender system



A holistic approach ensures that all manufacturing steps are interconnected.

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8

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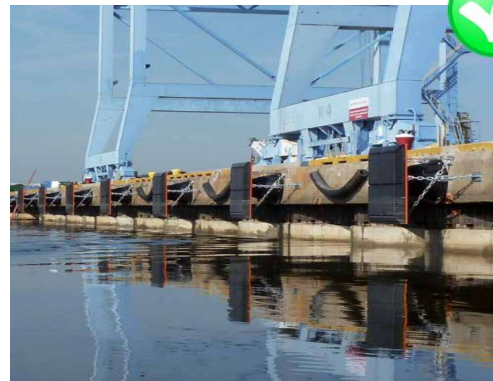
**TYPICAL PROBLEMS OF POOR FENDER SYSTEM DESIGN,
RESULTING CONSEQUENCES AND CORRECTIVE MEASURES.**

9

**TYPICAL PROBLEMS OF POOR FENDER SYSTEM DESIGN,
RESULTING CONSEQUENCES AND CORRECTIVE MEASURES.**

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FENDER PANEL POSITION, CHAIN LAYOUT, RUBBER QUALITY

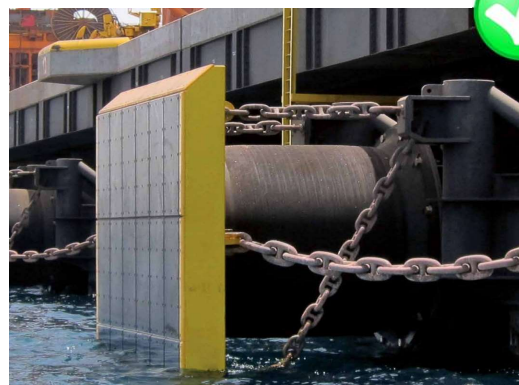


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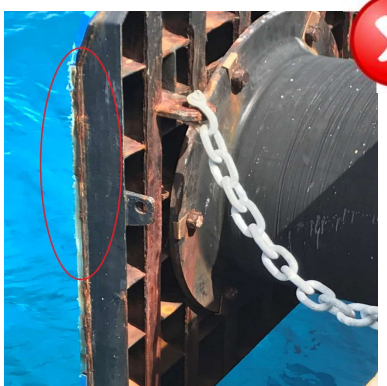
TYPICAL PROBLEMS OF POOR FENDER SYSTEM DESIGN, RESULTING CONSEQUENCES AND CORRECTIVE MEASURES.

INTERNAL STEEL PANEL STRUCTURE



TYPICAL PROBLEMS OF POOR FENDER SYSTEM DESIGN, RESULTING CONSEQUENCES AND CORRECTIVE MEASURES.

UHMW-PE PROTECTION PADS



APPLICATION OF FENDER SYSTEM DESIGN .

“What looks good in a drawing, might not work in the field”.

13

APPLICATION OF FENDER SYSTEM DESIGN.

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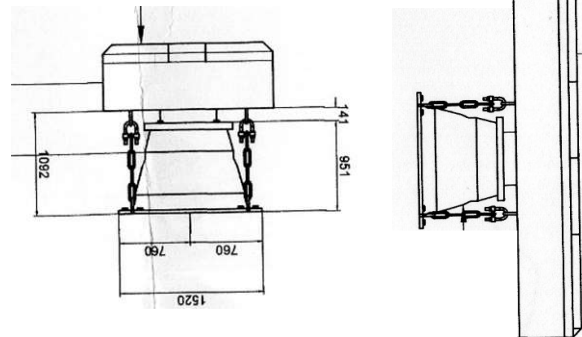
DESIGN OF STEEL PANEL AND RUBBER UNIT POSITION

Drawing

- ▶ Panel is shown straight and stable

Field

- ▶ Panel could show drooping and tilting under its deadweight
- ▶ Cannot be ‘seen’ on a drawing



14

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APPLICATION OF FENDER SYSTEM DESIGN.

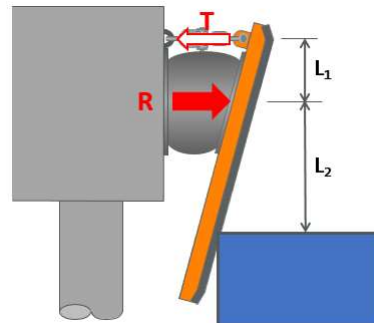
TENSION CHAIN DESIGN

Drawing

- ▶ Steel panel and corresponding tension chain might look correct

Field

- ▶ An incorrect tension chain design could diminish the energy absorption of the fender system at low level contact



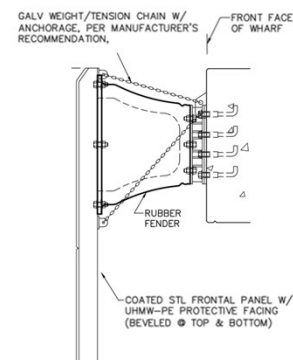
APPLICATION OF FENDER SYSTEM DESIGN.

CONE FENDER ORIENTATION

- ▶ Cone Fenders are more stable and durable if installed with larger flange to substructure

Drawing

- ▶ A reversed design might look good on a drawing



APPLICATION OF FENDER SYSTEM DESIGN.

CONE FENDER ORIENTATION

- ▶ Cone Fenders are more stable and durable if installed with larger flange to substructure

Drawing

- ▶ A reversed design might look good on a drawing

Field

- ▶ Inevitable risk of cracks and deformation of the rubber unit due to excess weight and irregular compression



THE IMPORTANCE OF A HOLISTIC APPROACH.

THE IMPORTANCE OF A HOLISTIC APPROACH.

How do ports benefit from a holistic approach to fender system design?

- ▶ Costs in terms of repair, downtime or even accidents can be avoided
- ▶ **Safety** in marine operation and **efficiency** for marine terminals can be ensured

How to ensure that all fender manufacturers follow the same route to a high-quality and durable fender system?

- ▶ Increase awareness of all aspects and their interconnection
- ▶ Include a holistic approach in industry standards

ULTIMATE GOAL: A HIGH-QUALITY AND DURABLE FENDER SYSTEM,
 PERFORMING AS EXPECTED, PROTECTING VESSELS, PORT
 INFRASTRUCTURE AND PEOPLE

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