



## STREAMLINE PORT FENDERS MANAGEMENT WITH QR CODE

Thibault Herrgott; Marco Gaal

[Thibault.herrgott@trelleborg.com](mailto:Thibault.herrgott@trelleborg.com), [marco.gaal@trelleborg.com](mailto:marco.gaal@trelleborg.com).

### Abstract

Port authorities face challenges in monitoring their multiple equipment, more specifically marine fenders which can typically last over 25 years. Tracking installation dates, inspections, and replacements is often difficult, risking safety and efficiency. Integrated QR codes into rubber fenders address this issue by turning them into smart, traceable assets. These codes provide instant access to technical data, inspection history, and maintenance records via smartphone or computer. A user-friendly web and mobile interface enable project-level management and complements existing port systems. This innovation enhances safety, extends asset lifespan, reduces downtime, and lowers environmental impact.

### Introduction

Port authorities today are responsible for a wide range of port equipment. Despite the deployment of maintenance services in most of them, the upkeep and monitoring of this equipment remains a major challenge. It is often difficult to obtain and consolidate information about it: When were the equipment installed? When was performed the last inspection? Is the equipment well maintained and do we need to change any components?

Lack of answers to these questions poses a risk to the safety of port infrastructure and personnel.

### Challenges

Managing equipment maintenance is particularly challenging when it comes to marine fenders, which are designed to last over 25 years. Their extended lifespan makes them a key factor in strategic decisions regarding port infrastructure—such as investments, replacements, and expansions. In recent years, the importance of service life has grown even further due to increasingly stringent environmental regulations. Simply put, equipment that lasts longer contributes to a reduced environmental footprint, making durability not just a financial consideration but also an ecological one.

The significance of inspection and maintenance is thoroughly addressed in the recently published PIANC WG211 guidelines (1), which dedicate an entire section to the upkeep of fender systems. These guidelines emphasize the need for regular, detailed inspections of all components—not just the rubber body, but also elements like chains, bolts, and steel panels. This comprehensive approach ensures that potential issues are identified early, allowing for timely interventions that preserve system integrity and performance.

Based on these observations, a maintenance plan should be developed and continuously updated. Such a plan is essential to guarantee the optimal functioning of fender systems, which in turn supports safe and efficient port operations.

To ensure that critical marine fender systems remain reliable and safe throughout their operational life, it is vital to record installation data and establish consistent monitoring and inspection cycles. This proactive approach helps ports manage risks, extend asset life, and comply with both safety and environmental standards.



## QR code

While traditional serial numbers have allowed to trace fender products back to their raw materials, this innovation is going even further. With the introduction of QR codes on rubber fenders, it is transforming each fender into a smart and interactive asset.

These QR codes, combined with their web interface, provide full transparency of installed fender systems and make maintenance planning more efficient. This approach simplifies the management of fender systems and ensures that fenders maintain optimal performance at all times. By simply scanning the QR codes, users can instantly access to important data of each fender system such as technical datasheets, maintenance manuals, number of inspections performed, or date of the last inspections.



Figure 1. QR code scan.

## Asset Management

While scanning the QR code is the most visible and practical aspect of this innovation, the true value lies in the suite of features unlocked afterward—significantly enhancing asset management. Upon scanning, users gain immediate access to technical drawings and detailed specifications of the fender system, offering a deeper understanding of its components and structure. This proves especially useful when identifying the correct part for replacement, streamlining the spare parts ordering process. The application also facilitates efficient tracking of spare parts associated with each fender system, following maintenance history, enabling faster and more organized maintenance operations.

Moreover, installation and maintenance manuals are readily available with a single click, providing instant support to on-site teams and helping reduce downtime by simplifying procedures.

Another key feature is the ability to set up automated reminders to schedule inspections. These notifications are tailored to the specific inspection needs of each component—for example, chain elements may require less frequent checks than rubber. Additionally, the application offers direct communication with the supplier, allowing users to quickly arrange inspections with their technical team.

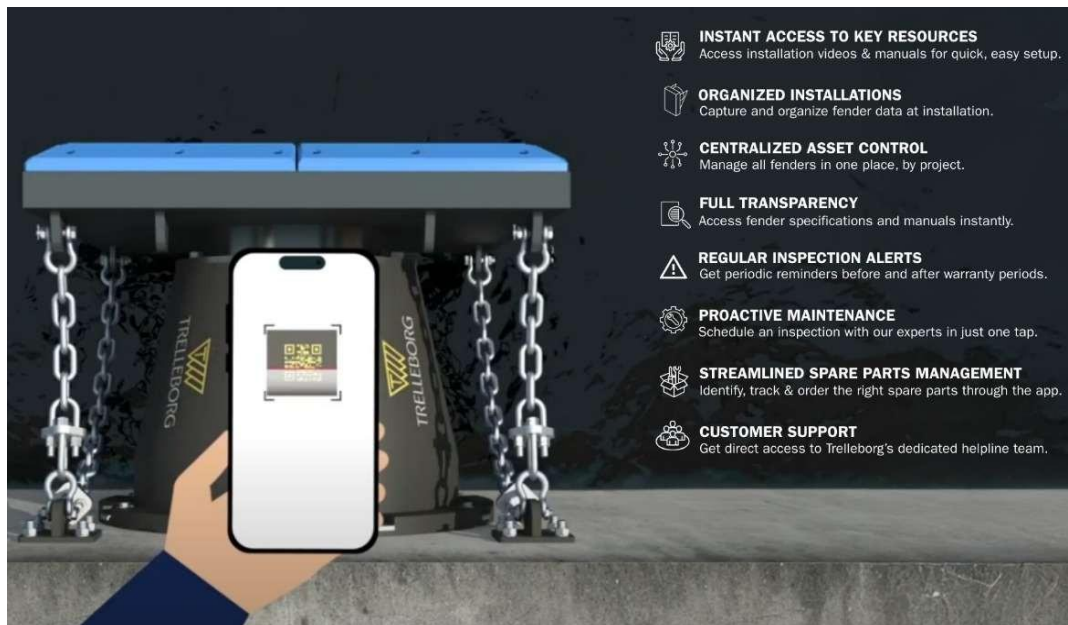


Figure 2. Features of the QR code.

Finally, the application presents a well-structured and intuitive interface. All components are grouped under their respective fender systems, and systems are organized by project. This allows users to navigate seamlessly between a general overview of all their projects and the detailed specifications of individual fender systems—ensuring complete visibility and control over their assets.

### Interface

A smartphone and web interface have been developed to streamline on-site data access and facilitate information management from desktop environments. These tools offer both a global overview by project and a detailed breakdown within each project, enabling users to access specific data for each fender system.

The smartphone interface ensures fast and intuitive access to key features, such as adding fender systems to a project, recording the date of the latest inspections, and monitoring spare parts maintenance.

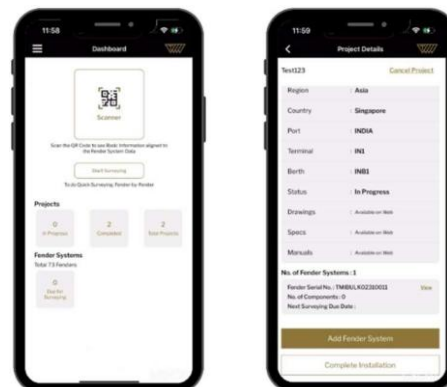


Figure 3. Smartphone interface.



The web interface presents a clear and structured layout, with direct access to various pages from the homepage. Users can easily navigate between a comprehensive view of all projects and a detailed perspective of individual fender components. This organization simplifies data handling and supports efficient maintenance operations.

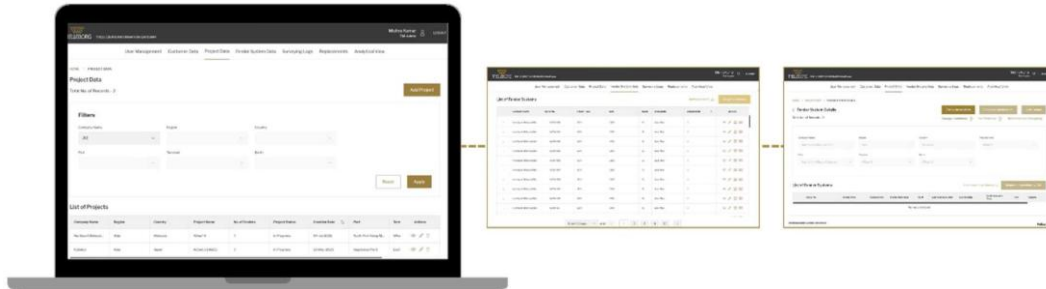


Figure 4. Web interface.

These digital tools have been designed for easy and intuitive operation by users. They are intended to complement existing port management systems, ensuring smooth integration into current workflows.

## Conclusion

In short, digital innovation is available these days to help port operators with their asset management. This QR code system allows port authorities to:

- Instantly access key data (installation date, inspection history, repairs, technical drawings) via smartphone or computer.
- Use an ergonomic web and mobile interface to manage fenders by project, view detailed component data, and schedule inspections.
- Improve safety, efficiency, and asset lifespan through better maintenance planning.

Ultimately, it empowers ports to make informed decisions, reduce environmental impact, and uphold the highest standards of safety and performance. The future of port equipment management is digital, and it begins with smarter, connected assets.

## References

- (1) PIANC MarCom Working Group 211 (2024). "Guidelines for the design, manufacturing and testing of fender systems", 177-181.