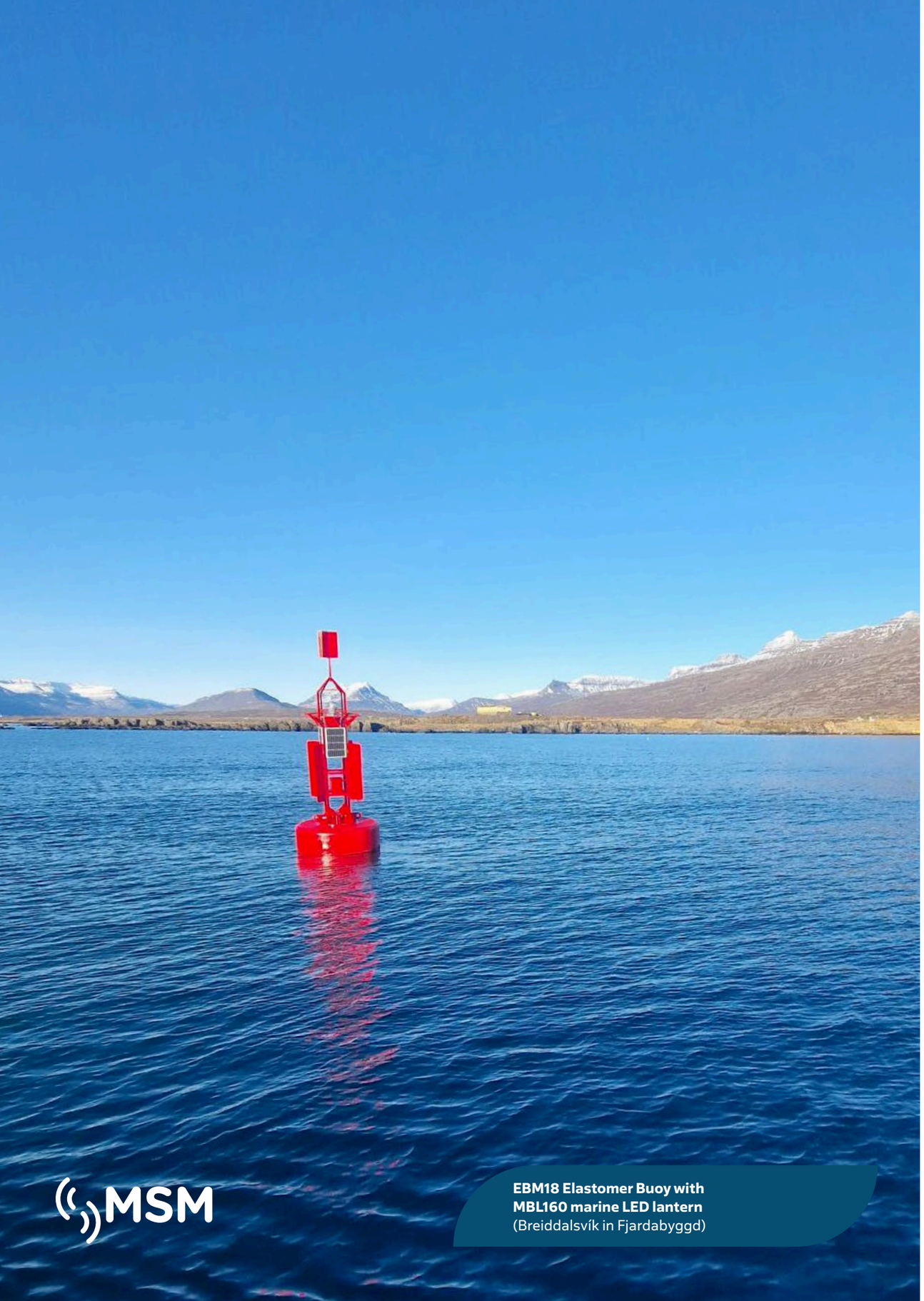
MSM

Case Study

ICELAND

Enhancing Maritime Safety with Elastomer Buoys & Solar-Powered LED Lanterns

in the Port of Breiddalsvík and Kokkálsvíkurhöfn, Iceland



EBM18 Elastomer Buoy with MBL160 marine LED lantern
(Breiddalsvík in Fjardabyggd)

1. Abstract

This technical case study explores **MSM**'s involvement within the successful implementation of an aids to navigation (AtoN) solution in the port of Breiddalsvík and Kokkálsvíkurhöfn in Drangsnes, Iceland.

The project involved **replacing two traditional steel buoys with modern 1800mm elastomer buoys equipped with MBL160 LED lanterns, 4x 50W solar panels, and 1 x 90Ah battery**. The shift from steel to elastomer buoys significantly improved the durability and reliability of navigation aids in the challenging environmental conditions of Iceland, reducing maintenance costs and enhancing maritime safety.

A **MCL400P self-contained lantern** was also chosen to replace an old lantern that was not providing the required performance within a harsh environment.

2. Introduction

The **port of Breiddalsvík** and **Kokkálsvíkurhöfn in Drangsnes**, situated in the rugged and unpredictable maritime environment of Iceland, have long faced challenges in maintaining reliable navigation aids.

The project aimed to **enhance maritime safety** by replacing two aging steel buoys with modern elastomer buoys equipped with state-of-the-art LED lanterns and sustainable energy sources, with **MSM**'s locally appointed agents, **HB-Mos SLF** (Björn Johannsson), providing local support.

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3. Challenges

The customer in Iceland were experiencing challenges with their existing solution using steel buoys including the harsh saltwater environment causing rapid corrosion & costly maintenance. The regular required maintenance also resulted in periods of downtime of the buoy leading to reduce reliability.

When preparing our recommendation, the MSM team also had to consider the potential **impact of the cold oceanic waters** associated with these two locations. Iceland is located in the North Atlantic Ocean, and its waters are influenced by the cold North Atlantic Current and the Arctic Ocean. As a result, the sea around Iceland is relatively cold, with temperatures ranging from 2°C to 10°C (36°F to 50°F) depending on the season.

The coastal areas of Iceland often feature glaciers that flow into the sea. Icebergs calve off these glaciers, creating ice lagoons and fjords, such as Jökulsárlón and Breiðamerkursandur in the southeast, adding to the country's striking coastal scenery. Ice can damage navigation buoys in several ways, especially in areas prone to **freezing temperatures and ice formation** during the winter months.

Ice can also physically damage the buoy's structure. As ice forms and expands, it can exert pressure on the buoy's outer shell, potentially causing cracks, dents, or punctures. These structural issues can compromise the buoy's integrity.

The **low levels of UV radiation** associated with Iceland could also provide some challenges in terms of generating power for the LED lanterns that were to be installed on to the buoys.
These low levels of UV can lead to a number of potential challenges in terms of reduced efficiency, an increased level of ageing and degradation and a potential of reduced long-term performance.

Iceland places a strong emphasis on **environmental conservation and sustainable management** of its marine resources. The government and various organizations work to protect vulnerable species and maintain the health of the marine ecosystem. MSM therefore had to consider a technical solution that meets Iceland's empashsis within the area of environmental conservation and sustainable management.

- *Impact of cold oceanic waters*
- *Ice formations*
- *Low levels of UV*
- *Environmental conservation*

3. MSM Solution

To address these challenges, MSM proposed **two elastomer buoys with a 1800mm diameter and 3500mm focal height along with a MBL160 LED lanterns to offer a range of up to 12Nm**. These low-consumption LED lanterns were powered by 4 x 50W solar panels and 1 x 90Ah battery as per the results of an IALA solar calculation. The benefits of MSM's technical solution can be summarised as follows:

Two EBM18 elastomer buoys with 1800 mm diameter & MBL160 LED lanterns with a light range of up to 12 NM

Benefits of Elastomer Buoys in Iceland's Challenging Environment

Elastomer buoys are specifically designed to withstand harsh marine conditions, making them ideal for the unpredictable Icelandic coast.

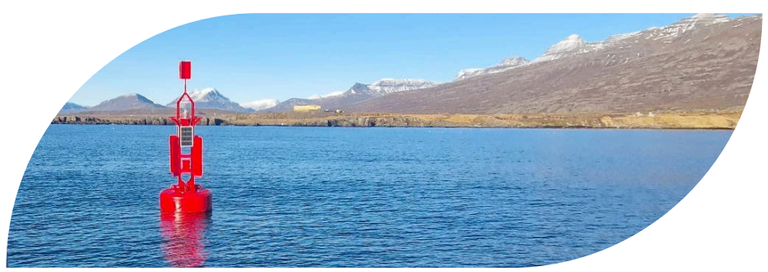
Elastomer buoys not only have a **high resistance to impacts and collisions**, but also, due to their fully elastic float, they have a **great recovery capacity without damage**. Their solid core of closed-cell polyethylene foam guarantees **no water absorption** whilst offering a **high level of flexibility**. After an impact, they can recover the original shape, like how a tennis ball does.

The float of an Elastomer Buoy is constructed with a polyurethane elastomer skin wrapped around a solid core of closed-cell polyethylene foam sheets. The manufacturing of the float core is based on a process of rolling a closed-cell polyethylene foam sheet up to the required diameter. The resulting float is then covered by a layer of Elastomer polyurethane of 10 mm thickness to form an elastic skin on an elastic core. This process provides an elastic float with great recovering capacity and zero water absorption.

The **colour of the float is impregnated in the polyurethane elastomer projection**, **UV stabilised,** which allows for a stable colour of the buoy for many years without repainting.

To reinforce the buoy stability, the buoy superstructure and tail/superstructure are manufactured using hot-dip galvanized steel, the same materials used for conventional steel buoys, which provides significant strength and stability to the buoy.

The process of manufacturing and the materials used in the Elastomer floats are the same as those used in fenders of ports for vessel berthing, where they are able to withstand repeated heavy collisions. Moreover, Elastomer buoys offer a lower cost of handling, maintenance, and repainting.
Maintenance operations of Elastomer buoys occur much less often and are much cheaper.



The **benefits of elastomer buoys in this environment** include:

Resistance to corrosion

Unlike steel buoys, elastomer buoys are highly resistant to corrosion, extending their operational lifespan.

Increased reliability

Fewer maintenance interruptions improved the reliability of navigation aids, enhancing safety for vessels navigating the challenging waters of Iceland.

Impact resistance

Elastomer's flexibility allows it to absorb impacts from ice and debris without sustaining significant damage, ensuring continuous functionality.

Non corrosive

Unlike some metal buoys that may corrode over time, elastomer buoys are non-corrosive, which can help prevent the release of harmful substances into the marine environment.

Reduced maintenance

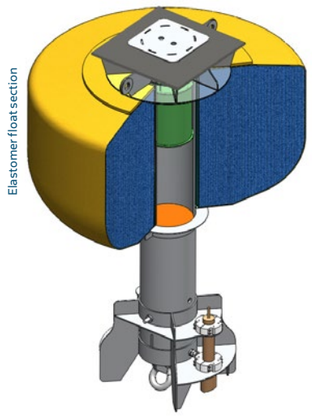
The shift to elastomer buoys significantly reduced maintenance requirements.

Recyclable & sustainable buoys

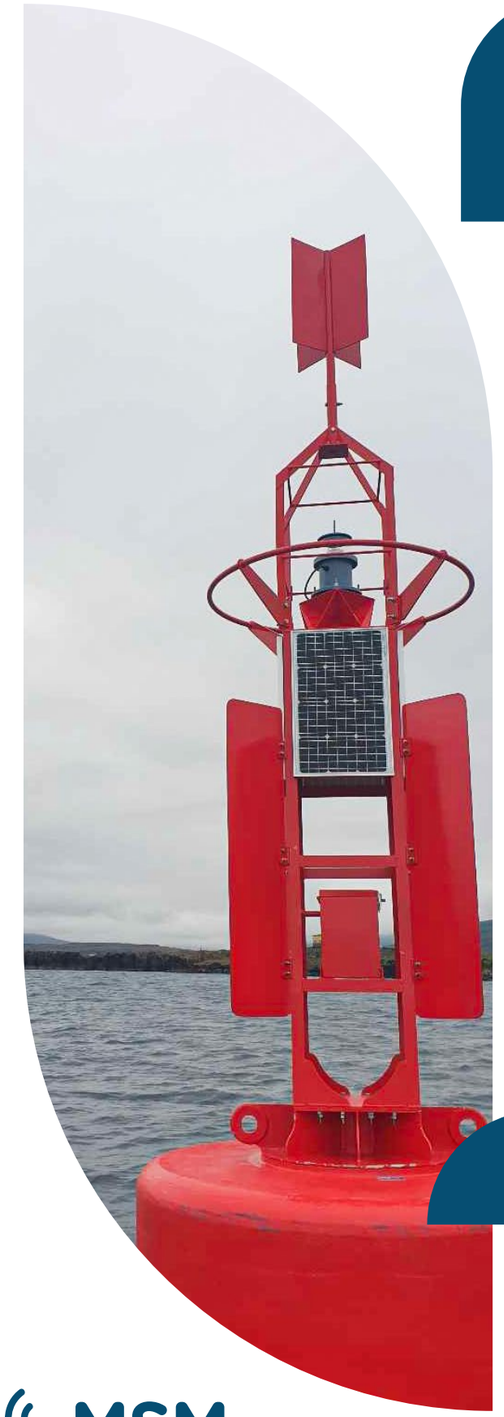
As per our certification by Bureau Veritas (January 2019), the elastomer buoys manufactured by MSM from solid polyethylene foam sheets coated with a layer of polyurethane elastomer are recyclable and can be valued for conversion into Wast-Derived Fuel.

Lower operational cost

Reduced maintenance needs translate into lower operational costs, allowing for better allocation of resources.



Elastomer float section



EBM18 Elastomer Buoy with MBL160 marine LED lantern
(Breiddalsvík in Fjardabyggd)

Solar-Powered LED Lanterns

MSM's **MBL160 LED lanterns** is the perfect solution for Iceland and the low levels of sunlight associated with this location.

The luminous source of the MBL160 lantern consists of an **innovative lens system especially designed to achieve the maximum performance of its LED diodes**. Manufactured with high-quality and resistant materials, the MBL160 provides a **long service life within harsh marine conditions** like what they will experience within these two locations.

As part of this project, MSM also supplied a **MCL400P lantern**. MCL400P is a compact LED marine lantern of medium range, with built-in solar power, characterized by **great optical efficiency and low consumption**, made up of LED diodes of high intensity, reaching a **nominal range of 14 nautical miles**. MCL400P was selected as a **more sustainable & easier to maintain solution** in comparison to the existing standalone option that was being powered by a mains supply.

MCL400P Self-contained LED lantern
(Breiddalsvík in Fjardabyggd)

4. Results

The implementation of elastomer buoys with solar-powered LED lanterns will contribute to **improvements in maritime safety within the port of Breiddalsvík and Kokkálsvíkurhöfn in Drangsnes**.
The benefits included:

Enhanced Reliability
The buoys and lanterns operated consistently, reducing the risk of accidents.

Lower Maintenance Costs
Reduced maintenance needs resulted in cost savings for the port authorities.

Environmental Responsibility
The adoption of renewable energy sources aligned with sustainability goals.

5. Conclusion

The replacement of traditional steel buoys with elastomer buoys and solar-powered LED lanterns marked a pivotal step in **enhancing maritime safety** within the port of Breiddalsvík and Kokkálsvíkurhöfn in Drangsnes, in Iceland.

The **durability, reduced maintenance, and sustainability benefits of this solution made it well-suited to the challenging environmental conditions of Iceland**, ensuring safer navigation for vessels in the region.

This case study highlights the importance of adopting **innovative technologies** to address maritime challenges and promote **sustainability in the industry**.

The **Icelandic Road and Coastal Administration** (IRCA) is continuing to invest in cutting-edge Aids to Navigation (AtoN) technologies to bolster safety along Iceland's navigable routes.

By adhering closely to the guidelines and recommendations set forth by the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), **the IRCA ensures that maritime navigation within Icelandic waters meets global standards**.

Through **strategic investments in the latest AtoN technologies**, including the latest buoy materials and LED technology, the IRCA aims to enhance the safety of navigation for vessels traversing Iceland's coastal areas. This proactive approach not only fosters safer maritime operations but also underscores Iceland's commitment to maritime safety on an international scale, whilst reducing maintenance costs.

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