

## Monitoring and Managing Aids to Navigation in the Digital World

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### Summary

The navigational tools available to mariners are vast and continue to evolve as new technologies are realised. Maritime authorities now have the ability to monitor and manage their Aids to Navigation (AtoN) assets digitally, which can reduce cost and improve service reliability.

As such, authorities have come to realise that managing a very large asset base is both complex and labour intensive. An effective solution lies in using technology to help them to be proactive, gain visibility of their assets and streamline their processes.

*Keywords: AtoN Systems, Maintenance, IALA, Monitoring, Asset Management.*

### Introduction

Historically, maintenance on AtoN has been undertaken on a scheduled basis. Whether that be monthly, six monthly or annually.

With the advent of new technologies authorities now have the ability to monitor and manage their assets which can reduce costs and improve service.

### AtoN Systems

An AtoN normally consists of a platform or structure such as a lighthouse or buoy. The signals that they provide can either be visual (a light) or non-visual (an AIS) or a combination of both. These signals require some kind of electrical power to provide the signal and are housed within the structure. Combining the above elements forms a system that has strengths and weaknesses. The weakest part of the system requires the most attention. Whether that be an incandescent light source the needs replacing often or chain made of poor steel that wears out prematurely. These elements often dictate the maintenance regime. However, modern technology in the use of LEDs and synthetic moorings can drastically extend the maintenance period.

### Maintenance

Traditional maintenance is undertaken on a scheduled basis. As an example, an incandescent lamp has a nominal lifetime of 2,500hrs. this equates to approximately six months of operation at which point the lamp would need to be replaced so

scheduled maintenance is conducted every six months to coincide with the lamp replacement.

Conditioned based maintenance relies on everything working as it should be or in other words, if it isn't broken, don't touch it! This approach often leads to Reactive maintenance whereby a fault is reported and it is required to be fixed immediately. Using Predictive maintenance techniques can lead to significant cost reductions in unplanned visits and extended maintenance periods. This requires monitoring of asset data, looking at data trends and planning against that data. Figure 1 shows eighteen months of data from a solar charged lantern comparing the solar charge current against the load current of the system. It can be seen that the load current goes up and down between Winter and Summer; and that the charge current exceeds the load current. This represents a healthy system.

### The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA)

IALA is a non-profit, international technical association. Established in 1957, it gathers together Marine Aids to Navigation authorities, manufacturers, consultants, and, scientific and training institutes from all parts of the world and offers them the opportunity to exchange and compare their experiences and achievements. IALA encourages its members to work together in a common effort to harmonise Marine Aids to Navigation worldwide and to ensure that the

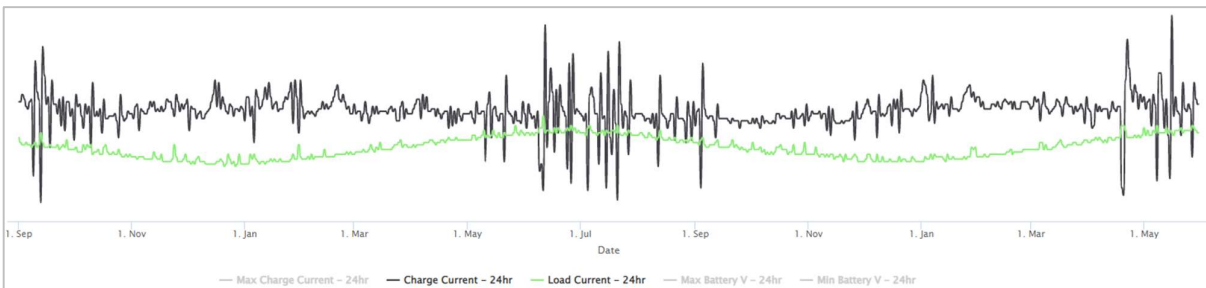


Figure 1 - Eighteen Months of data showing solar charge current vs. load current

movements of vessels are safe, expeditious and cost-effective while protecting the environment.

Taking into account the needs of mariners, developments in technology and the requirements and constraints of aids to navigation authorities, a number of technical committees have been established bringing together experts from around the world.

The work of the committees is aimed at developing common best practices through the publication of IALA Standards, Recommendations, Guidelines and Model courses.

An example of an IALA recommendation would be: R0130 – Categorisation and Availability Objectives for Short Range Aids to Navigation where each category is defined given an availability objective.

IALA is in the process of becoming an Intergovernmental Organisation (IGO) in order to have a similar standing as their sister organisations the International Maritime Organisation (IMO) and the International Hydrographic Organisation (IHO). It is hoped that this can be achieved by 2025.

battery voltage, charge current, character, intensity and status. It should also allow for configurable alarms such as off-station, low battery and lantern failure. It should follow the recommended standards with regard to encryption of data and have an API key for integration to legacy systems.

**Discussion and Conclusion**

It is clear that by having digitally connected assets that maintenance can be reduced or certainly planned for. A level of availability can be achieved and weak parts of a system can be identified. From this an asset management plan can be developed and executed to improve service which in turn can reduce costs.

**Monitoring**

There are many ways to monitor an AtoN. An observer can be used to inform the service provider of any outages. This may be achievable in a small network of AtoN, but not very practical in a large system. The modern default system for monitoring is via satellite communications. Once thought prohibitive due to cost, it is now cost compatible to telecoms. It is very reliable and provides pole-to-pole coverage.

**AtoN Asset Management**

As shown in Figure 2 an AtoN asset management system should show all AtoN assets in one easy to access platform. It should be able to accept multiple data inputs and display essential data such as

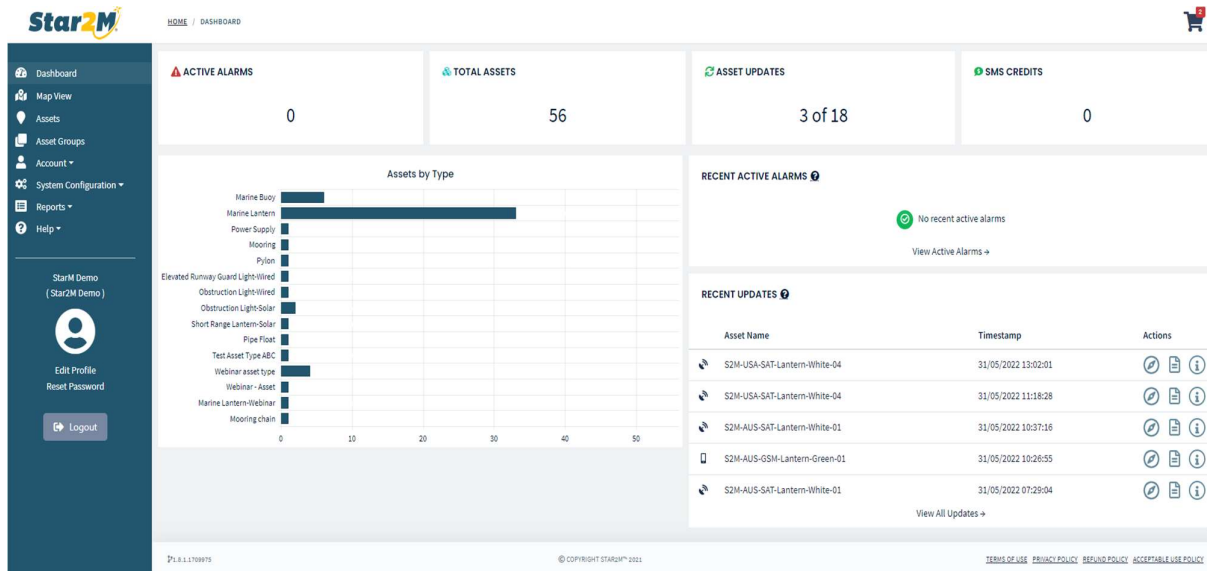


Figure 2 - A proprietary monitoring platform dashboard