CASE STUDY
LIGHTHOUSES UPGRADING
MÁLAGA (Spain)
The Malaga coast has 6 emblematic lighthouses, whose equipment has just been renewed by MSM to adapt them to their current needs, optimizing their operation and management.

After a first prospection to check the status of this lighthouses network and plan the roadmap for the renovation, the MSM technical team travelled to the province of Malaga to carry out different actions, including renovations, supply and installation of equipment, and maintenance to complete a major project that has involved 6 lighthouses:

- Punta Doncella Lighthouse in Estepona
- Calaburras Lighthouse in Mijas
- Marbella Lighthouse
- Málaga Lighthouse “La Farola”
- Torre del Mar Lighthouse in Vélez-Málaga
- Torrox Lighthouse

**COMMON WORKS DONE IN ALL LIGHTHOUSES**

In addition to the tasks that were carried out in each of these lighthouses according to their specific needs, a series of common works were executed for all sites:

- Reprogramming of existing PLCs to manage the operation of the signal, alarm monitoring and remote control functions. Additionally, practical training on the operation of this software for aids to navigation technicians was provided.

- Installation of GLOBAL NETCOM software developed by MSM, a system for the monitoring and remote control of all lighthouses and beacons being part the AtoN network of the Port Authority of Malaga, including a training course for the use and management of the software.

- Installation of CCTV cameras to remotely monitor the correct operation of the optic equipment through Global Netcom and also provide security against possible vandalism or criminal acts.

- Installation of a UPS to cover power micro-outages and prevent problems caused by the different systems that depend on the electrical panel.

- Supply of a spare metal halide lamps set.
Our roadmap started at the Punta Doncella Lighthouse, located in southwest of Estepona, a few meters from the fishing port. An important lighthouse, since together with the Punta Almina Lighthouse in Ceuta, it guides boats when heading towards the Strait of Gibraltar towards the Atlantic.

The construction of the first lighthouse of Punta Doncella began in 1861 and it was in 1863 when it came into operation. In 1922, to obtain a greater range, a new tower was erected and a new rotating system was installed, as well as a new lantern, and a petroleum vapor ignition installation.

One of the main tasks that has been carried out in this lighthouse has been the installation of a new lighting system composed of two 360 W discharge lamps and its corresponding two-position lamp changer, model MLC02B. In addition, an Uninterruptible Power Supply (UPS) has been installed to guarantee the operation of the system in the event of a power outage.

Adding a new lighting system and an emergency beacon involved the adaptation of the control panel to the operation requirements of the new equipment.

On the other hand, to ensure the operation of the lighthouse in case of failure of the main light, an Secondary Light has been installed, powered by a system formed by gelled electrolyte batteries and their corresponding charger. The chosen model has been the MBL400C LED marine lantern, which has a vertical divergence of 2º and a nominal range of 14 NM, in addition to allowing IR programming.

An ADSL router was set up, allowing the remote connection of the control cabinet elements that require to be remotely controlled.

Other work carried out was the replacement of the access door to the balcony of the lanternhouse, placing a new watertight door to prevent the entry of air and water to the equipment area.

Once the full equipment of the lighthouse was renewed, a delicate maintenance operation was carried out: the mercury filtering and the cleaning of the mercury container bucket. A work that was carried out strictly following the regulations of hazardous waste handling.

Finally, after completing the renovation works of the Punta Doncella Lighthouse, which also included the replacement of all the deteriorated elements of the lighthouse rotation system, our team carried out all the necessary tests to ensure the optimal operation of the new lighthouse equipment after its commissioning.
The lanternhouse of the Calaburras Lighthouse has recovered its original magnificence thanks to this full restoration.

The next stop of our route was the Calaburras Lighthouse, located at the most prominent point of the Malaga coast and standing as the most important lighthouse in the province since it focuses the Strait of Gibraltar to guide the boats coming from the Mediterranean.

It should be noted that this lighthouse, projected in 1861, began operating in 1863, and in 1928, due to its semi-ruinous state, a new tower was built.

The intervention undertaken in this lighthouse by MSM team last September 2022, involved similar works to those carried out in the Punta de Doncella Lighthouse: installation of a new lighting system consisting of two discharge lamps and the two-position lamp changer model MLC02B, installation of a UPS, as well as the installation of an secondary light model MBL400C of identical features as the one installed in the Punta Doncella Lighthouse (2º vertical divergence, nominal range of 14 NM, and IR programming) with a power supply system consisting of gelled electrolyte batteries and a charger. In addition, the control panel was also adapted to the new equipment installed, also configuring a 4G wireless router for remote monitoring. The metal frame of the 100-year-old door that gives access to the outside of the lanternhouse was replaced, the rotation system was tuned-up, cleaning engines and gears, and maintenance work was carried out including mercury filtering and the cleaning of the container tank.

Certainly, these operations have provided to this lighthouse full equipment to offer the best performance, as well as they have bring the original splendour back to the lanternhouse.
Marbella Lighthouse is located next to the Marina, signalling the Bay of Marbella landfall. The current lighthouse, built in 1974, replaces the previous Marbella lighthouse located in Los Barronales, which was projected in 1861 and lit in 1864, and due to the urban expansion of the area was relocated with a new tower.

In this lighthouse the renovation tasks were very similar to the works carried out in the Punta Doncella Lighthouse, so that Marbella Lighthouse remained optimally functioning according to the specified technical requirements:

- New lighting system: two 360 W discharge lamps and the 2-positions lampchanger
- Installation of an Uninterruptible Power Supply
- Installation of a secondary light (model MBL400C) and a power supply system consisting of gelled electrolyte batteries and their corresponding charger.
- Adaptation of the control panel to the new equipment installed.
- Configuration of the 4G wireless router for the system remote monitoring.
- Tune-up of the classic rotation system.
- Mercury filtering and cleaning of the mercury container tank.

**Lighting System:**

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>Marbella</th>
</tr>
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<tbody>
<tr>
<td>BUILDING YEAR</td>
<td>1974</td>
</tr>
<tr>
<td>CONSTRUCTION MATERIAL</td>
<td>Cylindrical concrete tower</td>
</tr>
<tr>
<td>TOWER HEIGHT</td>
<td>29 m</td>
</tr>
<tr>
<td>FOCAL HEIGHT</td>
<td>46 m</td>
</tr>
<tr>
<td>NOMINAL RANGE</td>
<td>22 NM</td>
</tr>
<tr>
<td>LIGHT RHYTHM</td>
<td>GpD (2)</td>
</tr>
<tr>
<td>RHYTHM PERIOD</td>
<td>14 s</td>
</tr>
<tr>
<td>LIGHT CHARACTERISTIC</td>
<td>L 0,4 Oc 3,2 L 0,4 Oc 10,5</td>
</tr>
<tr>
<td>LIGHT COLOUR</td>
<td>White</td>
</tr>
</tbody>
</table>
La Farola now has a high-performance lighting system. Equipped with 2 metal halide lamps of 1000 W, La Farola was able to resist a succession of adversities over time such as the earthquake in Andalusia of 1884 or the Spanish Civil War, after which it had to be rebuilt in 1939.

The Malaga Lighthouse is located in the Port of Malaga and, currently, in addition to being used as a maritime signal, it is also used as a control center, since it is equipped with several systems, such as radar, AIS or radio systems, which allow the port traffic control.

The renovation works undertaken in this lighthouse, as well as the equipment installed, were the same as those carried out in the Punta Doncella Lighthouse and the Marbella Lighthouse: a new lighting system was installed, but this time with 2 metal halide lamps of 1000 W, and its corresponding two-position lamp changer model MLC02. A set of devices was also installed to ensure the operation of the lighthouse in case of any incident: a UPS, a MBL400C secondary light with a power supply system composed of gelled electrolyte batteries and a charger. On the other hand, the control panel was adapted to this new equipment, the router was configured for remote monitoring and control, the rotation system of the lighthouse optics was inspected, and finally, we proceeded to the filtering of mercury and cleaning of the mercury container tank complying with all security measures. Thus, leaving the infrastructure of the lighthouse completely renewed for optimal operation.

"La Farola" of Malaga is a lighthouse of high historical value which managed to resist a succession of adversities over time such as the earthquake in Andalusia of 1884 or the Spanish Civil War, after which it had to be rebuilt in 1939.

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This lighthouse is located at the end of the Poniente Seafront of Torre del Mar district, belonging to the municipality Vélez-Málaga. It is a lighthouse that marks the bay of Torre del Mar, and it should be noted that it is a flashing lighthouse equipped with horizon omnidirectional optics.

The original lighthouse of Torre del Mar was built in 1864 next to the mouth of the Algarrobio River, which was destroyed in 1880 by a strong storm. That is the reason why a new lighthouse was built, and inaugurated in 1930, which ended up being moved to a new location in 1969 due to urban growth. Finally, under the requirement of achieving a longer range in 1974, a new tower began to be built and inaugurated in 1976.

Concerning the renovation work carried out by the MSM team, one of the most relevant actions was the installation of an LED lighting source for classic lighthouses: the MLL1000 LED lamp developed and patented by MSM. An innovative piece of equipment, based on a system that creates a virtual individual focal point, which has been installed within the classic optics of the lighthouse exactly on the focal point of the original optical system.

In addition, a backup power supply system was installed for the main light consisting of gelled batteries and a charger, to cover a possible fault in the network or in the facilities. Just like all the lighthouses involved in this project, an MBL400C secondary light was installed, incorporating a power supply system consisting of gelled electrolyte batteries and their corresponding charger. The lighthouse control panel was adapted to the new equipment, and the 4G wireless router was configured to allow remote control.

Following this intervention, the Torre del Mar Lighthouse steps up to LED technology with our MLL1000 lamp thus achieving greater luminous stability, low energy consumption, and long service life.
The Torrox Lighthouse is in Punta de Torrox, next to the mouth of the Torrox River and the site of the ancient Roman city of Caviclum. Planned in 1860 on the boundary between two beaches belonging to Torrox village, this lighthouse came into operation in 1864 to signal an anchorage frequently used by wide-ranging sizes of ships. Its equipment was renewed several times, having since 1983 a modern continuous rotating optical system, which was causing some failures in the signal, hence the need to renew the equipment.

One of the main works carried out by MSM in this lighthouse was the installation of a new lighting system designed for this location: the MFR LED reflector light, made up of optical panels with high-intensity LED reflector elements arrayed in columns and equipped with electronic rotation motors without gears and brushes, and with a minimum friction adjustment and high precision rotational speed adjustment (less than 2%).

To guarantee the operation of the lighthouse in the event of any incident, a backup power supply system was installed for the main light consisting of two gelled batteries. In addition to installing a MBL400C secondary light, with a power system consisting of gelled electrolyte batteries.

On the other hand, the lighting control panel of the lighthouse was adapted to the new equipment for optimal operation. The 4G wireless router was also configured for remote connection to all the elements of the control panel that need to be remotely controlled.

With the works undertaken in the Torrox Lighthouse, this series of interventions carried out by MSM technicians for the renovation and modernization of the lighthouses of the Malaga coast was completed, leaving this long-range AtoN network working correctly under the required technical parameters.
Currently, although the use of mercury in lighthouses is in disuse due to its toxicity, we can still find lighthouses that require the use of mercury for their operation. These are lighthouses that have kept operational classic rotating optical systems, such as Punta Doncella Lighthouse, the Calaburras Lighthouse, the Marbella Lighthouse, and the Malaga Lighthouse “La Farola”. Many years ago, the use of rotation systems filled with mercury was a technological innovation in the lighthouses: the heavy Fresnel optics floated on tanks with an O-ring shape filled with mercury (since this metal, at room temperature, remains in a liquid state and is very heavy), thus managing to rotate faster and smoothly to obtain a stable flashing sequence.

In the case of the province of Malaga, there are 4 lighthouses that still have a rotation system supported by a mercury tank. So, in this upgrading project of equipment for lighthouses, it was considered to carry out a series of tasks for the filtering of mercury and the cleaning of the mercury container bucket. A delicate work that was carried out in compliance with current regulations and using all appropriate security measures.

The rotating system was removed from the lighthouse to extract the mercury, and the tank was cleaned appropriately. Subsequently, once filtered, the mercury tank was refilled to finely tune the entire rotation mechanism so that the lighthouse continues to operate optimally and extend its service life.
Tell us about your project. Our team of experts will assist you for lighthouses upgrading and rehabilitation.