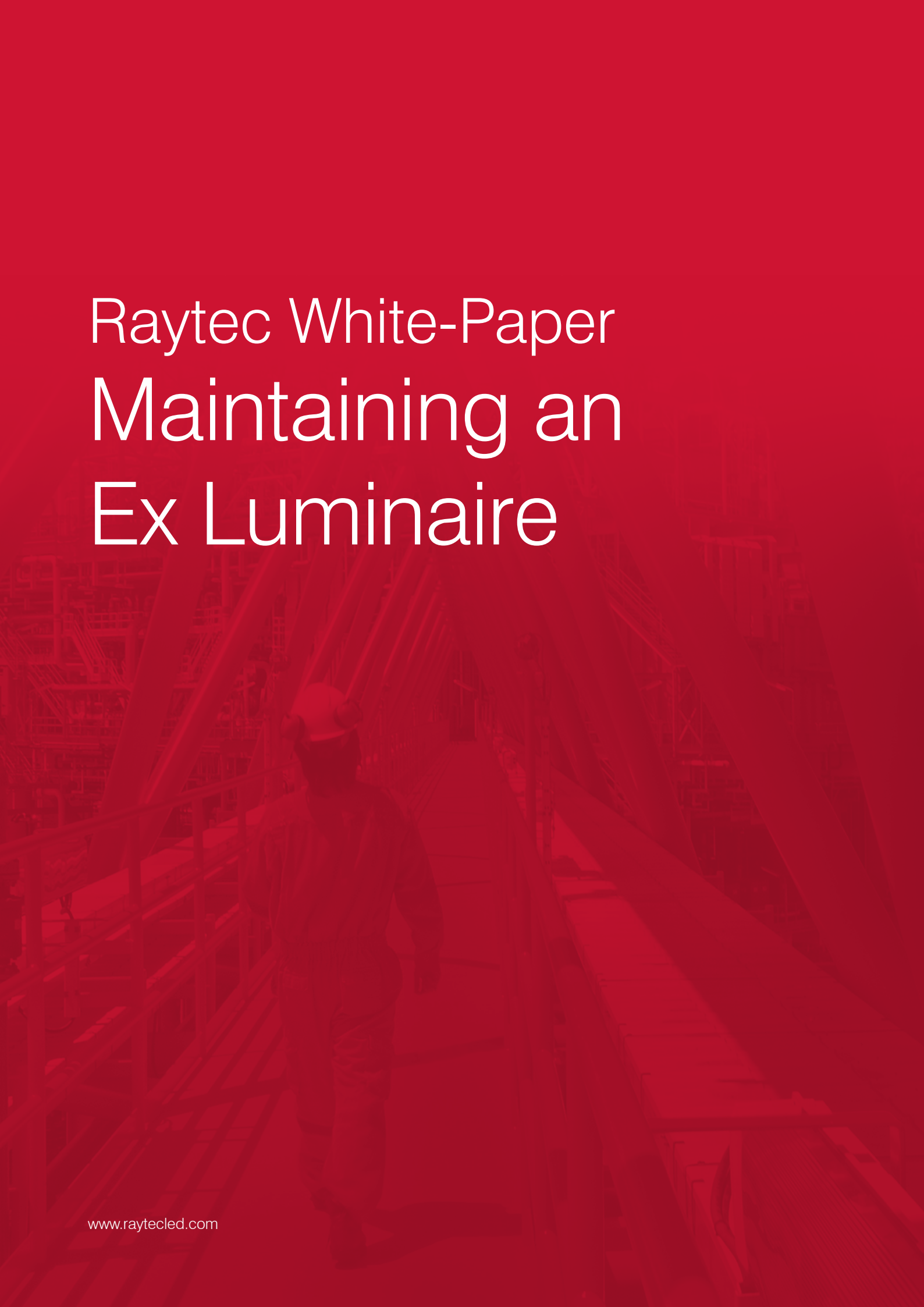
Raytec White-Paper

Maintaining an Ex Luminaire



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1. Introduction

When sourcing lighting to install in hazardous areas, cost, performance and reputation of the manufacturer, are important criteria to consider. But how much thought do end-users give to ease of maintenance? For many, the answer to this question is probably, ‘not enough’.

This White-Paper is intended to help end users gain a better understanding of what makes a hazardous area luminaire easy to maintain, and how it can help to reduce costs.

The design of a luminaire, and how easy it is to maintain, can vary significantly between different manufacturers and different luminaires. In part, this is down to how the units are certified; certification can restrict the level of maintenance that can be carried out on-site. However, ease of maintenance is also down to the manufacturer and how much importance it’s given during the design process. It’s easy for a manufacturer to overlook ease of maintenance, especially as the person specifying the lighting is not always responsible for maintaining it.

Choosing an LED luminaire will of course help to reduce the amount of maintenance required, but as with any electrical product, there is always some risk of failure. In hazardous area applications, where the environment can be particularly harsh and challenging, this risk is often amplified. So, while LED undoubtedly helps to reduce the level and frequency of maintenance, no hazardous area luminaire should really be thought of as being completely ‘maintenance free’.

Before we look more closely at what actually makes a luminaire easy to maintain, we’ll first consider what maintenance is required for any luminaire installed in a hazardous area.

2. What Maintenance is Required?

2.1 Routine Inspection

Luminaires that are certified for use in hazardous areas possess special features which render them suitable for use in these environments. Routine inspections are therefore required over the lifetime of the luminaire to ensure these special features are preserved.

The level and complexity of these inspections are covered under hazardous area guidelines (BS EN60079-17), but speaking generally, will usually be visual and are unlikely to require the unit to be opened up. As a result, the design of a luminaire, and how easy it is to maintain, is unlikely to have any significant impact on the complexity and duration of these routine inspections. Crucially though, these inspections are designed to highlight the need for any additional, unplanned maintenance. It is these requirements that make a luminaire's ease of maintenance so important.

2.2 Unplanned Maintenance

Unplanned maintenance can be categorised as any maintenance procedure which is required outside of routine inspection. Unplanned maintenance is likely to be more complex, and there is a higher chance that the unit will need to be opened up for a problem to be rectified or repaired.

A luminaire's ease of maintenance will determine two things;

- Who can carry out the repair; the end-user or the manufacturer?
- Whether the unit can be repaired at all, or if it must be replaced?

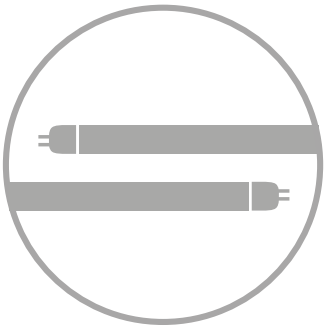
The answer to these two questions will have a significant effect on the length of time which the end-user will be left without light, and on the cost (both the direct cost of the repair, but also the associated costs of downtime).

Pro-Tip – Any unplanned maintenance requirements could increase the lifetime cost of the luminaire if it is not easy to maintain.

3. Identifying Ease of Maintenance

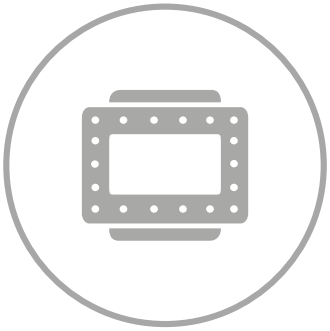
3.1 Traditional Luminaires

Luminaires in this category are non-LED and use traditional technology (such as fluorescent tubes or sodium lamps). Of course, this category is very broad with a wide variety of different types of luminaire. However, they are similar in that they all have a shorter lifetime (so lamps will have to be replaced numerous times over the lifetime of the luminaire). While the process of maintaining the luminaire may be a slow or difficult process, maintenance can generally be carried out on-site.



3.2 Sealed for Life LED Luminaires

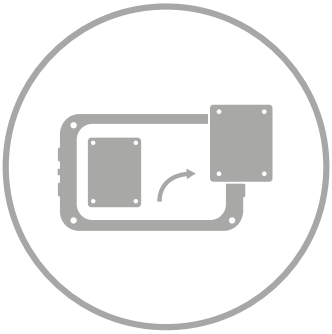
We know that choosing an LED luminaire means maintenance is required less often, but we've also highlighted that when installed in a hazardous area application, it should not be considered as being 'maintenance free'. Despite this, many LED luminaires are factory sealed. Because the seal is critical to the luminaire's hazardous area certification, it cannot be opened up for maintenance or repair. Tampering with the seal, or forcing the unit open, would mean the luminaire no longer complies with its Ex rating and could present a risk of explosion. Sealed for life units must therefore be returned to the manufacturer for any maintenance procedures to be carried out.



3.3 Modular LED Luminaires

Modular luminaires are designed with maintenance in mind; the unit is not factory sealed and can be opened up on-site. Maintenance can therefore be carried out by the end-user. Spare parts are interchangeable and can be removed independently, while the ability to mount key components remotely can also make access for maintenance much easier.

The key feature of a modular luminaire is that maintenance can be done on-site and there is no need to return the unit back to the manufacturer.



Pro-Tip – A modular luminaire allows maintenance to be carried out on-site, whereas a sealed for life unit must be returned to the manufacturer to resolve any issues.

4. Why is Modular Easier to Maintain?

Now we know how different types of luminaire can be grouped, we need to understand what's different about a modular luminaire which makes it easier to maintain.

A modular luminaire should be designed to ensure parts can be removed and replaced without causing damage to the luminaire. This means parts such as PSUs, emergency batteries, light engines etc. can all be removed independently. The luminaire is not factory sealed, which means an end-user can access internal components and carry out maintenance without having to remove the luminaire first. Meanwhile, spare parts can also be kept on-site to service the installation. These features help to speed up the process of maintenance and reduce downtime.

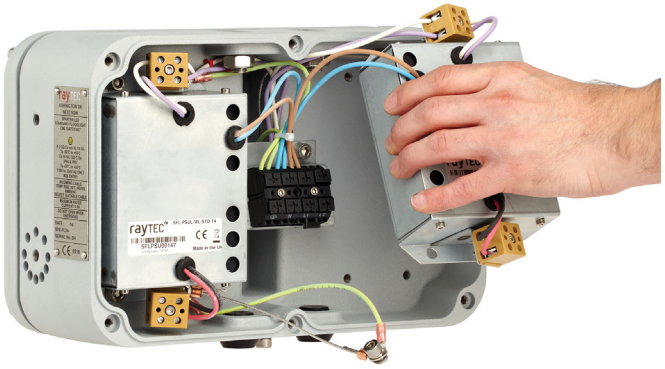


Figure 1: A modular luminaire allows parts to be removed independently

At this point, you may be asking, 'How is all this possible within a hazardous area environment?'. Primarily, it's down to the unit's protection method and how it's been certified. A true modular unit will be 'Ex e' certified (increased safety), which in short, means the unit has been designed and certified to prevent an explosion (rather than contain it). Not all Ex e luminaires are modular but certifying using this protection method does allow the manufacturer more flexibility in being able to design it for easy maintenance.

A modular unit should also make access for maintenance easier. In the same way that parts can be removed independently, the control gear can be mounted remotely, away from the luminaire's main body. This makes access for maintenance much easier (we cover this in more detail in section 6.0).

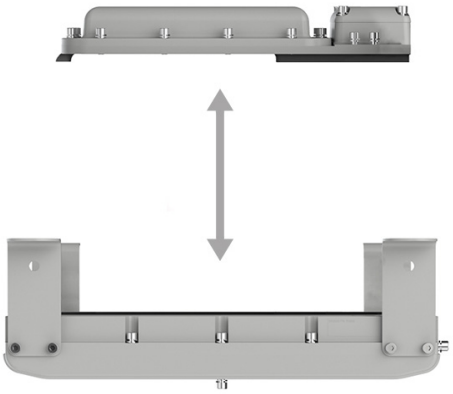


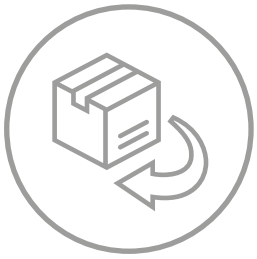
Figure 2: Modular luminaire's also allow PSU's to be removed and mounted remotely for easy access

Pro-Tip – Because a modular luminaires parts are interchangeable, a small stock of spare parts can be kept on-site to service the installation.

5. Modular vs Sealed for Life

If you are reading this White-Paper, and have an interest in reducing maintenance costs, you probably already understand the benefits of selecting a luminaire using LED technology. For the remainder of this White-Paper we will therefore be focusing on the differences between sealed for life and modular luminaires.

We know that a modular luminaire is easier to maintain, but we also need to understand why ease of maintenance is so important. To recap, the biggest and most significant difference between the two is that modular luminaires can be maintained on-site, whereas a sealed for life luminaire must be returned to the manufacturer.

Modular	Sealed for Life
	
Fix on-site	Return to manufacturer for repair

5.1 Downtime

A component failure could result in either a partial or total loss of light from the luminaire. A loss of light may mean an increased risk to workers on-site, or operations may even have to cease. This could have huge cost implications, which means the speed of resolution is critical.

Sealed for Life Luminaire

If a failure does cause a loss of light output, it's unlikely that an end-user will be able to do anything to rectify the problem. The luminaire must therefore be returned to the manufacturer which will have a significant impact on the length of downtime.

Let's take a look at a typical downtime period for a sealed for life luminaire.

Figure 4: Typical downtime of a Sealed for Life luminaire

Transporting a unit between an end-user and manufacturer can be a slow process. Ex lighting is installed across the world, but a customer will often be expected to return it to a single location for repair. The exact duration will depend on the end user's proximity to the manufacturer, but it could add a number of days to the overall downtime period.

Another factor that contributes towards the duration of downtime is the time it takes for a manufacturer to complete a fault assessment. The assessment will identify the cause of the failure and establish whether it can be covered under warranty (this is usually required before any further action can be taken to resolve the issue). Of course, the length of time this takes to complete will vary between manufacturers. While the best case may be that the assessment is completed within a few days of the unit being received, in reality, it could take significantly longer.

For offshore applications (and other applications where access is difficult and transport is restricted) the duration of downtime could increase significantly. Offshore applications rely on the use of helicopters to get goods to and from shore; these flights are often limited in frequency, and also unreliable due to the harsh conditions of an offshore environment. This could lead to long delays which will increase overall downtime.

The longer the downtime, the higher the cost to the end-user.

Modular Luminaire

With the ability to access the internal components (without risk of invalidating the certification), modular ex lighting can be serviced on-site. This allows light to be restored much quicker in the event of a failure.

Without the need to return the unit to the manufacturer, transit times are no longer an issue. With the ability to keep spare parts on-site to service the installation, combined with a design which lends itself to easy maintenance, any issues with a modular luminaire can be rectified almost as quickly as they're identified.

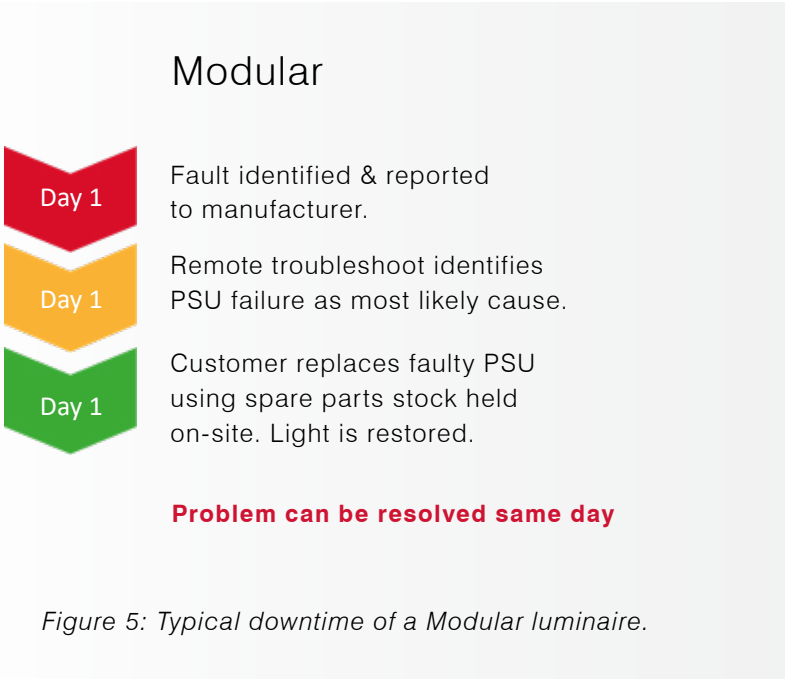


Figure 5: Typical downtime of a Modular luminaire.

On-site maintenance also facilitates remote troubleshooting. For a sealed for life unit (with no way of carrying out a repair), a remote troubleshoot would be a pointless exercise. For a modular unit though, it allows a faulty component to be identified quickly, and then replaced from spare part stock kept on-site.

However, understanding the exact cause of failure may still be important. If the failure has been caused by something on-site, the assessment will provide important information to the end-user and help them rectify the problem.

Because faulty components can be removed independently, they can be returned to the manufacturer without having to ship the entire luminaire back. As well as reducing shipping costs, time also becomes less critical. The luminaire's output can be restored first using the spare parts, and the faulty components can be returned for assessment afterwards.

How Fast Can You Change a Power Supply on Spartan Linear?

Watch the video below as we demonstrate how quick the process is to change a PSU/driver on a SPARTAN Zone 1 Linear

CLICK TO WATCH

5.2 Environmental Impact

Knowing that a sealed for life luminaire must be returned to the manufacturer for maintenance, let's now consider the environmental impact; an increasing global concern.

Sealed for Life Luminaire

Once the luminaire eventually reaches the manufacturer, even they may be unable to actually repair it. Carrying out the fault assessment is often impossible without damaging the luminaire to the extent that it cannot be resealed. The process of returning the luminaire is more likely to be for fault identification purposes (and whether the fault is covered under warranty). Regardless of the cause of the fault, the most likely solution will be for it to be replaced by a brand-new unit. The existing housing will be scrapped, and if it contains high levels of polycarbonate or GRP (glass reinforced plastic), this could be particularly damaging to the environment.

We identified earlier that Ex lighting is installed across the world, so the logistics of shipping the luminaire back to the manufacturer could significantly add to the luminaire's environmental footprint (the extent of this will depend on the location of where the unit is installed, and of the manufacturer). The best case is that the manufacturer has a local repair centre (to reduce shipping distance), but with many manufacturers, the luminaire will have to be returned to a single global location.

Modular Luminaire

The environmental cost of a modular luminaire is a fraction of that of a sealed luminaire. Because the parts are interchangeable, a single component failure will not render the whole luminaire useless. Basic troubleshooting should allow a faulty component to be identified remotely, and the ability to replace parts while the luminaire is in-situ, means in theory, there is never a requirement to return the entire fitting to the manufacturer.

To identify the exact cause of failure, and for warranty purposes, a faulty component could still be returned to the manufacturer for inspection. However, the ease and environmental impact of doing this will be much smaller when compared to returning the entire unit.

5.3 Cost

Reducing downtime and the impact on the environment will ultimately translate into significant cost reductions too.

Modular Luminaire

The ability to repair the luminaire on-site removes any costs associated with returning the luminaire back to the manufacturer.

Furthermore, even if the repair is not covered under warranty, the cost of repair will be significantly cheaper than having to replace the entire luminaire.

Sealed for Life Luminaire

Transporting goods to and from site can be challenging and expensive. The responsibility of returning the faulty unit to the manufacturer will almost always lie with the customer, rather than the manufacturer. Even if the fault is covered by the luminaires warranty, the customer may still be expected to cover the cost of the luminaire being shipped back.

Furthermore, if a fault occurs which is not covered under warranty, i.e. over-voltage of a PSU, the customer may have to pay the cost of a new unit as the entire luminaire is likely to be replaced rather than repaired (even though only one, relatively inexpensive component has caused the failure).

Sealed for Life Luminaire	Modular Luminaire
Increased downtime; no on-site maintenance possible	Reduced downtime; allows field-based repair
Increased environmental impact; more scrappage, more shipping.	Reduced environmental impact; interchangeable components
Increased lifetime cost; no cost-effective method of repair	Reduced lifetime cost; spare parts can be kept for servicing

Figure 6: summary of modular vs. sealed for life

6. Increasing Ease of Access

A luminaire that is easy to maintain is only likely to benefit an end-user if they are able to easily access the unit in the first place. The nature of some hazardous area applications means that doing so may be dangerous or require specialist equipment. Thankfully, the design of a luminaire can also help to make access easier.

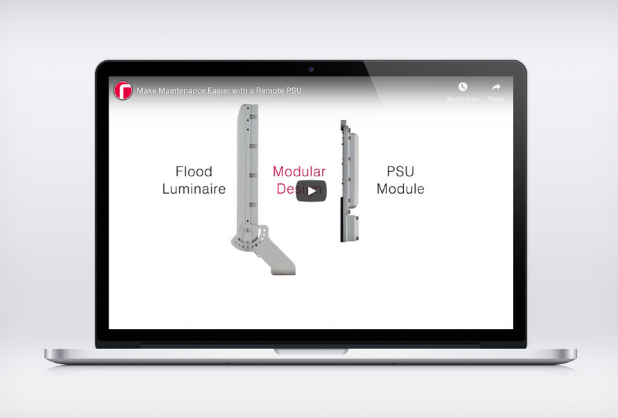
As well as being easy to maintain, a truly modular solution should also allow key components to be mounted remotely (with a wired connection to the luminaire head, via a cable) and provide an end-user with greater flexibility in the way that they mount the luminaire. If PSUs can be mounted at ground level, access for maintenance becomes far easier. As well as reducing the cost of maintenance, this will also help to increase speed and minimise downtime.

At Raytec, this is something we've experienced when working with clients installing luminaires in grain storage warehouses, which will usually have High Bay luminaires mounted to (or suspended from) the warehouse ceiling. With non-modular lighting installed, gaining access to the luminaire may require the grain to be removed before maintenance is carried out; a slow and costly process. Plus, even if the luminaire can be accessed without needing to remove the grain, carrying out maintenance with the grain still below is risky; it could lead to it becoming contaminated if anything falls while maintenance is being carried out. In contrast, being able to mount the PSUs remotely means maintenance can be carried out at ground level (so there is no risk of contamination), and the grain does not have to be removed. Ultimately this means maintenance can be done quicker, and at a lower cost.

Make Maintenance Easier with a Remote PSU

Watch the video below to see how SPARTAN's High Power Flood and Bay luminaires removable PSU can benefit installation and maintenance.

CLICK TO WATCH



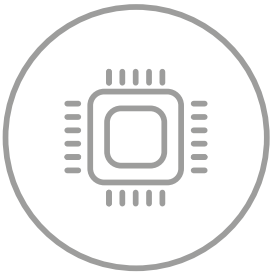
7. Warranties and Returns

We have mentioned warranties a few times during this White-Paper, and a good warranty is certainly an important thing to look for when selecting a luminaire for a new lighting installation. A good warranty can help to reduce costs and provide peace of mind. However, even with the best warranty, associated downtime costs are unavoidable if the unit cannot be maintained on-site and must be returned to the manufacturer.

There may also be hidden costs to a warranty that you might not have considered. We consider some of these here;

What's Actually Covered?

Some warranties may only cover mechanical problems (such as corrosion to the luminaires housing). But what about electrical components, such as the luminaires PSU, where failures are more common? If they are not covered by the warranty, the manufacturer will not be obligated to rectify the problem should something go wrong. Furthermore, the labour cost to repair the fault could come as an extra charge to the end-user.



Return Shipping

If the unit has to be returned to the manufacturer for repair, it will generally be the responsibility of the end-user to cover the cost of doing so. In some instances, the customer may also be expected to cover the cost of getting the unit back to site after the repair has been carried out; even if the repair has been covered under warranty. This will depend on the manufacturer's terms, so it's always best to check if you're unsure.

Is a Repair Possible?

We highlighted earlier that even the manufacturer may be unable to repair a sealed for life luminaire. This issue is amplified for issues not covered under warranty. It means the end-user is more likely to have to pay for an entire replacement, rather than just covering the cost of repair. The expense of this is likely to be significantly larger than the end user would have anticipated.

Discretion

Warranty terms vary between different manufacturers. Some warranties may include a reference to manufacturer 'discretion', which gives the manufacturer more authority and flexibility in deciding how warranty claims are resolved. As an example, the manufacturer may have the discretion to resolve a problem by repairing the luminaire, replacing it with an equivalent, or to issue a credit instead; regardless of the customer's preference.

8. Summary

In order to reduce costs over the lifetime of a hazardous area luminaire, maintenance should be at the forefront of an end-users mind when choosing a new lighting solution. Ease of maintenance should be considered alongside the cost and performance of the luminaire, and the reputation of the manufacturer. For some applications, where the associated costs of downtime are higher, it should be considered as being of greater importance.

Choosing an LED luminaire that is modular in its design is critical. It means maintenance can be carried out on-site, and output can be restored in a matter of minutes if there is an issue. This speed of maintenance is critical to keeping downtime to a minimum and keeping costs low.

Modular	Sealed for Life
Light can be restored in minutes	20+ days before light can be restored
Reduced downtime, lower cost	Increased downtime, higher cost
Low environmental impact	High environmental impact

Figure 7: Comparison of the benefits between Modular vs Sealed for Life

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