

WHY LIGHTS FAIL

SECTION OBJECTIVES

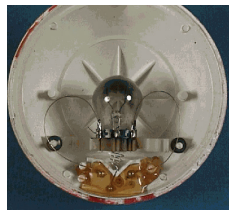
1. Major Causes of Failure
2. Tips For Longer Lasting Lighting Systems
3. Chemical Impact On Lighting
4. Product Pitfalls
5. Counterfeit Products

1. Major Causes Of Failure

Corrosion

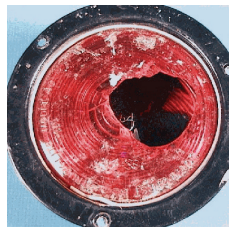
Causes of Corrosion:

Water, dirt, salt, and any other road contaminants can enter a lamp or connector, providing an electrical path which can vastly accelerate corrosion.



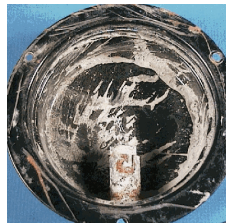
Minimizing Corrosion:

Corrosion cannot occur when the bulb is sealed within the lamp housing, as they are in Truck-Lite's sealed lighting products.



Further Protection:

Connectors should be sealed with non-conductive grease like electrical contacts, circuit switches, and junction boxes.



Purpose of Sealant:

To totally encapsulate the area to protect it from the elements.

Shock, Vibration, & Burnout

Major Causes of Shock & Vibration:

Trailers experience constant road pounding when they travel down a highway. This pounding can cause filaments in a bulb to distort and prematurely break.

In addition, shock and impact damage can be caused by things other than road vibration. Some examples are:

- Loading a container chassis on to a truck chassis
- Dump truck loading or tailgate banging
- Loose mounting of cargo hardware
- Unloading operations
- Impact with stationary objects, e.g., poles or loading docks

Solution To Shock & Vibration:

Install a lamp designed with shock-mounted mechanisms that cradle the bulb and absorb the effects of shock and vibration that would otherwise be transferred directly to fragile bulb filaments or LED lamps.

Baseless Bulbs:

Suspended to endure heavy-duty applications better than traditional S-8 non-shock mounted bulb units or standard J-slot bulb sockets.

Advanced Technology - LEDs:

LEDs are rated at 100,000 hours of operation. They are solid state, which makes them much less susceptible to shock and vibration. The electronics of LEDs are completely sealed in epoxy.

Inadequate Wiring & Cable

Suitable Wiring:

Wire size or gauge is very important; the use of a wire gauge too small can cause dim or intermittent operation or excessive voltage drop and presents a potential fire hazard.

Avoiding Excessive Voltage Fluctuation:

Suitable wiring can increase product life and safety. A sealed, waterproof wiring harness system based on electrical load of the vehicle should be selected.

Stranded copper wire should be used. Copper wire has a higher current carrying capability than an aluminum wire of the same size. It is also more flexible and less likely to break.

Truck Light Offers Harness Systems That:

- Exceed industry standards
- Eliminate troublesome splices
- Seal out the elements
- Provide a common ground
- Last the life of the trailer

Excess Voltage

Excess voltage is a difficult problem for bulb life. Many failures caused by voltage spikes are a result of load dumps (such as starting the engine with the lights on). Other sources of excessive voltage are heavy draw electrical devices such as lift gates or welders. When the units are turned off, they can create a backlash in the form of a voltage spike.

Voltage regulators that are set too high can shorten the life of a bulb, as can disconnecting the battery while the truck is in operation.

A good way to protect the lights from voltage damage is to not use heavy draw accessories or start the vehicle when the lights are on.

Voltage should be checked regularly to ensure the vehicle is operating within a safe range. One volt beyond the designed voltage will reduce the expected life of a bulb filament by more than 50 percent. LED systems eliminate this problem.

Poor Grounding

Installing a lighting product and harness system that uses an internal ground will help maintain an absolute ground because it does not depend on the chassis ground. Internal grounds will also help eliminate rust and corrosion associated with chassis grounding.

Loss of Bulb Contact

In the traditional non-shock mounting bulb units and the standard J-slot bulb sockets, corrosion and/or loss of spring tension could cause a loss of contact. With the inception of the sealed, baseless bulb lamp and soldered connections, bulb contact is certain and product life is further enhanced. Again, LED systems solve this problem.

Physical Damage

To help prevent physical damage, the lens should be a super-tough, high-impact plastic that is impervious to heat generated by the bulb.

The lens and the lamp housing should both be manufactured from a tough, durable plastic, such as polycarbonate.



The 21st Century Lighting System

Studies have shown that, when sealed shock-mounted bulbs and lighting devices are used along with sealed wiring harness systems, product life can be extended as much as 20 times beyond traditional unsealed bulb units in heavy-duty and tractor/trailer applications.

It should be everyone's goal to use an original equipment part that lasts the life of the vehicle, or requires little attention and minor cost after the initial purchase. Today's technology is capable of designing and producing lighting products that can offer 500,000 to 1,000,000 miles of maintenance-free service for most applications.

Product life performance can be extended and overall costs of vehicle operations can be reduced by doing a careful evaluation of the total vehicle lighting system, its problems, and the methods used to control and eliminate those problems.



2. Tips For A Lasting System

1. If at all possible, test probes should not be used to puncture insulation while troubleshooting lighting failure. If it becomes necessary, the hole from the probe must be resealed. If the hole is not sealed, wicking action can cause moisture to travel considerable distances inside the wire, resulting in corrosion that has the potential to destroy the circuit.

When correcting illumination problems, don't simply turn up the voltage output. Find the sources that caused the failure to prevent more (and probably more serious) problems. Over-voltage can quickly kill both lamps and batteries. To prevent the loss of current carrying capability, always replace trailer light cords with the same, or better quality and gauge of wiring.

2. Under-voltage is often caused by poor electrical connections. To correct this problem, don't simply turn up the voltage — find out the root of the problem for efficient operation.

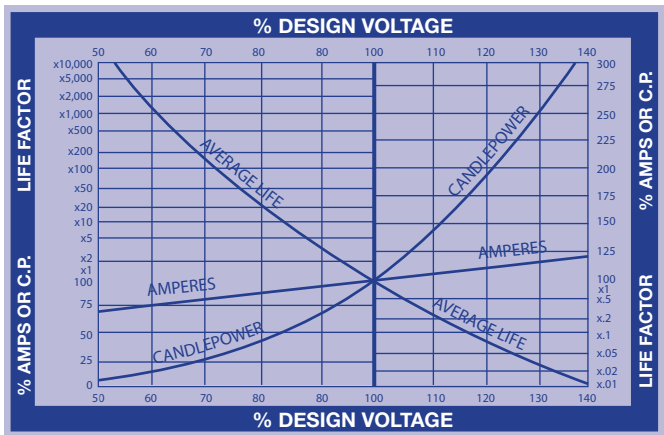
3. Do not immediately throw away lamps if they aren't burning. It is important to play detective when solving lamp problems; determine that another source isn't the cause of your lamp failure. Testing the lamp with a meter, power supply, or battery can help determine the lamp's cause of failure. The following are common causes of lamp failure:

- a bulb with stretched or broken filaments most likely failed due to vibration
- a yellowish, whitish, or bluish glaze on the bulb indicates a rupture in the bulb's glass envelope
- a dark, metallic finish indicates old age
- a black, sooty bulb indicates a poor seal in the bulb

4. Treat the electrical system like you treat the chassis. Lubricate sockets, pigtails, battery terminals and connections with NYK-77 nonconductive anti-corrosion compound. The purpose of the sealant is to completely encapsulate and protect the electronics from corrosion and other types of water damage. Any type of corrosion preventive compound, such as grease, may be used, as long as it is not carbon based.

5. Inspect the electrical system for proper ground connections. This is a major cause of lamp failure, especially when the trailer is used for a ground. When the lamps are grounded through the lamp housing, make sure there is a clean connection (that is, metal to metal). A fifth wheel ground strap may be used for added protection on the chassis ground system.

6. Loose, bare, or unsupported wires or fixtures should be addressed immediately. Harness and wiring should be on the underside of the top frame members, rather than on the bottom where dirt and road splash connect.



7. Heat is a major contributor to lamp problems. Lamps must “breathe” or the heat buildup will shorten a lamp’s lifespan. LED lamps have a lower power draw, which can alleviate many heat problems. However, even a

cooler LED lamp can overheat if the lens is covered in dirt. Keep your lamps clean and they will perform better in the resulting cooler environment.

8. There are many household cleaning products that are not compatible with polycarbonate lenses and housing.

The following solvents/cleaners MUST NOT BE USED with polycarbonate:		
Trichlor	Carbon Tetrachloride	Diversol [®]
Acetone	Chlorinated Hydrocarbons	Lemon Joy [®] (phosphate free)
Triclene [®]	Texize-8006, 8129, 8758	Kleenol Plastics
Methyl Ethyl Keytone (MEK)	Liquid Cleaner - 8211	Lestoil [®]
MIBK	Agitene [®]	Lysol [®]
Toluol	Ajax [®]	Stanisol Naphtha [®]
Benzol	All Liquid Detergents	Oils
Gasoline	Pink Lux [®] (phosphate free)	
The following solvents/cleaners are compatible with polycarbonate:		
Mild soap and water	10% Sol Bon Ami [®]	
Mineral Spirits	Dirtex [®]	
Hexane	2% Sol. Reg. Joy	
VM & P Naphtha	Heptane	
Varsol No. 2	White Kerosene	
#1 & #3 denatured alcohol	Methyl, isopropyl & isobutyl alcohols	
Freone TF & TE-35	Lacryl [®] PCL-2035 polycarbonate cleaner	
Ethanol	Petroleum Ether/65 degrees C boiling point	
<i>Questions as to compatibility of other specific materials should be directed to the manufacturer and/or the Truck-Lite Corporate Laboratory.</i>		

9. Always replace wiring, trailer light cables and harnesses with an equal or heavier gauge of wire than was originally used. Using a lighter gauge wire can lead to problems. See pages 8 and 9 for wire gauge details.

10. You should never crank the truck with lights on; voltage surge is hard on lamps. You should also avoid needlessly using the hazard markers and clearance lights. When parked at a truck stop or terminal yard, save the lights by turning them off. Avoid parking against the dock with the hazard markers, turn signals, or tail lamps operating.

3. Chemical Impact on Lighting

What Is It?

Almost all cracked parts are caused by incompatible chemicals or cleaners. Although lenses are very durable, they can crack due to the combination of stress induced by the molding process and chemical acceleration of the stress.

Typical Examples Include The Following:

- Lights on buses or vehicles that are frequently washed with incompatible cleaners
- Lights near engines or exhausts
- Lights exposed to some soaps, body cleaners, lubricants, paint, paint cleaners, antifreeze, washer fluids, brake fluid, and hundreds of other chemicals

What Makes The Plastic Crack?

The chemical penetrates the plastic and unhooks the long chains of molecules that make the plastic strong. Anywhere that the plastic is under stress (like a lens weld on a mounting hole) may crack.

Can Cleaning Solutions Be Damaging?

The use of solvents that are not compatible with polycarbonate will result in the softening, crazing, and/or cracking of the plastic part. Polycarbonate lamps and mounting bases may be used under stress in their normal applications (see chart on page 19).

4. Product Pitfalls

Truck-Lite has cataloged numerous problems that occur in the field. Here are a few of the repeat offenders:

Over Tightened Mounting Screws:

After a while, polycarbonate will crack under stress. The rule of thumb is to use the minimum torque possible. Never use more than 20 inch-pounds.

Loose Brackets Or Undersized Grommet Holes:

Both of these issues can prematurely knock out filaments.

Not Adding NYK-77® To Plugs Or Lights When Installing:

Truck-Lite adds only enough NYK-77 for the lamp. Additional NYK-77 should be used on the connection end.

Note: This is not recommended for use with LED lamps that use Fit 'N Forget® connectors.

Continued Stretched Or Pulling (Especially Sideways) Of A Cable On A Junction Box Or Distribution Module:

This may eventually cause a disconnection or an electrical short.

Using A Backup Light For A Dome Light Or Vice Versa:

One will cause heat damage; the other is not legal.

Not Replacing Plugs Which Show Signs Of Corrosion:

Even though they may work, they will promote rapid pin corrosion on the new replacement light pin (plug) connection.

Using Incompatible Cleaners Or Chemicals And Allowing Them To Get On The Lights:

Lights will crack and fail.

Painting A Vehicle And Allowing Paint Or Solvent To Contact Lights Or Wiring:

Most paints (excluding water based) are incompatible with polycarbonate lights. They may also cause wires or cable insulation to crack.



Allowing Lights to Contact Insulating Materials (Like Loading Dock Air Seals) While Energized:

Another variation of this is the placement of insulation too close to contacts of the light housings. This can result in heat distortion/damage and shorter life.

Failure to Orient Lights With the Word “TOP” Properly:

This is important for a couple of reasons, including the fact that the bulb life may be shortened by heat or increased shock. The other reason is that it is an obligation for legal compliance.

One Volt Beyond Designed Voltage Will Reduce Expected Life Of A Bulb Filament By More Than 50 Percent*:

It is not always controllable, but the “rule of thumb” is that vehicle voltages should be adjusted to the minimum acceptable voltage for proper operation.

*See chart on page 18 for reference.

5. Counterfeit Products

The primary function of vehicle safety lighting systems is to provide a safe environment for vehicle operators, pedestrians, and anyone else that is in the vicinity of vehicles. The reliance on lighting products make it extremely important that buyers trust in the products they are using.

Counterfeit lighting products are often reverse-engineered look-a-likes of reputable brand name products. Counterfeiters sometimes use identical markings, part numbers, logos, and even packaging. Imported knock-off products which resemble the look or function of brand name equipment are becoming more prevalent in the heavy-duty industry. In the case of lamps, knock-offs are often designed without care for patents or trademarks of the original lighting products. It's uncommon for knock-off lamps to meet FMVSS safety regulations, and the number of existing product violations in the domestic market is rapidly rising.

Do The Risks Outweigh The Rewards?

These products are designed to mislead customers into believing they are buying the original brand, while infringing upon copyright and trademark rights of the original manufacturer. When counterfeit vehicle safety lighting products are sold to customers who believe they are getting dependable, durable solutions for legal lighting applications, they are expecting the same road safety, maintenance, service, and support levels of brand names the products mimic.

Distributors of counterfeit products are subject to the same legal penalties as the foreign manufacturers, and in the case of direct import of the product, are classified as the manufacturer of record on such products. If a distributor or original equipment manufacturer contracts

with a manufacturer outside of the United States to have products shipped into their US facility, the distributor or OEM retains all of the responsibility that a typical lighting company would have. This includes certification compliance and product liability. The United States Congress and the National Highway Transportation Safety Administration (NHTSA) employ dedicated positions in support of enforcing actions against noncompliant vehicle lighting products.

Supplying falsely marked counterfeit products not only leads to damaged customer relations, but also has ties to legal prosecution.

Non-Compliance Issues

Combination lamps and their basic photometry are key areas of concern when it comes to counterfeit lamps. Often, these combination lamps lack basic advertised functions, such as side-reflex or combination properties. Additionally, the standard lighting requirements necessitate that light output extends beyond specific limits; counterfeit products typically do not meet these requirements.

Lack Of Industry Know-How

The growing presence of Light Emitting Diode (LED) safety lighting products in the heavy-duty industry has caused an increase in the number of companies that manufacture and export lighting solutions. Manufacturing lighting products requires close monitoring of production, and most utilize low-variance standards with supplies and materials. Though they often have some experience in the production of electronics, many of these new sources do not have the necessary experience in and understanding of the heavy-duty lighting industry as it applies to safety, legal requirements, product downfalls, and more—which Truck-Lite can offer.

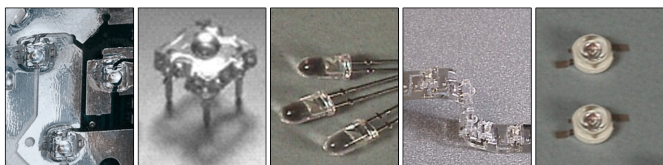
As a longtime member of the traditional heavy-duty safety systems industry, Truck-Lite is familiar with the specifications and legal requirements that drivers and maintenance staff rely on. It is with that experience and education that Truck-Lite designs and manufactures many of the new products and product advancements that are being copied and reproduced elsewhere.

Opportunities With LED Advancements

When incandescent bulb technologies were the only light source capable of delivering the necessary light output that is required for legal vehicles safety applications, much of a lamp's development could rely on the standards of the internal light bulb and its proven expectations. With the use of electrically charged crystals, the appearance, color, and light output of a LEDs varies from diode to diode—unless the manufacturer has standards in place to ensure each diode is grouped and driven properly. If diodes are not classified and used based on their specific output reading and bins, the resulting output can vary from lamp to lamp.

Identifying Product Markings

Product brand, a manufacturer's identification mark,



and the presence of a certification stamp are all key indicators that your lighting products can be trusted. Many off-market lighting products show no printed signs of the manufacturer, and make it nearly impossible to contact anyone in regards to product performance, installation, compliance, or warranty support. Also, look for certification notes on the lamp as evidence that the lighting product was designed to meet the regulations that your application requires.

Prevention

The NHTSA regulates safety standards to ensure certain levels of performance and safety, regardless of the manufacturer. But, as an organization, the NHTSA has no authority to address counterfeiting. Instead, the authority belongs to the U.S. Copyright Office, the U.S. Patent and Trademark Office, the Federal Bureau of Investigations, the Department of Justice, and Customs and Border Protection to stop the potentially unsafe product from import. Despite their best efforts, it simply isn't possible to keep all non-compliant products off store shelves.

Buyers can do their part to combat the downfalls of counterfeit products by inspecting lamps for product markings and classifications, as well as inquiring about the manufacturer at the point of sale.

The initial purchase of a vehicle lighting product—whether it is in the original vehicle purchase, or the costs of acquiring a replacement unit—is only the beginning of the complete vehicle life cycle cost. Any inferior products bring added costs and, more importantly, vehicle downtime. The choice to invest in a reputable brand such as Truck-Lite brings with it the reliability that ensures you won't be replacing lamps prematurely.

The value that comes with peace of mind is hard to find in an unmarked, non-compliant lamp.