Loading-Dock Seal Fires: Why They Occur, How to Prevent Them

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Dock-seal fire damage caused by truck-trailer marker lights.

Burned loading dock-seal head pads or head pads damaged with burn holes can be found on many docks at which truck/trailers stay parked with the engine running for as little as 20 minutes. Frequency of the burn holes - and fires, in some cases - spiked in the late 1990s, baffling investigators, who first thought they were caused by bare trailer-light bulbs touching seal material. They soon learned that the damage was the result of the trailer lights, but with normal lens enclosures in place, trailer lights on (usually in defiance of dock rules that they be turned off), and with the trailer pressed to the dock seal. Heat build-up caused the dock-seal material to smolder, which would often flare up with the inrush of oxygen as trailers pulled away.

Since 1968, the National Highway Traffic Safety Administration (NHTSA) has required all van-style trailers 80-in. wide or wider to have two rear clearance lamps and three rear identification lamps mounted on the upper header. At the time, NHTSA left the decision for use of the marker lamps to trailer manufacturers' discretion. Because available marker lamps were not of the size or type that could be easily mounted on the upper header of most trailers, few trailer manufacturers installed the lamps. By 1999, however, smaller lights became available, and the NHTSA began enforcing the trailer-light requirement. Its enforcement corresponds

directly with the rise in incidence of dock-seal fires and burned head pads.

Tests conducted by Frommelt's engineering group eventually identified and verified the mechanism by which low-watt bulbs in trailer marker lights create the temperatures needed to melt or burn vinyl, hypalon and polyurethane foam, the components of common, compression-style foam dock seals. They determined that the heat output of an individual light gradually builds to a high temperature in a very concentrated area due to the insulating effect of being compressed into the foam pad over time. No external source of ignition, such as an exposed bulb filament, is required.

Once burning has begun, polyure-thane foam can combust at temperatures exceeding 800º F when exposed to a large quantity of oxygen. This can occur when a trailer leaves the dock and quickly draws air into the compressible, open-cell foam. It explains why many dock-seal fires erupt quickly as the trailer departs. This same phenomenon can occur to a lesser degree while the trailer is still parked and moving vertically as it is being loaded or unloaded.

Frommelt's new dock-seal design uses metal foil to dissipate trailer-light heat.

Complicating the problem is the fact that some trucks are equipped with secondary alternators (used to power onboard sleeper-cab appliances) that can boost trailer-light output as high as 14 volts. Tests using 14-volt marker lights compressed into a polyurethane foam pad for an extended period proved that the lights can cause the temperature at the foam/fabric interface to reach 900º F. They also showed that, under these conditions, when the foam compression was released and the pores filled with air, the foam could auto-ignite.

Though many fireproof materials are commercially available, none possessed the combination of strength, abrasion resistance and heat resistance that would allow a simple substitution of fabric on a dock seal. In Frommelt's effort to gain fire resistance, the company used fabrics designed for high-wear reliability that would still mitigate the issue of temperature buildup from trailer marker lights. Its Firefighter head pad is designed to dissipate the heat generated before it can build to dangerously high levels. The approach is accomplished by using three layers of reinforced heavy-duty metal foil, sandwiched between inner and outer layers of vinyl compound-coated fabrics, all covering a fire-retardant polyurethane foam block. The triple layer foil acts as a heat sink. It absorbs heat generated by the marker light, and dissipates it across the entire surface of the pad, instead of allowing heat to build in a small area. Tests showed that when the Firefighter head pad was exposed to hot trailer marker lights, the surface temperature remained below 440º F, well below the temperature at which the foam can auto-ignite.

There are other options that partially address the heat problem presented by trailer marker lights. All dock-seal manufacturers, for example, offer fire-retardant fabric and foam. These materials, however, do not protect seal components from damage, but are designed to "self extinguish" after igniting, to prevent the spread of fire. By definition, fire-retardant materials must begin burning for the retardant to take effect. Significant dock-seal damage can still occur even if fire-retardant materials are used. Therefore, use of fire-resistant materials is the best way to minimize the effect of trailer-light build-up, and protect against the spread of fire.

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