

Automatic Power's patented LED engine offers the highest light output, at the lowest power, with the highest lumen maintenance available in the market today.

Automatic Power Inc has been awarded U.S. Patent No. 7,461,952 B2 for a high-efficiency, high-heat dissipation light emitting diode array. The unique heat management system incorporates a heat pipe and large surface area aluminum heat sink that allows operating LEDs at a high forward bias current without degrading the life expectancy of the LEDs. A lumen maintenance of L= 70% @ 60,000 hours is easily attained.



Patented Heat Pipe Evaporator-Condenser System for Superior Heat Management

Lumen Maintenance (L)

Lumen Maintenance (L) refers to the ability of a light to maintain its lumen output over time. Incandescent lamps have been in use for many years and their operating parameters are well known. In marine applications, lamps typically have a life of 1,000 to 2,000 hours. They operate at nearly the same lumen output over their life and then they fail. Therefore, they have a lumen maintenance "L" of nearly 100% over their useful life. When the bulb fails, it fails in a catastrophic manner and it obvious that the bulb needs to be replaced. However, the lumen output for Light Emitting Diodes (LEDs) degrades over time. The rate of degradation is a function of the forward current applied and the subsequent generation of heat at the diode junction. Unless the generated heat can be effectively dissipated, the Lumen Maintenance figure for a particular LED will be low. 5 mm LEDs typically degrade by more than 70% after 10,000 hours. This equates to a Lumen Maintenance value of only 30% @ 10,000 hours. So, if

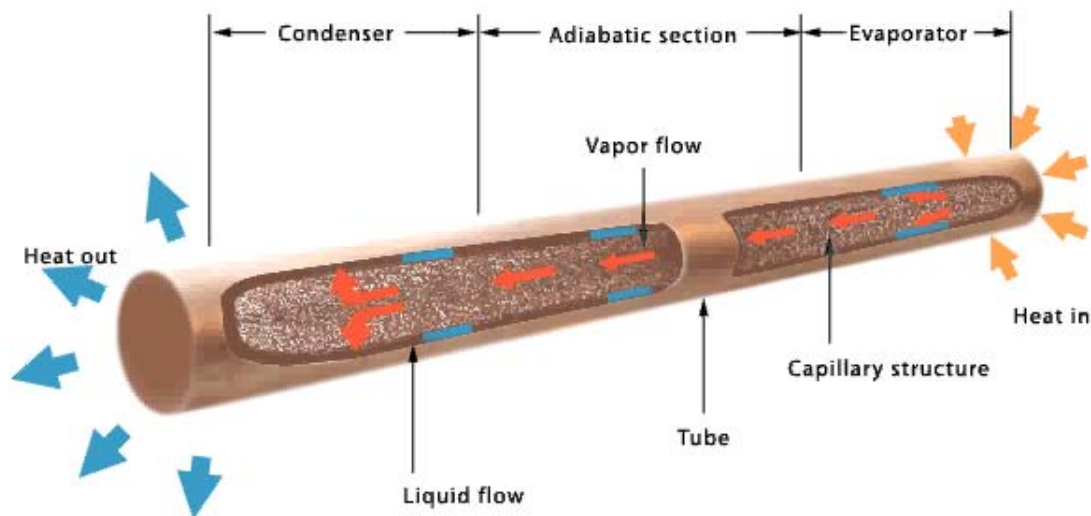
the LED initially produced 150 candelas, after 10,000 it is still lit, but it is only outputting 45 candelas. If the LEDs are driven at a higher forward current to increase lumen output, the resulting “L” will be extremely low.

The unique heat dissipating LED Engine patented by Automatic Power allows for operating LEDs at a high forward current to maximize light output while maintaining an “L” figure of 70% to 60,000 hours. There is no other product on the market today that can produce the lumen output/watt at a similar “L”. *This means that API lanterns employing its patented LED engine offers the customer the highest light output at the lowest power with the highest lumen maintenance available in the market today.*

Light Emitting Diodes and Heat

LED are more efficient than incandescent lamps in converting electricity into light, but they generate more heat. Incandescent lamps radiate only 8% heat as visible light and over 73% of heat as infrared light. The remaining heat is only 19%. However, LEDs produce light in a well-defined wave length resulting in more lumens/watt—they emit 25% of heat as visible light but no heat as ultraviolet light. So 75% of the heat generated is left and must be dissipated to ensure a high lumen maintenance value.

API’s patented heat dissipating LED array features a heat pipe that is commonly employed in the aerospace industry to cool high-performance computers. Heat generated at the LED thermal pad evaporates a liquid in the heat pipe that is then drawn by a wick/capillary action to the large surface area aluminum heat sink that supports the parabolic mirrors. The vapor is then cooled and condensed back to a liquid state where the capillary action returns it to the thermal pad. The cyclical flow dissipates the heat so that the temperature at the thermal pad is kept at 50 °C.



Heat Pipe Operation

LEDs in the Market

LED technology is changing at a rapid pace with more robust LEDs capable of sustaining more heat and generating more lumens/watt coming to market

Lumileds is the recognized leader in LED technology. Its first and second generation Luxeon high flux LEDs set a standard in the LED market place. The current third generation Luxeon Rebel is unsurpassed in lumen output/watt and is extremely heat tolerant. For these reasons, API uses Lumileds LED exclusively in all its lanterns. The Rebel LED, used in API's patented high heat dissipation light emitting diode array allows API to offer the customer the highest lumen output lantern with the lowest power consumption with the highest Lumen Maintenance.

The quality of Lumileds LED is so good that Lumileds is the only manufacturer of LEDs to publish long-term lumen maintenance data for its LEDs based on over 20,000 hours of actual operation

Selecting an LED Lantern

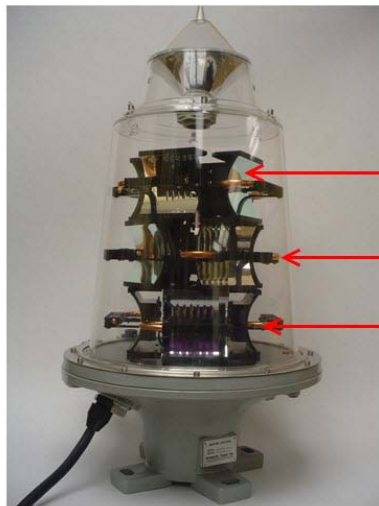
In the past, maritime departments chose an LED Marine Lantern on the following:

- Cost
- Light output (EFI)
- Power (amp-hrs/day)
- Serviceability (ease of maintenance)
- Longevity (how long will the LEDs last)

These factors are still important. However, LED longevity was often advertised by lantern manufactures as being 100,000 hours. No reputable LED manufacture will make that claim today. Lumen Maintenance is a new factor to consider in procuring an LED lantern. The LED will not burn out, but it will degrade overtime to a point where the output is below the required intensity. So the question is not "how bright is the light?" but "how bright will the light be after X number of hours of operation?"

Lumen Maintenance is a function of the heat generated by the driving current and the ability to dissipate the heat to keep the LED diode junction temperature at the level indicated by the LED manufacturer for the "L" value desired. In procuring a LED lantern the procurement specification should clearly state the "L" value to be achieved (e.g., L=70% @ 60,000 hours—after 60,000 hours of operation, the LED output will be 70% of its initial value) and require the lantern manufacturer to provide Lumen Maintenance data published by the LED manufacturer for the LED used. And detail how their heat dissipation system keeps the LED temperature at, or below, the LED manufacturer's stated temperature for a specific "L".

Automatic Power Long-Range LED Lanterns A Step Above the Competition

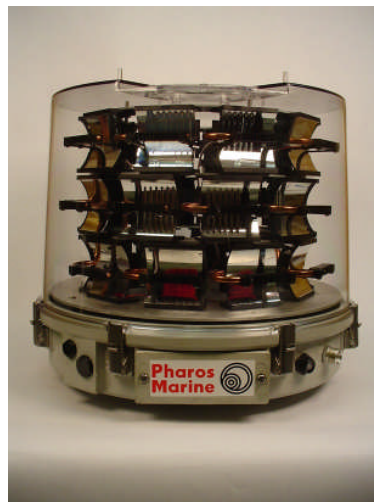


Dichroic hybrid spectral metal coated parabolic reflectors

High-flux LEDs

- Copper-tubed heat pipe
- Heavy duty, large surface area, extruded aluminum heat sink
- LED temperature maintained at less than 50 deg. C

20⁺ nm FA-250LED-Long Range Marine Lantern



25⁺ nm FA-410LED-Long Range Marine Lantern

Please visit our website

www.automaticpower.com

for Technical Specifications of our LED Long Range Lanterns