GAME CHANGERS

Truck-Lite®

GAME CHANGERS

Truck-Lite Heritage

1955
Truck-Lite founded

1992
Introduced world's first LED S/T/T lamp

1997
Penske acquired Truck-Lite from Quaker State

1998
Introduced LED lighting to military market

2000
Entered mirror market with Raydyot acquisition (Birmingham, UK)

2000
Sold 1 millionth LED STT lamp

2002
Signal-Stat acquisition established aftermarket business with NAPA

2004
Acquired FER to establish European lighting manufacturing (Eisenach, Germany)

2005
Sold 5 millionth LED STT lamp

2006
Flex-Lamp acquisition increased European OEM and AM lighting (Harlow, UK)

2007
Awarded 3-year contract with U.S. Army for LED headlamps

2009
Named standard on Ryder trucks

2009
Entered fuel processor business with Davco acquisition from Penske

2010
Introduced world's first DOT compliant 7" round LED headlamp

2012
Introduced world's first custom designed LED headlamp

1955 1990 2000 2014

Truck-Lite Co., LLC

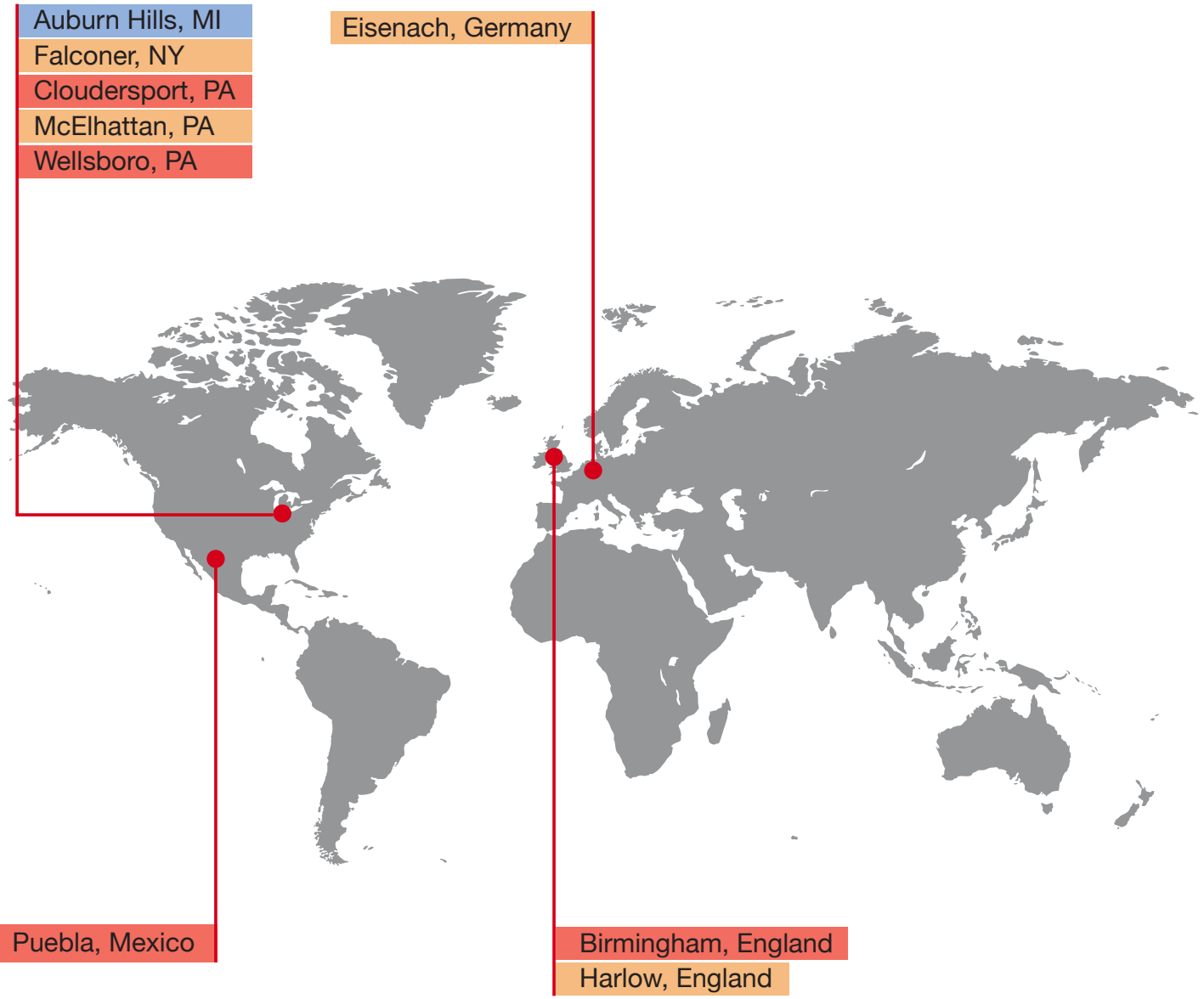
- 2,200 employees
- 4,000 customers and 24,000 distributor locations
- 17,000 finished goods part numbers
- Eight manufacturing plants worldwide

Global Manufacturing

Manufacturing & Engineering

Manufacturing

Engineering



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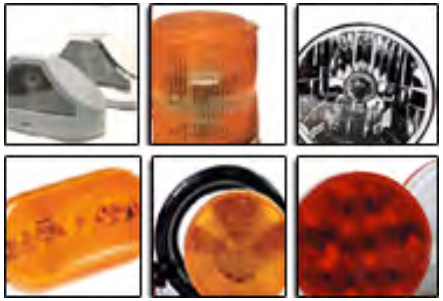
Product Offerings

LightingProds

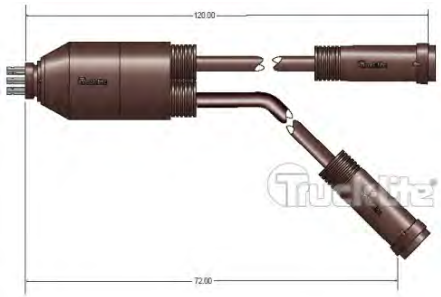


- Stop Turn Tail / Multi-Function
- Signal Lighting
- Marker/Clearance
- Interior
- Forward
- Emergency

Mirrors

- Mirrors Systems
  - All size classes
  - Hood and Fender Mount
  - Rearview
  - Accessories
- Reflective Systems

Harnesses and Electronics

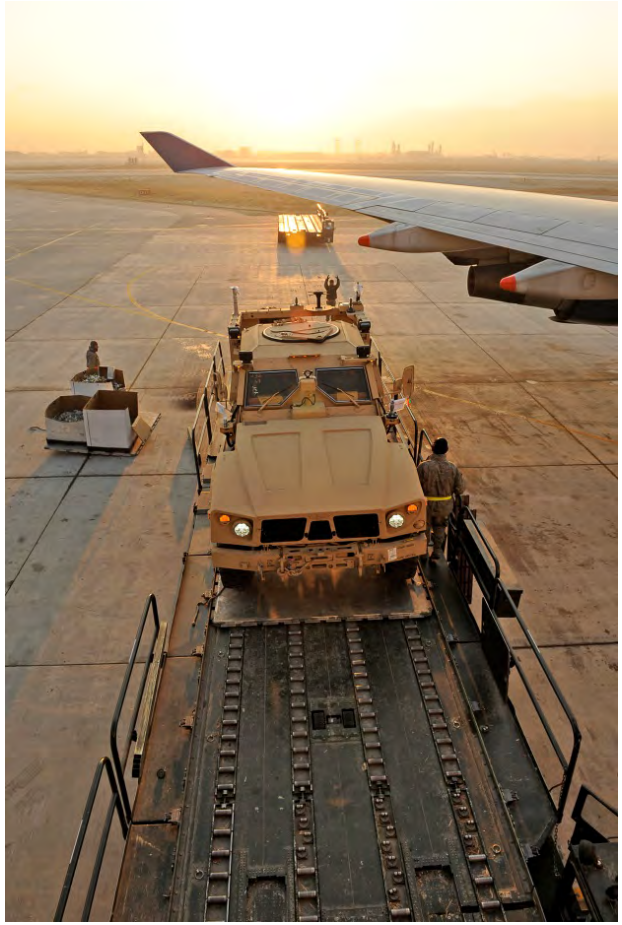


- Turn Signal Switches
- Backup Alarms
- Flashers
- Lighting Harnesses
- Sockets & Plugs
- Trailer Cords

Fuel Processors

- Industry Leading Fuel Processor
- Filters, Separates Water and Heats
- Heavy/Medium Duty Trucks
- Marine Applications

LED Headlight History



The Genesis: Military Production

- Started military sales in 1998 with red and amber LED products
- Approached by US military in 2004 to develop LED forward lighting -24 volt electrical system
- Introduced first LED Headlight into theater in summer of 2007
- Over 400,000 units sold since 2007
- LED headlamps are standard on 90% of all military OEM production

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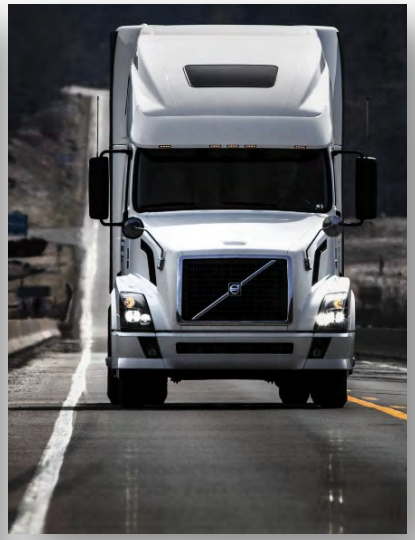
Current LED Forward Lighting Applications



Leadership and Innovation

Industry Firsts:

- Heavy-duty custom LED headlight
- Sealed lighting products
- Shock mounted lighting products
- Sealed wiring harness
- LED stop/turn and tail lamp
- LED lamps approved in Europe: ECE M/C, and S/T/T
- “Gas Assisted” mirror
- White LED license, dome and back-up lamps
- All LED rear lamp with direction indicator sensing
- LED Military/commercial vehicle headlight
- Lifetime harness and lighting warranty
- LED ECE 3-function stalk lamp

Innovation In Visibility Systems:

- Strong intellectual property portfolios
- Largest user of LEDs in the heavy-duty commercial vehicle industry

Truck-Lite has been awarded

over

200 Patents Worldwide

Truck-Lite LED Work Lamps

LED Expertise

Innovation in Visibility Systems

- 1st largest user of LEDs in the heavy-duty commercial vehicle industry
- 4th largest user of LEDs in the world

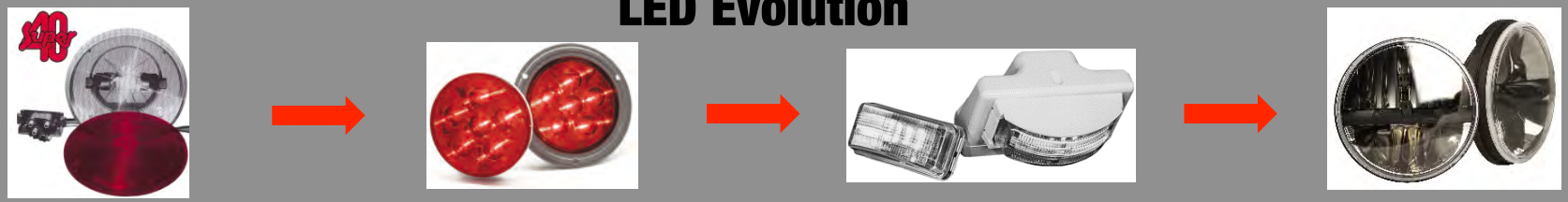
LED Lighting has grown relative to total lighting

- 2005 – 13% units, 38% dollars
- 2013 – 29% units, 66% dollars

White LED lighting has grown relative to LED total lighting

- 2005 – 3% units, 12% dollars
- 2013 – 9% units, 36% dollars

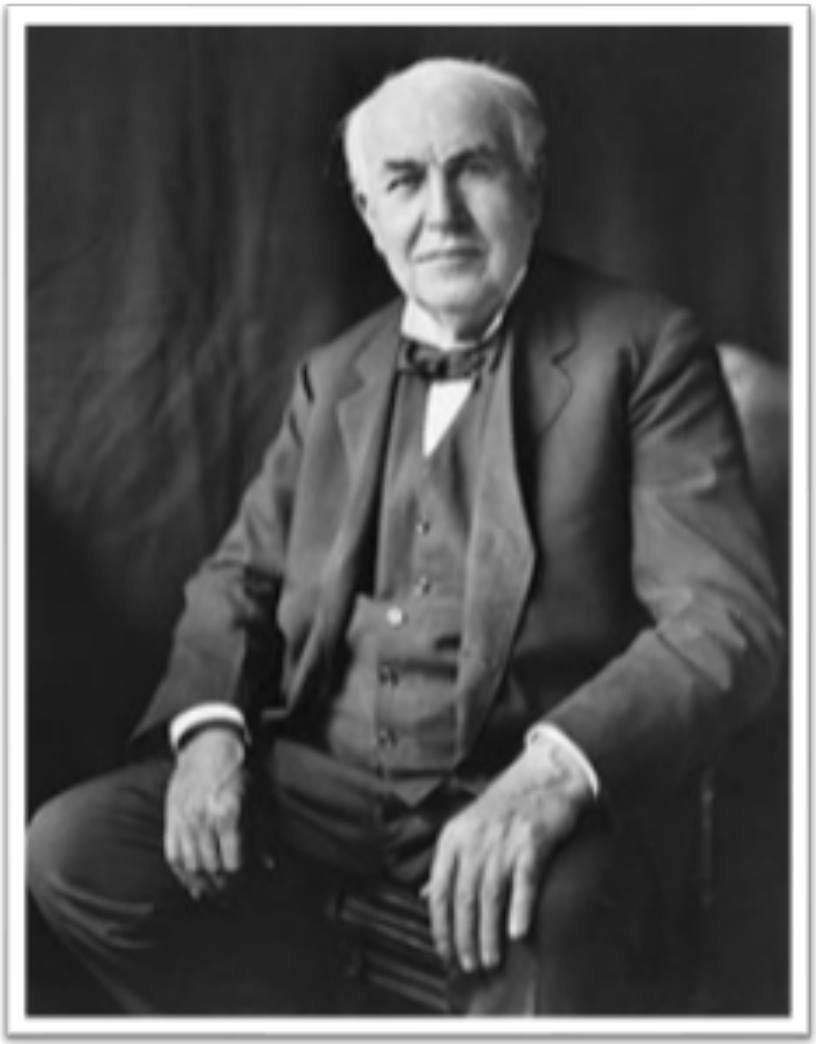
LED Evolution

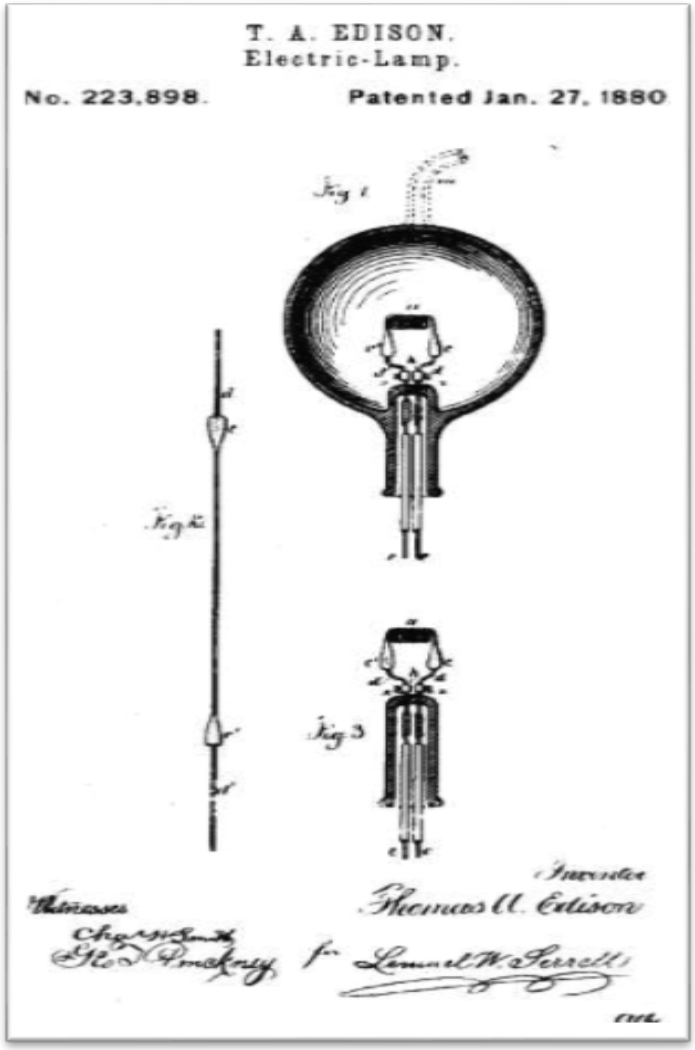


“We change through progress, and we progress through change.”

- John H. Patterson, Founder
National Cash Register (NCR)
1884

History




T. A. EDISON.
Electric-Lamp.
No. 223,898. Patented Jan. 27, 1880
Fig 1
Fig 2
Fig 3
Witnesses
Inventor
Thomas A. Edison
for Lemuel W. Serrell

Historical Development of LEDs

- 1962 – first LED, a novelty in the GE lab
- Late 60s – low output red LEDs (< 1 mcd) find commercial applications as indicator lamps
- mid 70s – Green LEDs
- Early 90s – Blue (Nakamura), completing spectrum
- Late 90s + - commercialization of high brightness LEDs

LED to Incandescent Comparison

LED Lamps

- Rated life: 100,000 hrs
- 300 mili-amps
- 200ms faster rise time

vs.

Incandescent Lamps

- Rated life: 5,000 hrs
- 2.1 amps

LED Lamps have

20x THE LIFE

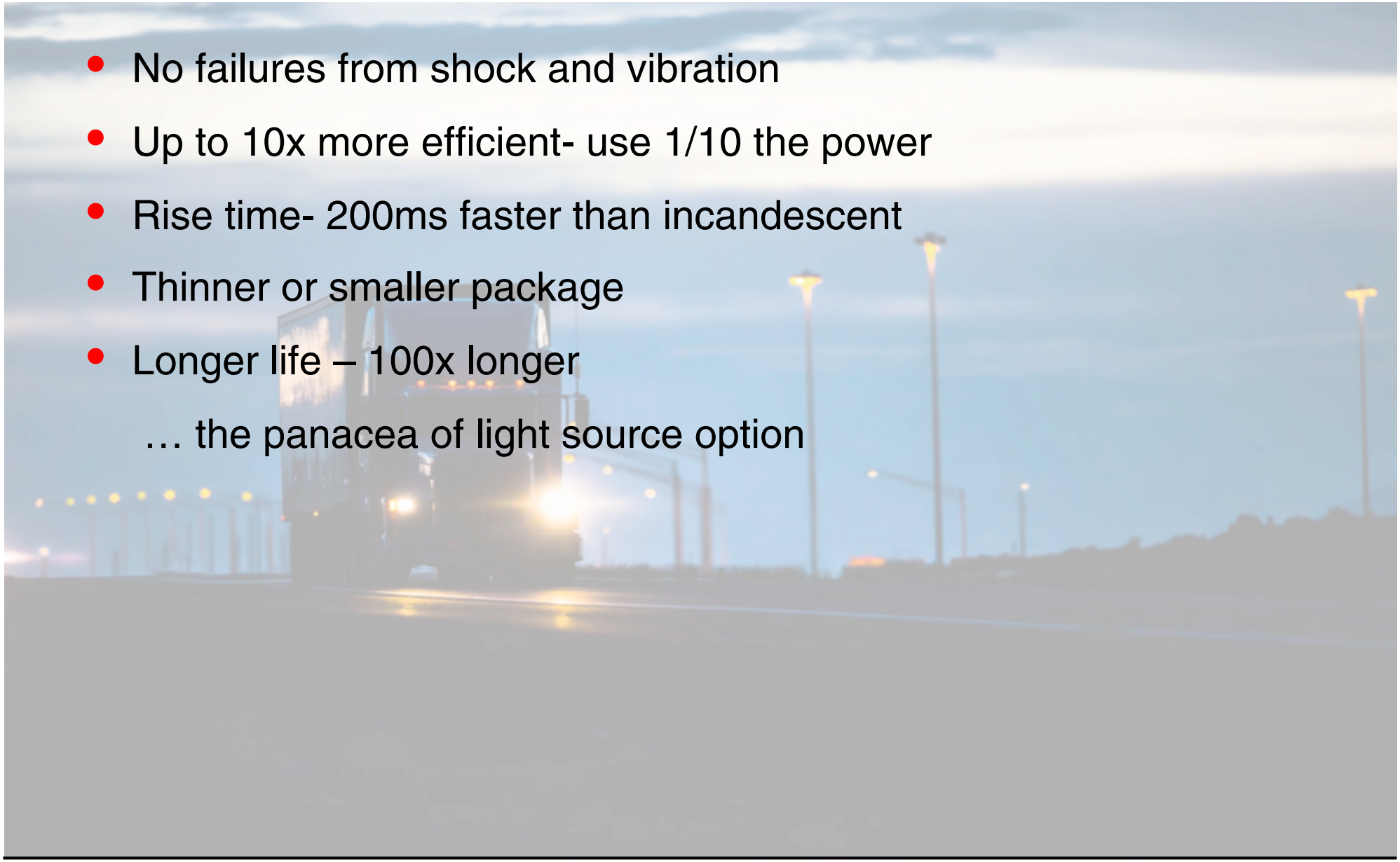
using

85% LESS POWER

What You Should Know About LEDs

- Lumens (Light units) per Watt (power) – Going up
- Cost per lumen going down
- Incandescent lighting is showing signs of decline
  - Quality and Reliability
  - Availability
  - Cost
- Packaging of LED, drive circuits and thermal management are maturing, making costs lower

LEDs In The Transportation Market



- No failures from shock and vibration
- Up to 10x more efficient- use 1/10 the power
- Rise time- 200ms faster than incandescent
- Thinner or smaller package
- Longer life – 100x longer

… the panacea of light source option

Improved Visibility

- …provide greater balance in spectral distribution than traditional halogen Headlight systems, rendering road obstructions in true-to-life color
- …are closer to the color of daylight; leading to improved object recognition at night
- …can reduce eye strain amongst users
- …assist eyes to perceive more contrast

"I like how they light up the sides of the truck, making it easier to see animals." -Fleet Test Driver

Reduced Driver Fatigue

- According to the U.S. National Library of Medicine, darkness causes the body to produce more melatonin, a naturally produced hormone in the human body, which signals the body to prepare for sleep
- Custom LED Headlights produce light that is rich in a spectral wavelength that research shows can inhibit the production of melatonin[1]
- Limiting melatonin production while driving can provide a life-saving advantage over halogen lamps

[1] John M. Sullivan, "Visual Fatigue and the Driver," UMTRI-2008-50, 31 October 2008.

LED Lighting

“The Future”

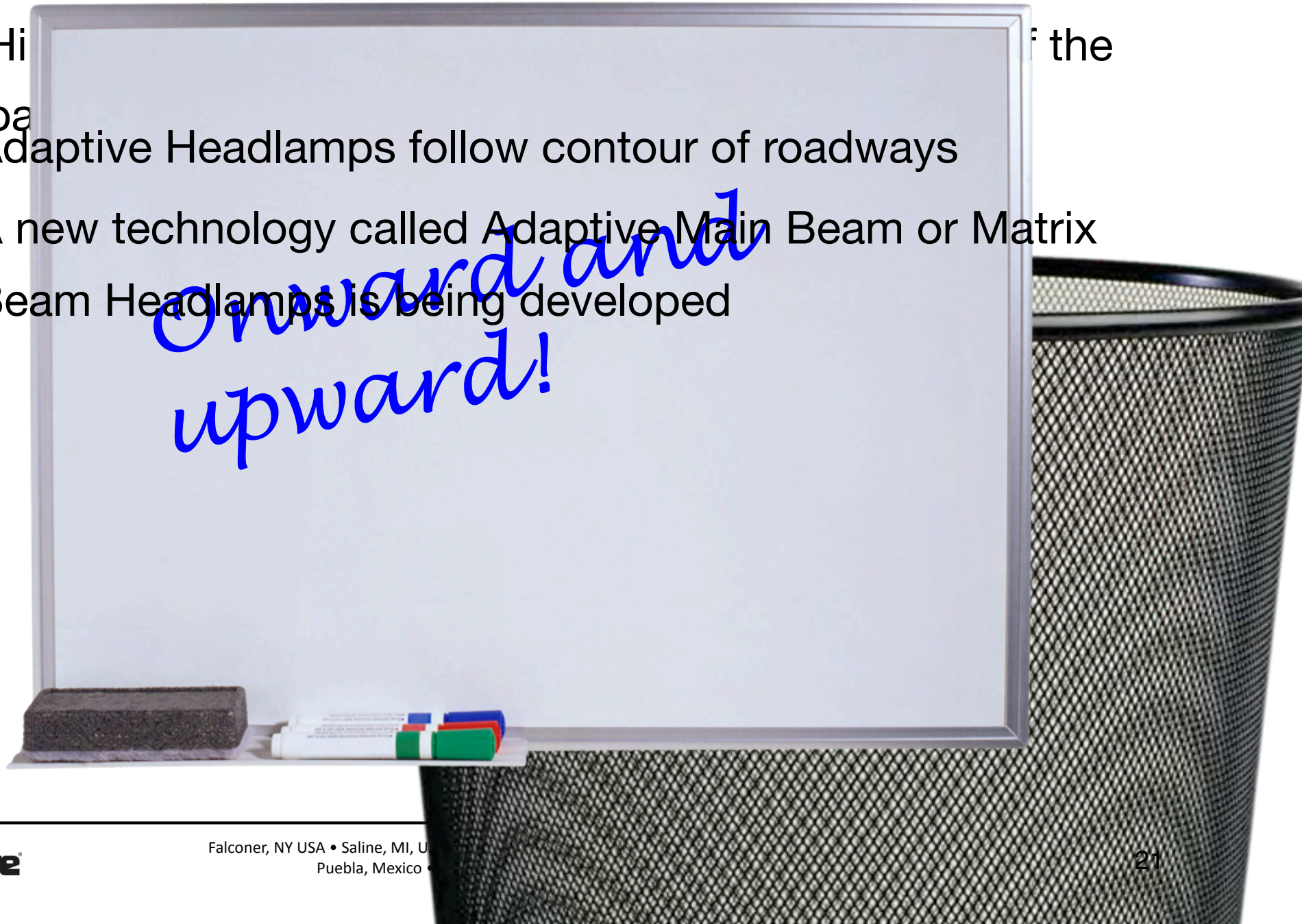
- “From chicken wings to the world wide web”

Future Forward Lighting Technologies

Electronics are coming to Forward Lighting

Future Headlamps Being Reinvented

- Hi f the pa
- Adaptive Headlamps follow contour of roadways
- A new technology called Adaptive Main Beam or Matrix Beam Headlamps is being developed

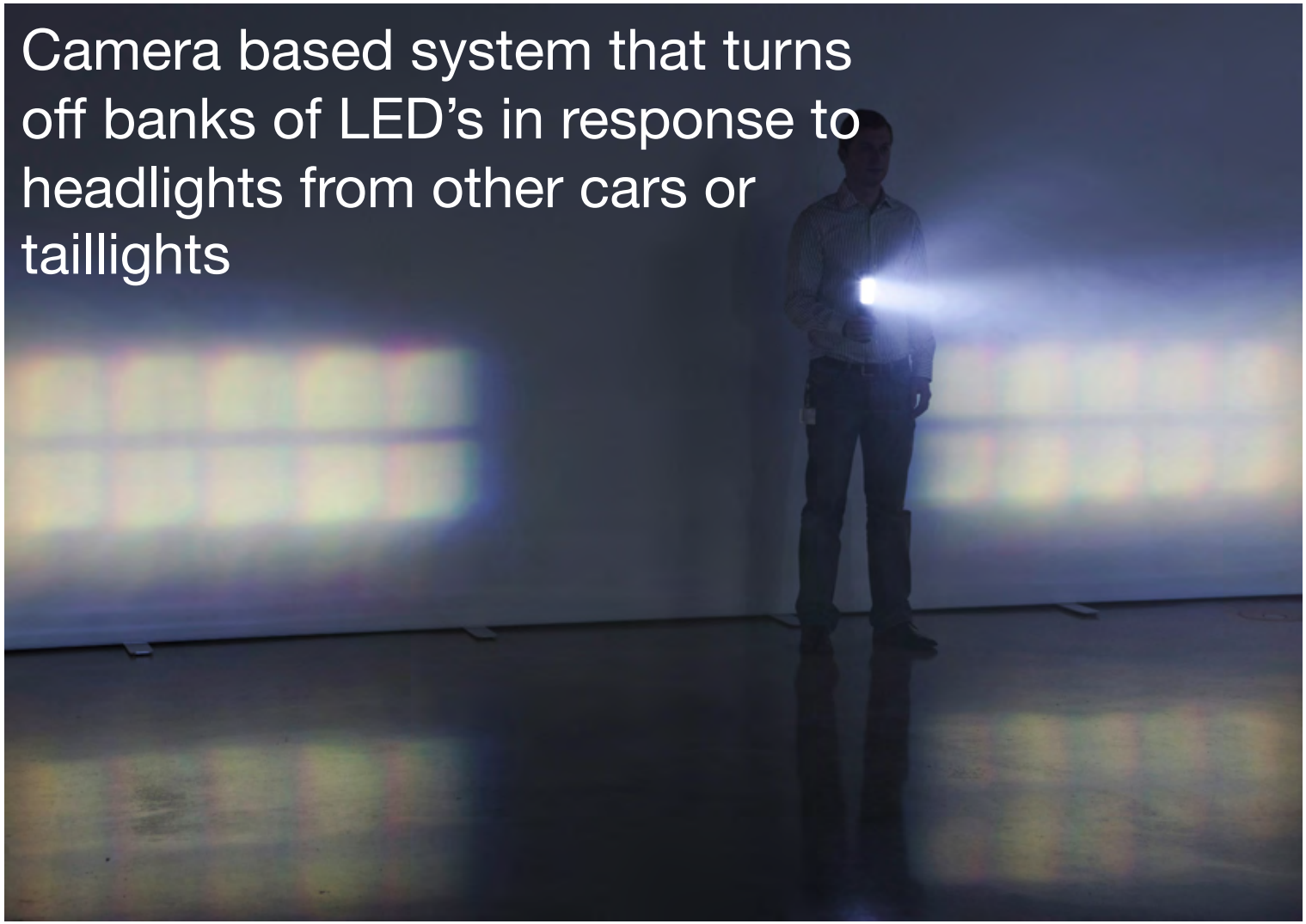


Adaptive Main Beam

- Darkens beam for oncoming traffic and trailing vehicles
- AMB Headlamps

Not currently legal in US Market

Matrix Beam Headlight



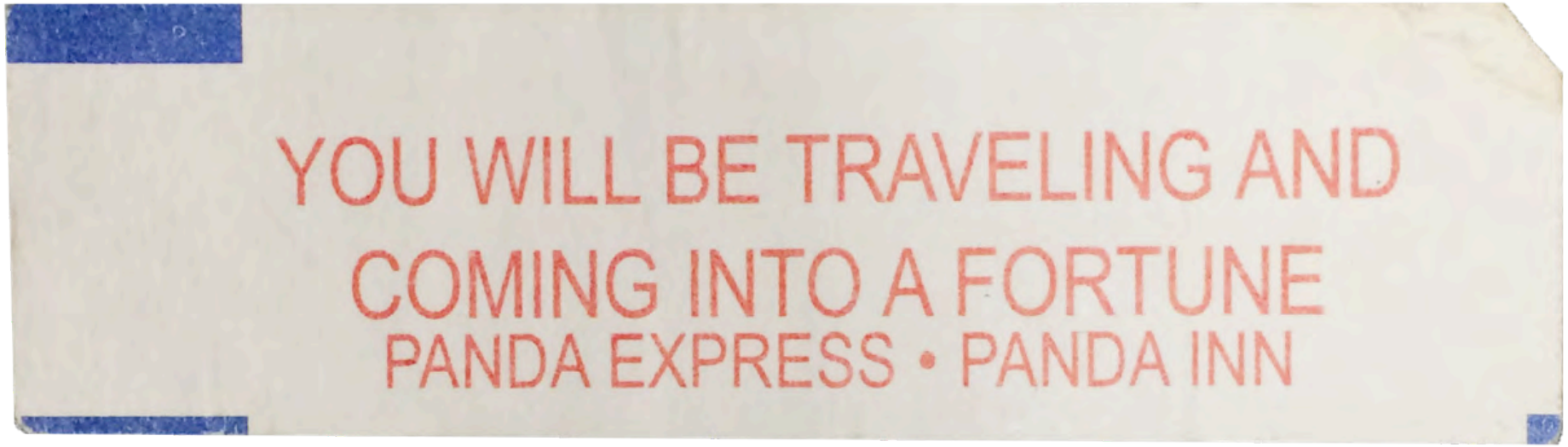
Essentially AMB but could be used in conventional system

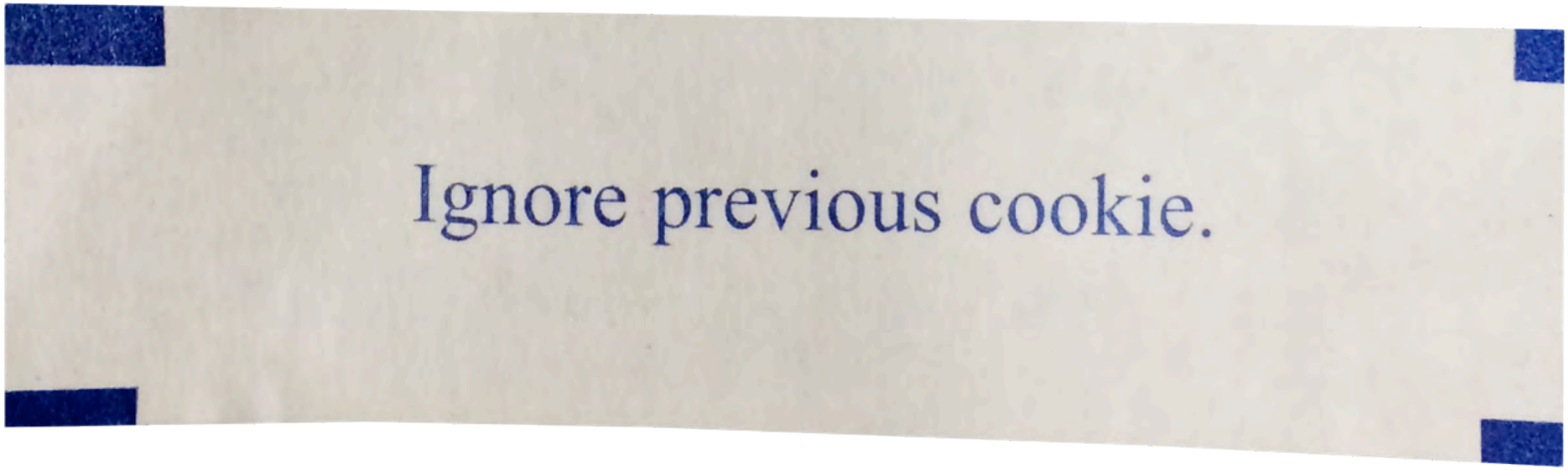
LARP- Laser Activated Remote Phosphor

- Sometimes called Laser Headlamps
- Directs laser beam into phosphor ball to create white light
- Lasers have the potential of generating 5X more light than LED's
- Potential to achieve high beam with a reflector the size of two quarters
- Experimental phase but may soon be a concept to be studied(3 to 5 years from market)

Electronic Dynamic Lighting

- **In less than 10 years we will see:**
  - LED Headlamps- 200 to 300 components- complexity increasing
    - Adaptive Main Beam-(AMB)
    - Marking Lights- camera activated- illuminates pedestrian and animals
    - Dynamic headlamps that change based on weather conditions
  - Moving Turn Signals
  - Matrix LED Headlamps
    - Many beam contributors with individually addressable arrays
    - 4 to 6 beam contributors
  - Adding Navigation with Laser and LED Headlamps to direct driver to exit or turn
  - Laser emitted from rear lamps to indicate safe following distance


YOU WILL BE TRAVELING AND
COMING INTO A FORTUNE
PANDA EXPRESS • PANDA INN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Thank you and be a "**Positive**" Game Changer!