Cinema Lamp Technology – One Element of Projection

ICTA Meeting

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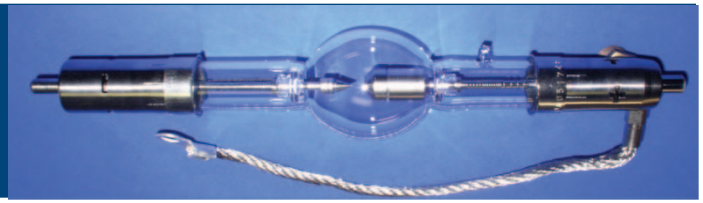
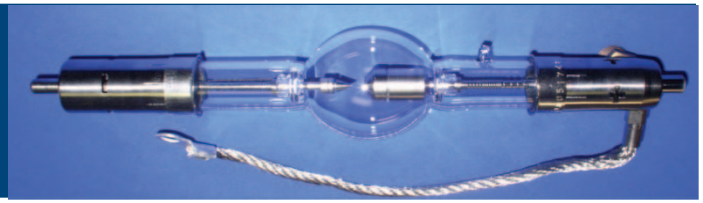
Cinema History



- Carbon Arc for many years!
- 1954: Xenon cinema lamp
  - Magnetic power supplies, (constant current)
  - 46 years to optimize the system!
- 2000: Digital cinema
  - Electronic power supplies, (constant power, new suppliers)
  - Re-designed lamp
  - Still optimizing!

System Driving Factors



Film vs Digital Projection

A. Overall system efficiencies

B. Aperture size

C. Reflector

D. Lamp changes

System Efficiency

Conventional Cinema: 100%

Reflector, IR-Filter & Lens

Digital Cinema 2D: ~70%

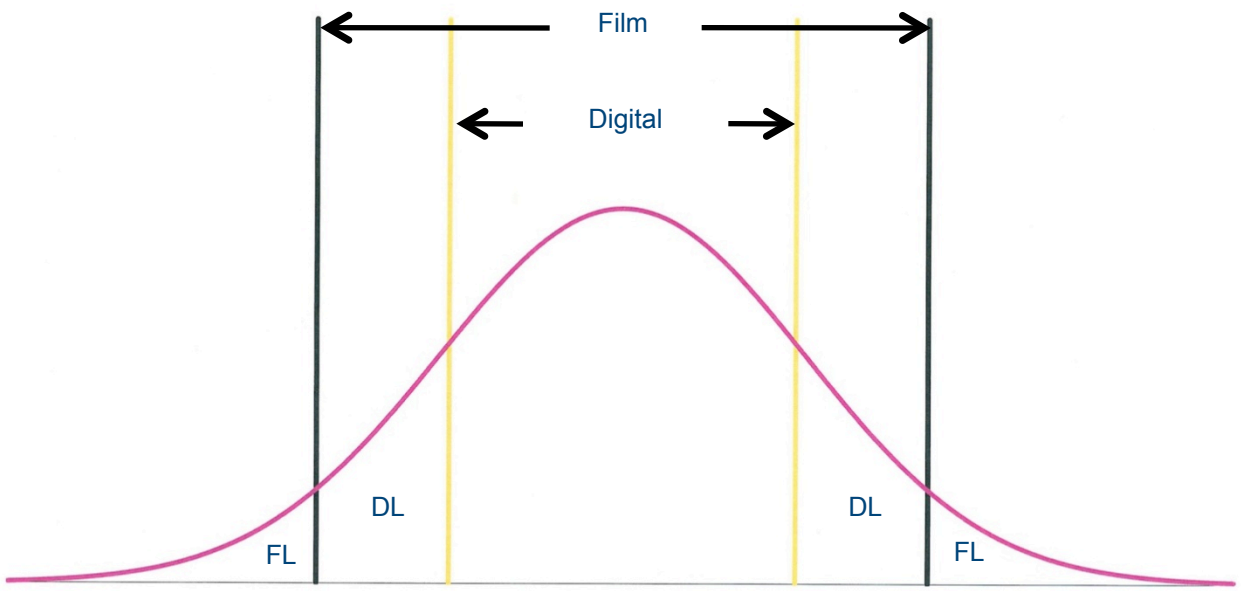
Reflector, Integrator & DLP-Chip

Digital Cinema 3D: ~50%

However digital provides other improvements the industry has recognized!

Aperture Size (Interface to optical system)

Type	Size
Film	Relatively large, (film frame size)
Digital	Relatively small, (chip size)



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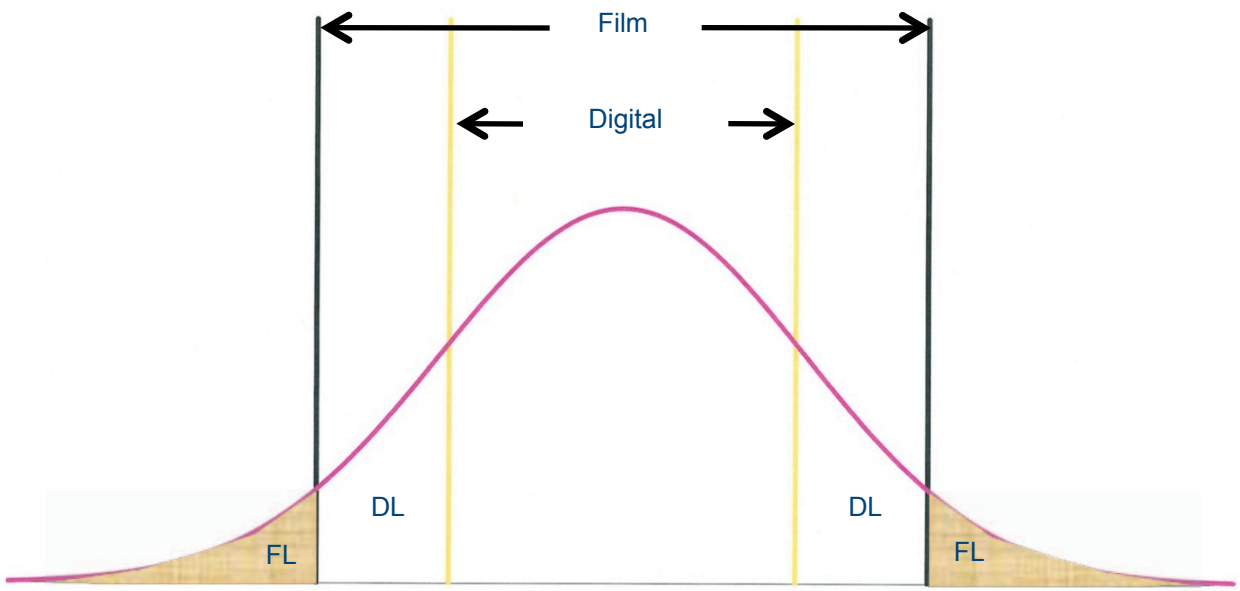

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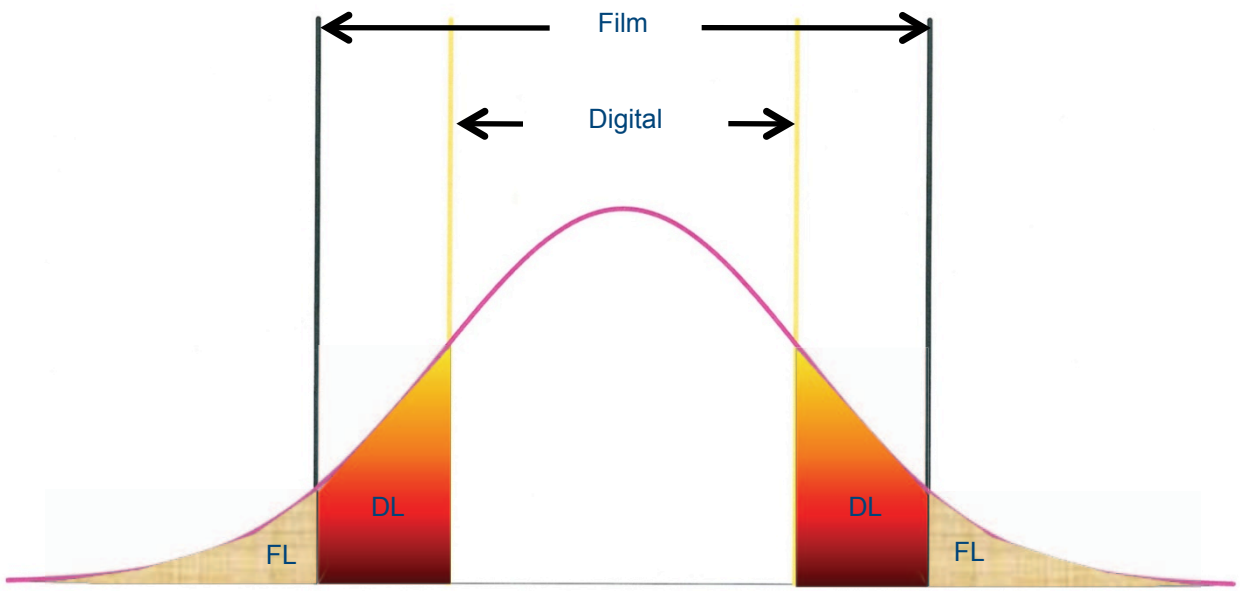
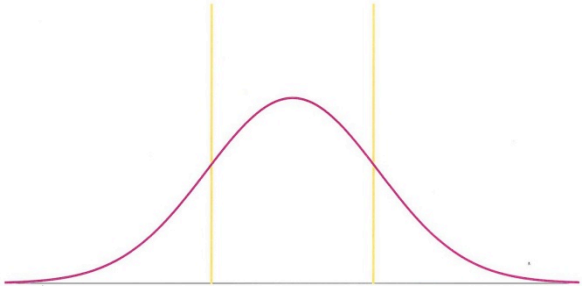
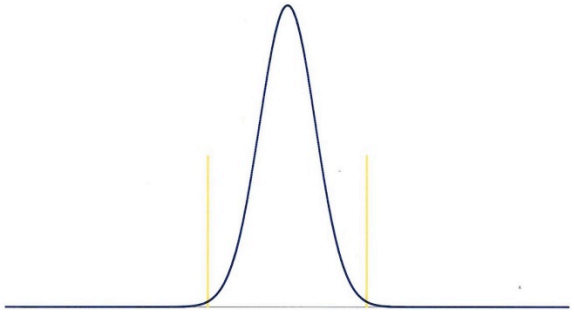


OSRAM

Aperture Size

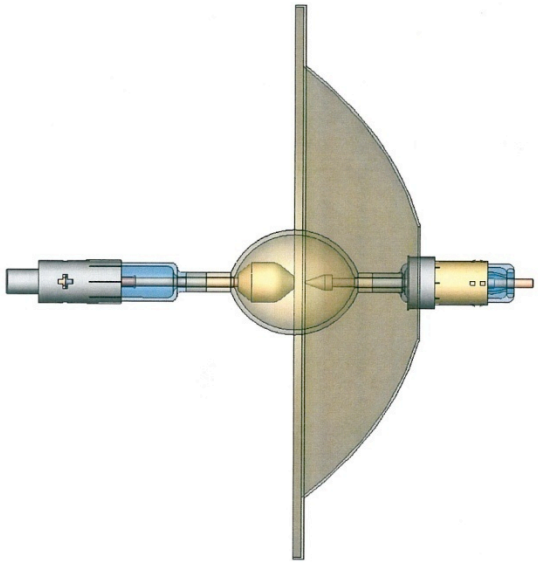


Ideal lamp & optical system



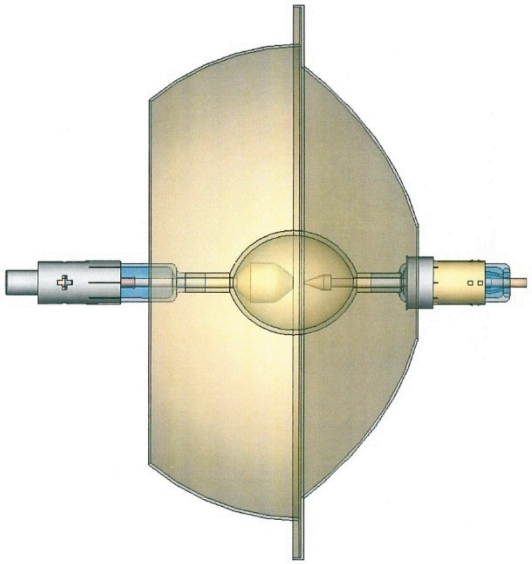
Reflectors

Conventional Cinema



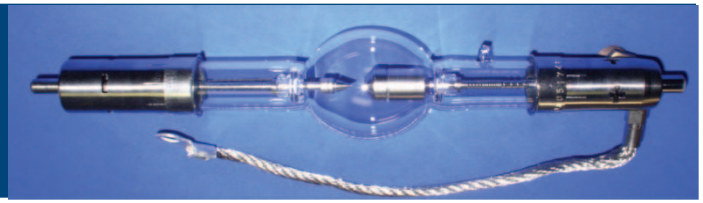
Digital Cinema

Provides 20-25% more light



Digital cinema lamps have reduced bulb diameter & length for improved optical performance

Lamp Driving Factors



Film vs Digital Lamps

Digital: Need *more* light!!!!

A. Higher power (wattage)

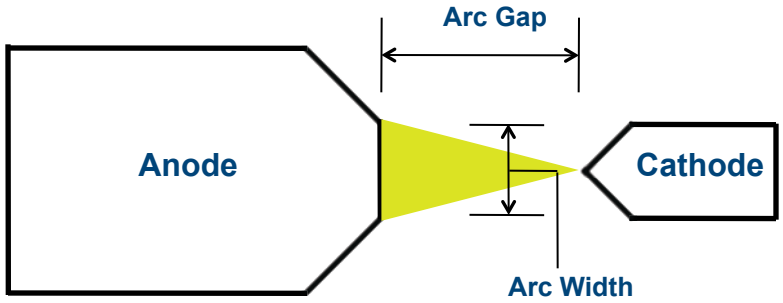
B. Increased brightness

C. Reduced bulb diameter & length

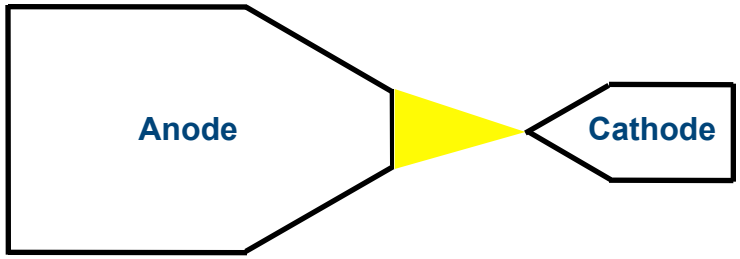
D. Additional lamp cooling!

Lamp Driving Factors: Luminous Area

Typical Film Lamp



Typical Digital Lamp



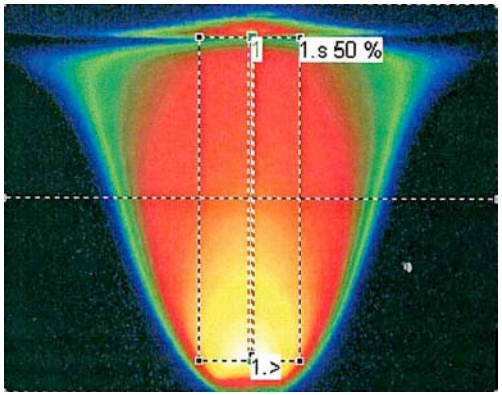
Digital Lamps have:

- Higher fill pressure
- More pointed, (sharper) electrodes
- Shorter arc gap
- Creates a reduced arc width and length, (reduced luminous area)
- Results in Higher Luminance (cd/cm^2)

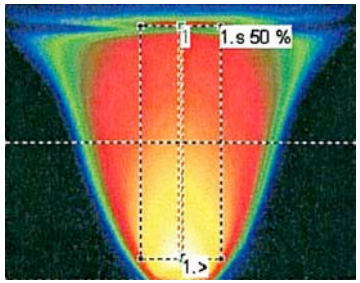
OSRAM

Film vs Digital Lamps

Lamp Type	Lamp Efficiency (LPW)	Fill Pressure	Arc Gap	Luminous Area	Average Luminance (cd/cm^2)
Film	Baseline	Baseline	Baseline	Baseline	Baseline
Digital	~same	higher	shorter	smaller	~20% greater



Film lamp luminous area



Digital lamp luminous area

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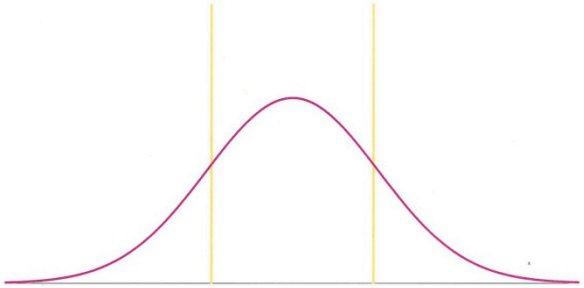
Aperture Size



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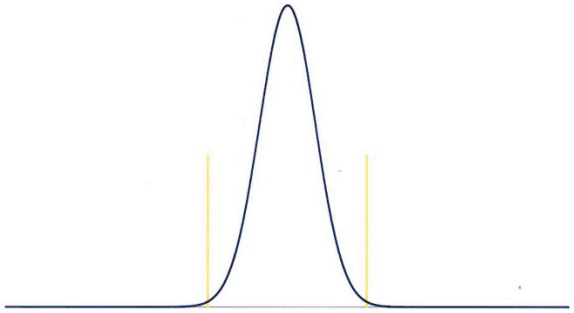

Cinema Lamp Life vs Lamp Power

General Rule, Tips

General Rule:

Higher lumens → Shorter life

Lower lumens → Longer life

Tips:

1. Select lamps that will provide sufficient light output throughout lamp life
2. Increase lamp power as lamp dims over life to maintain constant light output
3. Maintain proper cooling
4. Maintain clean & tight electrical connections
5. Clean projector regularly
6. Align lamp regularly