Reducing Operating Costs and Energy Consumption in Digital Cinema

Andrew Robinson & Richard Mitchell - Harkness Screens

Harkness Screens – Over 80 Years Experience

- Founded in 1929
- World leader in cinema with screens in more cinemas worldwide than any other manufacturer
- From single-screen independent theatres to large multiplexes to large format immersive theatre experiences or live events
- Production facilities in America, France, China and UK
- Indian production in late 2012/early 2013
- Unrivalled experience and knowledge

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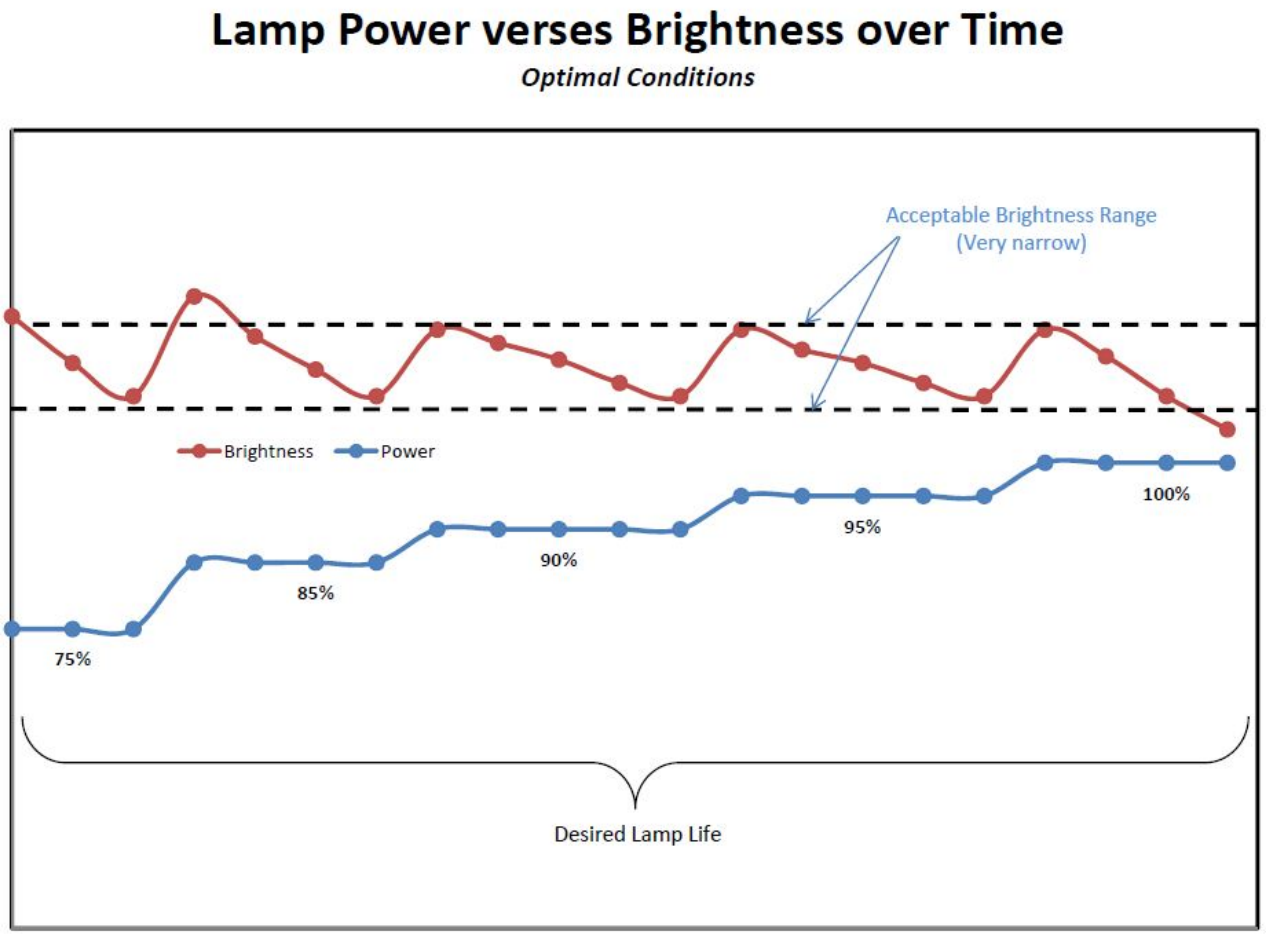
Operating costs in Digital cinema

- Experience shows that DCI projector operating costs are much higher than 35mm film projection
- Digital lamps are more expensive and have shorter lives than 35mm film lamps
- Power consumption will be more if higher kw lamps have to be used
- Cooling costs can be more than film projectors
- Overall operating costs can be more than double film projector operating costs
- Digital 3D compounds the problem as 3D systems are inefficient and need powerful lamps

Operating cost savings

- Operating costs of digital projection are significantly more than film projection - lamps cost more, have shorter lives and consume more power
- By using high gain screens correct brightness levels can be achieved with smaller lamps
- Smaller lamps last longer, cost less and use less power, so this can reduce total operating costs of the theatre
- It may be possible to use a smaller projector saving even more cost
- Smaller projectors and lamps can reduce booth HVAC costs

Lamp use optimization



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Lamp operating cost examples

- Typical benefits from running with a smaller lamp:

Christie Solaria projectors							
lamp kw	**warranty life hours**	**lamp cost $**	**annual lamp cost $**	**annual power cost $**	**total annual cost $**		**lamp down savings $**
6	500	1650	13728	3744	17472		na
4.5	1000	1350	5616	2496	8112		9360
3	1500	1275	3536	1872	5408		2704
2	2400	975	1690	1248	2938		2470
1.4	3000	825	1144	874	2018		920

A Practical Example

- Christie Series 2 Projector
- 14m screen
- 14fL required brightness for 2D presentation

Screen Gain	**1.8**	**1.4**	**1**
Projector Maker	Christie	Christie	Christie
Projector	CP2220	CP2220	CP2230
Lamp	CDXL-30	CDXL-30	CDXL-45
Lamp power (kW)	3	3	4.5
Brightness	14 FL	14 FL	14 FL
Warranty Lamp life Hours	1500	1500	1000
Lamp purchase cost $	900	900	1350
Total Lamp Cost	2496	2496	5616
Operating costs per Year $	1872	1872	2808
TOTAL COST	**5268**	**5268**	**9774**

How quickly does the screen yield a return?

- Taking the previous example, a saving of $4,506 could be achieved from replacing a 1.0 matt white screen with a 1.8 gain white screen.
- Cost of 1.8 gain screen c. $6,000 (inc shipping and install)
- Screen paid for in 16 month
- If a smaller projector is used then the return could be immediate

How might this benefit your cinema?

- Taking the previous screen example
  - Net saving of $4,506 per annum
- Cinema complex with 10 screens

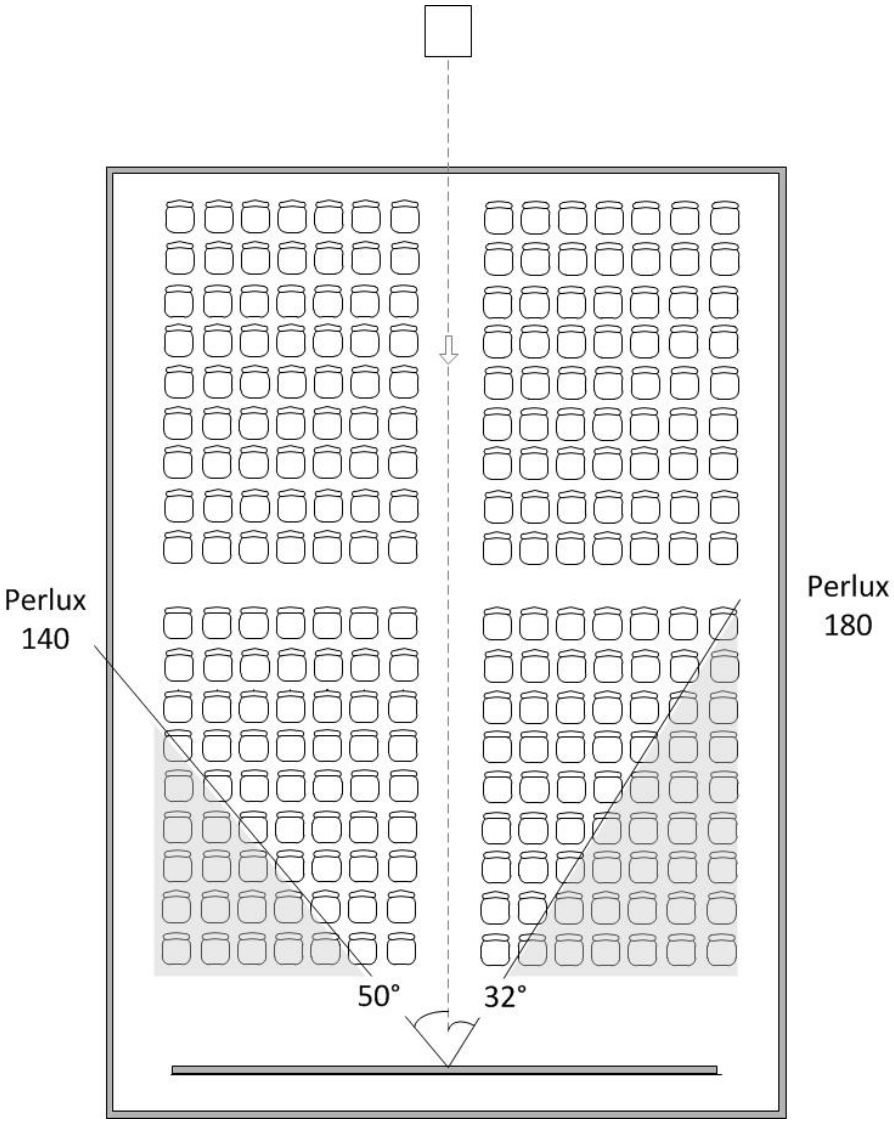
	Year 1	Year 2	Year 3	Year 5
Accumulated Savings	+$1494	-$3012	-$7518	-$16530

- Over 5 years, $16,530 per screen or across a 10 screen multiplex, $165,300
- Imagine the cost saving for a cinema chain with 30 – 50 sites and 400 screens
  - Saving could yield as much as $6.5m over five years

Disadvantage of using high gain screens

- The peak brightness is on axis and the light distribution is reduced at the sides of the theatre
- The light distribution over the screen varies – a tendency to ‘hot spot’
- Fortunately the light distribution from a digital projector is more even than a film projector – so gain screens are less inclined to hot spot with digital
- Good theatre design can minimise the disadvantages

Designing to use gain screens – theatre shape



- In this typical theatre almost all seats have better than half-gain level even with 1.8 gain screens.

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Considerations for using high gain screens

- Theatres with a square auditorium – short throw, short focal length are less suitable for high gain screens
- Screen shape – a curved screen is recommended over 1.4 gain
- Screen rake – check the spectral path is to the centre of the seating area and tilt the screen (forward or backward) as necessary
- Choose the highest screen gain level that works with geometry of theatre
- In retro-fit may have more limitations than in new construction

Considerations for using high gain screens

- For 3D applications choose screen to suit technology – normally has to be high gain
- Use silver screen (gain 2.4) with polarised light; high gain white (2.2 or 1.8) with other 3D systems
- For 2D, where possible use the highest gain to optimise lamp choice and achieve the correct brightness level (use smallest lamp possible)
- Use smallest projector possible with 2D only auditoriums

Best practice to control costs and ensure brightness levels

- Measure brightness of screen regularly
- Use screen of optimum gain
- Size lamp correctly – consider screen gain and lamp together
- Set new lamp to run at 75-80% of maximum power
- Adjust power setting as lamp degrades to maintain brightness
- Replace lamp at end of useful life

What to do next?

- Carry out regular maintenance checks
  - Harkness Screens can advise on this
- Visit our website www.harkness-screens.com
- Visit us at ShowEast or CineAsia
- Call or email your Harkness Screens representative:-

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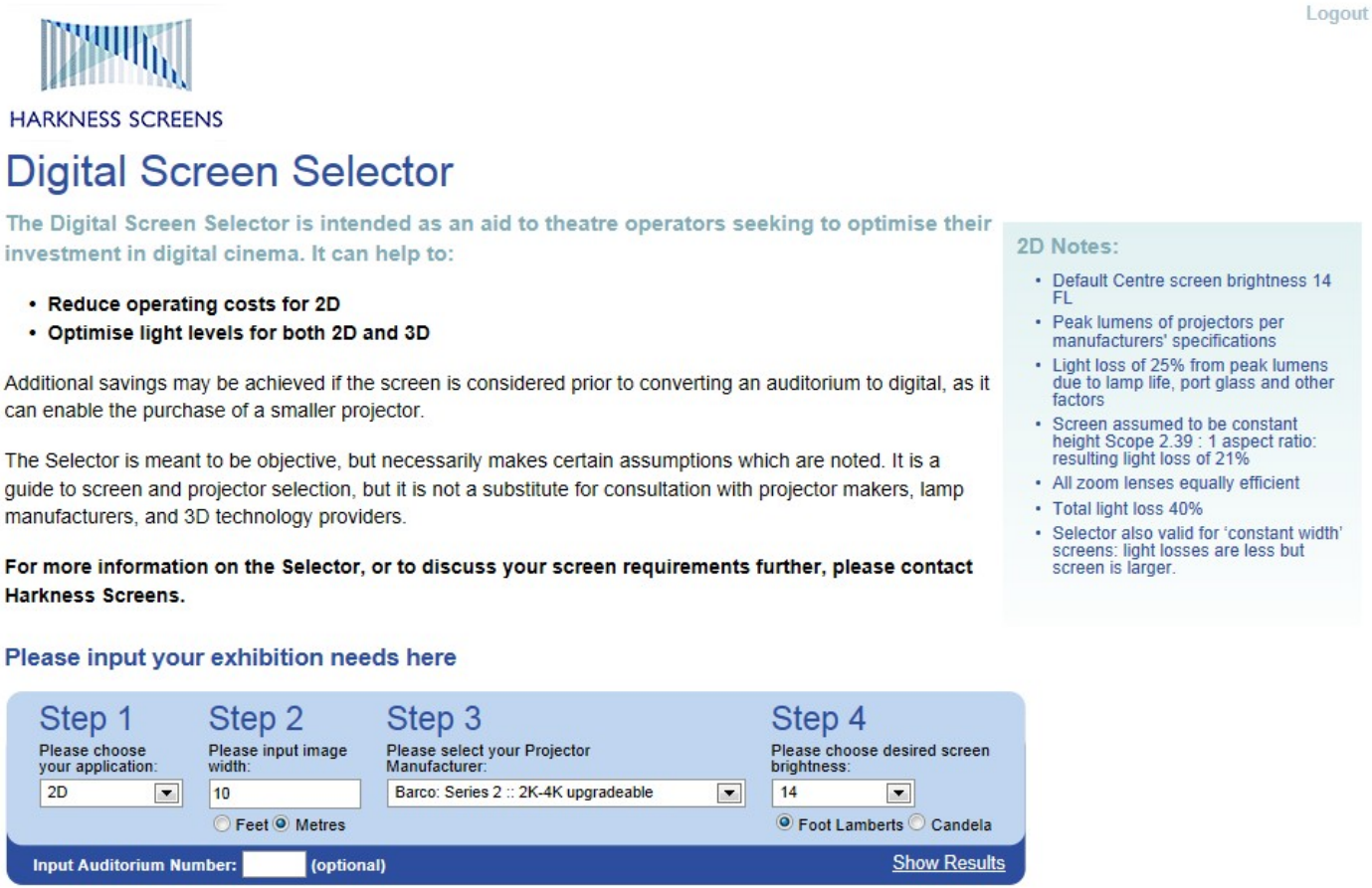
Digital Screen Selector

- Free to use on the Harkness web site to consider screen options with 2D and 3D projection



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Digital Screen Checker

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Questions and Answers

- Type your question into the chat box

Thank you!
www.harkness-screens.com