Introduction

Following a two day site visit to the Jersey Opera House herein a report on the state of the stage lighting infrastructure together with suggestions for improvements specifically in the area of energy efficiency to create an ecologically sound and future proofed installation which can service the needs of the diverse product that will use the venue.

Basic Principals

The stage lights hang on internally wired bars suspended from the existing counterweighted flying system overhead above the stage. Face lighting is provided from a variety of positions "Front Of House" (FOH) including the boxes, the circle front, under the upper circle, the slips at the rear of house (ROH), the roof voids (ROH), the spot box at the back of the upper circle, the two advance bars near the proscenium and the dome in rear of the centre ceiling.

In addition to overhead and FOH lighting floor based side lighting is provided from lights affixed to vertical, moveable floor based pipes know as "booms".

The stage lights are then wired through to the dimmer room at which point a choice is made to route the light to "dimming" or non dimming known as "hard power".

From the dimmers a control signal is then sent to a lighting desk and the stage lights "fixtures" are then "plotted" into lighting cues to change the looks of the lighting to fit the mood required.

Current Status

Whilst thirty years old the current dimming system was extensively tested for functionality and found to be almost entirely working to a highly efficient and acceptable level.

The lantern stock (the fixtures) have all been recently PAT tested, maintained and are ostensibly fit for purpose.

The control system (lighting desk) whilst a non standard choice for this type of venue is perfectly acceptable although please note that it is not considered the normal protocol and therein requires a high level of niche training in order to be operated. A touring company visiting the theatre would most likely not be able to use it, preferring instead the industry standard which they would tour in with the show.

The current fixtures are perfectly capable of lighting a wide variety of presentations including drama, dance, opera, musicals, comedy and conferences.

However……most all of the fixtures currently in the opera house stock are older style "conventionals" that have a tungsten source that require hefty phase control dimming. Hugely heavy on electricity consumption and regarded now as unethical when utilised in a theatre that has undergone a recent refurbishment. The eco credentials being completely incompatible with a modern requirement.

The Transition to an LED based Lighting System

In today's world, the transition to a more sustainable, energy-efficient future has never been more vital. The steps we take towards a greener, more sustainable way of living in the next three years will impact future generations for a lifetime.

For many schools, theatres, and venues, transitioning from existing tungsten lighting rigs to greener LED alternatives represents a significant opportunity to reduce the impact the operation of their performance spaces has on the planet.

LED theatre lighting is a dramatically more energy-efficient alternative to traditional tungsten lighting rigs. While both types of lighting serve the same essential purpose—illuminating our stages and auditoriums—their differences couldn't be starker. LEDs consume up to 80% less power than tungsten lights, translating directly into lower energy usage and cheaper energy bills.

Beyond cost savings, adopting eco- friendly LED lighting also aligns with the need to protect our environment. LEDs release less heat, reducing the need for additional cooling systems and further conserving energy. Lower energy consumption means fewer greenhouse gas emissions, aiding the battle against climate change.

Many incandescent lamps are only 5 – 10% efficient. E.g., only ~60w of a 1000w of energy may be emitted as light. As a result, up to ~940w is emitted as heat.

As we head towards a greener future, manufacturers are reducing or discontinuing the production of energy-inefficient tungsten lamps. This situation is making these bulbs increasingly hard to find and, consequently, more expensive. By investing in LED lighting now, you can avoid supply chain uncertainties and ensure seamless performances without any unexpected hitches.

The financial argument for LEDs extends beyond just energy cost savings. Yes, an LED lighting rig uses fewer fixtures and less power, which means lower utility bills. But also consider the longevity of LEDs. With lifetimes significantly longer than tungsten lamps, the need for frequent replacements—and their associated costs—is drastically reduced.

In conclusion, transitioning from tungsten to LED lighting is about keeping up with technological advancements and embracing a more sustainable, cost-effective future. It's about ensuring continuity in your performances and providing the best experiences for your audience without compromising our planet.

Whilst LED is seen as the way forward it must be stressed that older tungsten fixtures are perfectly serviceable ways to light the stage. However I reiterate that after any refurbishment the outcry at using these inefficient technologies would be justified and doubtless fail the energy efficiency projected for the building pre renovations.

If seen as a purely short term remedial placeholder before the fixtures are replaced with ethical sources then of course the theatre could open and service a variety of shows needs.

A phasing of improvements could be easily implemented by replacing systems in blocks of purchases over a scheduled period.

In the interest of balance the Association of Lighting Designers are keen to suggest that many theatres and performance venues who could not afford to replace their tungsten stock. In their "save tungsten" campaign they issued this statement -

In response to the news that the EU is once again contemplating banning the use of tungsten halogen light bulbs in entertainment lighting, the Association of Lighting Designers (ALD) is co-ordinating a high speed effort to gather reasons why this ban should not move forward, particularly from those who would be materially affected by such a ban, in time to create a formal response before the end of the proposal's consultation period on 26th January 2018.

"The ban is not strictly new," notes acclaimed, award-winning lighting designer Michael Hulls, who is leading the effort as a continuation of his earlier 'Save Tungsten' campaign. "The EU has been moving towards banning the use of all tungsten light sources for some years. However, theatre lighting has, until now, had an exemption from this ban. This exemption is what the EU is now proposing to end. Were that to happen, it would mean that by 2020 we would no longer be able to obtain bulbs to keep our stocks of familiar, reliable tungsten theatre lighting fixtures, from the Source Four all the way back to the Patt 23, working."

"What the EU are proposing is a ban on 'placing in the market," notes architectural lighting design Kevan Shaw, who has been involved with these regulations for some years, keeping an eye out on behalf of the theatrical as well as the architectural lighting community. "The intent is that product in the supply chain can be sold, but that no new product can be manufactured or imported, and new product cannot legitimately be CE Marked, which can prevent installation or use under contractor's or end users' health-and-safety policies."

The EU guidance document does note that banning tungsten light bulbs in this way would potentially lead to large amounts of equipment quickly becoming redundant, but suggests that the EU's feeling is that the overall power savings mean that this 'sharp shock' approach would be worth it.

"Unfortunately, that seems to us to fail to consider three key points," Michael Hulls notes. "The first is that a number of studies have shown that the power used by tungsten lighting in theatre is very, very low: because we dim lights across performances that usually just run for an hour or two, the actual power consumed is a tiny fraction of the connected load. The second is that for many venues, particularly smaller venues, the cost of having to replace their existing, often long-serving, rig of tungsten fixtures – and possibly also the infrastructure such as dimmers supporting that rig – with expensive new LED fixtures would be prohibitively, sometimes ruinously expensive.

"The third is that in recent years, we have been adopting LED lighting fixtures, where they give us new lighting possibilities and perform as well as or better than existing fixtures. In moving lights, in particular, there is a rapid movement to dimmable LED sources instead of always-on arc sources. In other words we as lighting designers are already considering all of the tools available to us, but despite their being many new tools, some very good, we sometimes still just can't find anything else that can replicate the very particular properties of tungsten.

"To ban, and force the scrapping of much perfectly good equipment, on the basis of incorrect assumptions about how much power would be saved seems counter-productive.

An Analysis of Power Consumption

Accompanying this report are four lighting design drawings. They are -

1) A standard opera house rig using purely conventional (tungsten) sources.
2) A hybrid lighting rig using conventional FOH and automated overhead units (LED)
3) A completely LED rig using static and automated fixtures.
4) A more developed LED rig with fixtures to light large scale musicals, pantomimes etc.

With no incorrect reporting of consumption as alluded to in the Association of Lighting Designers article of earlier the figures calculated for these drawings are startling.

Rig 4 uses 57 KWH

Rig 3 uses 46 KWH

Rig 2 uses 156 KWH

Rig 1 uses 268 KWH

An LED rig that will satisfy the demands of most stage presentations would use

83% less than the current tungsten one.

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Ways Forward

The new (and excellent) electrical infrastructure will future proof any modern stage lighting installation.

It is suggested that a full LED lighting rig of automated and static fixtures be implemented either in tranches or in one move.

Having an automated overhead rig has many advantages quite apart from consuming only 17 percent of the current electrical draw required to light the stage.

One of the main side benefits is accessibility with the majority of the lighting rig being focused from the lighting desk and not from high level access equipment like ladders and tallescopes therefore speeding up the get ins by not quarantining the stage from use by other departments when the lighting department are required to monopolise the footprint of the stage to access the lights. The advantage to safety too is great.

The lighting designs that accompany this report suggest that for productions with higher lighting needs that additional equipment can be hired in to supplement the more basic albeit comprehensive LED rig that this document proposes.

Equally the more lavish version could be implemented from the get go and therefore offer a world class facility to visiting companies.

Like the Rose Theatre in Kingston touring shows would be made aware that their project would need to be "replotted" to fit the new lighting rig and most companies are glad of this development. Equally in special circumstances the inflexible touring productions could be offered the standard conventional tungsten fixtures to recreate their lighting plans faithfully in the Jersey Opera House.

In terms of infrastructure if an LED lighting rig was to be sourced then the current mode of dimming would be all but disbanded as the fixtures themselves provide their own dimming. The current dimmers at the opera house are also capable of being switched over to hard power so the actual method of powering a new LED lighting rig already exists within the building. Even if these units were to fail there are a multitude of options provided by the electrical renovations.

Essential Works

In order to provide a comprehensive control system throughout the building a series of data cables DO need to be installed. It is regrettable that there are no direct fireproof routes from the stage directly into the FOH boxes or easily to satellite control points within the auditorium. A wireless solution is not acceptable as it can fail dependent on ambient circumstance so these cable routes must be installed to control future lighting.

Whilst the LD 90 dimmers have been thoroughly tested for functionality it is the recommendation of the electrical contractors that a full insulation test be carried out to certify them for use. This is likely to around 40 hours of work.

The drop down panels under the upper circle must be looked at and provided with safety wires as they are prone to drop open themselves under their own weight.

Generic Costings

This basic LED automated and static lighting rig attached to this package of works uses -

46 LED Wash Lights

13 LED ERS Profiles

18 LED Framing Spots

12 LED Cyclorama Battens

2 Automated Follow Spots

1 ETC ION XE Control System

The extensive version for bigger shows has an additional 23 LED Framing Spots

Current prices are loosely -

Washlights [redacted]

ERS Profiles [redacted]

Framing Spots [redacted]

Battens [redacted]

Follow Spots [redacted]

Control [redacted]

This gives you the ballpark figures of [redacted] for the standard rig and [redacted] for the more comprehensive rig with 23 additional Framing Spots.

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