



Sustainable Light

Our own carbon neutral man, Nick Moran, visits the Arcola Theatre in East London

In a crowded market in East London, The Arcola Theatre has been raising its profile in recent years. Recently, not content with winning arts awards for its productions and for the venue itself, the Arcola has been promoting itself as "the world's first carbon neutral venue".

Aspiring to zero emissions

It's a big claim, and if you read the small print in the most recent press release you would discover a few caveats: Firstly, the status of world's first carbon neutral theatre is an aspiration, not an assertion of its present position, and secondly, difficulties securing the freehold of the building have put some of their plans on hold.

However, Dr. Ben Todd, the Arcola's executive director and the man behind the aspiration, is not one to be deterred by mere present circumstances. Ben is an engineer with enormous

personal energy, and a fascination for the way theatre can make things happen. For Ben the ability of theatre to enable change goes way beyond the usual aspiration of getting the audience to think differently about x or y.

"Theatre people make things happen - often with very few resources. And they have an enthusiasm that makes others want to get involved." Ben Todd

At the Arcola, the involvement ranges from youth and community outreach projects, engaging local trades-people, performance classes and technical training, and encouraging volunteers - like many arts venues, the place relies on volunteers.

The mission

Now Ben has a mission that includes changing people's minds about what is possible

to do right now to slow down the rate of climate change. He has ideas, and the Mayor of London is interested in them. The most recent one to be tried out, in collaboration with Simple8 and Strawberry Vale Productions, is the "Sustainable Production". *The Living Unknown Soldier* (abbreviated to LUS), is a play based on a story by Jean Yves-Le Naour, adapted by its director Sebastian Armesto. It is a first attempt at mounting a production with the intention of leaving as little environmental damage in its wake as possible.

A sustainable production

The route to a sustainable production starts with small things, using re-cycled pulp for scripts and programmes, and counting staples. (According to Wasteonline; "if everyone in UK offices used one less staple a day we would save 72 tonnes of metal each year.") LUS's

production team aimed for "zero waste to landfill". This puts some constraints on set and costume design, and choice of props; sustainably produced timber from local sources for example, and making use of re-cycled material where ever possible (not that this is ever off the agenda for costume designers and / or supervisors on fringe shows).

Stage management and cast were asked to look at how they could reduce their environmental impact too - walking or cycling whenever possible and cutting down on water and energy consumption in the rehearsal room for example.

For the most part, the members of the company and production team didn't have to do too much different to substantially reduce the company's carbon footprint. Global Action Plan worked with the company to produce a carbon audit of the



production and it is hoped that this will help the next production team to take a step closer to the first truly carbon neutral production. However for Lighting Designer Andy Downie the demands of striving for sustainability had a much bigger impact. Dr Todd has secured a hydrogen fuel cell for the theatre - and that powers lighting for the show and the bar. OK, so what does this mean to Andy? It's a 5kW fuel cell, and as if that was not enough, at least 500W has been earmarked for the brand-new LED lighting system in the foyer and bar area.

Minimal power

I met Andy and Writer/ Director Sebastian Armesto with the Arcola's Technical Manager David Salter at the theatre in January. I asked

Andy, how he intended to go about lighting a show in the 150 seat studio theatre with a maximum available power load of only 4500 Watts? This is less than would be available from two 13A sockets. Any other show in the Arcola's Studio 1 would be able to access almost 10 times more power than this.

Because of their low energy consumption, LEDs were high on the agenda - Ben already planned to use them in the bar and foyer, and had strongly hinted that they could make a big contribution to the production too. Andy had reservations, both because of their colour temperature and their poor dimming.

Alphabet soup?

We discussed the need to keep a proportion of the load available for tungsten incandescent lanterns for faces. LEDs might work on the set - most of which is a flat "wall of remembrance". Low Voltage 50W Birdies would have a place in the rig - but then they do in most studio theatre rigs,

and we discussed dimmable fluorescents and other low energy sources. We spoke too about Colour Rendition Index or CRI. This is a measure of how well healthy human eyes are able to differentiate between colours illuminated by a particular light source. A score of 100 means the light source is as good as sunlight, and even subtly different shades can be distinguished throughout the spectrum. "Studio" lamps are usually quoted to have a CRI around 95, while the cheapest fluorescent lamps can have a CRI as low as 60. The often quoted minimum for human comfort is 70*. As some of us are only too aware, there are light sources that have such a low CRI that faces look unnatural and the subtlety of the scenic artist is completely wasted - and nobody wanted that.

Bryan Raven at White Light subsequently set up a demo for Andy of a range of LED and other low energy products. For the show, White Light provided 375W lamps for ETC Source

Four profiles. These lanterns usually have 575W or 750W lamps. Andy used three per side to provide the main face lighting. Also in the rig were LED Color-Bars, used to illuminate the set, some Robert-Juliat dimmable fluorescents, used at top light and fill, six 375W Source Four pars, used as back light for one scene when the face light was off, and a selection of Birdies. White Light also made available some larger LED fixtures, including three GLP moving wash lights, which Andy used to produce a spectacular battle field scene, commented on by Radio 4's Front Row. The other large LED fixtures did get rigged, but were not used in the eventual design.

Post mortem time

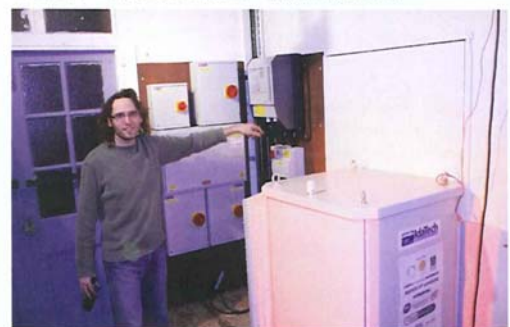
After the press night Andy and I talked again about the experience. He had been very glad of his Source Fours - Andy's background is in dance and he is very comfortable handling the quality of light produced by these lanterns at this

relatively shallow angle. They never ran at more than 60%, and at this throw, (less than 6m) the 375W lamp clearly provides plenty of intensity. The other success was the Color-Bars. Even their slight imperfections worked well in the context of their job on this show - though it is questionable how happy any LD would be with these units lighting a traditional white cyc (see pictures over page).

LED Color-Block units were used to transform the back wall of the set

What Andy felt didn't work for him were the larger LED fixtures - and for me his

reason was slightly surprising. His main objection was not colour temperature or CRI, it was that they were distracting. Since the audience are on three sides, at least some of the audience can see the face of these units where ever they are rigged. As they execute a cue, either dimming or changing colour, they become a little light show all of their own. The thing that makes these units a "must have" for certain TV shows makes them unsuitable for the intimate setting of a studio theatre. I wonder if "top hats" of some kind might solve this particular issue?



Dynamic Ben Todd.

Arcola Theatre in East London

Quality of light

As we played with the new toys during the fit-up, I found the quality of light from the GLP units very usable on faces – but they probably were set up with too narrow a beam to be much use at such a low trim height (around 3m).

Design-limiting issues

Another interesting comment illustrates that it is not just our practice that will need to change to accommodate low energy rigs. On several occasions, Andy had wanted to use specials to isolate a single actor on stage. With access to so few lanterns his choices were clearly limited. However the short time available for technical and dress rehearsals, and a wider failure to engage with a need for accurate and repeatable blocking meant he had to abandon these design ideas. There is something about modern acting technique on stage that resists "hitting a mark". While this is common

in film, and on a dance stage, actors on a live stage (often encouraged by their directors) prefer the freedom of responding in the moment to their space, and feel over constrained when "forced" to say particular lines from the same definitive marks each performance. While we can just about get away with this if we have access follow spots (or to a high tech moving light rig?) an LD with a low-energy rig is going to find it harder. As Andy said; "one of the actors had three specials through the piece, and on the final preview didn't hit any of them". When that happens, the LD has little option but to re-think and go back to areas rather than specials.

Results

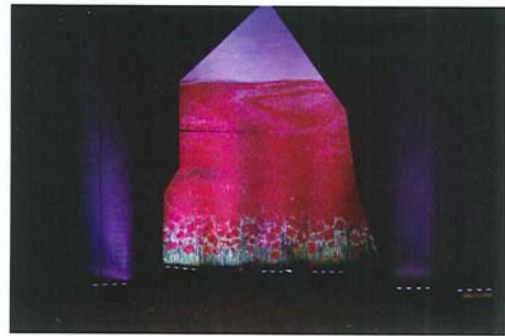
Overall, Andy was reasonably pleased with the results of his work. The reaction of informed audience members was positive too. Anna Beech, who was at the press night representing the team working on the Mayor of

London Greening London's Theatres Action Plan was very positive. She agreed that the show achieves its aim of making a step towards a sustainable production "without compromising on the artistic integrity of the piece."

Cost factors

Sustainable does not necessarily mean cheaper – at least not in the short term. Savings can come in various areas:

1. Reducing transport costs (e.g. cast and crew walking or cycling whenever practicable and using local suppliers should mean less money spent on long distance transport)
2. Reduced cost of disposing of set etc. at the end of the run (councils generally pick up compostable material free rather than charging to collect material that will go to land-fill)
3. Reduced electricity bills (the primary motivation behind the move to low energy lighting for every part of the building apart from



The Living Unknown Soldier
Above: Trailing the Color-Blocks on the show's back wall (the units were eventually rigged above the flatage).

Below: Small changes in values on the desk produce big changes in colour with these fixtures. The unevenness of the colour worked well on this set, but would not be to all tastes in other situations.



the stages at the National Theatre is reducing their mammoth electricity bill)

However, there are capital start-up costs to consider too:

1. Buying all those low energy lamps for toilets, back-stage, work-rooms etc. and the control gear to go with them, including movement sensors and potentially power-factor correction

2. Sustainable and recyclable materials are rarely the cheapest option, even taking into account that you are not paying the increasing cost of disposing of them to land-fill

3. Low-energy production lighting can't yet be bought for a snip second-hand on e-bay and restored by enthusiastic volunteers.

There is another cost – less obvious perhaps, but which also needs to be factored in; the cost, in preproduction time and production time, of learning to work with new kit in new ways. Getting to know how to light stages with a new set of tools takes time

– time to understand how the new tools work individually, in showrooms, and time to learn how they work together, in the performance space. As lighting professionals we need to make sure this is factored into schedules, and fee structures.

One important point Ben is keen to make is that this sustainable production could not have happened without generous support from many sponsors. The fuel cell came from Idatech, via the London Hydrogen Partnership. It also attracted funding from DCMS, ACE, the London Mayor and Hackney Council. Lighting equipment came from White Light hire and James Thomas Engineering (PixelRange), with the desk being supplied by ETC. (The Arcola's house desk is not able to drive the LED fixtures supplied by White Light. ETC also provided Adam Bennette to help Andy programme the desk, a SmartFade ML)

Adam and Andy using a lap top to interrogate the SmartFade ML lighting desk.

So what happens next?

As power becomes more expensive, and regulations limit its use, we will need to ensure that we use the most energy efficient equipment available for each job. For LDs this might mean LEDs or fluorescents in some instances. In other instances it might mean the 120Volt Source Fours specified by Huge Vanstone recently – in order to get the most light on stage for every Watt used. It probably means changing the almost automatic assumption that tungsten is best almost everywhere and fighting to keep our familiar inefficient incandescent lanterns for those special roles where nothing else will do (yet). It certainly means coming to terms with and learning how to use different sources, but as LDs we have done this before – in my own working life T-class lamps gave way to tungsten-halogen and then on some stages to discharge lamped moving lights. On some European stages incandescent lamps

are already being phased out, more for aesthetic reasons than environmental ones. The introduction of focusable spot lights at the beginning of the Twentieth Century enabled new practices throughout performance. They helped theatre to largely abandon sets made of painted cloths lit by batons, where the performer had to move down stage towards the footlight to be clearly seen. The "new lights" encouraged three dimensional scenery and gave actors the freedom to move and speak from anywhere on stage. Perhaps environmentally aware lighting practice could enable a similar revolution in theatre making?

Many low energy sources are OK at short throw, but unsuitable for distance work. Generally speaking, to make efficient use of a reflector and lens system you need to start with an intense and compact light source. Most low energy lamps – LEDs included, don't fit that bill. In a studio theatre getting the

kit close to the performers not too much of a problem. Andy used Robert Juliat fluorescents over the stage, less than 1m above the taller performers. On larger stages we may have to get used to light sources cunningly concealed to be closer to the performers – built into the set perhaps or a return to banks of footlight. An alternative could be costume that lights up. Fashion designers are already working on clothes that generate power from the movement of the wearer and use that power to glow. If the LD could control that glow, and work with a choreographer and the costume designer...

It doesn't all have to be negative – accepting the challenge of the new and moulding it to our purpose is what theatre people have always done – now who can we persuade to sponsor a new set of awards for sustainable shows with artistic integrity? #