

Royal Opera House and *Rusalka*

Case Study 2023



Overview

Rusalka was a main stage opera at the Royal Opera House (ROH) which ran in February and March 2023. Directed by Natalie Abrahami and Ann Yee, it was a poetic, contemporary new staging of Dvořák's lyric fairy tale which reveals our uneasy relationship with the natural world and humanity's attempts to own and tame it.

The show was identified as a trial production to pilot more sustainable ways of working as outlined in the Theatre Green Book. The challenge of creating a more sustainable production was presented to the creative team, who worked to realise it alongside our Production Manager, heads of workrooms, and staff across the Technical, Production and Costume department.

This case study summarises the key successes, challenges and lessons learned from *Rusalka*, based on the information coming out of our reporting and feedback received from different departments.

It should be noted that the ROH has certain restrictions in construction as most sets are made to last 10+ years, with the intent that they remain in the repertoire years after they were first staged. Factoring in co-production partners and hires of entire shows means they also have to be constructed to allow for multiple casts, storage, loading/unloading and shipping worldwide. This on top of crew and costume staff in receiving venues with their own working practices. They need to therefore need to be more robust and adaptable than if they were made for one run only at the ROH

Design Successes

The key successes on *Rusalka* were from changes made by the creative team and PM to the **design** of the show, choosing to remove or alter elements of their original designs to reduce material use or choose more sustainable options. Meaningful changes for set & scenery included:

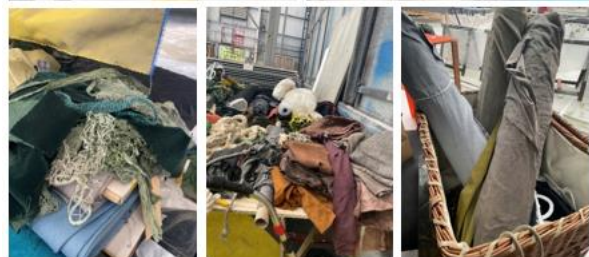
- The **removal of real water for the set design for the central pool**. This choice removed the use of a minimum of 3200 litres of water, chemicals for cleaning, the manufacture of a polypropylene tank, purchase of tarpaulin liner and the power required to heat and maintain it. It also removed the need for manufactured height between the stage floor and pool surface, reducing the quantity of timber and steel used in the set.
- The **redesign of the glass palace truck from Act II to remove a substantial amount of virgin polycarbonate**. The initial design included an extra staircase and was originally designed to be made almost entirely from polycarbonate. The final design was instead made from timber and steel alongside a small amount of twinwall for the underside of the ceiling.
- The decision to **cut the fire effect** originally designed for the production due to its environmental impact. This would have required gas stored in cannisters for the perimeter of the onstage pool. Alternative approaches were considered, but ultimately this effect was cut altogether, removing the need for additional resources too such as water, steam boilers and hosing.



Making Successes

Other wins for sustainability were due to **making greener** – reusing stock items, repurposing deadstock materials, and identifying new products:

- The scenic art department created foliage for the set of *Rusalka* from **deadstock costumes and materials**, after the original designs were also adjusted to reduce the quantity of foliage required by 40%. Estimates for reused materials gathered from ROH workshops for use on *Rusalka* were: 530 square metres of various fabrics (including 400 square metres of molten/flax/cotton), 600 square metres of netting, 200 square metres of gauze, 1150 metres of various rope (including paper rope, cotton, and sash cord), 250 metres of wire and 130 square metres of various rolls of fabric from the ROH costume department.



- **EcoBoard** was identified as a new material for use on the set of *Rusalka*. It was used to create an armature/framework for the rocks that sit around the central pool on the *Rusalka* set. It is 100 % biodegradable and has a negative carbon footprint. EcoBoard has its limitations due to its susceptibility to damp and its strength under the weight of trucks but will be considered for use on specific areas of future productions.
- Several **stock items** were used for staging *Rusalka* to reduce the quantity of new materials bought for the show, these included masking flats, stock black drapes and gauzes, as well as sliding flats from *Isadora* and black projection screens from *Tannhauser*.



Other successes across departments included:

- **Design changes and second-hand sourcing from props**
 - o Where possible the props workshop sourced second-hand items including used phones, old cookware and a vintage paraffin stove from eBay. Jezibaba's knife, the hooks on pales and wood/plastic elements of the nymph costumes were all made from scrap or re-used elements from around the workshop.
 - o Instead of using real helium-filled balloons for the arch in Act II, the designs were changed to make these from foil stretch material instead with a nylon

wadding mix inside, and to reduce the total number of balloons required. This meant that the balloons could last with the show in storage and did not need to be replaced over the course of the show's run.

- The creative team also had a 24 hour cooling off period for props changes in the rehearsal room, which (anecdotally) cut down on last minute propping that was then not needed.

- **Stock use by wigs & footwear**

- 39 out of the 50 wigs (78%) and a third of footwear used on *Rusalka* were from general stock. This included all footwear for the Men's Chorus. All wigs and footwear have either been stored with the show for future revival or kept as general stock at the opera house.
- As on all shows, all costume makers received costume guidelines to reduce future remakes on revivals, including a seam allowance of 3 cm where possible to aid the work of the Costume Revival workroom fitting the same costumes to a different set of performers.



- **Stock use by technical**

- In common with most theatre productions most of the technical equipment (94%) used on *Rusalka* was reuse, either from in-house stock or hired in. LED driver boxes originally used on a production of *Samson* were used on the show. All equipment used by Sound & Video came from their in-house stock.
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- **Insights into production energy use**

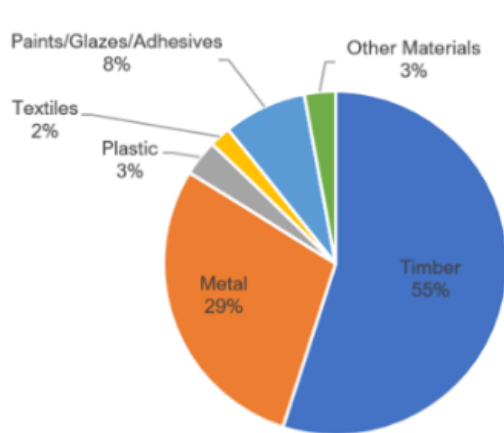
- An analysis of production lighting energy use via Power Track, a software programme developed by Rob Halliday, found that the total power consumption for one performance was 153 kWh. Further analysis by Rob found that performing the same show on a LED rig would use 51% of the power of the current system.
- To work more sustainably on *Rusalka*, the lighting team completely powered off any lighting fixture not used in the show where functionally possible, a practice that will be continued on productions going forward. This resulted in a lower base standby power for the current rig than in other productions. The lower consumption was also due to the greater use of LED fixtures in the show and the general artistic intent of the show.

Rusalka highlighted a number of **challenges to sustainability** and areas where we need to improve to align with the Theatre Green Book.

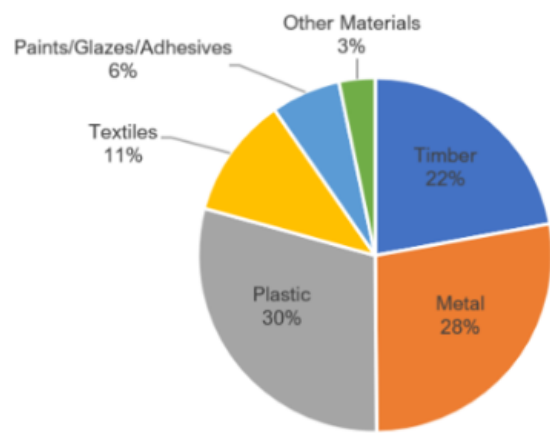
- ***Most of the material used on the show for constructing the set, props and costume was bought from new.***
 - Some of the materials used were low carbon and from certified sustainable sources. For instance, our scenic and props workshops buy most of their softwood from Volunds Timber and plywood from Creffields – a fully certified FSC and PEFC company. This is sourced mostly from Sweden, Finland or Latvia.
 - Other bought materials were virgin and raw materials, with a considerable environmental impact. These included steel lengths, polycarbonate twinwall, polystyrene sheets and acoustic foam. Artificial foliage and PVC inflatables were sourced by the props workshop. The feedback from the team was that it was not possible to source sustainable alternatives in many cases, due to the constraints of the design, time and budget.

- ***Further work is needed to explore more environmentally friendly techniques and products to reduce plastic use.***
 - Polystyrene is regularly used by our workshops, particularly in scenic art and props to create amazing scenic pieces (particularly for organic forms like trees). However, the slow degradation of polystyrene means that it is a big contributor to plastic pollution. Its durability is ideal for stage and storage, currently making it difficult to find a suitable alternative.





Scenic Construction & Art: Material Type (% by weight)

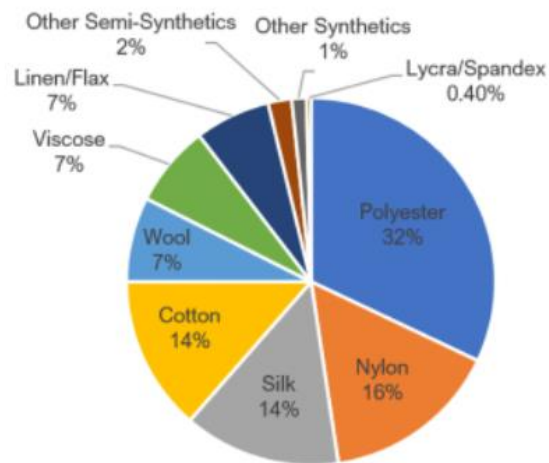


Props & Armoury: Material Type (% by weight)

- **Most costumes were made from fabrics with synthetic fibres.**
 - Where possible, the costume team tried to source more environmentally conscious fabrics for the designs. This included natural fabrics, semi-synthetics and deadstock polyester fabric. However, in many cases synthetic materials were chosen due to budget and design constraints.
 - An analysis of the main fibre type of the fabric bought for the show showed that polyester was the most frequent fibre (32%), followed by nylon (16%), silk (14%) and cotton (14%).
 - In many cases, the costume designs for Rusalka were not flexible enough to allow more environmentally friendly options to be used. Techniques such as printing and pleating meant that synthetic materials had to be used, requiring high heat for energy-intensive dyeing, and treating.
 - To align with Green Book Principles, we need to promote the use of recycled, organic, and natural fabric suppliers amongst designers. In many cases, this needs to be factored into the production timeline and budget, as well as the overall aesthetic of the show.

- **Tracking purchases for Rusalka identified last minute cuts and changes as a problem area for sustainability.**
 - In total, 85 parcels containing clothing items or fabric were returned during the production process, mostly by post. Changes to the designs by the creative team also meant that additional costumes had to be made last minute, requiring next day deliveries and extra courier deliveries of fabric.
 - These last-minute decisions also meant that there was insufficient time to explore alternative products or work with sustainable suppliers who require a greater lead time for production.

- **To create more sustainable productions, we need to start thinking more about the future life of the items created for productions.**
 - Due to the stylized design and use of the oil slick effect on the costumes for Rusalka, it is likely that only about 50% of the costume items will be re-used in house across other productions once the show is 'deaded'. The intention for the other 50% is to be sold or donated, with recycling being a last resort.



Costume: Fabric usages by main fibre type (% by meterage)

Lessons Learnt



Sustainability must be embedded **from the very beginning** to make greener productions.



Time and **budget** were barriers to choosing more sustainable options.



Greater **sharing between productions and second-hand purchases** is needed to work towards the Theatre Green Book baseline standard.



Rusalka illuminated the need to more fully understand how to **Design** as well as **Make greener**.



Further **guidance and parameters** are needed to support teams make more informed decisions.

Changes we are embedding



The **Green Production Agreement** is included in all artistic contracts and has been updated (Sept 23) to be more robust



The **TRAIL project** is underway to create an asset management system that supports reuse across productions



Elements of **modular scenery** are being developed and used on future productions



Rusalka has enabled us to develop **tools for Green Book reporting** and carbon calculations, we are all refining these and working with our colleagues in other theatres



We are developing **internal guidelines and resources for designers & makers (scenic, props, and costume)** on sustainable productions



We are developing processes for when we **retire shows from the repertoire**, so we have a data but also a narrative that helps with our storytelling

Moving forwards



Greening productions is a continual process. All productions will have sustainability goals and elements of good practice.



Designers and Directors must consider the impact of the choices they make and ensure the timely delivery of designs.



Greater dialogue between Designers and Production Workshops is needed to achieve greener designs.



A key part of our work is producing spectacle. Sharing resources between productions will help us realize ambitious large designs whilst meeting green targets and working to constrained budgets.



There are constant developments in greener materials we need to research and trial in collaboration with colleagues across the sector to stay up-to-date.



If we know the expected life of a production, we can make informed decisions about material choice - either creating a set that can last decades or one that can be deconstructed more easily.