



EURO-MATIC UK LTD

## The Role of Shade Balls in Modern Water Management

A Scalable Solution for Evaporation Control and Algal Reduction in UK Reservoirs



## Executive Summary

As the UK faces mounting pressure on its water resources due to climate change, population growth, and increasing drought frequency, traditional water conservation methods such as leak detection and metering are no longer sufficient on their own. This white paper presents **shade balls** as a scalable, cost-effective, and environmentally conscious solution for reducing evaporative loss and controlling algal blooms in reservoirs, lagoons, and other open water bodies.

Shade balls, originally developed to deter birds from landing on open water to reduce birdstrike risk, have since evolved into an effective water management tool capable of reducing evaporation by up to **90%** and significantly limiting algae growth by blocking sunlight. Case studies across the UK—including Didmarton WRC with Wessex Water and Yorkshire Water—demonstrate real-world improvements in water quality, compliance, and operational efficiency.

Given the UK's projected water supply deficit of up to **4,000 million litres per day by 2050** (Environment Agency), incorporating shade balls into national and regional water strategies is both timely and necessary. Their deployment aligns with DEFRA's 25 Year Environment Plan, the Environment Agency's National Framework for Water Resources, and broader goals around sustainability and resilience.

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## 1. Introduction: A Changing Water Landscape in the UK

The United Kingdom, long perceived as a rain-rich nation, is undergoing a fundamental shift in water availability. Climate change, seasonal droughts, and outdated infrastructure are straining public and environmental water supplies. The **South East and East of England** have already been designated as areas of serious water stress, and by **2050**, the **Environment Agency** warns that the UK could face a **daily shortfall of 4 billion litres**.

Traditional water-saving efforts—such as consumer metering, infrastructure upgrades, and leak detection—remain critical, but they do not address the volume of water lost through surface evaporation or the quality degradation caused by algal blooms. New, complementary solutions are required to address these overlooked risks.

This white paper explores **Shade Balls** as one such solution—evaluating their effectiveness, sustainability, and practical application in UK reservoirs and water treatment facilities.

## 2. Traditional Strategies Are No Longer Enough

Conventional water management practices have significantly reduced demand across the UK, yet they largely focus on consumption-side efficiencies. **They do not address two fundamental issues** that impact surface water storage:

1. **Evaporative water loss**, especially during high-temperature periods;
2. **Sunlight-driven algal blooms**, which increase treatment costs, degrade water quality, and trigger regulatory breaches.

With rising temperatures and more frequent drought events, the evaporation of water from exposed reservoirs is a growing concern. Meanwhile, algal blooms—fuelled by nutrient runoff and climate variability—continue to disrupt water treatment and harm ecosystems.

To meet these dual challenges, water authorities must consider proactive interventions such as shade balls to protect stored water resources.

## 3. Shade Balls: Technical Overview and Development

**Shade Balls** are 100 mm hollow spheres, typically made from UV-stabilised High-Density Polyethylene (HDPE), designed to float on the surface of open water bodies. Developed originally by **Euro-Matic** in 1965 to deter bird activity around open water to reduce birdstrike risk, they have since been refined as an environmentally friendly tool for **evaporation and algae control**.

Euro-Matic are located in Hungary, Germany and the UK and ship their product worldwide. The Shade Balls are **half-filled with water**, allowing it to remain stable and submerged 50% below the surface in all weather conditions. The company has received multiple awards, including the **FSB Sustainability Award (2023)** shortlisted with the Staffordshire Chambers of Commerce for Sustainability award for **2023** and **2024** and most sustainable Businesswoman in **2025**; and continues to lead in this niche sector.

**Key Technical Features:**

- **Up to 91% surface coverage**
- **Reduces evaporation by up to 90%** (Dr. D. Handley, University of Leeds)
- **Blocks sunlight to inhibit algae growth**
- **Maintenance-free**; self-adjusts with water level
- **UV-stabilised for >25 years**
- **Withstands winds of 48m/s (147 km/h)**
- **Recyclable at end of life**
- **Safe for aquatic life (fish, newts, etc.)**

**4. Addressing Evaporation in the UK Context**

While the United Kingdom has traditionally benefited from a temperate and relatively high-rainfall climate, **water evaporation from surface reservoirs is becoming an increasingly important and often under-addressed challenge**. As climate change drives up temperatures and alters rainfall patterns, the issue of evaporative water loss is gaining renewed urgency in national and regional water planning efforts.

**4.1 Average UK Reservoir Evaporation & Future Projections****Current Evaporation Rates:**

UK reservoirs typically lose **400–600 mm** of water per year to evaporation. Nationally, this equates to around **275 million cubic metres annually** — enough to supply **five million people** each year.

**Future Outlook (Next 25 Years):**

Climate modelling (UKCP18 and Penman–Monteith estimates) indicates:

- **Evaporation is expected to increase by 12–25% by the 2040s**, with the most significant rises in **spring and winter** due to warmer temperatures.
- **Southern and Eastern England** are likely to see the greatest increases, aligning with regions already facing serious water stress.
- More **variable rainfall and prolonged dry spells** will intensify evaporative losses and pressure on surface water storage.

**Implication:**

Rising evaporation will reduce available water for supply and increase operational challenges. Low-impact solutions like **Shade Balls** can play a crucial role in offsetting these losses and improving long-term water resilience.

These losses, while modest compared to those in arid climates, are far from insignificant. They represent a critical inefficiency, especially during dry spells when reservoir levels drop and demand surges. The summers of **2018, 2022, and 2023** exposed this vulnerability, with significant water restrictions imposed in parts of southern and eastern England. The Met Office has confirmed a steady increase in the number of "very hot days" in the UK, and projections suggest that summers will become **up to 50% drier by 2070**, with **temperatures potentially rising by 4°C** under high-emission scenarios.

## Impacts on Supply, Ecology, and Cost

The consequences of evaporation extend beyond mere volumetric loss. Evaporative reduction in reservoir levels:

- **Lowers drinking water availability**, particularly in water-stressed regions
- **Disrupts ecological flows** necessary for riverine and wetland health
- **Promotes algal blooms**, degrading water quality and requiring costly chemical treatment
- **Increases energy use** in pumping and water treatment operations
- **Challenges long-term planning assumptions** used in Water Resource Management Plans (WRMPs)

These impacts are exacerbated by urbanisation, increased abstraction pressures, and climate-induced changes to natural replenishment cycles.

### 4.2 National Policy Alignment

The **Environment Agency’s National Framework for Water Resources (2020)** explicitly highlights the importance of reducing water demand, improving efficiency, and planning for a more resilient water future. It calls for the creation of **regional water resource groups** and **multi-sector collaboration**, encouraging innovation in managing both supply and demand.

Similarly, **DEFRA’s 25 Year Environment Plan** includes an explicit goal to ensure “**clean and plentiful water**”, alongside boosting resilience to **climate change and drought events**. Evaporation control—though not explicitly mentioned—fits squarely within the strategic objectives of both frameworks.

### Mitigation Technologies

Practical and scalable technologies now exist to tackle surface water evaporation directly. These include:

- **Shade Balls**, which float on reservoir surfaces, blocking sunlight and reducing both evaporation and algae growth
- **Floating solar PV arrays**, which generate clean energy while reducing evaporation by shading the surface
- **Geotextile or modular floating covers**, which create impermeable layers to prevent loss

Among these, **shade balls offer the highest surface coverage at the lowest cost**, are maintenance-free, and are compatible with natural aeration and aquatic ecosystems.

### Case Example: Haweswater Reservoir

- **Surface Area:** ~3.9 km<sup>2</sup> (3.9 million m<sup>2</sup>)
- **Annual Evaporation Loss (500 mm):** ~1.95 million m<sup>3</sup>
- **Potential Savings (90% reduction):** ~1.76 million m<sup>3</sup>
- **Equivalent to:** Water supply for ~**32,000 people/year**

Incorporating evaporation-mitigation technologies at key reservoirs such as Haweswater could yield **regionally significant water savings** while enhancing resilience to future droughts.

### 4.3 Strategic Opportunity

Incorporating evaporation control technologies like shade balls into the UK's water infrastructure offers a **low-impact, high-benefit intervention** aligned with:

- **Water company WRMPs**
- **Regional drought planning**
- **Climate adaptation policy**
- **Public interest in sustainable infrastructure**

As pressures on water resources increase, embracing these technologies is a **logical and urgent step** toward building a resilient, efficient, and climate-ready water supply system for the UK.

## 5. Improving Water Quality Through Algae Suppression

Excessive algal growth in surface water bodies poses a significant risk to water quality, public health, and regulatory compliance across the UK. In wastewater treatment and open storage lagoons, uncontrolled algal blooms can cause permit breaches, increase treatment costs, and degrade aquatic ecosystems. Shade balls, by blocking sunlight and disrupting photosynthesis, offer a low-maintenance, chemical-free solution to mitigating this challenge.

### Case Study: Didmarton WRC, Wessex Water

In February 2022, Wessex Water initiated a pilot project at the Didmarton Water Recycling Centre (WRC) to test the efficacy of shade balls in reducing algal blooms and associated water quality indicators. The site discharges treated water into a lagoon before final outflow into the River Avon. Persistent algal growth within the lagoon had led to repeated permit breaches and raised concerns about the ecological impact of the effluent.



To address this, the surface of the lagoon was covered with a layer of shade balls designed to reduce sunlight penetration, thereby disrupting algal photosynthesis. Over a six-month trial period during peak summer months, water samples were collected weekly from both the lagoon inlet and final

effluent point using standard 1L PET bottles for BOD and suspended solids analysis, as well as half-filled bottles for algal cell counts. Sampling times were deliberately randomised to ensure a robust dataset.

## Results and Observations

The study yielded the following key outcomes:

- **Algae Reduction:** Final effluent algal counts consistently remained below 5,000 cells/ml, and often below 400 cells/ml. For context, even low-level algal blooms typically range from  $10^5$  to  $10^6$  cells/ml. The suppression effect was both significant and sustained throughout the test period.
- **Improved Effluent Quality:** Comparative measurements showed **notable reductions in both Biological Oxygen Demand (BOD) and suspended solids** in the final effluent versus the inlet to the lagoon. This improvement suggests that the shade balls not only prevented additional algal growth but also supported passive settling and improved biochemical stability.
- **Regulatory Compliance:** With the shade balls in place, the site remained consistently within discharge permit limits, avoiding further non-compliance issues and contributing positively to the health of the receiving watercourse, the River Avon.

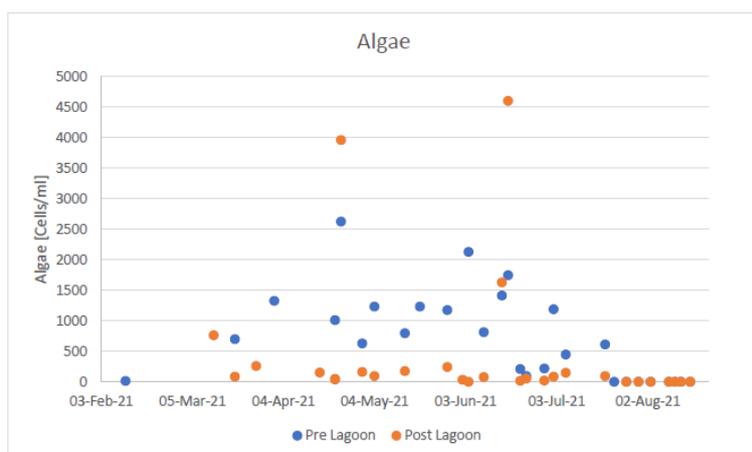


Figure 1: Algae before and after the lagoon.

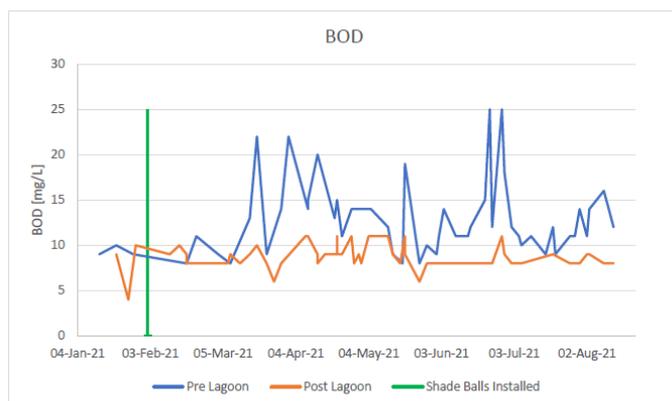


Figure 2: BOD before and after the lagoon.

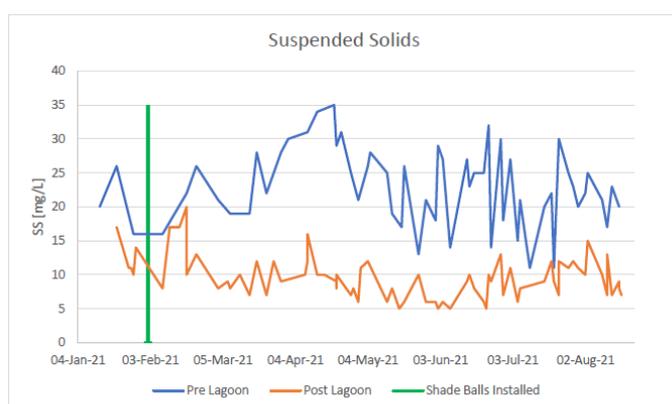


Figure 3: Suspended solids before and after the lagoon.

## 5.1 Broader Implications for Water Management

Algal blooms are not confined to wastewater lagoons. They are an increasing issue in drinking water reservoirs, agricultural runoff basins, and industrial water systems—particularly as warmer temperatures and nutrient-rich environments become more prevalent due to climate change and land use intensification.

Traditional treatments often rely on chemical algaecides or costly dredging and filtration processes. These can be energy-intensive and disruptive to aquatic ecosystems. In contrast, shade balls offer a **non-invasive, cost-effective solution** that:

- **Inhibits photosynthesis**, curbing algae growth at its source
- **Reduces the need for chemical dosing**, improving sustainability metrics
- **Supports natural sedimentation** by minimizing water agitation and direct light exposure
- **Decreases operational risks** related to odour, toxicity, and water clarity

### Supporting Evidence from Other Applications

International examples support the Didmarton findings. In Los Angeles, shade balls deployed on large municipal reservoirs led to a **90% reduction in algae-related incidents**, significantly reducing reliance



### 6.3 Economic Considerations and Life-Cycle Overview

| Benefit                   | Detail  |
|---------------------------|---|
| Capital cost              | LA example: 96 m shade balls cost ~£28 m (US\$34.5 m at \$0.36 each) <a href="#">reddit.com+5en.wikipedia.org+5de.wikipedia.org+5</a> |
| Evaporation savings       | LA — ~1.1 b l/year; Cali WRC — ~1.7 Mm <sup>3</sup> in 18 months  |
| Cost-benefit analysis     | LA saved ~US\$250 m versus other methods (dam, full covers)   |
| Payback on capital        | In Australia, savings on water supply (A\$500/ML) delivered an ROI of ~1.11x over 10 years  |
| Comparative lifespan      | Shade balls: ~10–25 years; floating covers: ~2–5 years  |
| Life-cycle considerations | Production uses water and energy; an Imperial College-led study flagged a payback period of 2–3 years                                 |

While manufacturing bears an environmental cost—e.g. ~2.9 Mm<sup>3</sup> embedded water per 96 m balls in California—studies indicate the cumulative water saved once operating efficiency stabilises exceeds embodied cost, especially if deployed for more than 3–5 years [imperial.ac.uk](#).

### 6.4 Comparative Benefits vs Alternatives

- **Versus floating solar PV:** Shade balls are significantly cheaper, faster to deploy, and avoid the need for electrical infrastructure also prevent the water from recreational use.
- **Versus impermeable covers:** Shade balls cost a small fraction of high-capital engineered covers, yet deliver comparable evaporation reduction over long lifespans [waterworld.com+6mdpi.com+6reddit.com+6](#) and also prevent the water from recreational use.
- **Versus chemical/algal treatments:** By preventing growth at source, shade balls eliminate recurring chemical costs and reduce treatment complexity.

### 6.5 Summary

Shade balls offer a low-cost, low-maintenance, and scalable tool for UK water utilities:

- **Immediate water savings** without operational complexity
- **Extended lifespan** reduces need for frequent replacement
- **Synergy with environmental goals**, reducing chemical use and emissions
- **Strong ROI** when factoring lifecycle and maintenance

By integrating shade balls into water company plans—particularly in high-evaporation and algae-prone regions—they deliver substantial benefits in **water efficiency**, **treatment cost**, and **regulatory compliance**, all while aligning with national sustainability targets.

## 7. Real-World Applications and Outcomes

### Case Study: Yorkshire Water – Emergency Supply Reservoir

Faced with recurring algal blooms and escalating operational costs, Yorkshire Water implemented shade ball technology at a strategically important emergency water supply site. The reservoir had experienced persistent algae proliferation, which not only compromised discharge quality but also led to frequent pump blockages and labour-intensive manual cleaning.

To address this, Yorkshire Water partnered with Euro-Matic to deploy a full surface coverage of shade balls across the reservoir. The project was delivered efficiently, with no disruption to ongoing operations, and required no mechanical installation or downtime.



### Key Outcomes:

- **Algae Growth Suppressed**, Significant reduction in sunlight penetration curtailed algal bloom cycles, keeping water clearer and more stable.
- **Maintenance Simplified**, Manual pump cleaning—previously frequent and costly—was eliminated, reducing site labour demands and downtime.
- **Improved Effluent Quality**, Discharge from the reservoir consistently met regulatory thresholds, reducing risk of permit breaches and associated penalties.

- **Effective Stakeholder Collaboration**, the project benefited from clear communication between Yorkshire Water site managers and Euro-Matic's engineering team, ensuring rapid deployment and ongoing performance monitoring.

This case highlights the practical impact of shade balls as a plug-and-play solution that delivers measurable improvements in water quality, operational efficiency, and regulatory compliance—all within a short timeframe and with minimal capital expenditure.

## 8. Discussion: Integrating Shade Balls into UK Water Strategy

Shade balls are not a universal fix, but a valuable component in a broader water management toolkit. They are most effective when integrated alongside conventional strategies such as leak reduction, smart metering, demand-side management, and public education. At the reservoir level, shade balls offer a low-disruption, high-impact intervention that can materially reduce water loss, stabilise water quality, and lower operating costs.

From a policy perspective, shade ball deployment supports key national objectives:

- **DEFRA's 25 Year Environment Plan** calls for “clean and plentiful water,” enhanced drought resilience, and improved ecological outcomes — all of which are directly supported by shade ball use.
- The **Environment Agency's National Framework for Water Resources (2020)** highlights the need to reduce abstraction and minimise avoidable losses; shade balls offer a practical, scalable method to retain stored water, especially during dry months.
- **OFWAT's strategy for innovation and long-term resilience** encourages water companies to adopt forward-looking, evidence-based solutions — precisely the context in which shade balls are most valuable.

Suitable Deployment Scenarios:

- **High-evaporation areas**, such as the South East and East of England, where prolonged dry periods are becoming more frequent.
- **Reservoirs prone to algal blooms**, where light suppression can reduce treatment costs and ecological impact.
- **Sites with regulatory pressure or high maintenance costs**, especially those that rely on manual pump cleaning or chemical dosing.
- **Emergency and contingency storage**, where maintaining water quality with minimal intervention is a critical operational requirement.

By combining low capital costs with measurable performance outcomes, shade balls represent a mature, climate-adaptive technology. Their alignment with existing regulatory priorities makes them a strong candidate for integration into future water resource planning — particularly in regions facing the dual pressures of climate change and population growth.

## 9. Conclusion

The UK water sector stands at a pivotal moment. With increasing climate variability, growing population demands, and ageing infrastructure, the need for resilient, scalable, and environmentally sustainable interventions is more urgent than ever. Traditional measures—while essential—must now be complemented by practical innovations that address water loss and quality challenges at the source.

Shade balls have demonstrated clear and repeatable benefits in both UK trials and international deployments. They have proven to:

- **Reduce evaporation by up to 90%**, conserving millions of litres annually
- **Suppress algal blooms**, improving water quality and reducing treatment costs
- **Provide passive, low-maintenance performance** with a lifespan of 25+ years
- **Support national goals** on water security, environmental protection, and regulatory compliance

While not a replacement for broader systemic reform, shade balls offer a highly effective, low-impact solution that complements existing water conservation strategies. Their simplicity, scalability, and track record make them a strong candidate for wider adoption across the UK's reservoir infrastructure—particularly in high-risk or high-stress catchments.

To fully realise their potential, broader deployment should be supported through:

- **Targeted pilot schemes** in evaporation-prone and algae-sensitive reservoirs
- **Inclusion in long-term asset management and water resource plans**
- **Strategic funding and innovation incentives** backed by DEFRA, OFWAT, and the Environment Agency

In short, shade balls represent a practical, proven, and cost-effective addition to the UK's evolving water management strategy—one that offers immediate impact while supporting longer-term climate resilience.