Summary of Water, Effluent, and Cleaning

Water plays a crucial role in every stage of spirit production and significantly impacts the distillery's environmental footprint.

Managing effluent might not be the most glamorous aspect of distilling, but your approach will greatly affect both the distillery's cashflow and operations, as well as its environmental impact.

Identifying effluent sources and measuring key elements are essential for effective control. Additionally, it's useful to know how local authorities use these measurements to determine treatment charges.

Once calculated, proper cleaning practices are essential for maintaining equipment, ensuring product quality, promoting safety as well as reducing your effluent loading.

Key Elements of Water, Effluent, and Cleaning:

1. **Understanding Distillery Effluent:**

Effluent is the wastewater produced during distillation, containing organic matter, chemicals, and residues. Proper management of effluent is necessary to prevent pollution, avoid fines, and protect local water sources.

The main waste comes from fermentation, product residues, CIP rinse water, used detergents and sanitisers, cleaning waste, tank rinse product waste.
Not everything is considered effluent though (or could be excluded from effluent with the right processes and mindset).

Pot ale, grape stems or spent yeast lees are often sold on as co-products, but you can also separate more to reduce your loading and increase your recycling / co-product creation rates. Examples include:

EFFLUENT TYPE	TYPICAL DISPOSAL	STORAGE NEEDED
Spent grains	Animal feed	Silo
Pot ale (or lees)	Animal feed	Waste yeast tanks
Heads and tails	Recycled to recover extract and alcohol.	Holding Tank (redistilled to recover alcohol – sent to recycle)

Hazardous chemicals	Specialist waste contractors	Secure storage tank / area
Waste solvents (or fuel)	Absorbed using spill kit then processed by specialist waste contractors	Secure storage area

2. **Measuring and Monitoring Effluent:**

The key parameters to measure, monitor and calculate effluent are:

Volume: Amount discharged in a set period.

Suspended Solids: Total suspended solids (TSS) affecting treatment.

COD: Chemical Oxygen Demand indicating organic matter breakdown.

BOD: Biological Oxygen Demand indicating microbial digestion requirement.

pH: Acidity or alkalinity, aiming for near-neutral for safe discharge.

Temperature: Should be < 20°C for watercourses discharge.

Then it's important to know what your local authority consents to and what their limits for effluent discharge are. The BOD, COD, and TSS are known collectively as the 'effluent loading' and all water agencies will have strict maximum tolerances.

It you opt to discharge your effluent into a sewer – essentially choosing to have it treated by the local authority's municipal treatment plant, it is almost certain that you will need to obtain a consent to discharge.

A typical set of consent limits looks like this:

Maximum volume: Usually in thousands of L per 24 h

Maximum suspended solids: Usually shown in mg/L (E.G. 350 mg/L)

COD: Usually shown in kg per timeframe (E.G. 600kg per 24h)

pH range: Usually shown as a range (E.G. 6-8)

Maximum temperature: E.G. Max 45°C

Effluent Treatment Options:

Treatment processes are divided into primary (solid waste removal), secondary (biological treatment), and tertiary (advanced filtration and disinfection) stages.

Aerobic systems use oxygen-loving bacteria, while anaerobic systems rely on oxygen-free environments to process waste.

Reducing effluent volume and loading through water management, chemical use reduction, and waste by-product management is essential.

3. **Water Quality and Treatment:**

Water quality affects the flavour and texture of spirits. The source and treatment of water are crucial for maintaining consistency and quality.

Water treatment methods include reverse osmosis (RO), activated carbon filtration, ultraviolet (UV) sterilization, and deionization.

Regular water quality monitoring and implementing water conservation practices are important for sustainability.

4. **Cleaning Practices and Technologies:**

Effective cleaning ensures high-quality products, extends equipment lifespan, and promotes safety.

The Sinner's Circle model (temperature, action, chemistry, time) helps optimize cleaning processes.

Cleaning-in-Place (CIP) systems automate cleaning, enhancing efficiency and minimizing contamination risks. Meanwhile, modern cleaning technologies include dry steam vapor systems and ultrasonic cleaning.

Key Takeaways for Students:

1. **Comprehensive Effluent Management:**

Implement continuous monitoring and regular sampling to understand effluent composition and ensure compliance with environmental regulations.

2. **Effective Water Quality Control:**

Treat and monitor water quality to maintain consistency and enhance the flavour profile of spirits. Utilize tools like reverse osmosis and UV sterilization.

3. **Optimized Cleaning Processes:**

Apply the Sinner's Circle model to balance temperature, action, chemistry, and time for effective cleaning. Ensure equipment is designed for easy cleaning.

4. **Sustainable Practices:**

Implement water conservation practices, such as recirculation and reuse of water, and explore opportunities for repurposing waste by-products to reduce environmental impact.

5. **Proactive Mindset and Continuous Improvement:**

Conduct audits, set goals, and develop water management plans. Stay informed about advancements in cleaning and treatment technologies to continuously improve operations.

Further Reading:

The Way of Water
Clear Waters (Managing effluent)