3D TRASAR™ Technology enables waste ultrapure process water to be recycled safely at pharmaceutical plant

NALCO Water
An Ecolab Company

CASE STUDY – PHARMA
CH-1765E

BACKGROUND

One of the world's leading pharmaceutical companies has a strong commitment to sustainability. Among their environmental commitments is a goal to reduce water consumption by 2% each year.

Many companies will have optimised the different stages of their process to use as little water as possible. These are the relatively easy efficiency gains that can be made. But after this has been done, further optimisation requires the reuse of the waste water from one part of the process as the water source for another part of the process, or recycle of waste water from the waste water treatment plant. This is a much more complex thing to do as it requires a much deeper understanding of the impact of these new connections on plant operation. What were previously fairly standard, easy to manage water sources with little variability (such as city water or well water) are replaced by water sources with completely different levels of ions and often with significant variability in the quantity available or both.

This particular site had optimised the operation of their cooling towers, steam boilers etc. to use as little city water as possible. To make further savings, it was necessary to reuse some of the waste streams as the water source for further unit operations.

The site had identified that it had an ultrapure (UPW) process water plant that had two main waste water streams, reverse osmosis (RO) reject water and continuous electro-deionization (CEDI) reject water.

GOALS

Management at the site believed that it might be possible to reuse this waste water from the UPW plant as partial replacement for the city water make up supply to one of their cooling towers. However, it was apparent that there might be complexities involved.

Customer Impact	eROI℠	Economic Results
11,680 m^3 of water saved per year, reducing fresh water consumption in the cooling tower by 50%	WATER	Annual savings in water € 22,075 per year (€11,563 of make-up water cost and €10,512 of discharge water cost)

eROI is our exponential value: the combined outcomes of improved performance, operational efficiency and sustainable impact delivered through our services and programs.

The site goals were to:

- Reuse as much of the RO reject and CEDI reject as possible
- Avoid any negative impact on the cooling water system from using these waters
- Have a robust system for managing the cooling water chemistry that can take account of the variability of the system.

CURRENT SITUATION

The site approached Nalco Water to advise on the practicality and recommended course of action.

The first step was to review the current operation of the cooling tower to understand the water dynamics of evaporation rate, blowdown rate and make-up rate. It was immediately apparent that there was insufficient RO and CEDI reject water available to completely replace the city water make up to the tower.

This introduces a further level of complexity. As the reuse water would be only a partial replacement for the city water, it would be necessary to model what the tower water quality would be under different conditions of blowdown rate; as the blowdown rate decreased, a greater proportion of the make-up water would be coming from the UPW waste water. This means that in effect changing the blowdown rate also changes the make-up water quality; a completely different situation compared to when all the make-up water comes from a single source as is the case in most cooling systems.

So, the second major step was to model what the water quality would be under different scenarios and then consider how that water quality could be successfully chemically treated to prevent scaling, corrosion and microbiological activity.

Having determined the optimal water balance for the system, predicted the water chemistry and selected appropriate water treatment chemistry, attention then turned to the control systems. It was recognised that the control system would be a vitally important part of the new operation as there would be a much increased need to handle wider variations in water quality. Without an effective control system significant scaling or corrosion damage could occur.

SOLUTIONS

3D TRASAR Technology

Nalco Water proposed utilising its unique 3D TRASAR Technology. This technology combines highly effective treatment chemicals that are especially effective in these stressed conditions and the most advanced monitoring and control techniques to ensure that treatment levels are adjusted on-line to take account of the system variability.

The system includes on-line measurement of the corrosion rate and scaling risks to ensure the cooling system can operate at maximum water efficiency without taking undesirable risks.

RESULTS

The site installed a collection tank to receive the waste water from the UPW plant. The water in this collection tank is then pumped into a return cooling water line that runs close by.

The average amount of water reused this way is 32 m^3 per day, representing 50% of the make-up water and saving €22,075 per year (€11,563 of make-up water cost and €10,512 of discharge water cost).

CONCLUSIONS

The reuse of process wastewater as cooling tower make up presents many challenges. These need to be addressed methodically and comprehensively if this is to be achieved safely and without any adverse impacts upon the receiving system.

The use of Nalco Water 3D TRASAR Technology, and the Nalco Water on-site expertise to assess and control the risks correctly, enables this to be done, making significant contributions to water use efficiency and sustainability to meet customers' key business drivers.

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