

WATER EFFICIENCY CAN BE A STEAMY ISSUE FOR POWER PLANTS

Generating power can mean the use of a diverse range of technology, from a simple coal fired facility to the latest in nuclear plants. But all have one thing in common, the need to control heat and produce steam, and this generally necessitates using large volumes of process water.

Traditionally water is supplied to a power station from a nearby river or from the sea. However, both of these sources have issues of water quality. Ideally, water should be cool, clean and free from contamination but this is seldom the case.

Contamination from sea water can include Zebra Mussels, small fish and seaweed, combined with sand and high chlorine levels. River water can contain sand algae and diatom contamination.

In order to condition the water to be suitable for use, traditional methods involving chemical treatment in combination with filtration plants and softeners are all employed.

In many operations, the use of water is often an accepted process cost. There is scant attention paid to ways in which better water quality can significantly improve overall plant performance and reduce operating costs.

By employing modern filtration technology to some areas not normally examined as a primary application, power plants can improve both heat transfer efficiencies and sophisticated plant protection which will impact on the total generating cost and environmental impact.

Cooling Water

When evaporative cooling towers or high efficiency tube heat exchangers are used for cooling, the drop in efficiency is normally put down to the pumps or fans consuming more power and accepted as 'the norm'. As a matter of fact, efficiency is also dropping due to the reduction of heat transfer efficiency through contaminants collected in the water and deposited onto the heat transfer surfaces.

Tests on typical cooling water would show that the majority of particle contamination is significantly higher below the 10 micron size than above it. It is true that the larger particles can be the primary cause of premature blockage, but the removal of the finer debris minimises the possibility of bio fouling whilst at the same time removing the larger contamination.

These elements can lead to premature tube blockage, bio fouling and or silting, all of which results in significant plant performance losses.

Effective removal of these particles can actually boost efficiency and reduce the risk of biological contamination. Side stream filtration, correctly applied to handle a rate of between 3-15% of the total volume or flow on cooling systems (the higher the side stream flow the quicker the clean-up is achieved), can be installed to remove contamination down to 0.5 micron or 2.0 micron. This approach has been shown to improve plant performance, reduce chemical costs and improve biological control.

Steam Raising

Many power plants take river water for both steam generation and cooling water make up. However the quality of water drawn from a river will vary depending on location, climatic considerations and up stream inputs (such as effluent plant and other industrial users).

The use of high efficiency media filtration technology when used as a prefilter can remove contamination to less than 1.0 micron, thereby reducing the load on the conventional RO plants. This can significantly improve the feed water quality to the membrane plant often reducing the fouling factor. This leads to extended operation cycles with lower operational cleaning thereby reducing costs and increasing membrane life.

Coal Storage

Traditional coal fired power plants carry huge stocks of coal on site. During periods of heavy rain especially, the environment has to be protected from the waste run off from these coal fields as coal laden water cannot be returned to the river without the removal of the coal. This can easily be achieved by the correct combination of filtration technology. For example, simple installation of Gravity drum filters can effectively protect the river from contamination, whilst returning the recovered coal to stocks so providing a double benefit.

Pump Protection and Lubrication

With nuclear power plants many of the above applications exist, but in many cases the water source is not river but sea water, which in itself presents a new set of challenges. The filtration of sea water for pump cooling using two stage SpinClean systems is tried and tested application within the nuclear arena. However, more and more plants are looking to the latest in high efficiency media filtration called CrossFlowMF1.0 to remove fine corrosion products from the cooling water within the reactor cooling circuits.



CrossFlowMF1.0 is the latest technology that filters below 1.0 micron - reliably – even achieving down to 0.45 micron to ensure cleaner process water. This in turn can reduce a power plants carbon footprint.

Operationally, this technology utilises a unique patented vortex bed stabiliser which maintains flat bed filtration with high surface turbulence. This ensures that no bio-fouling can be seeded whilst holding filtered contamination in suspension above

the media bed. This gives lower pressure drops, longer filtration and shorter backwash cycles making direct savings on operational costs.

The high interstitial void volume of the media allows for greater dirt holding capacity and contamination interaction for the Zeta potential of the media to remove the finer particulates.

Compared with conventional media filtration, the inlet configuration allows for high flow rates, these being 5 times higher than the normal accepted flux rates of conventional filters. Backwash volume used is also significantly lower, especially when the longer operational period is taken into consideration. It is also more effective with backwash times per unit being as low as 2 minutes.

This new technology has been shown to provide a high efficiency removal rate of over 86% at 1.0 micron in one single pass whereas conventional filters have to undertake multiple passes to get anywhere such efficiency.

All of these benefits have proven that water is a true energy source as well as a valuable resource which, on the world stage, is a diminishing resource. By bringing in the use of innovative water saving solution, everyone and the environment will benefit.

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