

PUMPING RETURN ACTIVATED SLUDGE [RAS]

One of the properties of the screw centrifugal impeller is its low shear properties. This arises from the fact the single spiral vane is approximately three times longer than the vane in the conventional waste water pump therefore it takes the liquid three times as long to pass through the impeller from entrance to exit. This impeller geometry means there is a long slow turn from axial to radial direction with significantly lower acceleration and deceleration of the flow. In the case of return activated sludge, the gentle passage through the pump means there is no damage to the floc which is often the primary concern of the process engineer.

RAS pumps frequently have low heads which means the duties fall within the capabilities of axial [propeller] pumps. Unlike the screw centrifugal pump with its single spiral vane impeller, the axial flow propeller will typically have 3 or 4 blades and the diffuser which sits immediately behind the propeller will typically have between 5 and 7 blades. This pump geometry is not conducive to gentle/low shear pumping.

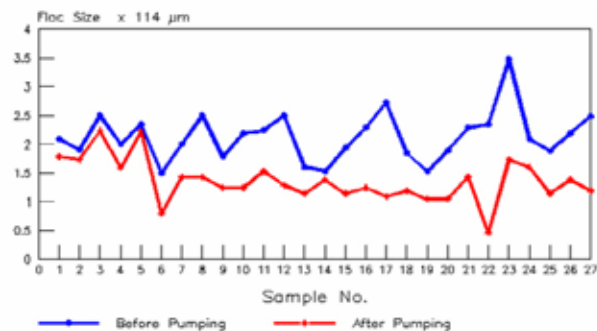
COMPARATIVE TESTS

Axial Flow v Hidrostal

The following tests clearly show a multi blade axial flow propeller pump will significantly damage the floc on return activated sludge. However, when replaced by screw centrifugal pumps no damage occurred.

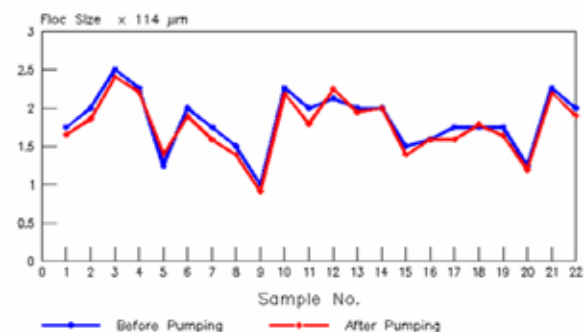
FLOC SIZES OF RETURN ACTIVATED SLUDGE USING 18" [450mm] AXIAL FLOW PROPELLER PUMP

→ Axial Flow propeller pumps cause damage



FLOC SIZES OF RETURN ACTIVATED SLUDGE USING 16" [400mm] SCREW CENTRIFUGAL PUMP

→ No damage



In addition, the replacement of the axial-flow propeller pumps by screw centrifugal pumps solved the problem of frequent blockages and high maintenance costs and significantly improved the quality of the final effluent as a result of better settleability and size of the floc.

Archimedean Pumps for RAS Pumping

Ever since the activated sludge process has been used as part of a sewage treatment process, Archimedean screw pumps have been the preferred choice to lift the activated sludge so it can be returned to the head of the works. This is because they are an ideal pump to lift large volumes through relatively low heads and, due to its slow rotational speed, do not damage the floc. It is also a pump that is capable of handling any rags and fibres present in the sludge.

However, since the arrival of the screw centrifugal pump there has been a real choice. Previously, only propeller pumps which damaged floc offered a lower cost alternative. Now the screw centrifugal pump offers lower capital cost and the benefit of non damage low shear pumping, as well as the ability to handle rags and fibre.

The Archimedean screw pump also offered another very important benefit namely it would flow match or was self regulating. As the inflow varied, the sump level would rise and fall and the screw pump would automatically vary its output, so it would smoothly and continuously return the activated sludge back into process at the same rate as it was being removed within the maximum and minimum limits of the pump. As a consequence, the pump was deemed to be self-regulating.

This same beneficial characteristic is available using the Hidrostal Prerostal system [See Section 10 of this folder and 10.3 'A comparison of Prerostal% vs. Archimedean screw].