

## 15.- Biopaq Anaerobic Flotation Reactor (AFR®)

<b>Title and name of product or technology</b>
BIOPAQ AFR®, Anaerobic Flotation Reactor
<b>Abstract</b>
<p>The commonly known UASB and the high-rate IC reactors are the industry-standard for treatment of wastewater with higher concentration COD but this water also should be relatively 'clear' in terms of very little suspended solids and nearly no FOG (Fat, Oil and Grease). In typical situations where content of solids and FOG in the waste water are too high one always needs pre-treatment steps such as settling tanks and/or DAF units in order to remove FOG. These pre-treatment steps are a necessity and therefore critical. They make the whole installation more vulnerable to malfunctioning; they require chemical dosing and produce a sludge layer from the DAF unit that often can not be treated on site.</p> <p>For solid waste streams or for heavy slurries the current option is to digest it in a CSTR. These can only treat low loads, are large due to long retention times and can not be used for water. The digested material leaves the CSTR as a mixture of digested matter and water and needs a post treatment (dewatering) to separate the water from the digested material.</p> <p>Paques now has developed the AFR reactor: a new and innovative technology that <i>fills in the longtime existing gap</i> between the CSTR-digesters (for fat and solids containing slurries) and the high-rate IC reactor (which always need a DAF when waste water contains FOG).</p> <p>The new AFR reactor is a single reactor system where slurries and water containing biodegradable solids, fat, oil, grease and SCOD are all together mixed and digested into biogas and clean effluent.</p>
<b>Description including main features/advantages</b>
<p>The AFR combines the pre-, main- and post treatment in a one-stage system with flocculent sludge. The physical or chemical pre-treatment as well as the post-treatment to remove sludge can be skipped due to an integrated flotation unit.</p> <p>The flotation unit supports the biomass retention and therefore a high biomass density in the reactor so that the HRT can be shortened, whereas the SRT remains high. This will contribute to a compact, space saving design of the reactor. The increased SRT will enable the system to deal with the fat and the solid content of the wastewater that normally causes difficulties in granular anaerobic biological treatment. The retention of the compounds due to flotation facilitates the anaerobic digestion and will contribute to their conversion into biogas.</p>
<b>Innovative aspects</b>
<p>The BIOPAQ AFR® is a completely new technology that makes it possible to treat wastewater rich in COD and FOG in a single reactor whilst biogas is generated both from the soluble COD in the water as from the solids and FOG part.</p> <p>One single AFR reactor can replace a train of DAF+EGSB+CSTR.</p>
<b>Current and potential industrial users/domains of application</b>
<ul style="list-style-type: none"> <li>- tankcleaning companies (that clean tankertrucks carrying food-stuff)</li> <li>- dairy processing industry</li> <li>- industries processing food, fats, vegetable oil, proteins etc</li> </ul>
<b>Current state of development</b>
<p>A first prototype has been built at a tankcleaning company. Paques is now ready to research the applicability in other industries. A mobile AFR pilot unit is available to do on-site testing with specific streams.</p>

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