

## **Study of Flotation Unit parameters used to separate contaminants in treated water<sup>1</sup>**

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### **Summary**

The floatation unit technology is considered a more advanced methodology than the sedimentation approach as it is more effective in separating most contaminants regardless of its size no matter how small and tiny it was and irrespective of the minimal density difference between the water and most contaminants. The sedimentation approach depends on using assisting water that contains more dissolved air than the normal water under the regular conditions and therefore, once the over saturated water (assisting water) enters the container of the floatation unit filled with contaminated water, small bubbles will formulate immediately sticking most of the contaminants that exist in the contaminated water, whether small or big leading to a reduction of its density and thereof floating on surface during a short period of time. The floating sludge can be removed mechanically.

To obtain over-saturated water, it can be done through mixing air with water under high pressure which will result in dissolving more air compared to the one that could dissolve under regular conditions.

It is well known that the amount of air that can dissolve in water under a stable temperature relates forward to the water pressure. Consequently, the increase in water pressure increases the amount of dissolved air.

<sup>1</sup> For the paper in Arabic see pages (45-71).

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- The study of the impact of Hydraulic flow related to the floating area  $Q_{AF}$  , and the impact of quantity flow of solid materials related to the floating area  $B_A$  [kg/m<sup>2</sup>-h] enables us to determine the most accurate dimensions for the floating container and thereof, better control of the performance of the floating unit.
- The quantity and size of the released bubbles from the over saturated water records best results under saturation pressure range  $p_D = \Delta p$  between 5 and 7 [bar]. Whereas, any increase over the above mentioned rates is considered insignificant.
- The quantity and size of the released bubbles from the over saturated water records best results under vacuum pressure  $p_S$  range at the entrance of the saturation pump varies between -0.15 and -0.25 [bar]. Whereas and decrease  $p_S$  below -0.15 [bar] may lead to low saturation.
- The increase in the quantity of saturated air  $L_{Luft}$  over the range of 38 24 ~ [NL/m<sup>3</sup>] and the decrease of the air vacuum pressure of the saturation pump under -.25 [bar] will lead to formulating additional amount of air on top of the saturation tank which will indicate that these amounts of air has not dissolve in water. We hereby notice that this is one of the irregular operating methods that affect negatively in the efficiency of the floatation technique.
- The addition of Polymers solution at the percentage of (0.62 [gTS/L<sub>H2O</sub>F]) to the contaminated water helps the tiny molecules of the sludge to stick together formulating big molecules which facilitates the floatation process.
- The decrease in the frequency of the skimming mechanism  $f_R$  leads to increase in the percentage of solid materials in the flotation sludge  $TS_{FL}$  , in addition to increased quantity of the flotation sludge.