Apinya Siriwanlop 2006: Investigation of Flocculent-Flocs in a Multilayer-Floating-Media Flocculator Using High Resolution Images. Master of Engineering (Environmental Engineering), Major Field: Environmental Engineering, Department of Environmental Engineering.
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A combination of photography, video and image analysis were used to investigate flocculent-floc in a multilayer-floating-media flocculator. Real-time flocculent-floc images were recorded by a digital camera. It was an optical floc sampling technique which did not intrude the system and did not destroy the floc. This technique could be used to measure number, size, and density of flocculent-floc. A digital camera was set in front of the column which was illuminated by 3 light-sources on the opposite side of the column to provide back-lighting. The flocculent-flocs were compared with microscopic analysis and digital image analysis. The flocculent-floc sizes did not correspond between microscopy and photography. This was because microscopic analysis could not measure realistic floc size without floc disruption and breaking during sampling and handling. Floc density in comparison to flocculent-floc size significantly changed in that density decreases with increasing floc size.

The performance of a multilayer floating-media flocculator using different bead sizes such as 3-mm, 6-mm and 10-mm was investigated in terms of large-floc formation and low-head-loss development. From the experimental results, the following conditions were obtained. The dosages of coagulant, polyaluminium chloride (PACl) at 1.25mg/L, 2.5 mg/L, 5 mg/L, 10 mg/L and mg/L under different hydraulic rates of 2.5 m^3/m^2-h, 5 m^3/m^2-h and 10 m^3/m^2-h were used to investigate the performance of this system. For a controlled experiment of 80-NTU influent turbidity, the optimum hydraulic rate and PACl dose were 2.5 m^3/m^2-h and 2.5 mg/L, the highest turbidity removal of 95.2%, the maximum floc size of digital image analysis of 327 μm, maximum floc size of microscopic analysis of 60 μm, floc density 1.01038 g/cm^3, and the lowest head-loss development of 10 mm were achieved in this optimum condition. The multilayer floating media had several advantages over the single media, such as lower head-loss development, allowing fine floc to penetrate deeper, more area of media utilized, better turbidity control and bigger floc formed.

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