Charpter VI

PELLET FLOCCULATION FOR LOW-CONCENTRATION SUSPENSION

6.1 Comparision definition of pellet flocculation to normal flocculation in this investigation

In this research, the author would like to divide the flocculating science and engineering into two distinct parts as follow:

6.1.1 Normal flocculation was the process for producing normal floc with low-settling velocity due to low density of floc.

6.1.2 Pellet flocculation was devided into two main subdivisions which were dependent on the concentration of suspension in the system.

6.1.2.1 Pellet flocculation for low-concentration suspension to produce small pellet floc size with high settling velocity due to high density of floc.

6.1.2.2 Pellet flocculation for moderate-high and high concentration suspension to produce large pellet floc size with high settling velocity due to high density of floc.

Because of different in concentration of suspension in both kinds of pellet flocculation. Therefore, some mechanism of

pellet flocculation was expected to be quite different.

6.2 Mechanism of pellet flocculation for low-concentration suspension

Above mechanisms which had stated by Yusa et al., Tambo and Matsui, and Watanabe et al., had been used for explanation in phenomena of the pellet flocculating technique in those case of moderately high and high concentration suspension. Because low-concentration suspension had some property diffrent from those of moderately high and high concentration suspension. So, Tambo suggested that, in low-concentration suspension metastable state was less possibily happening than moderately high and high concentration suspension. Therefore, one by one attachment growth of pellet floc was less possibily happening for pellet flocculation in low-concentration suspension also (Tambo, 1990).

This investigation, the main objective was clarification of low-concentration suspension. The actual mechanism of pellet flocculation quite complex and were not clearly understood. Because there were no suitable mechanism for explanation of this phenomenon, especially in the case of low-concentration suspension. Thus, the author postulated the mechanism of pellet flocculation for low turbid water, which was presented in the 50 NTU turbid water treatment step (see detail in chapter 4), for further studying. Under the suitable condition of the treatise, in the fluidized pellet-floc bed clarifier, the mechanism of pellet flocculation for clarification of low turbid water were postulated as follow:

Microflocs from the rapid mixing tank attacted with anionic polymer to act as elementary particles of the following process. After that, the elementary particles would be sent into the bottom part of the fluidized pellet-floc bed clarifier. The elementary particles would agglomerate with each others and with the previous pellet flocs to form strong floc-aggregates. The strong floc-aggregates were formed by means of normal floc-normal floc aggregation, normal floc-pellet floc aggregation and pellet floc-pellet floc aggregation, by adsorption action and/or bridging action of floc to floc. Under the special condition, strong floc-aggreates were tough enough to hold together, yet weak enough to deform and reduce in size. Therefore, in this investigating condition the strong floc-aggregates were more compacted by uneven-external force which was given onto the surface of the strong floc-aggregates by collision action of floc and rolling action of floc by means of floc-floc action and/or floc-solid surface action. Suitable uneven-external force could induce by optimal velocity gradient of suitable paddle agitation. When uneven-external force was given onto the surface of the strong floc-aggregates, that external force could promote to cause an rearrangement of flocs in the aggregates, and also leading to deformed shrinkage of the aggregates. The liquid in flocs and aggregates were exuded from the aggregates while deformability and shrinkage action of the aggregates and produced more compact, pellet floc as result.

When some of low density flocs and floc aggregates from the bottom and the lower region of the fluidized bed were moved upward to the upper region of the bed by upflow velocity. The

flocs were more compacted by uneven-external force given on surface of floc also. Therefore, the result of the phenomenon would be high-density pellet flocs at the upper region also.

Along the path way of the fluidized bed, shear rate force of a suitable intensity of paddle agitation would brokedown the irregulary growth part of floc and the low-strenght part of flocs or splitting the large floc size into equilibrium floc size. Thereby releasing some trap water from flocs while the flocs were broken also. Therefore, leading to make the flocs slightly sphearical in shape and produced equilibrium floc size as result. The minute fractures or small fragments of the broken flocs would be entrapped in the pellet-floc bed. By this way, the minute fractures would contact and aggregate with other flocs to reaggregate flocs into floc aggregates. And were more compacted by uneven-external force given on surface of the floc aggregates as well.

Flocs on the upper region of the fluidized pellet-floc bed which had higher settling velocity than hydraulic upflow velocity would settle down to the lower and the bottom region of theábed. These flocs would agglomerate with the new elementary particles that were introduced in the clarifier, to form high density and strong floc-aggregates. The strong floc-aggregates were more compacted by uneven-external force to producing high density pellet flocs again and again.

The concept mechanism of pellet flocculation for low turbid water by mean of this investigation was shown in figure 6.1 as follow:

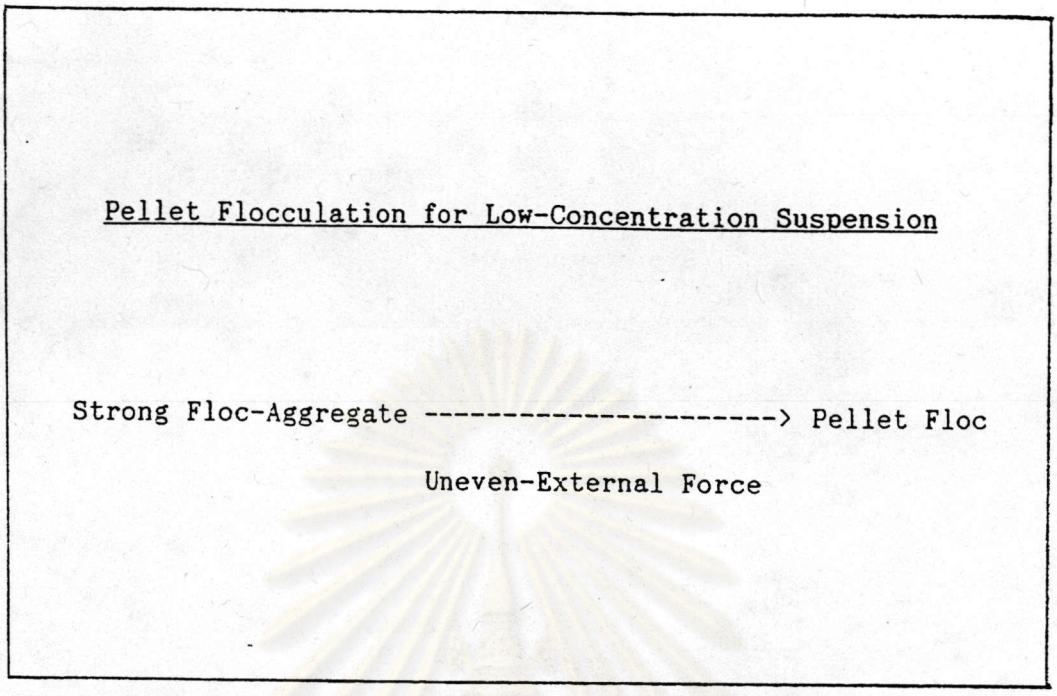

Figure 6.1 Pellet-flocculation mechanism for low-concentration suspension by mean of this investigation.