Chapter V

RESULTS AND DISCUSSION

5.1 Effect of PAC1 and polymer dosages on effluent turbidity of upflow velocity 30 cm./min.

From the experimental results had shown in figure 5.1 could be described as follow:

5.1.1 Consider at 5 rpm. of paddle agitating speed

At PAC1 dosages of 1 and 2 mg./l. indicated that at polymer dosage of 0.1 mg./l. the effluent turbidity were in range from 6.9 to 12.1 NTU. When increased polymer dosages from 0.1 mg./l. to 0.2 and 0.3 mg./l. the effluent turbidity were in range from 3.6 to 7.5 NTU.

At PAC1 dosages of 3 and 4 mg./l. indicated that at polymer dosages of 0.1, 0.2 and 0.3 mg./l. the effluent were quite similar in quality, between 0.7 and 2.8 NTU.

5.1.2 Consider at 10 rpm. of paddle agitating speed

At PAC1 dosages of 1 and 2 mg./l. indicated that at polymer dosage of 0.1 mg./l. the effluent turbidity were in range from 5.4 to 6.3 NTU. When increased polymer dosages from 0.1 mg./l. to 0.2 and 0.3 mg./l. the effluent turbidity were quite similar in quality, between 2.9 and 3.8 NTU.

At PAC1 dosages of 3 and 4 mg./l. indicated that

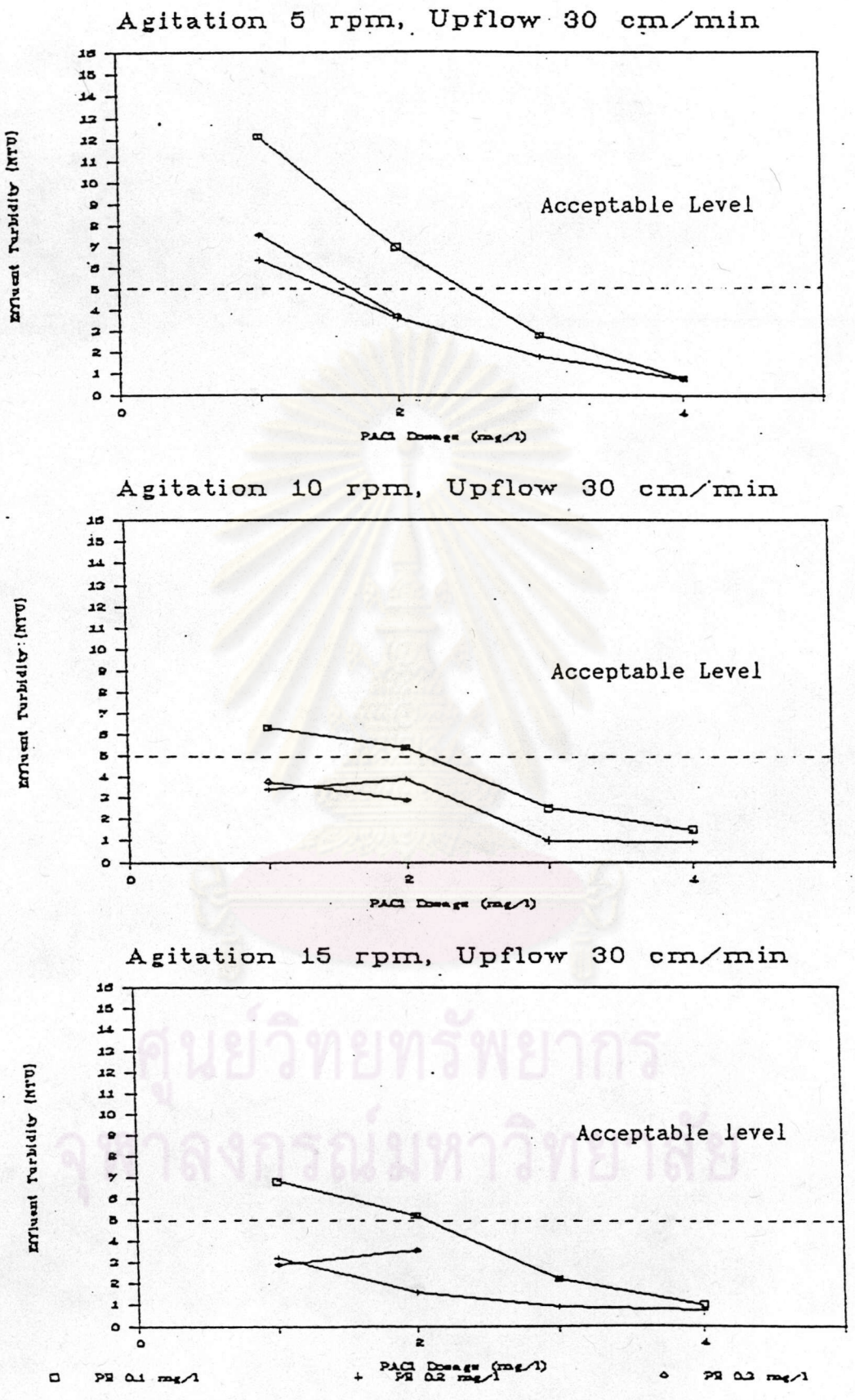

Figure 5.1 Effluent turbidity with PACl dosage, at various polymer dosages for upflow velocity of 30 cm./min. and 5, 10, 15 rpm. of speeds of paddle agitation.

at polymer dosages of 0.1 and 0.2 mg./l. the effluent were quite similar in quality, between 0.9 and 2.5 NTU.

5.1.3 Consider at 15 rpm. of paddle agitating speed

At PAC1 dosages of 1 and 2 mg./l. indicated that at polymer dosage of 0.1 mg./l. the effluent turbidity were in range from 5.2 to 6.8 NTU. When increased polymer dosages from 0.1 mg./l. to 0.2 and 0.3 mg./l. the effluent turbidity were quite similar in quality, between 1.6 and 3.6 NTU.

At PAC1 dosages of 3 and 4 mg./l. indicated that at polymer dosages of 0.1 and 0.2 mg./l. the effluent turbidity were quite similar in quality, between 0.7 and 2.2 NTU.

5.1.4 Discussion of the experimental results

Using upflow rate of 30 cm./min. indicated that at PAC1 dosages of 1 and 2 mg./l. tend to required higher polymer dosages of 0.2 and 0.3 mg./l. for producing good clarified water, between 1.6 and 7.5 NTU. When used higher PAC1 dosages of 3 and 4 mg./l., indicated that every polymer dosages could produce quite similar in good quality of clarified water, between 0.7 and 2.8 NTU.

From above results suggested that higher PAC1 dosages promoted sligthly better charge neutralization of the colloidal particles and also leading to permit better attachment of the particles into flocs, when contact occur, than using lower PAC1 dosages. So that at higher PAC1 dosages, could be produced clearer treated water than using lower PAC1 dosages. When higher polymer dosages were used, slightly better clarified water could be produced than using lower polymer dosages. Thus, at the lower polymer dosages tend to require higher PAC1 dosages to achieve in

permitting better attachment of the particles into flocs, when contact occur. Therefore, leading to made more possibility to produce good pellet flocs and clarified water as well.

5.2 Effect of PACl dosage and speed of paddle agitation on effluent turbidity of upflow velocity 30 cm./min.

From the experimental results had shown in figure 5.2 could be described as follow:

5.2.1 Consider at 0.1 mg./l. of anionic polymer dosage

At PACl dosages of 1 and 2 mg./l. indicated that at 5 rpm. of paddle agitating speed the effluent turbidity were in range of 6.9 to 12.1 NTU. When increased speed of paddle agitation from 5 rpm. to 10 and 15 rpm. the effluent turbidity were quite similar in quality, between 5.2 and 6.8 NTU.

At PACl dosages of 3 and 4 mg./l. indicated that at all speed of paddle agitation the effluent turbidity were quite similar in quality, between 0.8 and 2.8 NTU.

5.2.2 Consider at 0.2 mg./l. of anionic polymer dosage

At PACl dosages of 1 and 2 mg./l. indicated that at 5 rpm. of paddle agitating speed the effluent turbidity were in range from 3.6 to 6.3 NTU. When increased speed of paddle agitation from 5 rpm. to 10 and 15 rpm. the effluent turbidity were quite similar in quality, between 1.6 and 3.9 NTU.

At PACl dosages of 3 and 4 mg./l. indicated that at all speed of paddle agitation the effluent turbidity were quite similar in quality, between 0.7 and 1.8 NTU.

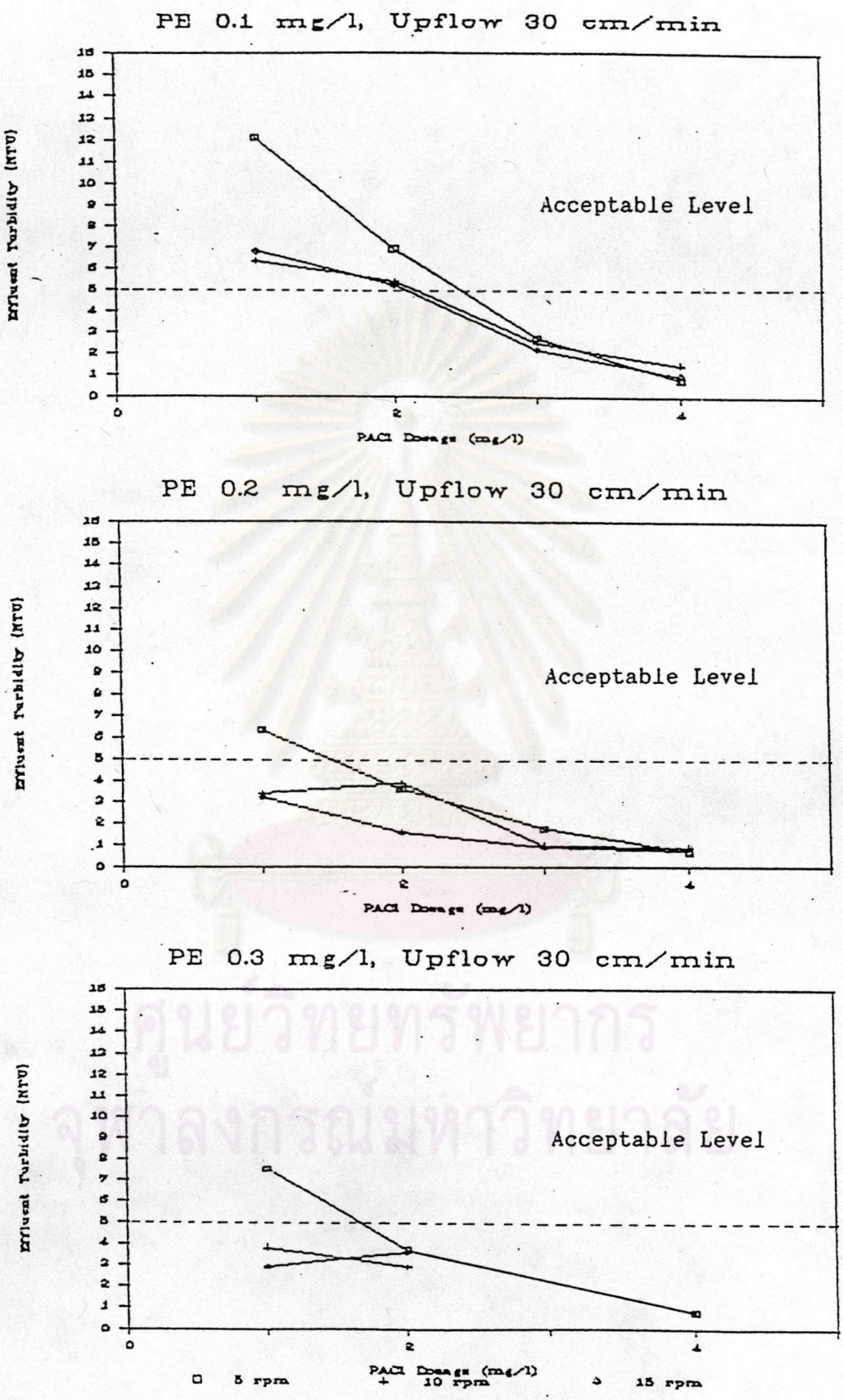

Figure 5.2 Effluent turbidity with PACl dosage, at various speeds of paddle-agitation for upflow velocity of 30 cm./min. and 0.1, 0.2, 0.3 mg./l. of polymer dosages.

5.2.3 Consider at 0.3 mg./l. of anionic polymer dosage

At PAC1 dosages of 1 and 2 mg./l. indicated that at 5 rpm. of paddle agitating speed the effluent turbidity were in range from 3.7 to 7.5 NTU. When increase speed of paddle agitation from 5 rpm. to 10 and 15 rpm. the effluent turbidity were quite similar in quality, between 2.9 and 3.8 NTU.

At PAC1 dosage of 4 mg./l. indicated that at 5 rpm. of paddle agitating speed could produce very good effluent turbidity of 0.8 NTU.

5.2.4 Discussion of the experimental results

In this investigation indicated that at higher PAC1 dosages of 3 and 4 mg./l. produce sligthly better clarified water than at lower PAC1 dosages of 1 and 2 mg./l. From above results showed that higher speed of paddle rotation of 10 and 15 rpm. produced sligthly lower effluent turbidity, between 1.6 and 6.8 NTU, than the effluent that produced by 5 rpm. of paddle rotating speed. At high PAC1 dosages of 3 and 4 mg./l. indicated that at all rate of paddle rotation could produce quite similar in quality of clarified water, between 0.7 and 2.8 NTU.

From the above results showed that at lower PAC1 dosage required higher intensity of agitation for producing good clarified water than using higher PAC1 dosages. When high PAC1 dosages were used, indicated that all rate of paddle agitation were enough for producing good effluent turbidity. From the results suggested that at 10 and 15 rpm. of paddle agitating speed tend to slightly more suitable for this flocculation and clarification process at upflow velocity of 30 cm./min., especially in low PAC1 dosages.

5.3 Effect of PAC1 and polymer dosages on pellet-floc settling velocity of upflow velocity 30 cm./mim.

From the experimental results had shown in figure 5.3 could be described as follow:

5.3.1 Experimental results of this investigation

From the results showed that settling velocities of pellet flocs were quite constant in the same range from about 42 to 61 cm./min., seem that at all PAC1 and polymer dosages used in this investigation produced the same range of pellet-floc settling velocity.

5.3.2 Discussion of the experimental results

From the above results at upflow velocity of 30 cm./min., PAC1 dosages of 1-4 mg./l. and polymer dosages of 0.1-0.3 mg./l. indicated that all of PAC1 and polymer dosages were suitable for producing higher settling velocity of pellet flocs than hydraulic upflow velocity of this flocculation and clarification process.

5.4 Effect of PAC1 and speed of paddle agitation on pellet-floc settling velocity of upflow velocity 30 cm./mim.

From the experimental results had shown in figure 5.4 could be described as follow:

5.4.1 Experimental results of this investigation

In figure 5.4 had shown that pellet-floc settling velocity was quite constant in the same range from 42 to 61 cm./min., thus indicated that all PAC1 dosages and speeds of

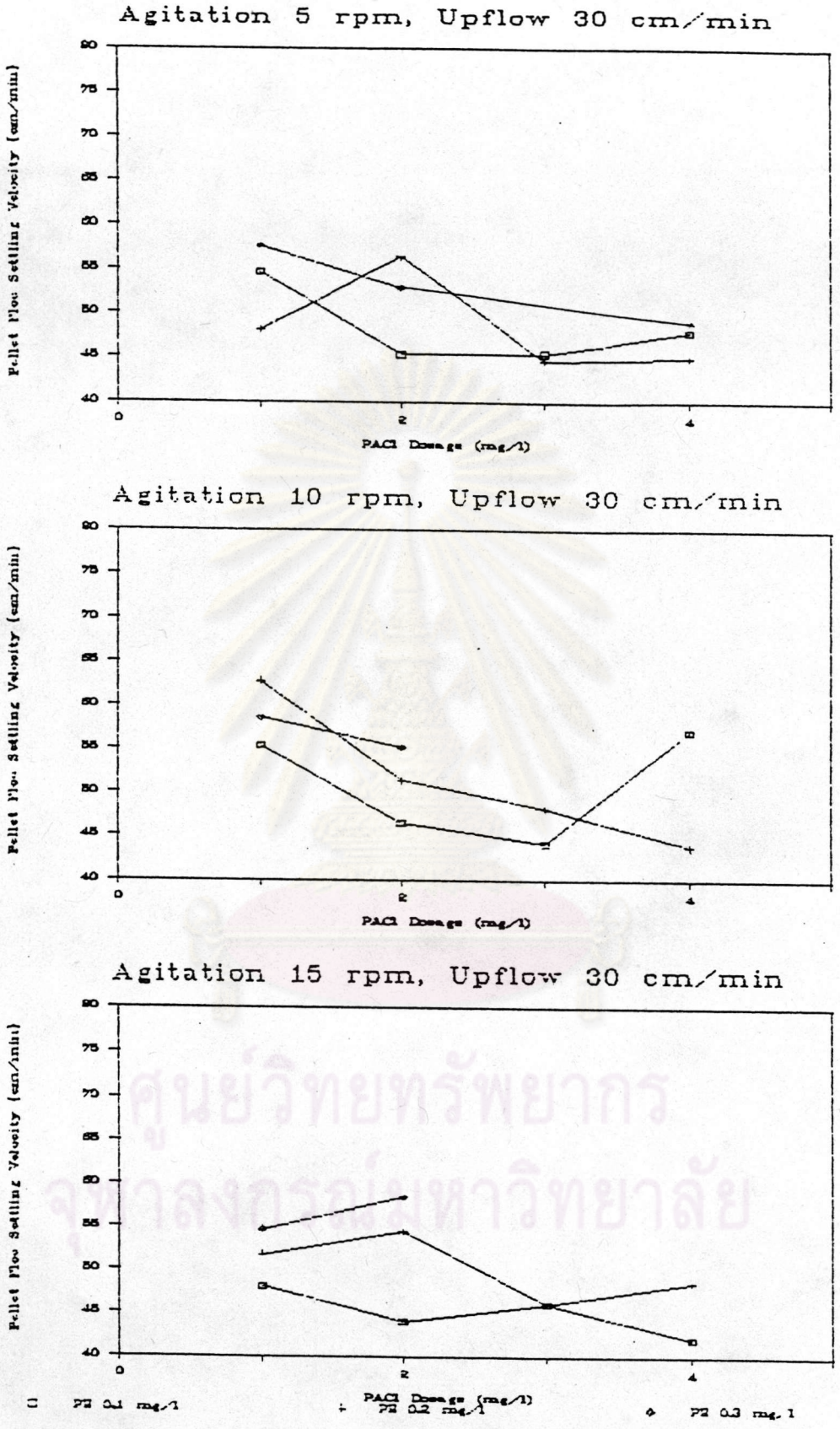

Figure 5.3 Pellet-floc settling velocity with PACl dosage, at various polymer dosages for upflow velocity of 30 cm./min. and 5, 10, 15 rpm. of speeds of paddle agitation.

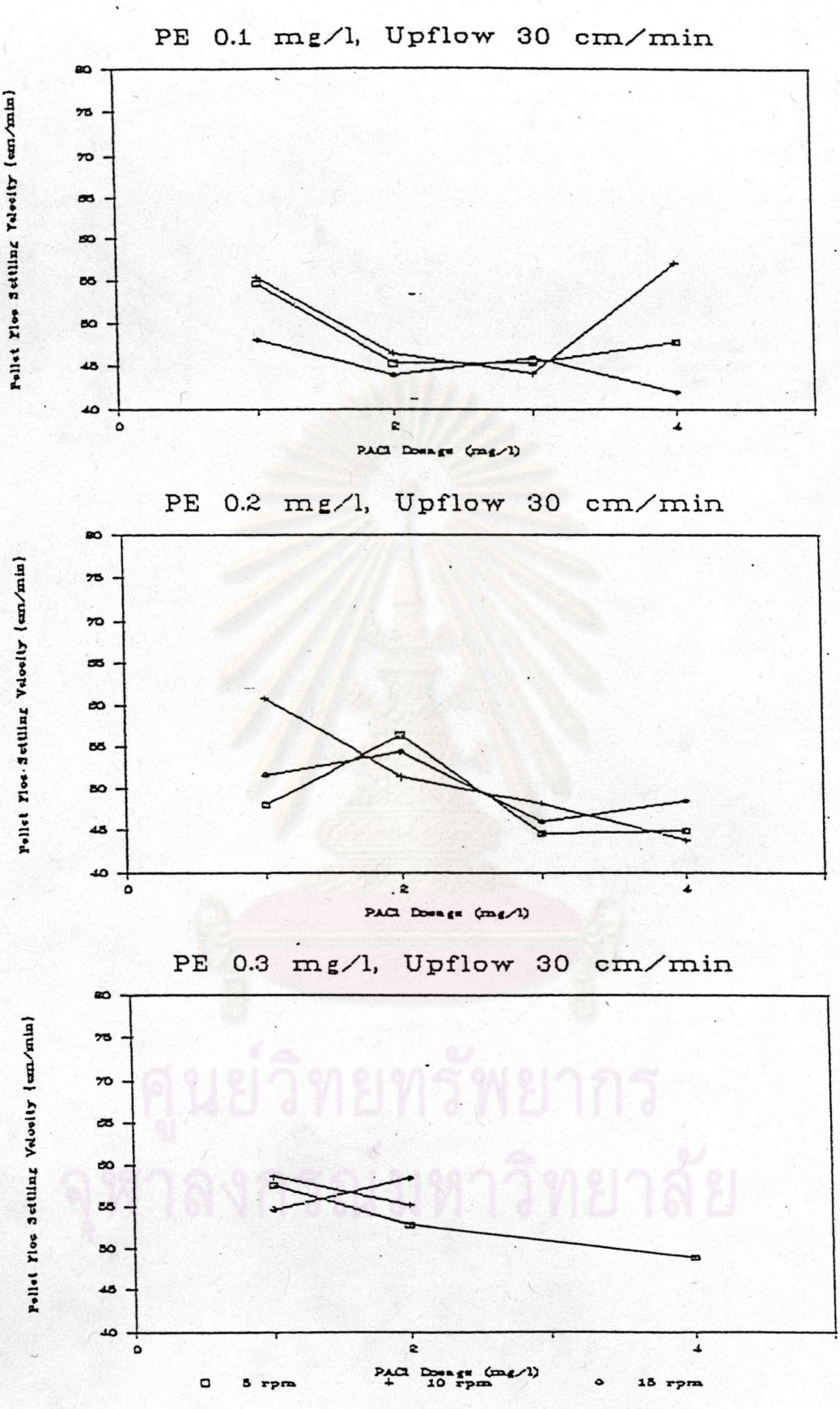

Figure 5.4 Pellet-floc settling velocity with PACl dosage, at various speeds of paddle agitation for upflow velocity of 30 cm./min. and 0.1, 0.2, 0.3 mg./l. of polymer dosages.

paddle agitation in this investigation produced the same range of floc settling velocity.

5.4.2 Discussion of the experimental results

From the above results at upflow velocity of 30 cm./min., PACl dosages of 1-4 mg./l. and polymer dosages of 0.1-0.3 mg./l. indicated that all of PACl dosages and speeds of paddle agitation were suitable for producing high settling velocity of pellet flocs for this flocculation and clarification process.

5.5 Effect of PACl and polymer dosages on pellet-floc diameter of upflow velocity 30 cm./mim.

From the experimental results had shown in figure 5.5 could be described as follow:

5.5.1 Experimental results of this investigation

In figure 5.5 had shown that pellet-floc diameter was quite constant in the same rang of about 0.17 to 0.24 mm. indicated that PACl and polymer dosages in this investigation produced the same range of pellet floc size.

5.5.2 Discussion of the experimental results

From the above results at upflow velocity of 30 cm./min., PACl dosages of 1-4 mg./l. and polymer dosages of 0.1-0.3 mg./l. indicated that all of PACl and polymer dosages were suitable for producing the same range of pellet floc size for this flocculation and clarification process.

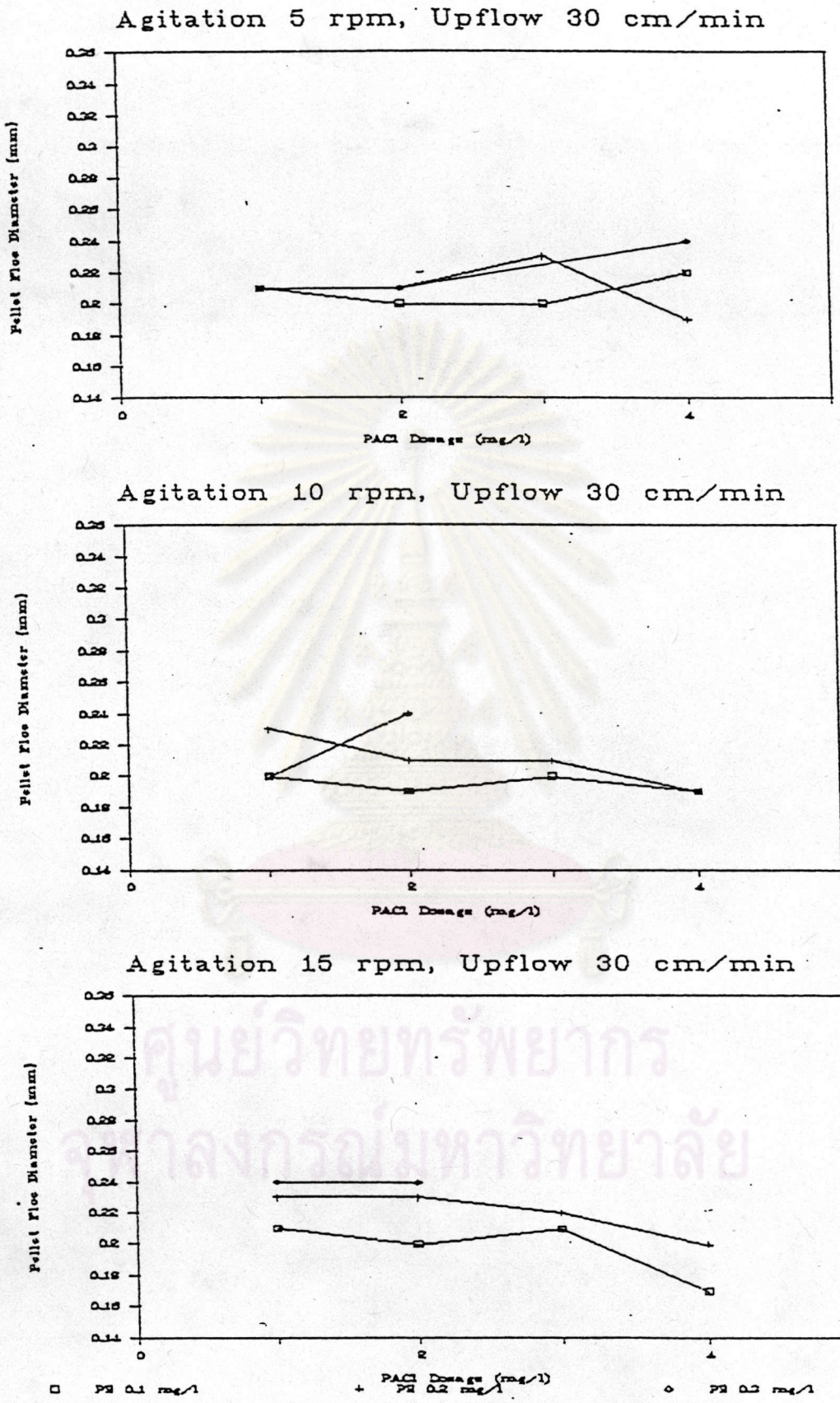

Figure 5.5 Pellet-floc diameter with PACl dosage, at various polymer dosages for upflow velocity of 30 cm./min. and 5, 10, 15 rpm. of speeds of paddle agitation.

5.6 Effect of PACl dosages and speed of paddle agitation on pellet-floc diameter of upflow velocity 30 cm./mim.

From the experimental results had shown in figure 5.6 could be described as follow:

5.6.1 Experimental results of this investigation

In figure 5.6 had shown that pellet-floc diameter was quite constant in the same range of about 0.17 to 0.24 mm. indicated that all of PACl dosages and speed of paddle agitation in this research produced the same range of pellet floc size.

5.6.2 Discussion of the experimental results

From the above results at upflow velocity of 30 cm./min., PACl dosages of 1-4 mg./l. and polymer dosages of 0.1-0.3 mg./l. indicated that all of PACl dosages and speeds of paddle agitation were suitable for producing the same range of pellet floc size for this flocculation and clarification process.

5.7 Effect of PACl and polymer dosages on effluent turbidity of upflow velocity 40 cm./min.

From the experimental results had shown in figure 5.7 could be described as follow:

5.7.1 Consider at 5 rpm. of paddle agitatating speed

At PACl dosages of 1 and 2 mg./l. indicated that at polymer dosage of 0.1 mg./l. the effluent turbidity were in range from 3.9 to 8.0 NTU. When increased polymer dosages from 0.1 mg./l. to 0.2 and 0.3 mg./l. the effluent turbidity were in range from 0.8 to 3.4 NTU.

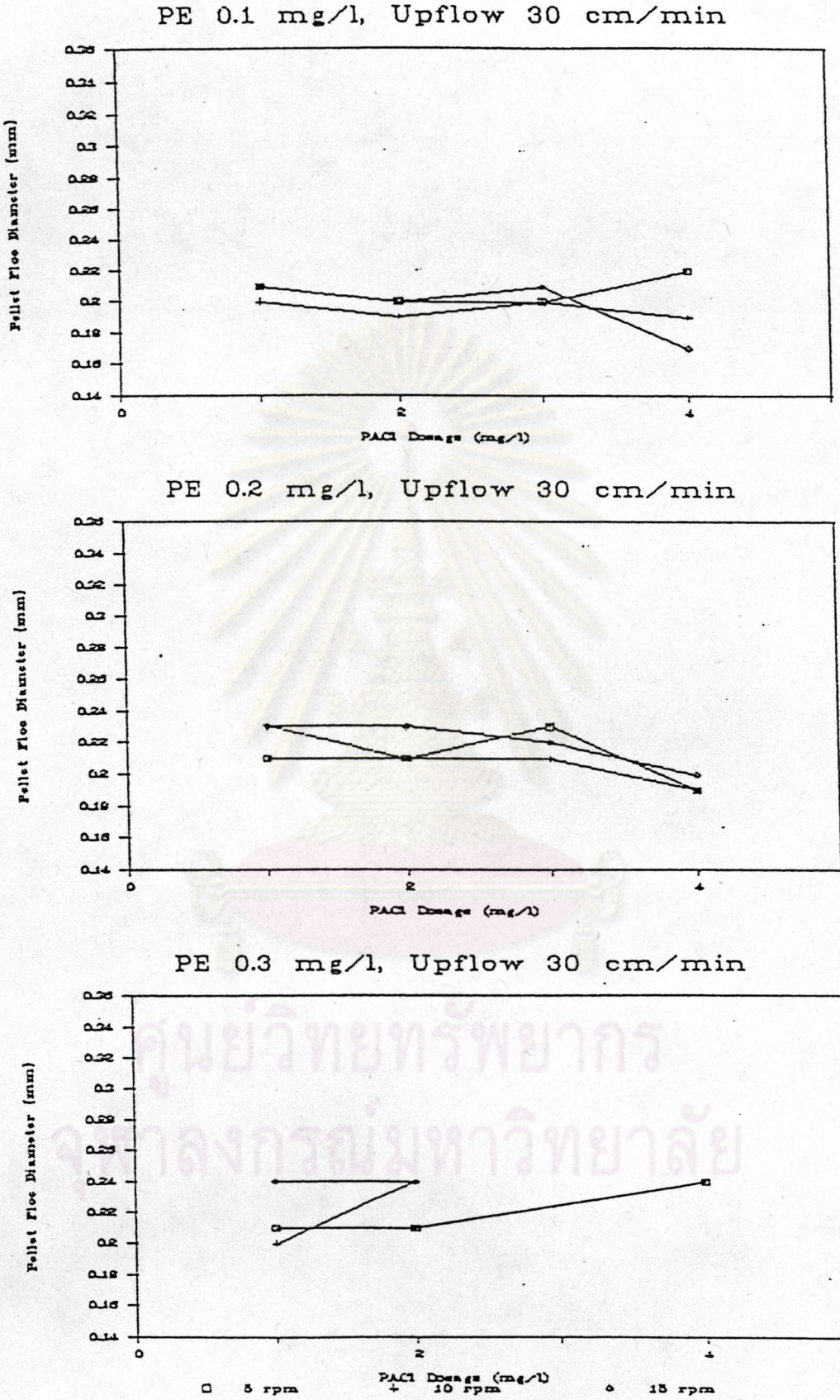

Figure 5.6 Pellet-floc diameter with PACl dosage, at various speeds of paddle agitation for upflow velocity of 30 cm./min. and 0.1, 0.2, 0.3 mg./l. of polymer dosages.

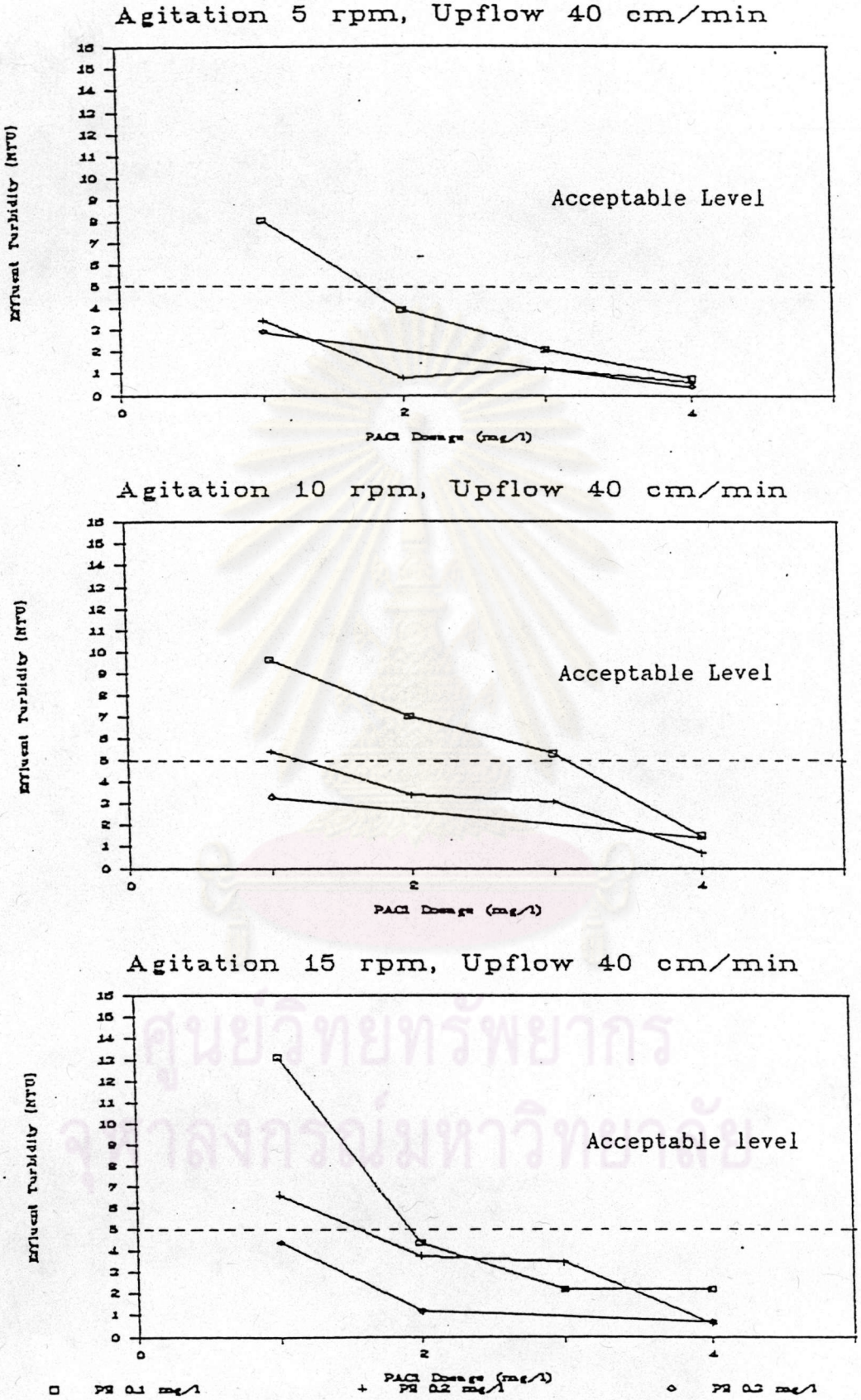

Figure 5.7 Effluent turbidity with PACl dosage, at various polymer dosages for upflow velocity of 40 cm./min. and 5, 10, 15 rpm. of speeds of paddle agitation.

At PACl dosages of 3 and 4 mg./l. indicated that at polymer dosages of 0.1, 0.2 and 0.3 mg./l. the effluent turbidity were quite similar in quality, between 0.4 and 2.1 NTU.

5.7.2 Consider at 10 rpm. of paddle agitating speed

At PACl dosages of 1 and 2 mg./l. indicated that at polymer dosage of 0.1 mg./l. the effluent turbidity were in range from 7.0 to 9.6 NTU. After increased polymer dosages from 0.1 mg./l. to 0.2 and 0.3 mg./l. the effluent turbidity were quite similar in quality, between 3.3 and 5.4 NTU.

At PACl dosages of 3 and 4 mg./l. indicated that at polymer dosages of 0.1, 0.2 and 0.3 mg./l. the effluent turbidity were between 0.7 and 5.3 NTU.

5.7.3 Consider at 15 rpm. of paddle agitating speed

At PACl dosages of 1 and 2 mg./l. indicated that at polymer dosage of 0.1 mg./l. the effluent turbidity were in range from 4.4 to 13.1 NTU. When increased polymer dosages from 0.1 mg./l. to 0.2 and 0.3 mg./l. the effluent turbidity were between 1.2 and 6.6 NTU.

At PACl dosage of 3 mg./l. indicated that at polymer dosages of 0.1 and 0.2 mg./l. the effluent were quite similar in quality, between 2.2 and 3.5 NTU. When increased PACl dosage into 4 mg./l. indicated that at polymer dosages of 0.1, 0.2 and 0.3 mg./l. the effluent were quite similar in quality, between 0.6 and 2.2 NTU.

5.7.4 Discussion of the experimental results

From the results of the investigation, considering in upflow rate of 40 cm./min. indicated that when increase in PACl dosage caused an slightly decrease in effluent turbidity.

At PAC1 dosages of 1 and 2 mg./l. showed that when using higher polymer dosages of 0.2 and 0.3 mg./l. could produce clearer effluent turbidity, between 0.8 and 6.6 NTU, than at 0.1 mg./l. of polymer dosage. At 5 rpm. of paddle agitating speed when using PAC1 dosages between 3 and 4 mg./l. indicated that at all polymer dosages could produce good effluent turbidity, between 0.4 and 2.1 NTU. At paddle rotating rate of 10 and 15 rpm. using PAC1 dosages of 3 and 4 mg./l. seem that effluent turbidity of at all polymer dosages were in range from 0.6 to 5.3 NTU.

From above results seem that at higher PAC1 dosages tend to promote slightly better charge neutralization of colloidal particles and also leading to permit better attachment of the particles into flocs, when contact occur, than using lower PAC1 dosages. Therefore, at higher PAC1 dosages could produce clearer treated water than at lower PAC1 dosages. And at higher polymer dosages produced clearer clarified water than at lower polymer dosages also. From the results, however, indicated that lower polymer dosages tend to require more PAC1 dosage to achieve permitting better attachment of the particles into flocs, when contact occur and therefore, leading to make more possibility to produce good pellet flocs and clarified water as well.

5.8 Effect of PAC1 dosages and speed of paddle agitation on effluent turbidity of upflow velocity 40 cm./min.

From the experimental results had shown in figure 5.8 could be described as follow:

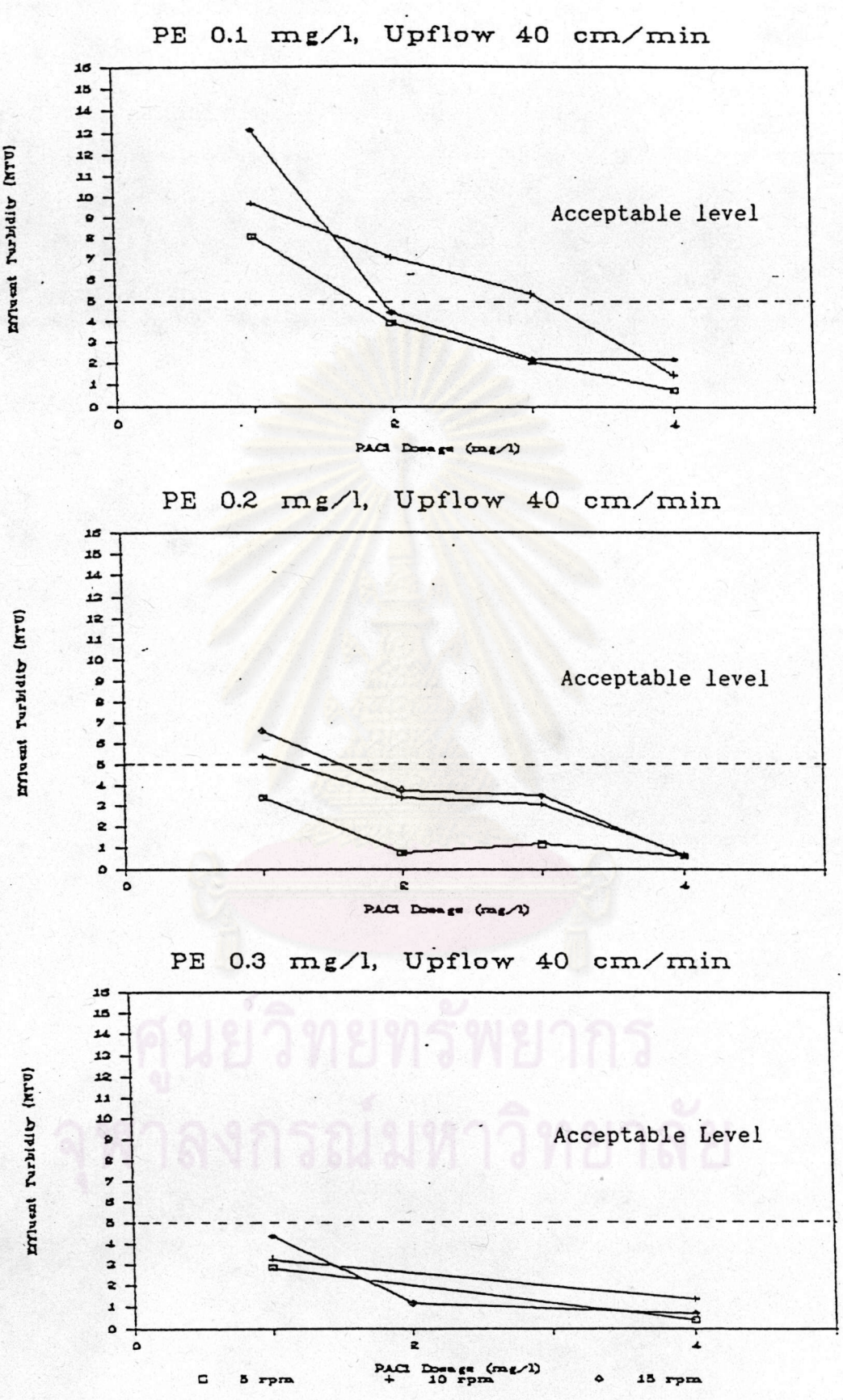

Figure 5.8 Effluent turbidity with PACl dosage, at various speeds of paddle agitation for upflow velocity of 40 cm./min. and 0.1, 0.2, 0.3 mg./l. of polymer dosages.

5.8.1 Consider at 0.1 mg./l. of anionic polymer dosage

At PACl dosages of 1 and 2 mg./l. indicated that at 5 rpm. of paddle agitating speed the effluent turbidity were in range from 3.9 to 8.0 NTU. When increased speed of paddle agitation from 5 rpm. to 10 and 15 rpm. the effluent turbidity were in range from 4.4 to 13.1 NTU.

At PACl dosages of 3 and 4 mg./l. indicated that at 5 rpm. of paddle agitating speed, the effluent were quite similar in quality, between 0.8 and 2.1 NTU. When increased speed of paddle agitation from 5 rpm. to 10 and 15 rpm. the effluent turbidity were quite similar in quality, between 2.2 and 5.3 NTU.

5.8.2 Consider at 0.2 mg./l. of anionic polymer dosage

At PACl dosages of 1 and 2 mg./l. indicated that at 5 rpm. of paddle agitating speed the effluent turbidity were in range from 0.8 to 3.4 NTU. When increased speed of paddle agitation from 5 rpm. to 10 and 15 rpm. the effluent turbidity were quite similar in quality, between 3.4 and 6.6 NTU.

At PACl dosages of 3 and 4 mg./l. indicated that at 5 rpm. of paddle agitating speed the effluent turbidity were quite similar in quality, between 0.6 and 1.2 NTU. When increased speed of paddle agitation from 5 rpm. to 10 and 15 rpm. indicated that effluent turbidity were between 0.6 and 3.5 NTU.

5.8.3 Consider at 0.3 mg./l. of anionic polymer dosage

At PACl dosage of 1 mg./l., indicated that at 5 rpm. of paddle agitating speed, the effluent turbidity was 2.9 NTU. When increased speed of paddle agitation from 5 rpm. to 10 and 15 rpm. the effluent turbidity were quite similar in quality,

that were between 1.2 and 4.4 NTU.

At PACl dosage of 4 mg./l., seem that at 5 rpm. of paddle agitating speed the effluent turbidity was 0.4 NTU. When increased speed of paddle agitation from 5 rpm. to 10 and 15 rpm. the effluent turbidity were quite similar in quality, between 0.7 and 1.4 NTU.

5.8.4 Discussion of the experimental result

In figure 5.8 indicated that increase in PACl dosage cause an slightly decrease in effluent turbidity. When using lower paddle agitating speed of 5 rpm. produced slightly clearer effluent turbidity than at higher paddle agitating speed of 10 and 15 rpm.

From the above results indicated that higher PACl dosages promoted sligthly better charge neutralization of the colloidal particles and also leading to permit better attachment of the particles into flocs, when contact occur, than using lower PACl dosages thus good pellet floc and clarified water could produce as well. At the lower PACl dosage tend to require lower speed of paddle agitation than at higher PACl dosage. Thus, at upflow velocity of 40 cm./min. suggested that 5 rpm. of paddle rotating speed quite suitable for this clarification process than 10 and 15 of paddle rotating speed, specially in low PACl dosage.

5.9 Effect of PACl and polymer dosages on pellet-floc settling velocity of upflow velocity 40 cm./min.

From the experimental results had shown in figure 5.9 could be described as follow:

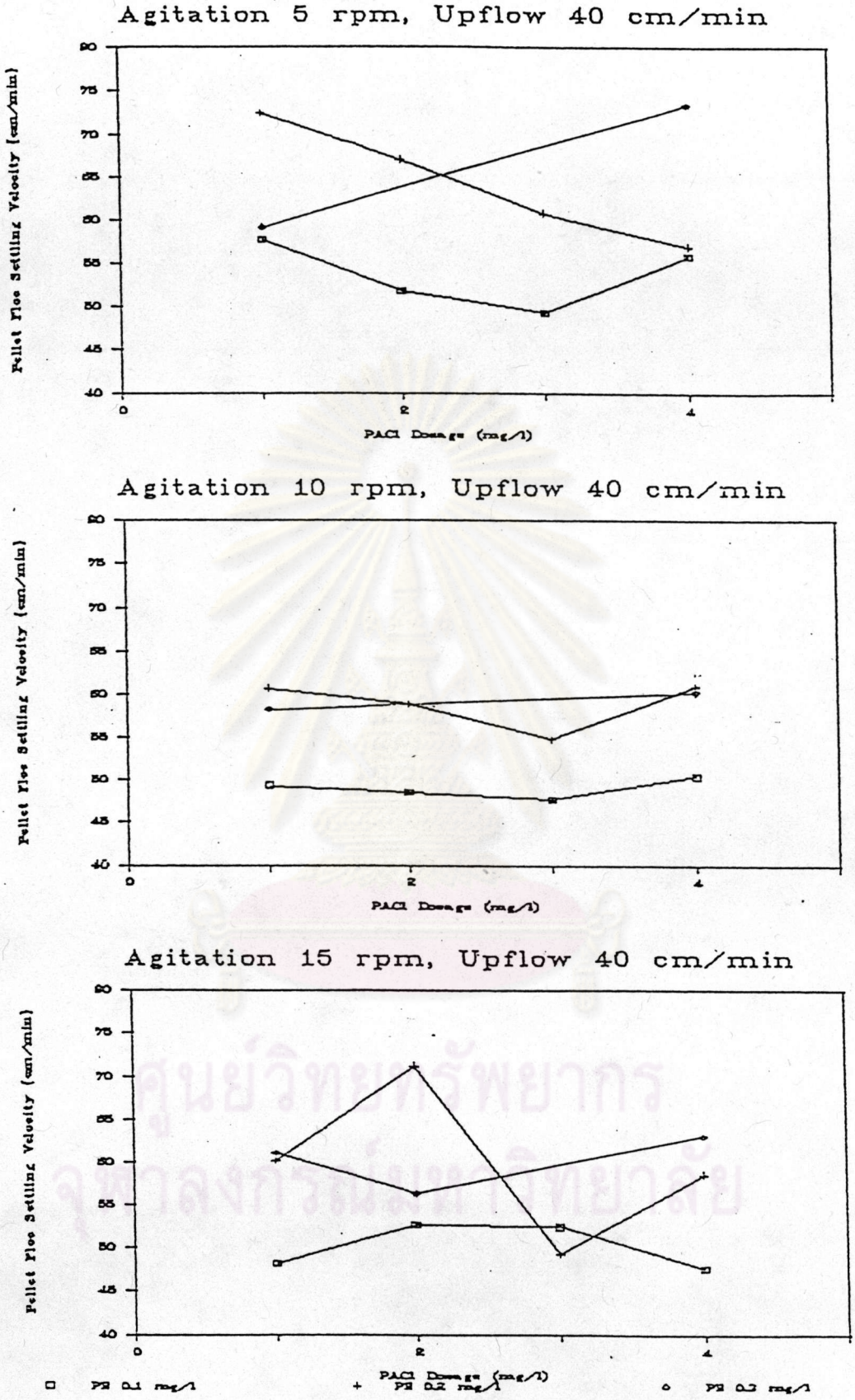

Figure 5.9 Pellet-floc settling velocity with PACl dosage, at various polymer dosages for upflow velocity of 40 cm./min. and 5, 10, 15 rpm. of speeds of paddle agitation.

5.9.1 Experimental results of this investigation

In figure 5.9 indicated that settling velocity of pellet flocs were in the same range from 48 to 73 cm./min. At high polymer dosages of 0.2 and 0.3 mg./l. showed that settling velocity of flocs were between 55 and 73 cm./min. and at low polymer dosages of 0.1 mg./l., settling velocity of flocs were in range from 48 to 58 cm./min.

5.9.2 Discussion of the experimental results

From the above results at upflow velocity of 40 cm./min., PACl dosages of 1-4 mg./l. and polymer dosages of 0.1-0.3 mg./l. indicated that at all of PACl and polymer dosages were suitable for producing high settling velocity of pellet flocs, which were higher than the hydraulic upflow velocity of this flocculation and clarification process. From the results suggested that at high polymer dosages of 0.2 and 0.3 mg./l. made more strengthen of flocs. Thus, leading to had more possibility to produced good pellet flocs and tend to had higher settling velocity of flocs than using by low polymer dosage of 0.1 mg./l.

5.10 Effect of PACl dosages and speed of paddle agitation on pellet-floc setting velocity of upflow velocity 40 cm./min.

From the experimental results had shown in figure 5.10 could be described as follow:

5.10.1 Experimental results of this investigation

From figure 5.10 indicated that at all PACl dosages and speeds of paddle agitation could produced the same range of settling velocity of pellet flocs, which were in range

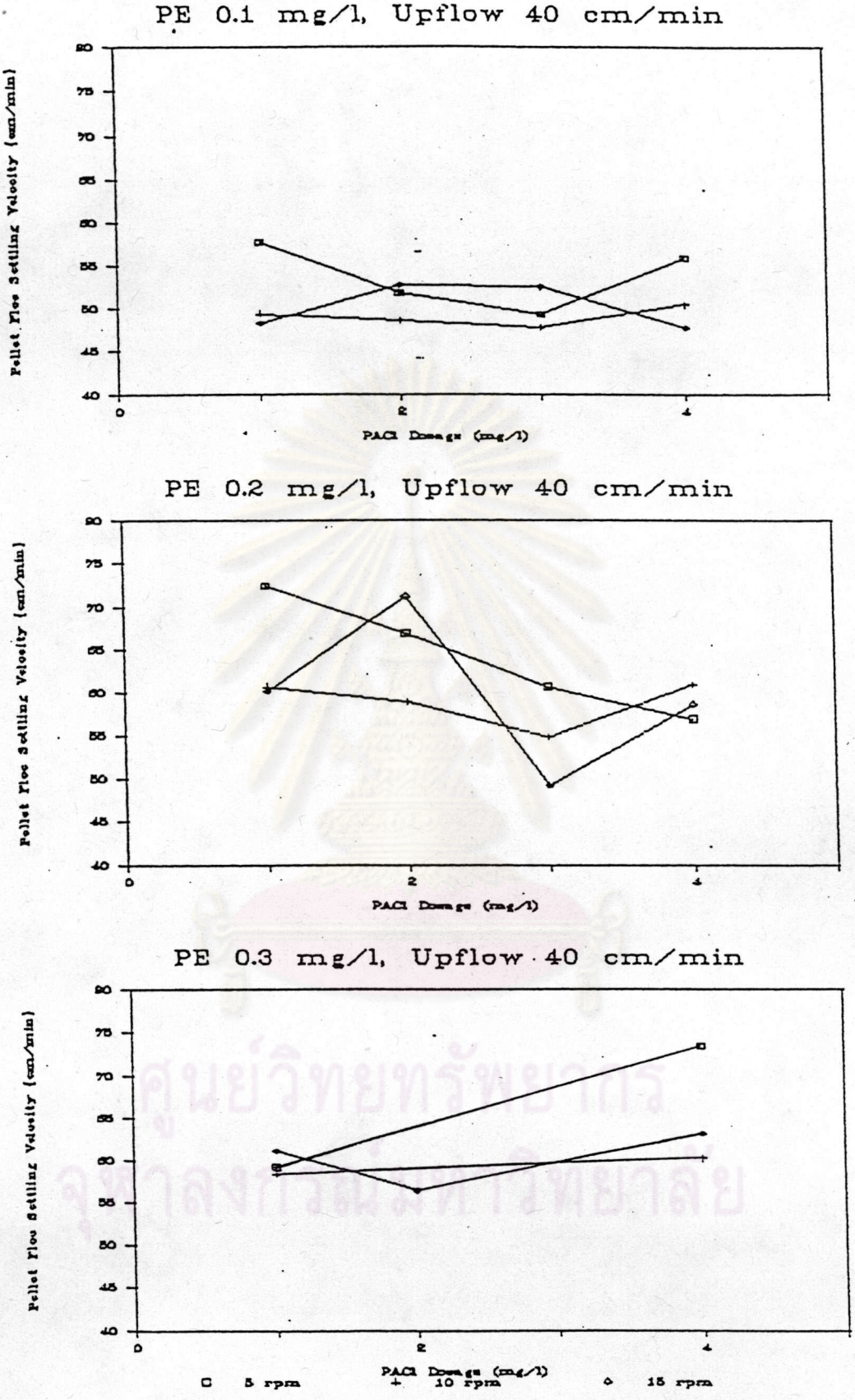

Figure 5.10 Pellet-floc settling velocity with PACl dosage, at various speeds of paddle agitation for upflow velocity of 40 cm./min. and 0.1, 0.2, 0.3 mg./l. of polymer dosages.

from 48 to 73 cm./min.

5.10.2 Discussion of the experimental results

From the above results at upflow velocity of 40 cm./min., PACl dosages of 1-4 mg./l. and polymer dosages of 0.1-0.3 mg./l. indicated that at all PACl dosages and speeds of paddle agitation were suitable for producing high settling velocity of pellet flocs, which were higher than the hydraulic upflow velocity of this flocculation and clarification process.

5.11 Effect of PACl and polymer dosages on pellet-floc diameter of upflow velocity 40 cm./min.

From the experimental results had shown in figure 5.11 could be described as follow:

5.11.1 Experimental results of this investigation

From figure 5.11 indicated that pellet floc size were in range from 0.21 to 0.35 mm. When increased in PACl dosage showed that the pellet floc size were still in the same range. At high polymer dosages of 0.2 and 0.3 mg./l. could produce floc size of around between 0.21 and 0.35 mm., that were tend to have slightly larger floc size than using low polymer dosage of 0.1 mg./l. At the polymer dosage of 0.1 mg./l., the pellet floc size were in range from 0.21 to 0.28 mm.

5.11.2 Discussion of the experimental results

From the above results at upflow velocity of 40 cm./min., PACl dosages of 1-4 mg./l. and polymer dosages of 0.1-0.3 mg./l. indicated that at all of PACl and polymer dosages

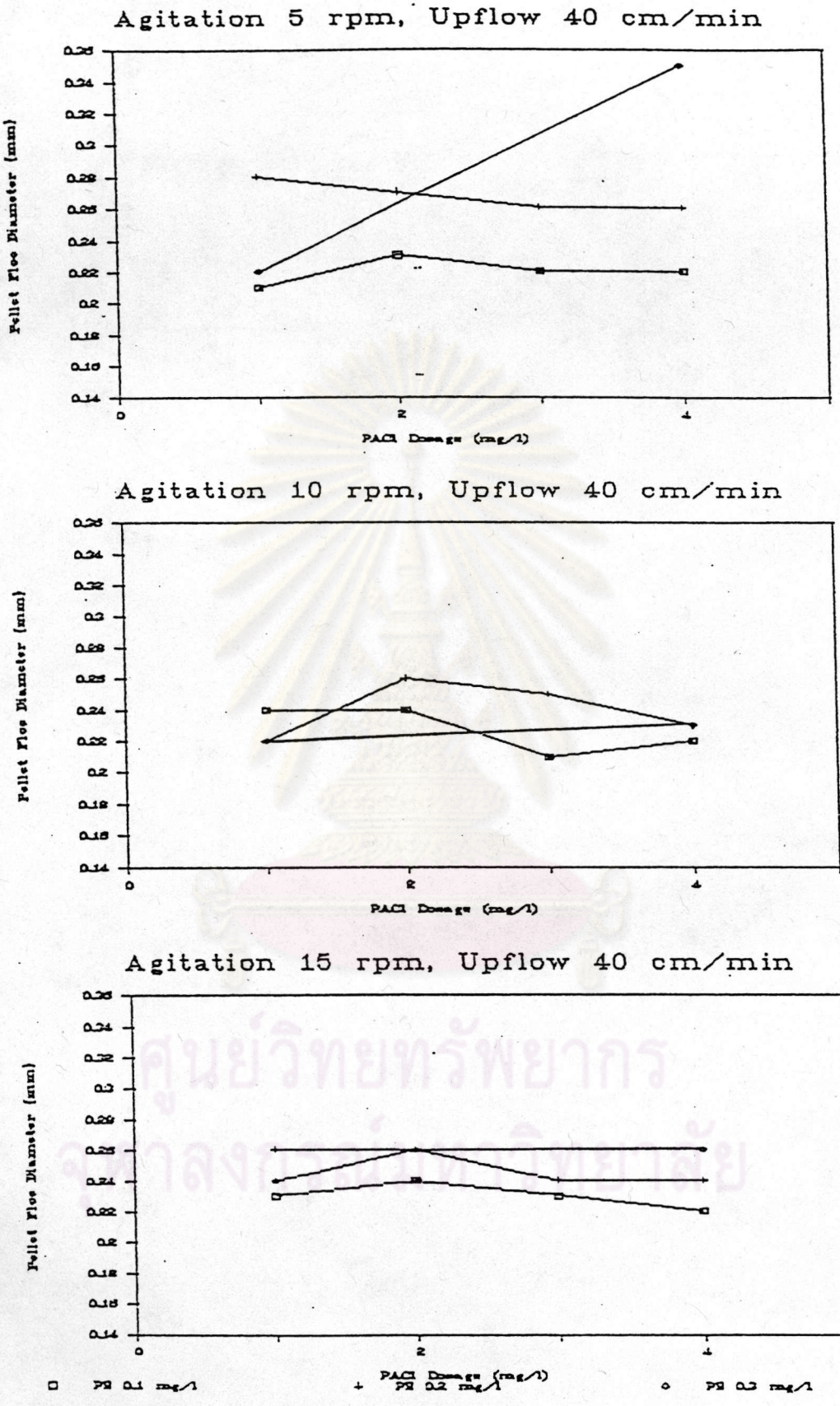

Figure 5.11 Pellet-floc diameter with PACl dosage, at various polymer dosages for upflow velocity of 40 cm./min. and 5, 10, 15 rpm. of speeds of paddle agitation.

were suitable for producing the same range of pellet floc size, by this flocculation and clarification process. And suggested that higher polymer dosage made more strengthen of flocs and could produce slightly larger floc size than using lower polymer dosage.

5.12 Effect of PACl dosages and speed of paddle agitation on pellet-floc diameter of upflow velocity 40 cm./min.

From the experimental results had shown in figure 5.12 could be described as follow:

5.12.1 Experimental results of this investigation

From figure 5.12 indicated that pellet floc size were in range of 0.21 and 0.35 mm. When increased in PACl dosage showed that the pellet floc size were still in the same range. And at all rate of paddle rotation showed that pellet floc size were produced in the same range also.

5.12.2 Discussion of the experimental results

From the above results at upflow velocity of 40 cm./min., PACl dosages of 1-4 mg./l. and polymer dosages of 0.1-0.3 mg./l. indicated that at all of PACl dosages and speeds of paddle rotation were suitable for producing the same range of pellet floc size, by this flocculation and clarification process.

5.13 Effect of upflow velocity at various PACl and polymer dosages on effluent turbidity

From the results of 5.1 and 5.7, had shown in figure 5.1

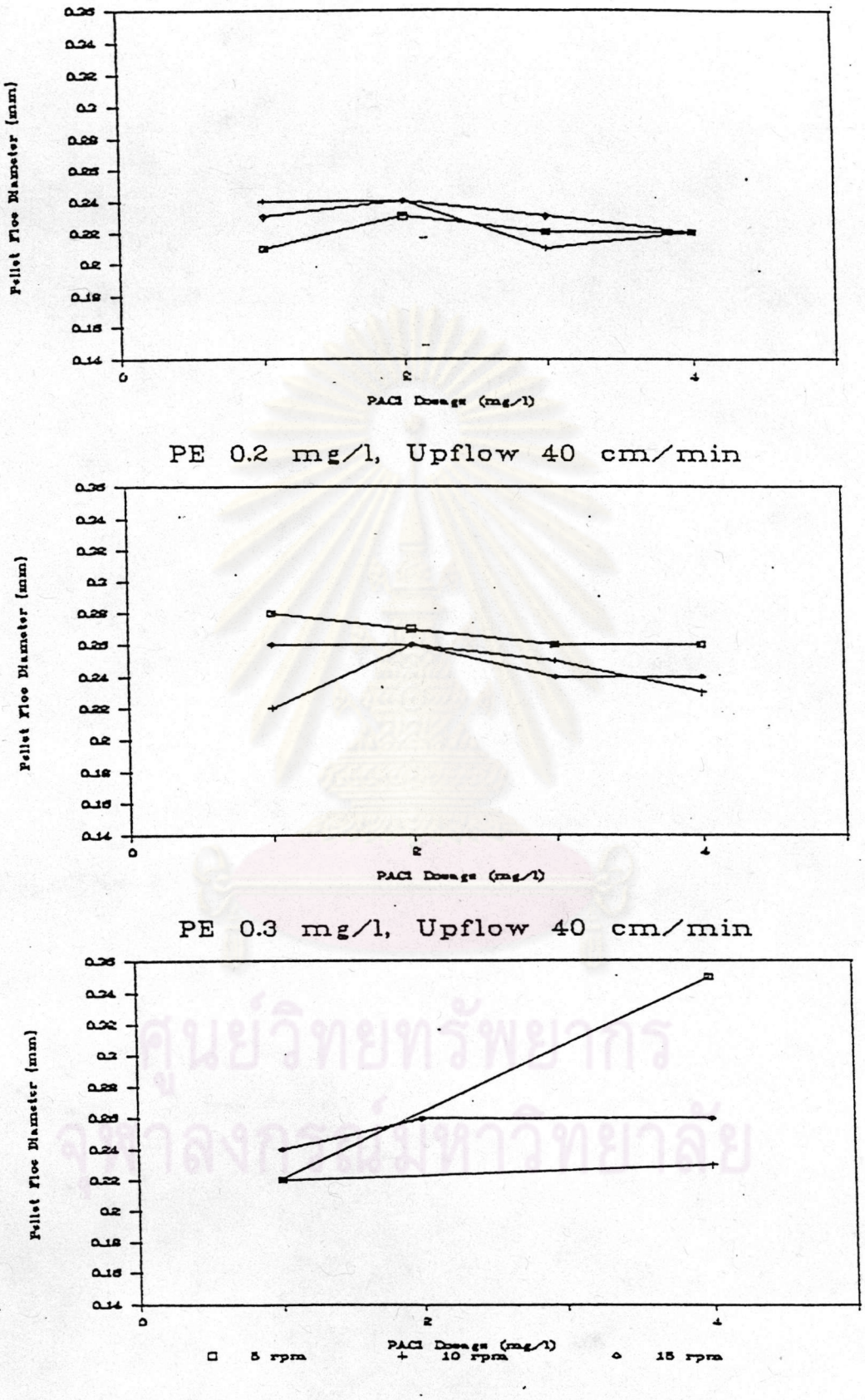

Figure 5.12 Pellet-floc diameter with PACl dosage, at various speeds of paddle agitation for upflow velocity of 40 cm./min. and 0.1, 0.2, 0.3 mg./l. of polymer dosages.

and 5.7 were described as follow:

5.13.1 Consider at 5 rpm. of paddle agitatating speed

At PACl dosages of 1, 2 , 3 and 4 mg./l. and polymer dosages of 0.1, 0.2 and 0.3 mg./l. indicated that the trend of the effluent turbidity at upflow velocity of 40 cm./min. were slightly clearer than using upflow velocity of 30 cm./min.

5.13.2 Consider at 10 rpm. of paddle agitatating speed

At PACl dosages of 1, 2 , 3 and 4 mg./l. and polymer dosages of 0.1, 0.2 and 0.3 mg./l. indicated that the trend of the effluent turbidity at upflow velocity of 30 cm./min. were slightly clearer than using upflow velocity of 40 cm./min.

5.13.3 Consider at 15 rpm. of paddle agitatating speed

At PACl dosages of 1, 2 , 3 and 4 mg./l. and polymer dosages of 0.1, 0.2 and 0.3 mg./l. indicated that the trend of the effluent turbidity at upflow velocity of 30 cm./min. were slightly clearer than using upflow velocity of 40 cm./min.

5.13.4 Discussion of the experimental results

From the trend of above results indicated that at upflow velocity of 30 cm./min. required high speed of paddle rotation of 10 and 15 rpm. for producing good clarified water. On the other hand, at upflow velocity of 40 cm./min. required low speed of paddle rotation of 5 rpm. for produing good clarified water. From these results suggested that at upflow velocity of 40 cm./min. made slightly more diluted-phase fluidized bed than using upflow velocity of 30 cm./min. and also leading to have some effect on the clarified water turbidity, which was produced by the process. Thus more experiment and data regarding the effect of upflow velocity upon clarification of turbid water by

pellet flocculation were urgently needed.

5.14 Effect of upflow velocity at various PACl and polymer dosages on pellet-floc settling velocity

From the results of 5.3 and 5.9, had shown in figure 5.3 and 5.9 were described as follow:

5.14.1 Consider at 5 rpm. of paddle agitatating speed

From the results indicated that settling velocity of pellet flocs at upflow velocity of 30 cm./min. were in range from 44.65 to 57.50 cm./min. And at upflow velocity of 40 cm./min. indiacated that settling velocity of pellet flocs were in range from 49.27 to 73.36 cm./min.

5.14.2 Consider at 10 rpm. of paddle agitatating speed

From the results indicated that settling velocity of pellet flocs at upflow velocity of 30 cm./min. were in range from 43.79 to 60.78 cm./min. And at upflow velocity of 40 cm./min. indiacated that settling velocity of pellet flocs were in range from 47.68 to 60.89 cm./min.

5.14.3 Consider at 15 rpm. of paddle agitatating speed

From the results indicated that settling velocity of pellet flocs at upflow velocity of 30 cm./min. were in range from 42.00 to 58.44 cm./min. And at upflow velocity of 40 cm./min. indiacated that settling velocity of pellet flocs were in range from 47.74 to 71.25 cm./min.

5.14.4 Discussion of the experimental results

From above results indicated that pellet-floc settling velocity at upflow velocity of 30 cm./min. were in the

range from about 42 to 61 cm./min. that tend to slightly slower range of settling velocity than using upflow velocity of 40 cm./min., which could produce settling velocity of flocs between around 48 and 73 cm./min. From these results suggested that at upflow velocity of 40 cm./min. made slightly more diluted-phase fluidized bed than using upflow velocity of 30 cm./min. and also leading to have some effect on the settling velocity of pellet flocs, which were produced by the process. Thus more experiment and data regarding the effect of upflow velocity on clarification of turbid water by pellet flocculation were urgently needed.

5.15 Effect of upflow velocity at various PACl and polymer dosages on pellet-floc diameter

From the results of 5.5 and 5.11, from figure 5.5 and 5.11 were described as follow:

5.15.1 Consider at 5 rpm. of paddle agitatating speed

From the results indicated that pellet floc size at upflow velocity of 30 cm./min. were in range from 0.20 to 0.24 mm. And at upflow velocity of 40 cm./min. indiacated that pellet floc size were in range from 0.21 to 0.35 mm.

5.15.2 Consider at 10 rpm. of paddle agitatating speed

From the results indicated that pellet floc size at upflow velocity of 30 cm./min. were in range from 0.19 to 0.24 mm. And at upflow velocity of 40 cm./min. indicated that pellet floc size were in range from 0.22 to 0.26 mm.

5.15.3 Consider at 15 rpm. of paddle agitatating speed

From the results indicated that pellet floc size at upflow velocity of 30 cm./min. were in range from 0.17 to 0.24 mm. And at upflow velocity of 40 cm./min. indiacated that pellet floc size were in range from 0.22 to 0.26 mm.

5.15.4 Discussion of the experimental results

From above results indicated that pellet floc size at upflow velocity of 30 cm./min. were in the range from 0.17 to 0.24 mm. that tend to slightly smaller range of floc size than using upflow velocity of 40 cm./min., which could produce floc size between 0.21 and 0.35 mm. From these results suggested that at upflow velocity of 40 cm./min. could make slightly more diluted-phase fluidized bed than using upflow velocity of 30 cm./min. and also leading to have some effect on the pellet floc size, which were produced by the process. Thus more experiment and data regarding the effect of upflow velocity on clarification of turbid water by pellet flocculation were urgently needed.

5.16 Performance of pellet-floc settling and diameter at various bed height

From the results in appendix B, could be described as follow:

5.16.1 Experimental results of the invesigation

From the results indicated that pellet flocs at the bottom region or at 0 cm. of the bed height tend to had higher settling velocity than pellet flocs at the upper region of the bed height, which were between 60 to 150 cm.

And diameter of pellet flocs at the bottom region or at 0 cm. of the bed height tend to had larger floc size than pellet flocs at the upper region of the bed height, which were between 60 to 150 cm.

5.16.2 Discussion of the experimental results

From the above results, suggested that flocs at the bottom region of the bed had more chance to contact and aggregate with the new elementary particles. The new elementary particles which contained of anionic polymer could promote to make more strong agglomerate and larger floc size. Therefore leading to producing higher settling of flocs at the bottom region of the bed. The large flocs at the lower region of the bed were eroded and splitted to slightly smaller floc size. Thus, smaller flocs which had lower settling than larger flocs were moved upward to the upper region of the bed by the hydraulic upflow velocity. So, flocs at the bottom region of the bed contained higher settling velocity and larger size than flocs at the upper region by this way.

5.17 Comparison of settling velocity and diameter of pellet floc from pellet flocculation on high-concentration and low-concentration suspension

From experimental results of pellet flocculation of high-concentration suspension which was investigated by Tambo and Matsui (1987b), and the results of low-concentration suspension which was investigated by this research could be described as follow:

5.17.1 Comparison of settling velocity of pellet floc

From the results indicated that settling velocity of pellet flocs from high-concentration suspension were around 180 cm./min. that were higher than around 40 to 80 cm./min. of settling velocity of pellet flocs which were produced from low-concentration suspension, in this investigation.

5.17.2 Comparison of diameter of pellet floc

From the results indicated that diameter of pellet flocs from high-concentration suspension were around 1 mm. in size that were larger than around 0.2 and 0.3 mm. of pellet floc size which were produced from low-concentration suspension, in this investigation.

5.17.3 Discussion of the results

From the above results suggested that different in concentration of suspension had some different in pellet-floc characteristic, such as settling velocity and diameter of pellet flocs. Because higher concentration suspension had more colloidal particles than lower concentration suspension, thus made more chance to agglomerate into larger floc size and higher settling velocity of pellet floc as results.