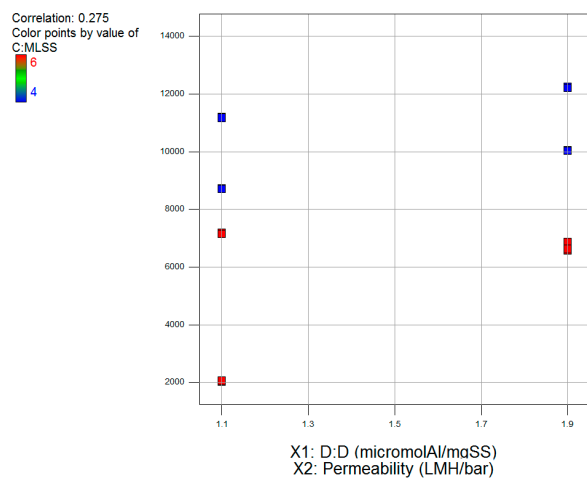
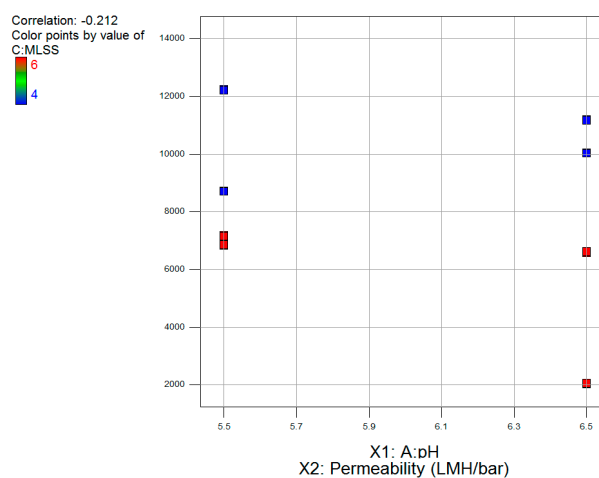


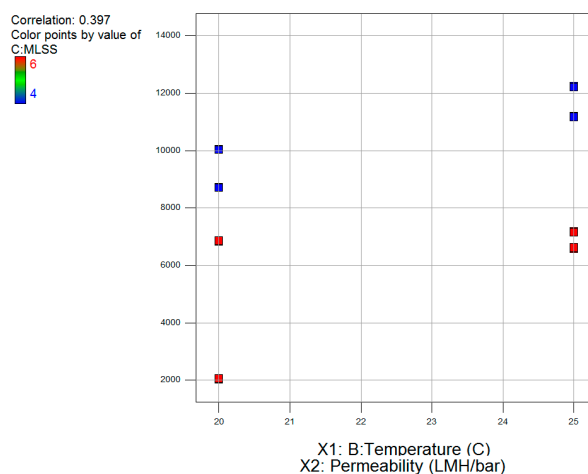
Supplementary Materials:



(a)



(b)



(c)

Figure 1. Preliminary examination of the influence of: (a) coagulant dose; (b) pH; (c) temperature on the average permeability, coloured by MLSS.

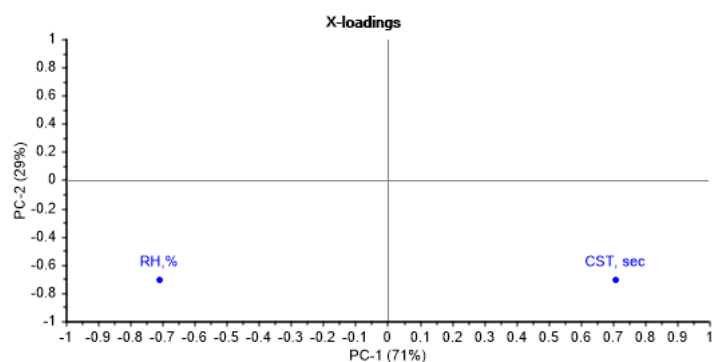


Figure 2. A negative correlation between capillary suction time (CST) and relative hydrophobicity (RH) earlier obtained for BF-MBR mixed liquor by Kulesha et al. [28].

Table 1. Characterization of particle properties by particle size distribution [48–52].

PSD parameter	Formula	Details
D[4,3], the De Broucker mean diameter	$\frac{\sum D_i^4}{\sum D_i^3}$	Volume/mass moment mean
D[3,2], the Sauter Mean diameter	$\frac{\sum D_i^3}{\sum D_i^2}$	Surface area moment mean
d10, d50, d90	- (from the cumulative distribution plot)	The diameter where 10%, 50% and 90% of the sample's population lie below this value
Uniformity	Median ($d_1 \dots d_i$ – Median ($d_1 \dots d_i$))	The measure of the absolute deviation from the median
Span	$\frac{D90 - D10}{D50}$	The distribution width

Table 2. Optimum pH ranges and the corresponding parameters of the system.

Chemical	Parameters				Optimum pH ranges
	Zeta potential, mV	CST, sec	Turbidity, NTU	D [4.3], μm	
PAXXL61 (OH/Al 1.9)	-6.9 – (-6.3)	120.3 – 140.1	2.5 – 3.9	53.0 – 55.0	5.5 – 6.0
PAX18 (OH/Al 1.3)	-6.8 – (-6.4)	170.3 – 181.4	2.0 – 4.6	78.0 – 79.8	5.5 – 6.0
ALS (OH/Al 0)	-7.4	224.9	7.8	30.9	4.5
PIX313 (OH/Fe 0)	-5.6 – (-5.1)	107.0 – 117.5	2.7 – 3.2	31.4 – 32.5	3.8 – 4.1

Table 3. Optimum dosages at the corrected pH values applying tested coagulants.

Chemical	Maintained pH	Parameters				Optimum dosage ranges, $\mu\text{mole Me/mgSS}$
		CST, sec	Zeta potential, mV	Turbidity, NTU	D [4.3]	
PAXXL61 (OH/Al 1.9)	5.5 – 6.2	45.8 – 60.7	-1.1 – 3.7	0.5 – 1.8	25.6 – 32.6	1.1 – 2.6
PAX18 (OH/Al 1.3)	5.5 – 6.0	75.1 – 77.7	-3.7 – (-2.5)	0.5 – 1.1	37.5 – 67.4	1.3 – 2.6
ALS (OH/Al 0)	4.4 – 4.5	81.2 – 103.0	-4.6 – (-3.7)	1.8 – 2.5	21.0 – 34.3	0.5 – 1.2
PIX313 (OH/Fe 0)	4.0 – 4.1	130.0 – 150.0	-3.9 – (-3.5)	2.0 – 2.6	16.4 – 24.9	2.2 – 3.2

The highest efficiencies in respect of the average normalized permeability change (δ_{avP_N}) and filtration time (F) were exhibited by the prepolymerized aluminium coagulants PAX18 and PAXXL61 (Table S3).

Table 4. Optimum dosages and the corresponding levels of the monitored parameters during TRT with pH adjustment.

Chemical	pH	Parameters					δ_{avP_N} %	F, min	Optimum Dosages, $\mu\text{mole Me/mgSS}$
		Zeta potential, mV	CST, sec	TTF, sec	Turbidity, NTU	D [4.3], μm			
PAXXL61 (OH/Al 1.9)	5.5 – 6.0	-1.1 – (-0.9)	17.9 – 18.9	209.0 – 285.0	0.6 – 0.8	21.5 – 39.3	155.4 – 198.2	120.0	1.1 – 1.9
PAX18 (OH/Al 1.3)	5.5 – 6.0	-2.3 – (-0.8)	17.9 – 20.6	430.0 – 635.0	0.9 – 1.2	52.0 – 67.0	157.0 – 179.0	120.0	0.6 – 1.9
ALS (OH/Al 0)	4.5	-5.2 – 0.1	20.4 – 27.5	457.0 – 1977.0	1.3 – 2.1	47.7 – 57.2	23.0 – 58.0	3.7 – 7.7	0.1 – 0.6
PIX313 (OH/Fe 0)	3.8 – 4.1	-7.7 – (-1.0)	20.1 – 38.0	784.4 – 2017.0	0.9 – 4.4	24.0 – 39.0	-25.0 – 27.8	1.2 – 15.5	0.1 – 0.6

Table 5. The obtained optimum concentration ranges of the added coagulants with and without the pH correction.

Coagulant	MLSS, g/L	pH _{coag}	Optimum Dose,	F, min	δ _{av} P _N , %	MLSS, g/L	pH _{coag}	Optimum Dose	F,	δ _{av} P _N , %
			μmol Me/mg SS					μmol Me/mg SS		
	no pH adjustment						pH adjustment			
PAXXL61 (OH/Al 1.9)	5.9	4.2	1.5 – 1.9	4.7 – 10.4	76.8 – 83.0	4.5 – 5.6	5.5 – 6.0	1.1 – 1.9	120.0	155.4 – 198.2
PAX18 (OH/Al 1.3)	4.7 – 5.2	4.1 – 4.2	1.5 – 3.7	7.0 – 49.0	5.6 – 63.0	4.5 – 5.6	5.5 – 6.0	0.6 – 1.9	120.0	157.0 – 179.0
ALS (OH/Al 0)	3.7 – 5.2	3.7	0.1 – 0.2	1.2 – 5.0	-20.0 – 12.7	4.5 – 5.6	4.5	0.1 – 0.6	3.7 – 7.7	23.0 – 58.0
PIX313 (OH/Fe 0)	3.2 – 5.3	2.8 – 3.2	1.3 – 3.0	3.0 – 7.7	15.7 – 19.6	4.5 – 5.6	3.8 – 4.1	0.1 – 0.6	1.2 – 15.5	-25.0 – 27.8

Table 6. Point prediction and confirmation for the tested factor settings.

Response	Predicted Mean	Predicted Median ¹	Observed	Std Dev ⁹	SE Mean	The confidence interval for Mean		99% of the population	
						95% CI ⁵ low	95% CI high	95% TI ⁶ low	95% TI high
						I. Factor: pH 5.5; Temperature 25°C; MLSS 4.0 g/L; Dose 1.9 μmole Al/mg SS			
Permeability ²	12222.8	12222.8	-	15.8	N/A	12199.2	12246.5	12136.5	12308.8
I. Confirmation Report									
Two-sided	Confidence = 95%					n = 1			
Response	Predicted Mean	Predicted Median ⁴	Observed	Std Dev	n ⁸	SE Pred	95% PI low Data Mean ³	95% PI ⁷ high	
Permeability ²	12222.8	12222.8	-	15.8	1	N/A	12179.9	12265.6	
II. Factor: pH 5.5; Temperature 20°C; MLSS 5.9 g/L; Dose 1.1 μmole Al/mg SS									
Response	Predicted Mean	Predicted Median ¹	Observed	Std Dev	SE Mean	The confidence interval for Mean		99% of the population	
						95% CI ⁵ low	95% CI high	95% TI ⁶ low	95% TI high
Permeability ²	4750.9	4750.9	-	28.1	N/A	4709.9	4791.6	4597.2	4901.7
II. Confirmation Report									
Two-sided	Confidence = 95%					n = 1			
Response	Predicted Mean	Predicted Median ⁴	Observed	Std Dev	n ⁸	SE Pred	95% PI low Data Mean ³	95% PI ⁷ high	
Permeability ²	4750.9	4750.9	-	28.1	1	N/A	4675.0	4826.2	

Notes: ¹ For transformed responses the predicted mean and median may differ on the original scale;

² Standard error (SE) not calculated on the original scale; ³ For transformed responses the data mean is calculated on the transformed scale; ⁴ For transformed responses the predicted mean and median may differ on the original scale; ⁵ CI (confidence interval); ⁶ TI (Tolerance interval); ⁷ PI (Prediction interval); ⁸ n (the number of runs during the confirmation); Std Dev ⁹ (standard deviation).