

## 5 Conclusions

From the results obtained from the experimental studies, centrifugation and coagulation each gave a different pre-treatment quality that was better than the filtration method of pre-treatment. Coagulation was able to reduce total nitrogen, suspended solids, turbidity and colour as much as an average of 68%. Centrifugation, on the other hand, recorded an average of 68.3% reduction of those parameters. Filtration, however, only achieved an average elimination of 10.1%.

Nevertheless, the overall treatment quality provided a totally different picture. Combination of filtration-ultrafiltration treatment gave the best overall treatment efficiency, with an overall reduction of 93.4% for total nitrogen, suspended solids, turbidity and colour content. For the treatment combination of centrifugation-ultrafiltration, the average removal efficiency was only 86.4% while coagulation-ultrafiltration treatment only managed to achieve an average of 67.1% removal.

The effect of transmembrane pressure on solute rejection was such that solute rejection tends to decrease with increasing transmembrane pressure. By applying larger transmembrane pressure on the membrane, pores are opened up thus providing wider paths for the solute to pass through. This is an advantage for membrane application in actual industry as lower transmembrane pressure gives better efficiency and at the same time requires less energy consumption.

Influence of pH on solute retention was also significant. The original pH of sample (pH 8) provided the best rejection environment compared with pH 2.2, which represented the lower pH range. Thus, treated POME can be fed directly to the membrane treatment plant after adequate cooling without any need of additives or adjustments on the chemical properties of the treated POME.

Filtration-ultrafiltration effluent showed characteristics close to the new effluent discharge standards proposed to be implemented in year 2005.

To conclude, ultrafiltration treatment of treated POME proved to have good potential in treated POME treatment to comply with regulations that gets more stringent with time. A follow up of this study is essential to realise the achievement of higher quality of treated wastewater using membrane treatment as an alternative measure in palm oil mill effluent management.