Filter Medium Resistance:

Using Equation XXX, the filter medium resistance was calculated for three 2 types of filters with varying pore size before and after regeneration. The first data points of each run (i.e. t=0s) were used in calculating the filter medium resistance as the R_c (i.e. cake resistance) term can be neglected since the filter cake, presumably had yet to form. **Table 1** below provides a summary of all the filter medium resistances obtained for each run completed. Filter resistances here are given in the form of $R_f\eta$, thus in units of mPa*s*m^{-1}, since the viscosity of the solution was not measured. This is an accepted practice as can be seen in Ullmann's Encyclopedia (Alt, Ripperger, & Gosele, 2011). The regenerated filters are denoted by a *(R)* after the filter letter.

Table 1

Filter		**A**	**A (R)**	**B**	**B (R)**	**C**	**C(R)**
Filter Resistance (mPa*s* m^{-1})	**Run 1**	1.16E+11	N/A	2.58E+11	N/A	1.34E+11	N/A
	Run 2	6.69E+10	1.00E+11	1.10E+11	4.14E+11	N/A	N/A
	Average	*9.13E+10*	*N/A*	*1.84E+11*	*N/A*	*N/A*	*N/A*

By comparing the average filter medium resistances of un-regenerated runs of filter A and B, the effect of pore size on filter medium resistance in filters of the same material can be determined. In this case, A and B were both cotton rag filters. Using the average of the two runs completed as a basis, filter B – pore size of 17μm – displayed a higher average medium resistance due to a smaller pore sized when compared to filter A – pore size of 22μm. This was expected due filter B's smaller pore size. However, comparable to the difference between the difference in resistance between filters A and C, which have a pore size difference of 29μm. . Moreover, with a pore size similar to the size of the solids in suspension, it was surprising to see that filter mediums of type C did not have resistances magnitudes larger than those of filters A and B. Ultimately, seeing that filters A and B are of the same material and filters A and C are of different materials, filter medium resistance is perhaps more dependant on the material of the filter instead of the pore size. That being said, no information could be found on the permeability of wood pulp relative to cotton filters. Thus to validate this conclusion, a more elaborate experimental procedure including a wider variety of filter types would be required.

Filters of type A and B were only regenerated once while no time was found to regenerate filter C. In the case of A and B, the regenerated filters displayed an increase in resistance as anticipated. This increase in resistance is attributed to the inability of the regeneration process to fully unclog the pores of the filters. For filters of Type A, the resistance increased by approximately 50% when compared to a new filter (i.e. from 6.69E+10 mPa*s*m^{-1} to 1.00E+11 mPa*s*m^{-1}). This comparison is based solely on run 1 and not on the average resistance obtained from the two runs. For filters of type B, the results of run 2 were used exclusively and yielded an increase of approximately 276% (i.e. from 1.10E+11 mPa*s*m^{-1} to 4.14E+11 mPa*s*m^{-1}). Based on these results, it can be concluded that resistance increase due to regeneration is higher in filters with lower pore sizes. This suggests that smaller pores are harder to unclog relative to larger pores as is expected. That being said, this phenomena may only be seen in cotton based filters, if at all considering only one run was conducted. Unfortunately, no experiments