An Investigation of Applying Both Dry- and Wet-strength Agents to Papermaking Wet End and the Effects on Paper Bulk ...

張孟騏、彭元興

E-mail: 387128@mail.dyu.edu.tw

ABSTRACT

This study investigated different doses and modes of applying dry- and wet-strength chemicals of different charge characteristics; the 3 modes deployed included single chemical addition, sequential chemical addition, and pre-mixed chemical addition. The experimental results indicated that at the phase I single chemical addition, adding wet-strength agent caused ca. 5% variation in paper bulk; tensile index of the paper increased 23%; and tear index increased 37%. When dry-strength agent was added, the paper bulk varied by 2%; tensile index of the paper increased 26%; and tearing index also increased 37%. Results of this phase suggested that adding wet-strength agent had better paper bulk advantage than that of dry-strength agent. In addition, along with increased doses, tensile and tear index of the paper also gradually increased; change in paper bulk, however, tended to level off with the chemical doses. In phase II, the wet-strength agent was reacted with pulp stock first, and then dry-strength agent added subsequently. The paper bulk showed a gain of 6%; paper tensile index increased 30%; and tear index increased 46%. Conversely when dry-strength agent was added first and then add the wet-strength agent, the paper bulked increased 4%; paper tensile index increased 20%; and tear index increased 32%. Thus, the results suggested that adding wet-strength agent first, dry-strength agent second would confer better benefits to paper bulk, tensile index and tear index than did the reverse order of addition. In phase III of the study, the dry- and wet-strength chemicals were premixed and added to pulp. Pouring dry-strength agent to wet-strength agent before mixing with pulp produced 6% bulk gain, 23% tensile index increase, and 37% increase in tear index in the resulting paper. The reverse order of premixing wet-strength agent with the dry-strength one led to paper bulking gain of 5%; tensile index increase of 20%; and tear index increase of 41%. The results suggested that premix the 2 chemicals before addition produced benefits in paper bulk and tensile index than those of single additions. Transmission electron micrographic observations indicated that wet-strength agent was irregularly shaped; while the dry-strength agent was long-chain molecules. Therefore, the bulking effect of dry-strength agent was inferior to that of wet-strength agent. When the 2 chemicals were premixed, however, wet-strength agent would cover the dry-strength agent, which rendered more effective in both bulking and strength improvements than did the single chemicals.

Keywords : bulk、caliper、dry-strength agent、wet-strength agent、physical properties、electrical charges

Table of Contents

REFERENCES

1.王志杰、李鴻魁、王麗嫻、党育紅(2007)，造紙濕部助劑的協調應用，紙和造紙，26:30~33。 2.李建、王高升、高莉、陳夫山(2007)，pH值、無機電解質對PAE和CMC在纖維上吸附量的影響，紙和造紙，26(2):39~42。 3.李仲華、彭淵、秦昌晃、盧健文(2010)，醛改性聚丙烯醯胺乾強劑在生活用指中的應用研究，紙和造紙，29(5):42~44、54。 4.李新平、王建勇、吳翠玲(2005)，造紙工業常用濕強劑及其發展趨勢，紙和造紙，6:35~38。 5.林慧宜(2006)，紙張鬆度之研究，碩士論文，國立中興大學，台中。 6.林俊宏(2009)，濕端化學基礎(二)，大葉大學大學部造紙學上課講義。 7.馬麗(2011)，改善輕型紙嵩厚度化學助劑的研製及作用機理研究，碩士論文，山東輕工業學

院。 8.徐清涼、廖昌呂(2009)，PAM增乾強劑在牛皮箱板紙抄造中的應用，造紙化學品，21(5):34~36。 9.唐靈、趙敏、李志祥、陳建中、葛青(2007)，紙張濕強劑研究進展，熱固性樹脂，22(5):53~56。 10.彭慶華、孫培生(2007)，環境友好型聚醯胺環氧氯丙烷濕強劑之性能研究，青島科技大學學報(自然科學版)，28(6):494~497。 11.彭元興、王益真、郭蘭生、陳毓鈞、鐘武宏(2004)，化學漿纖維形態特性及鍊漿的影響，綠色環境經營管理研討會。 12.費貴強、沈一丁、王海花、李小瑞、李翮(2010)，丙烯醯胺接枝氰乙基澱粉增乾強劑的製備及其對紙張的增強作用，中華紙業31(14):37~40。 13.劉軍海、李志洲、黃曉洲(2008)，造紙乾強劑的研究進展，化工科技，16(4):65~69。 14.蔡守昌(2009)，造紙濕端化學-乾強劑與濕強劑，大葉大學大學部造紙學上課講義。 15.蘇裕昌(2002)，紙力增強劑的發展與應用及紙力增強的機制，漿紙技術，6(2):1~25。 16.台灣區造紙工業同業公會(2012)。 http://60.244.127.66/big5/tpia/o201/20030620162154-left-i.htm 17.Asakura K, Akira I. 2003. Effect of internal addition of fatty acid diamide salts on sheet properties, Nordic Pulp and Paper Research Journal. 18(2):188-193. 18.Bristow J A, Kolseth P. 1986. Paper : structure and properties , Marcel Dekker, New York.pp.151-168. 19.Espy HH. 1995.The mechanism of wet-strengh development in paper: a review. Tappi J. 78(4):90-99. 20.Hailan J, Takayuki O. 2009. Effects of internal addition of bulking promoter on low-density and porous structure of handsheet, SEN ’I GAKKAISHI, 65(5):139-145. 21.Kubota K, Hiraishi A, Hamada Y, Nishimori T, Takahashi H. 2001. Light weight and improved paper production by using noble bulking promoter, Tappi J. 55(4):451-455. 22.Kenta M, Toshiharu E, Akira I.2010. AKD sizing behavior of high-bulk papers prepared with fatty acid diamide salts, Paper Chemistry and Papermaking Suspensions, 25(4):441-447. 23.Perng YS, Wang IC, Yang IT, Lee YW.2010. Effects of adding co-ground talc and calcium carbonate on the retention and paper properties of handsheets. Tappi J. 25(2):129-37. 24.Perng YS, Wang IC, Cheng YL, Chen YC.2009. Effect of fiber morphological characteristics and refining on handsheet properties. Taiwan J For Sci 24(2): 127-139. 25.Perng YS, Wang IC. 2004. Development of a functional filler: swelling sericite. Tappi J. 6(3):26-31. 26.Scott E W, Abbott J C, Stanley Trosset. 1995. Properties of paper: An introductionpp, pp.55-57.