

신문지 재생공정의 청정화 및 수율개선 기술 탐색(II)

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Abstract

Republic of Korea became the 8th paper and paperboard producing and consuming country all over the world in 2004. And last year the total production of paper and paperboard in ROK exceeded 10 million tons and now the scale of paper and paper related industry in ROK is expected to be more than 8 billion US dollar. ROK exports paper and paperboard as much as 160 million US dollar in 2002 and so the paper making industry in ROK could be regarded as an export industry. More than 70% of total paper and paperboard production is based on recovered paper as a raw material. Following facts could confirm above-mentioned aspects. Still ROK has poor forest resources (pulp production) and so more than 95% of BKP is imported from abroad. As a result ROK has environmentally friendly structure of paper industry whether it is wanted or not. Anyway, in order to confirm the continuant development of sustainable paper industry and to increase the production of paper and paperboard in ROK, sufficient supply of good raw material, recovered paper with keeping up of its quality could be inevitably required in the future.

However due to the deficiency of supply, every year newsprint mills of ROK import more than 600 thousand ton of old newspaper from abroad (Korea Paper Manufacturers Association, Annual Report 2004). According to the export of newspaper, deficiency of recovered raw material is unavoidable. And the quality of repeatedly recycled domestic recovered paper is inferior to that of imported one from abroad.

In order to overcome the deficiency of recovered paper, increase of recycling ratio

could be suggested. However the recycling ratio of paper in ROK is already very high (72%, Vital Signs 1998) and so it seems to be no more margin for increasing the recycling ratio of paper. Therefore making endeavor to enhance the recycling yield of recovered paper becomes very important in terms of saving valuable resource.

Recycling yield of recovered paper could be determined by two major factors, the amount of contaminants and the segregation efficiency of stock preparation units. Among the various recovered paper, printed one for example, old newspaper shows relatively low recycling yield compared with packaging grade because of loss in deinking process.

Deinking process could be classified into washing and flotation and these days selective segregation of ink by flotation is preferred owing to the less consumption of process water. The mechanism of ink separation by froth flotation is based on hydrophobicity of ink particles.

Hydrophobic ink surface has a strong tendency to adhere to air bubbles and after stick on to the floating air bubble, ink could be segregated from hydrophilic suspended material for example, hydrated cellulose and inorganic fillers. As it could be expected the efficiency of flotation deinking process depends upon the surface physico-chemical properties and hydrolic movement of suspended materials in stock. If the hydrophobic ink particles are completely detached from hydrophilic fiber surfaces, physico-chemical condition for the segregation of ink could be regarded as fulfilled for the moment. When the detached ink particles could have an enough chance to collide with air bubbles by sufficient agitation and when the detached ink particles could be trapped and floated up to the surface by air bubbles, the deinking efficiency could be increased.

The amount of Ink in deinking stock is below 2% in terms of weight. However the ratio of deinking reject or loss of pre flotation in ONP recycling process is higher than 10% usually. It means except for the hydrophobic ink particles, pulp fines and inorganic fines are floated and discharged by air bubbles. Although the

pulp fines and dispersed inorganic pigment or fillers as a virgin raw material have hydrophilic surfaces at first, when they are introduced to hydropulper as a recovered paper, their surfaces are changed into hydrophobic one by the adsorption of sticky contaminants or wet end chemicals intentionally added before. Here the stickies means various polymeric contaminants including styrene-butadiene rubber (SBR), polyvinyl acetate (PVAc), vinyl acetate (VA), polystyrene (PS), polyisoprene, hot melts (EVA, polyethylene, waxes) and even sizing agents (AKD, ASA) which could be characterized with hydrophobic sticky surface. Fragmented stickies could stick on to the surface of suspended solid and the adsorption of stickies on fine materials could be easier than that of stickies on fiber due to the big specific surface area of fine materials. As a result of hydrophobic adsorbed contaminants and sizing agent, fine materials including fine cellulosic fiber and inorganic fillers show hydrophobic surface characteristics and so the froth-flotation loss is aggravated.

Here the flotation loss means not only simple lost of raw materials but also waste of energy for stock preparation including pulping, cleaning and coarse screening. The loss of flotation means also unnecessary contamination of process water. As the flotation loss could generate solid waste and water contamination, the endeavor to optimize the flotation efficiency and to reduce the flotation loss is urgently required now. And if we can control the flotation selectivity by modifying the hydrophobicity of fine materials in deinking stock, reduction of production cost and saving of recovered paper could be made with the preservation of environment.