Wealth From Waste

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A combination of factors, including either shortages in virgin pulp or economical production under prevailing conditions, has created a quickening of interest in paper mills in installing systems or equipment to provide supplemental capacity as 'secondary fibre.' Use of secondary fibre or recycled fibre has presently become a major economic factor in the pulp and paper industry.

"Secondary fibre' is defined as any paper fibre used a second time as a raw material for the manufacture of paper and paper board.

Different varieties of waste paper make a good source of secondary fibre. These include while cuttings from paper mills and printers, general office waste, waste corrugated kraft papers and box cuttings, computer print out, over issue news and collected newspapers, old magazines and books, and of course mixed waste paper of various grades.

In the waste paper recycling area, the two most important factors are the return on investment for the plant and the contaminant removal system. One would definitely prefer that the properties of recycled secondary fibres approach those of virgin fibres, and as such the contaminant removal is the most important, since it determines the quality and thus the value of the finished pulp.

Any ingredient in the waste paper other than the cellulose fibre is considered contaminants. Thus, the removal of filler and inks, during wasting, is included as a contaminant removal in some of the waste recycling systems developed for the production of required quality of pulp for production of newsprint.

Improvement in the return on investment of any papermaking operation lies in increasing the effective production for the papermachine and that is improved machinerunnability.

New process technology and new equipment developments have resulted in a stock preparation system design for the recovery of waste paper with lower capital investment and higher efficiency of recovery Waste System.

The concepts of waste paper recycling system design, being dealt here, has been developed by Beloit Walmsley Group, associates of Jessop Co. Ltd., Calcutta. This concept requires that the waste plant capabilities are matched to the paper machine and product requirements. Obviously it is pointless to install a basic waste system to clean mixed waste for high grade products. Equally unnecessary sophistication reduces the saving, which may be realised from the use of waste, primarily through excessive running costs. Thus to obtain the maximum benefit from the use of waste paper, it is essential to consider the total plant operation.

Certain basic criteria must be met by any waste system to be successful. A waste system must :—

1. Operate in a trouble free economic manner.
2. Take commercially available waste paper.
3. Be useable at high concentrations in proper furnish.
4. Permit high efficiency paper machine operation.
5. Produce saleable paper.

To meet the above basic criteria, a correct waste system design can, howaver, ensure that with modern equipment all types of contaminants can be handled satisfactorily.

Any waste paper recycling system will have the following stages of operation :

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Pulping/defibering.

Coarse cleaning/high density cleaning.

Low density cleaning and screening.

Washing/thickening.

To achieve higher efficiency of recovery, the different types of contaminats or contraries found in waste papers have been classified into groups based on their physical characteristics such as morphological characteristics, dimension and specific gravity. All materials in a group will react in a similar way to the action of a particular machine or equipment. Extensive research work has determined which machine module or group of modules is most suitable for dealing with a particular group of contaminants, consistent with the requirements of the finished product. In addition to the system of removing normal contaminants, like woodchips, strings, pins, sands, clips, metallic elements, grits, glass etc., Jessop–Beloit group has systems/equipment to take out more problem materials, such as cellophane sealing tapes, metal foils polyethilene coatings, plastics, self adhesive tapes Stickies, hot melt adhesives, seals, asphalt bitumen etc.

Pulping or defibering is carried out in pulpers. The pulper's prime function is to completely fiborise the paper or board with least power possible and with minimum degradation of fibres. Its second function is that of segregating or screening out course contaminants without any size reduction of the contraries, because their ultimate removal by screening or centrifugal cleaning will be done more efficiently in the condition. The defibering part of the job of a pulper depends on the raw material characteristics and is measured by a parameter called 'defibering index' or pulping index. 'The defibering/pulping index is defined as the percentage of pulp that passes through a screen with 0 25 mm slots. The means used in a pulper for the cleaning function depends to a large extent on the amount and nature of the foreign matter. With the clean waste paper, the 'shask/barracuda' batch pulpers can achieve about 98 per cent defibring index normally. Paper or board when repulped to the extent of 98% defibering will not require any secondary pulping or use of deflaker and thereby reduces power consumption in the system. On very dirty waste paper, continuous waste pulpers are used with ragger and janker. The design of these pulping units never allow particle size reduction of the various contaminants. In continuous pulpers, the required defibering is controlled by perforation size of the extraction grats, together with the required extent of contrary removal at the pulping stage. The latest development in this area is high efficiency pulping in a "tri–dyne" pulper. At high consistencies, the fibre interaction increases and with it the defibring efficiency. As a result, the power input per fibre weight decreases and show pronounced power savings. There is also saving in the use of steam, where repulping is done at higher temperature, because of less water content at high consistency. The capital investment is also lower as the pulper tank volume is reduced to half for the same weight of fibre at higher consistency. The "tri–dyne" pulping rotor has an effective positive section to prevent cavitation, ensures adequate radial displacement for proper circulation in the tub and provides localised micro–turbulence at the values to increase hydrallic defibering. The systems of contaminant removal in the pulping stage are also available with the different types of pulpers stated here.

The next stage of cleaning and screening effects contaminant removal by size and by specific gravity in specific equipment. The high efficiency high density clearners' allow contrary removal by specific gravity at higher consistency between 2 5% and 6%. Unlike other high consistency cleaners or purifiers, these high density cleaners, 'use free vertex flow concept and applies dilution water below a throat section to separate tramp material. These cleaners remove all heavies of any particle size. The coarse screening is done in 'barrier screens which operates at high consistency up to 5% at a comparitively much lower power consumption.

This screen also removes plastics and other lighter contraries directly after pulper where the defibring has been done to the extent of 98%, resulting in a good amount of power saving in the system. Perforated pressure screens and slotted pressure screens are also used in the systems on high consistency stock, depending on the type and quantity of contaminants present, in the waste paper. Slotted screens are much more effective in removing certain types of contraries not susceptible to successful removal with round perforations. All screening at contaminant removal by size at lower power consumption.

Some waste paper repulping applications call for use of secondary pulper-cum-equipment for lighter contrary removal. The system is designed with a high density cleaner ahead of 'Belcor' The 'Belcor' is designed for effective separation of plastics and other contaminant at low power consumption due to small body diameter. Heavy contaminants are removed in the first few revolutions by the jink trap strategically positioned in line with the inlet to minimise wear. This system does not give rise to any contaminant concentration effect in the accepts from the 'Belcor'.

The low consistency centrifugal cleaning and centrifugal screening under pressure are recommended for certain groups of contaminant to meet the required qualtty of recycled pulp. For the removal of stickies along with other lighter contraries, the low pressure 'uniflow cleaners' are unique for its performance.

All these equipment are available today and system can be supplied to give almost any removal rate required by the paper maker to meet his process or product requirements.

Possibly the most sophisticated types of waste plants are those used for processing printed wastes to produce ink free stock.

The de-inking of waste is a long established process, which in recent years, has assumed increasing importance as the use of waste has expanded. Two processes are currently available, namely washing and floatation, however, elements of flotation can often be advantageously included in washing systems or elements of washing included in flotation systems. This type of plant is commonly referred to as a 'combination' system and has found favour with a number of deinking mills in recent years.

In the future it is likely that both environmental and economic pressure will force an increase in the use of waste paper reducing downtime on machine, needs to be definitely examined. Should such an examination be ignored and a poorly designed waste plant is installed, the effect on a mills future could be catastrophic. However, the ability exists within the industry to ensure that this should not happen and that the potential benefits of utilising waste paper can be realised.

It is in the interests of both the machinery user and supplier that a close co-operation should exist to ensure a profitable papermaking industry.