Effective utilisation of chemicals in stock preparation

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SUMMARY

Savings achieved through various measures taken in the Stock Preparation Unit, Prime section using costly chemicals, are presented. Substitution of costly dyes with more economical ones is described. The benefits derived through the change of point of addition of dyes and whitening agents are presented. The advantage of using the dilute solutions of additives for better control are discussed. A study on reduction of chemical and fibre losses by closing the white water system is given.

Precautions to be taken while accepting new substitutes are mentioned.. The reduction in alum consumption due to change in the Bleach Liquor from Calcium base to Sodium base is also discussed.

The Stock Preparation section of a Paper mill making quality paper and boards is the prime consumer of costly chemicals and additives. A paper mill making 50,000 tonnes of paper and boards per annum will consume various chemicals and additives with a budget of upto 20 million rupees in Stock Preparation Section alone. Therefore, a saving of even one percent in this expenditure without sacrificing the quality of the end product will generate substantial savings for the mill. The main items consumed are rosin, alum, talc/clay, titanium dioxide, starches and gums, dyes and optical brightening agents. Many new synthetic additives have come to market with claims to improve various properties of paper or simplify paper making process. It is, therefore, important for the mill personnel to try out these chemicals and use them if the claims are established at reasonable cost It is also essential that the mill optimises the consumption of each item by effecting various steps in a systematic manner to conserve as much of the costly chemicals as possible.

Some of the methods tried successfully by SPB in reducing the consumption of various inputs in Stock Preparation are :

a) Substitution of one product by another economical one to get similar result

b) Use of same product of different grade but costing less

c) Use of a product at a different point in the process of paper manufacture

d) Meter the chemicals accurately at a lower concentration

e) Avoid losses of chemicals by closing up the system

f) Trials with new products to establish their cost benefit

SUBSTITUTION OF ONE PRODUCT BY ANOTHER ECONOMICAL ONE TO GET THE SAME RESULTS

An example in substitution of a product by another economical one is the replacement of a combination of dyes by another one of lesser price. White papers and paper boards are tinted to give a grey cast so that the paper appears white on viewing in ordinary light. Generally a combination of blue and red dye (Victoria Blue and Rhodamine) are

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added to bleached pulp. But as one of the dyes (Victoria Blue) was very susceptible to change shade even with a slight change in pH and was also causing dye spots in paper, the tinting on white stock was changed to methyl violet alone. This, not only brought down the problem of shade variation and dye spots, but effectively reduced the dyeing cost per tonne of paper board. In the manufacture of duplex board a saving of Rs. 6/ per tonne of board was obtained. Quite a number of similar examples can be cited. In green printing paper, the acid brilliant green dye was replaced by basic brilliant green dye which was 7 times stronger in chroma and a substantial saving in cost per tonne (about Rs. 100/- in this case) could be achieved.

However, a word of caution here is necessary. Before a changeover from acid or direct dye to basic dye is done, its effect on pulp (whether it gets mottled due to preferential dyeing with one type of stock) should be studied as also the end use to which the paper is put. Using less number of dyes also brings down the inventory on these items as well as reducing procurement problems.

USE OF SAME PRODUCT OF DIFFERENT GRADE BUT COSTING LESS

Due to rapid development of chemical and dyestuff industries in the last one decade, it is now possible to identify more than one source for any product. It is also possible to obtain these products from small scale sector who have the advantage of smaller establishment charges and concessions offered by government. A part of this advantage can be passed on to the end user (paper industry). On a weighted average, Rs. 25/- is spent in colouring a tonne of paper. If a price saving by 10% is obtained, a saving albeit small, when viewed cumulatively for the whole year, will result in big savings in procurement cost. Similar examples can be given in procurement of other items viz, optical brightening agents, gums, glue, starches etc.

An evea handed policy of placing the order on both the large scale and small manufacturers will benefit the paper mill as the mill will not be dependent upon one source only and at the same time generate competition among suppliers without adversely affecting the quality of the material supplied.

USE OF A PRODUCT AT DIFFERENT POINT IN THE PROCESS OF PAPER MANUFACTURE (CHANGE OF PLACE OR POINT OF ADDITION FOR MORE EFFECTIVE UTILISATION)

With the extensive use of size press application for depositing chemicals on paper, it has become possible to change the point of addition of dyes and optical brightening agents in size press instead of the conventional wet end.

Optical brightening agent is added to surface sized map litho paper which enhances the visual appearance of paper by absorbing the light in the ultraviolet region and re-emitting it in the visible region of spectrum. As this is only a surface property, it was found that addition in the wet end is wasteful, as in a sheet of paper or paper board the surface layer alone requires optical brightening agent for enhancing the property of reflection. The effect obtained by adding 0.4% optical brightening agent in wet end was achieved by adding only 0.2% optical brightening agent in size press bath. A clear saving of Rs. 100/- per tonne of paper is obtained by this method.

Similarly, when deep coloured surface sized paper boards are made, a part of the colour can be added in the wet end and another part in size press While reducing the cost substantially in some cases upto Rs. 20?/- per tonne) this will help in uniform dyeing and reduce the two sidedness.

METERING OF CHEMICALS ACCURATELY AT LOWER CONCENTRATION

Modern paper machines are designed to run faster than ever before. This reduces the dwell time of stock in the chests. Intimate mixing of chemicals with stock is absolutely necessary to get uniform quality of product. To optimise on the addition of chemicals and to reduce the chances of error of addition in places where sophisticated instruments are not available, the easiest method is to meter the chemicals in diluted form. By this, a better mixing of chemicals with stock is achieved and control is easier as errors are minimised. By reducing the concentration of alum solution from 100 gpl to 75 gpl, it was possible to bring down the overall consumption by 8.3% or 5 kg/tonne of paper. The mill was able to save 250 t/year on alum alone. Similarly by reducing the rosin solution concentration from 45 gpl to 30 gpl, the rosin consumption was brought down by about 12% effecting a saving of 50 tonnes per annum for the mill. Concentration of dye solutions, gums, glue solutions has also been reduced and this brought in savings besides giving a more uniform product.

AVOIDING CHEMICAL LOSSES BY CLOSING UP THE SYSTEM

Progressive closing up of the white water system has been helpful in reducing the fibre filler losses and consequently helped in improved retention of

fillers overall on paper. Earlier, all the white water from paer machine was sent to floatation save all. the fibre component was returned to system and clarified back water was used for dilution purposes. The present concept is to reuse the white water generated on the machine as much as possible near the source of generation. Therefore, dilution to secondary centricleaners, consistency regulators, hydrapulpers is done with white water and any excess left over is sent to saveall for recovery of fibres. This has reduced the load on saveall by about 25% thus enhancing its recovery efficiency. Also, direct reuse of white water containing fibres and fillers has improved the overall retention upto 5%. In terms of quantity of filler saved the mill has been able to reduce the consumption of soapstone powder by about 400 tonnes per annum and yet maintained the same percentage of ash in paper as earlier.

However reuse of white water in all the places of paper machine and stock preparation area is not possible, as circulation of white water tends to increase the calcium hardness (as $CaCO_3$) and this mill tried to dilute the bleached stock with paper machine back water and immediately the alum consumption shot upto 8 to 9% from 5.0 to 5.5% on paper. This was because the back water hardness is of 300-350 ppm as against fresh water hardness of 100 ppm average. Increased calcium and sulphate ions in back water interferes with sizing besides causing problems of slime growth

TRIALS WITH NEW CHEMICALS TO ESTABLISH THEIR COST BENFFIT

Different pulp furnishes give different results with the additives and therfore it is necessary to undertake a regular trial in the plant scale before the utility of the additive is established. Laboratory tests are only indicative as mill conditions cannot be exactly simulated in the laboratory. The mill has the practice of testing any new product offered in one of the paper machines for a period of 2 to 3 days and resutls are evaluated before its regular use is decided upon. Any product not fully meeting the norms is discarded. Some. of the recent trials done are:

i) Cationic wax emulsions which are claimed to replace rosin partially were tried on both unbleached and bleached papes As the results were not encouraging, use of wax emulsions was stopped.

ii) In unbleached kraft papers, CMC (50% purity) and modified guar gums were tried for improvement of bursting strength. As 1% CMC brought about the same improvement in strength as 0.5% by weight of modified guar gums the mill has preferred to use the latter, the cost of both being nearly equal.

iii) Polyelectrolytes (which are long chain water soluble polymers containing ionisable side groups generally used as flocculants) of two different parties were tried for improving the filler retention and bursting strength in kraft papers, but were found ineffective.

iv) The mill is shortly taking up plant scale trials with polyacrylamides for improving the retention of titanium dioxide in posters. The laboratory trials were encouraging as the back water had a higher clarity and rate of drainage was more. the effect of these electrolytes in actual mill trials is yet to be assessed.

EVOLVING ALTERNATE STRATEGIES

The mill uses calcium hypochlorite liquor for bleaching of pulp Besides chlorine gas, use of calcium based liquor and subsequent washing of the pulp resulted in the hardness of pulp extract in the region of 150-200 ppm. As this was responsible for the alum consumption at 5.5 to 6.0% in paper making sodium hypochlorite was tried as bleaching agent. The pulp hardness dropped to 100 ppm on an average and alum consumption was reduced to approximately 3.5 to 4.0% However, there was no cost benefit on the whole due to a large difference in cost of making sodium based liquor compared to calcium based liquor.

CONCLUSION

In an economy where the cost of inputs is increasing regularly, it is necessary to monitor the use of chemicals and additives constantly so that the most economical product is used at the ideal point to produce the best results. Constant efforts to evaluate the utility of the new chemicals is needed. Wherever cost benefits are established, they should be taken advantage of.