

Relevance of Multi-Ply Board Machine For efficient Broke Utilization in Multi-Machine Paper Mills.

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In a multi-machine paper mill making different varieties of Paper and Paperboard full broke utilization becomes a problem if some facility for its alternate use is not available. In such mills a multi-ply Board machine can soften the sting. Multi-ply board machine can take care of all the excess broke which can not be recycled, in the same product from which it originates, for quality reasons. It can also take care of mixed broke, spillages and fibre waste during wash-ups and order change which otherwise is a loss.

INTRODUCTION

Multi-machine Paper mill is a mill having more than one machine of different capacities making more than one varieties of Paper and Paperboards from pulp of one or more types of raw materials. More the number of machines and more the varieties of Paper and Paperboards manufactured, more is the problem of efficient broke utilization unless some facility for its alternate use is not available. Multi-ply board machine is one such option. It can take care of all the excess, mixed and dirty broke in such a mill. As the relevance of multi-ply Board machines is directly related to mill broke it is necessary to understand various aspects of broke and its reutilization in the Paper industry.

What is Broke

Broke is the pre-consumer recovered Paper and Paperboard waste manufactured during Paper and Paperboard making process. Whenever a Paper or Paperboard machine is started it produces broke, while running it produces broke and while stopping also produces broke. In fact no salable Paper or Paperboard can be manufactured without making broke. There are several places in a Paper mill between the head-box and the salable finished product where broke is generated (Fig-1). The broke except in some extraordinary circumstances, never leaves the mill premises.

Broke is classified in two categories.

1. Wet-Broke

All the broke that is generated in the wet-end of the machine is called wet-broke. Wire edge-trims, sheet break

at the couch, all breaks in wet-presses before the sheet enters the dryers fall in this category.

Dry-Broke

Broke after the sheet leaves the wet-presses and right up to the final product before being shipped to the customer is the dry-broke. Broke in between the dryer part, at the size-press and breaker stack, before and after the calendars and before the Paper or Paperboard is reeled over the spool is called machine broke.

Waste produced from the jumbo roll in reelers, winders, re-winders, super calendars, cutters, sorting and packing and all the paper or paperboard rejected during these processes is termed as finishing broke.

All the waste generated in converting operations, any Paper or Paperboard shipped to a customer, but rejected and returned back due to off specifications and cannot be sold to the other customer, also fall in the dry-broke category.

Broke though is waste paper but in technical term broke and waste paper are independently classified. While broke is the pre-consumer waste and is generated in the process of making Paper or Paperboard, waste paper is the post-consumer waste generated in the process of using Paper or Paperboard for making goods or discarding them after use. It is not uncommon to find that some of the broke within the mill premises gets converted to waste paper. As the broke is generated at many points and in varying quantities in a mill, it is practically impossible to keep all the broke clean enough for recycling in the same product from which it

originates. Broke spoiled due to walking over, mixing of different varieties of broke in finishing house, and contamination due to mixing of wrapper pieces and mill dirt are some of the factors responsible for making considerable amount of dry-broke into waste paper. Where large no of varieties are made especially in a multi-machine mill, nearly 5 to 10 % of the total dry-broke can become waste paper unless a very strict control on broke handling is exercised.

Rate of Broke Generation

Amount of broke generation is difficult, rather impossible, to predict. Machines made with same specifications; running with the same type of stock, making Paper or Paperboard of similar specifications and housed in the same premises may not behave in the same manner. As there are multiple factors causing broke and there is no imperial formula to assess the broke generation, the mill management, has to depend upon the experience of the operators and the papermaker. By random checks and measurements of broke coming out from different points and for different grade, management make their own benchmark for broke generated by the machines.

Different methods are employed to determine the broke generation at different points on the machine. Hardly anyone attempts to separate the broke from all the generation points, weigh or calculate individually to identify from where it comes and the reason it is caused. Surveys reveal that the total broke can vary between 10 to 40%. As the amount of broke does not appear in the overall input - output figures, managements hardly take any action except in cases where the overall production efficiency starts going down from their set norms. However as the generation of broke is the indication of running efficiency of a paper machine, analysis of downtime can provide useful data about the generations of broke.

There is no way by which the broke can be reduced to nil. Some broke is inevitable as it is a part of papermaking process. Most of the broke is recycled in the same systems hence there is no obvious loss of raw material. But as the cost of furnish to paper machine is hardly 30 to 40% of the final value of the salable paper the management insists upon the technicians to save this loss of 60 to 70% of the final value of the product by controlling the broke generation.

Broke Handling

1 . Wet Broke

A). As can be seen from Fig.2 wet broke is generated in wire-part and wet presses. Wire edge-trims though a small quantity gets generated continuously as long as

the stock is flowing on the wire. Wire edge-trims fall continuously in the couch-pit where they are disintegrated by the couch-pit agitator and pumped to machine chest continuously either directly or through a small filter. Full width broke at the couch-pit is generated while the machine is threaded or problem occurs elsewhere. Couch-pit has a small capacity and hence if the full width sheet broke gets generated for more than 5 to 10 minutes, the broke stock from the couch-pit is pumped to the main broke pulp storage chest.

B). Depending upon the machine configuration, the wet-presses broke can go to the couch-pit , a press-pit, or dumped on the floor. From the couch-pit or the press-pit the broke after proper repulping is pumped to the main broke pulp storage chest. Broke dumped on the floor is carted to the dryend pulpers.

C). Total wet broke can vary from 3 to 10% on net production.

Dry Broke

The points of dry broke generation as can be seen from Fig. 2 are many.

A). Machine broke

All the broke generated after the press till the paper or paperboard is finally wrapped on the pope reel is the machine broke. In older machines, mounted on the ground floor, the broke is pulled on the tending side and transported manually to the broke pulpers.

All modern machines are now mounted on the first floor leaving sufficient clearance between the basement and the machine floor. The usual practice for such machines is to install a suitably sized pulper below the calendars. For transporting the dry broke from the dryers, a conveyor is installed from below the first dryer cylinder to the pulper below the calendars. Where there are no conveyors or they have been removed for operational reasons, the dry broke from the dryers is dumped on the basement and transported manually to the broke pulper.

Machine broke can vary from 3 to 10% on net production.

B). Finishing Broke

Finishing broke has two areas of generation

1. Finishing machine include Reelers, Rewinders, Cutters and Supercalanders.

2. Finishing house where sorting, counting and packing the Paper or Paperboard is done before the warehouse from where the same is shipped to the customer.

Finishing machines broke includes edge trims, Paper or Paperboard slabs removed from the jumbo-roll because of quality defects, broke generated at super calendars

and cutters. All this broke, is handled manually and carted to broke pulper either as it is or after baling.

Finishing broke can vary from 4 to 15% on net production.

Re-Use of Broke

In most cases the broke generated is used in the same process from where it originates. But in some cases where the Paper or Paperboard is manufactured with such additives that will make the repulping process difficult or will alter the characteristics of fibres after drying the broke cannot be recycled in the same grade of Paper or Paperboard. Part of the broke which gets contaminated while handling is also separated for alternate use.

Paper making experts are of the opinion that 6 to 8% of broke pulp in the furnish, affects the quality considerably. However this does not include the wet broke and save-all recovery. If for some reason there are some abnormal breaks in the wet end, the wet broke's effect on the quality cannot be ignored. In some speciality paper except for wet broke pulp, no dry broke pulp can be used and as such the entire dry broke is to be stored for some alternate use. To avoid these complications, one common broke pulp chest can be made for both the wet broke and dry broke for each machine separately. The pulp from this chest is added to the blending chest at the rate of 10 to 12%. (Fig 2).

However this cannot be taken as a thumb rule. Depending upon the virgin pulp characteristics and paper properties this percentage can vary. To make their own benchmark the Papermakers adjust the proportion of broke pulp such that the properties of paper and paperboard do not fall below the norms.

Based on the above criteria, relevance of a Multi-ply

Board machine in a multi-machine mill can be explained by the following illustration.

Doubts can be raised on the assumptions of total broke generation and its reutilisation on different machines. To justify,

a). By recording the total time the paper stock has run on the wire, total amount of paper, including all process losses, that should have been occurred during that time is calculated as under :

Substance weight in GSM X width of slice opening in meters X speed of the machine in meters per minute X total time the paper stock has run on wire in minutes ÷ 1000. tonnes. From this if the weight of net salable paper is deducted, the total weight of wet and dry broke will be known.

Such an exercise when done for different varieties and substance weight of papers for different machines the average recorded will give the total broke produced. The percentage of this broke on net salable paper will justify the assumed broke % figures taken in the illustration.

b). Whatever may be the percentage of total broke, today the entire quantity is recirculated in the same variety. To clear this doubt the Papermaker should run the machine with the stipulated percentage of total broke shown in the table for some days and compare the paper properties and runnability of the machine from the earlier records. The difference will clear the above doubt.

From Table 1, it can be seen that nearly 42.5 tonnes of broke remains as balance which can easily sustain one 60 to 80 TPD multi-ply board machine. Even if we increase the rate of broke reutilisation by 50%, balance broke remaining will be nearly 22 TPD, which can

Table 1

Prod. NTPD	Quality	GSM Range	Variety	Total Br.%	Total Br.TPD	Reuse Br.%	Reuse Br.TPD	Bal. Br.TPD
20	Fine	20-40	Bld/Col.	30.00	6.00	10.00	2.00	4.00
30	Specially	40-100	Bld/Col.	30.00	9.00	10.00	3.00	6.00
50	Sized	40-100	Bld/Col.	25.00	12.50	12.00	6.00	6.50
80	Ub.Kraft	30-120	Ublid	20.00	16.00	10.00	8.00	8.00
100	Wrt.ptg.	40-70	Bld	20.00	20.00	12.00	12.00	8.00
100	Sized	40-70	Bld	20.00	20.00	10.00	10.00	10.00
380	-	-	-	-	83.50	-	41.00	42.50

All figures are assumed and on net salable Paper

sustain a multi-ply board machine of 40 to 50 TPD capacity.

ADVANTAGES

The advantages of having a Multi-ply board machine in a multi-machine paper mill can be summarised as under.

1. Rate of broke reuse can be adjusted to suit the main product quality requirements and improve runnability of machines.
2. Mixed broke which amount to nearly 5 to 10% of the total broke can be profitably used in the board.
3. Fibres going to drain due to spillage and during order change can be recovered and used.
4. Excess broke, during machine upset conditions or, for any other reason will find an useful outlet.
5. Higher mill broke proportion in different plies of the board machine will improve the quality of board and reduce dependence on waste paper.

CONCLUSION

Multi-ply board machine in a multi-machine paper mill works as an scavenger for the fibres that otherwise has no useful place on the main machines. This will improve the yield of fibres and reduce pollution load.

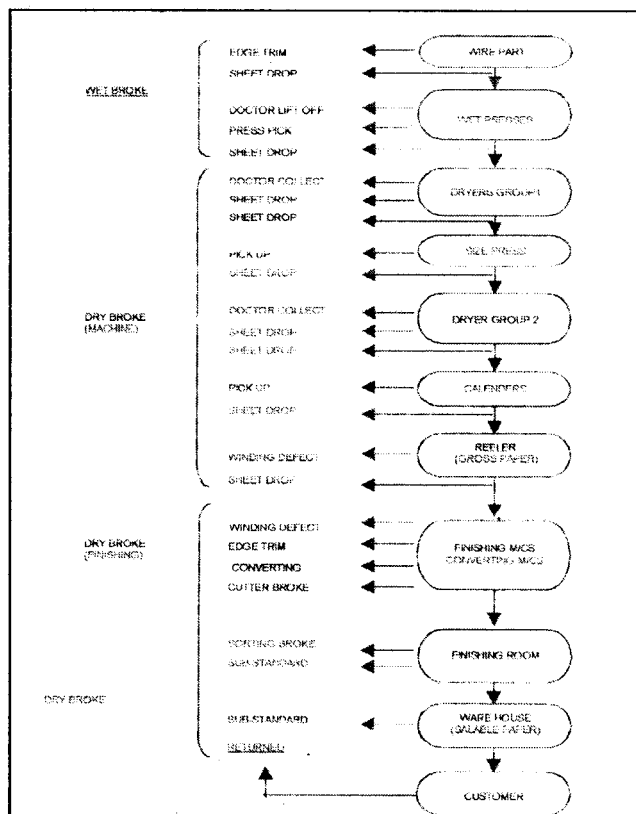


Fig. 1 : Point of Broke Generation on Paper Machine

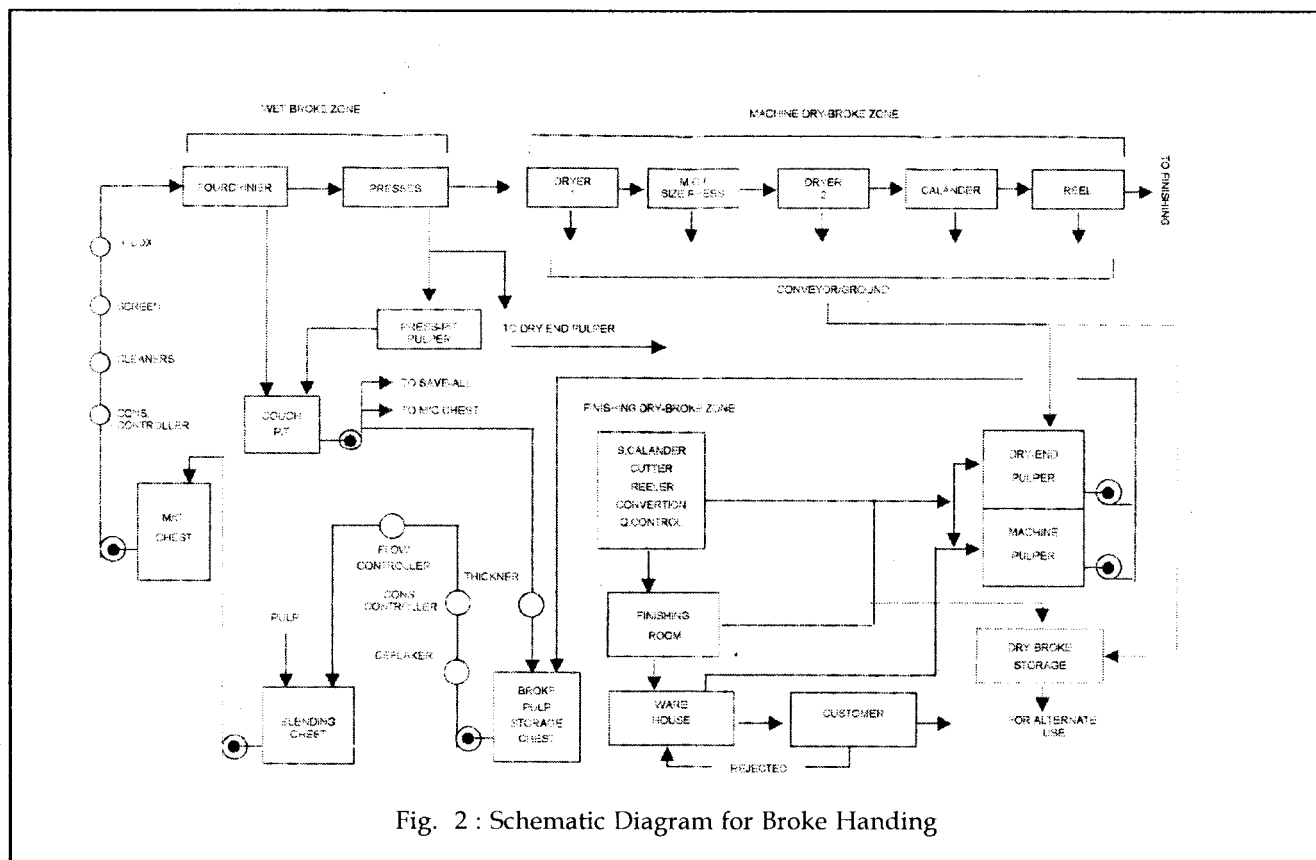


Fig. 2 : Schematic Diagram for Broke Handling