The National Newsprint & Paper Mills Ltd: Nepanagar (M.P)

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Utilisation of Solid Waste in Nepamills

The days are gone when to produce something was much more important than the cost of the product. Now the cost comes first. If a product is not competitive, cost-wise, some day the product will be out of the market. Effective utilisation of the By-product is also important to curtail the cost of the product.

Pollution is an unavoidable evil of modern industrialisation. As the industries grow more and more, complex problems of pollution are faced by man-kind and other living beings.

Much attention has been paid by scientists to use the waste and pollutants in an effective way by using the waste material and pollutant as fuel, filling material and as substitute raw material.

In the present study two such materials have been chosen and the Lab trials have been successful.

1. Nepamills has a captive power plant to meet the steam and power requirement. The ash generated has about 8-10% of unburnt coal particles. Lab trials have been conducted to treat mills effluent by this waste and there is significant improvement in colour.
2. During the chipping process of Bamboo, lot of Bamboo dust and fines are generated. During Laboratory trials a fraction of this bamboo dust has been used alongwith the bamboo chips to make a suitable grade of pulp.

Use of Coal Ash

Large quantity of effluent is discharged into the river Tapti, after proper treatment, but the colour of the effluent is not removed completely. The process involved in making newsprint is very much different from those used in making quality paper. The source and nature of effluent from different plants is summarised in Table No. I.

Activated carbon treatment process is well known for colour removal of Industrial effluent. The use of activated carbon is not feasible on economic grounds. Moreover the re-generation of activated carbon is not feasible, on the same lines as using coal ash containing some unburnt particle of coal for the treatment of effluent.

Nepamills power house is generating about 80-100 MT/day of ash, which contains 8-10% unburnt coal in it. The reasons of selection of coal ash for this study may be summarised as follows:-

a) The ash generated from power house contains about 8-10% unburnt coal which is activated to some extent.

b) The coal ash is available in large quantity and the cost is almost negligible as compared with activated carbon.

c) The major constituent of colour in the effluent is lignin. When effluent passes through coal ash, it will be absorbed by it, thereby increasing the combustion value of coal ash and therefore it can be sold at a higher rate.

d) For treatment purposes, beds of coal ash are made which serve as a filter bed for removal of suspended solids mostly pulp fibers thereby further increase the combustion value of coal ash.

e) Most of the impurities are removed in course of this process resulting in a great reduction in BOD and COD values also.

Preparation of Bed or Column

For experiment a M.S. Column of length 140 cm. and diameter 8 cm. was prepared as shown in the drawing. The lower part of about 20 cm. was filled with coal ash and about 60 cm. length was filled with graded ash (12 mesh). Fine ash was selected for better absorption. This column was loosely packed to a volume of approximately 4 Litre and weigh about 3.6 kg., 40 Litres of effluent from each grade was passed from lower to upper and of the column for better absorption. Flow rate of about 1 litre in four minutes was kept which was found to be best after several trials. Samples were collected in two parts.

a) Till clear effluent was obtained from the column.

b) After saturation of coal ash column i.e. when there was no more change in colour of original effluent.

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STRENGTH PROPERTIES OF BAMBOO AND BAMBOO DUST COLD SODA PLANT

PARTICULARS	I					II			III	
Strength Properties	Bamboo Chips	Bamboo dust fractions +16	+20	+30	+34	Bamboo dust +20 Fraction		Bambo Chips	Bamboo dust + 20 Fraction	Bamboo Chips 93% Bamboo dust +20 Fraction 7%
						I	II			
I. CSF	244	277	229	187	110	325	180	198	180	180
B.F.	14.65	4.8	4.4	4.3	4.0	6.1	8.0	13.1	6.2	12.84
T.F.	51.7	23.76	23.5	21.5	19.7	28.0	25.85	49.44	25.8	16.1
B.L.	2250	1325	1180	1100	1210	1760	2380	2860	1760	2790
II. CSF	177	148	139	158	-	124	87	114	78	124
B.F.	15.5	6.8	5.72	5.0	-	8.2	9.9	15.1	6.41	14.6
T.F.	50.76	26.6	26.3	-	-	24.72	26.3	39.55	21.4	41.2
B.L.	3020	1745	1610	1230	-	2365	2750	3280	2090	3090

TABLE NO. 1 POLLUTION LOAD OF DIFFERENT ACTIONS OF NEPAMILLS

PARTICULARS	GRADE I	GRADE II AND IV	GRADE III	MIXED POLLUTED WATER
Source	Paper Machine	Mech. Pulp & Cold Soda Pulp	Chemical Pulp	Fix. effluent
Volume of	12 Mill. Ltrs.	28 Mill. Ltrs.	40 Mill. Ltrs.	80 Mill. Ltrs.
Total Solid Mg./1	600 to 800	1500 to 2000	900 to 1000	1500
Total Suspended Solid Mg./1	300	400	250	300
BOD	80 to 100	600-700	70 to 80	250
COD	150 to 200	1600 to 2000	300 to 500	700

TABLE NO. 2 COLOUR REDUCTION OF THE EFFLUENT TILL THE STATURATION OF COLUMN

COLOUR OBSERVATION	VOL. OF GRADE II AND IV IN LTRS.	VOL. OF GRADE III IN LTRS.	VOL. OF FINAL EFFLUENT IN LTRS.
Volume of effluent till no colour is observed (clear)	23.6	19.3	45.2
Value of effluent till the saturation of column.	31.6	28.70	56.50

TABLE NO. 3 REDUCTION IN DISSOLVED SOLIDS

Code of effluent	Initial dissolved solids Mg./1.	Dissolved solids after passing column till clearity Mg./1	% Decrease in dissolved solids	Dissolved solids after saturation of column Mg./1	% Decrease in dissolved solids
Raw Water	420	-	-	-	-
Grade II & V	2540	640	74.80	980	61.41
Grade III	2308	450	80.50	808	64.94
Final Effluent	1188	898	65.49	710	40.15

TABLE NO. 4 REDUCTION IN SUSPENDED SOLIDS

Grade Effluent	Initial suspended Solid Mg.1.	Suspended solids after passing column till clearity Mg.1	% Decrease in Suspended Solids	Suspended solids after saturation of column Mg.1.	% Decrease in suspended solid
Rew Water	8	-	-	-	-
Grade II & IV	600	10	98.33	42	93
Grade III	368	8	97.83	34	90.76
Final effluent	112	6	94.64	14	87.5

TABLE NO. 5 REDUCTION OF COD VALUES

Grade of effluent	Initial COD Mg./1	COD after passing Column till Clearity Mg /1	% Reduction in COD	COD after saturation of Column Mg./1	% Reducation in COD
Grade II & IV	2240	408	81.78	1108	50.53
Grade III	480	60	87.50	248	48.33
Final Effluent	260	42	83.84	138	46.92

TABLE NO. 6 REDUCTION OF BOD VALUES

Grade of Effluent	Initial BOD Mg./1	BOD after passing Column till Clearity Mg./1.	% Reduction in BOD	BOD after saturation of column Mg./1.	% Reduction in BOD
Grade II and IV	660	168	74.54	334	49.39
Grade III	112	28	75	54	51.78
Final Effluent	48	14	70.83	26	45.83

Selection of Effluent Samples

The following sample of effluent were selected for the experiment.

a) **Gr. II & IV:** It contains highest pollution load of suspended solids. BOD and COD.

b) **Gr. III:** This is the effluent of the chemical pulp mills and has highest content of lignins and is mainly responsible for colour of effluent. It is not biodegradable.

c) **Final Effluent:** Which is sent to river Tapti after treatment, it has got a brown colour.

Observation and Discussion

The studies were carried out as under:

a) **Colour removal:** Colour of each grade was reduced to a satisfactory level after passing it through coal ash column. This is specific in case of chemical pulp effluent which is mostly consists of lignins and is resistant to biological degradation. The results are recorded in Table No.2.

b) **Reduction in Dissolved and Suspended Solids:** Reduction in dissolved and suspended solids present in the effluent was observed to a great extent. Dissolved solids got reduced by 60 to 80% and compared well, with that of raw water. While the suspended solids got reduced by 90 to 98%, which equals filteration process. The results are recorded in Table II & IV respectively.

c) **Reduction in COD & BOD Values:** The COD and BOD values got reduced by 50 to 85%. The COD and BOD of chemical pulp effluent which is not easily reduced otherwise came down by 60 to 70% due to absorption of lignins. The results are recorded in Table No. V & VI.

d) **Increase in combustion value of coal ash:** The increase in combustion value of coal ash was recorded from 15 to 30%. This enriched coal ash will prove more useful to brick kiln and sagol manufacturers.

The results of the experiments are quite encouraging and useful. The coal ash which is cheaper and available in abundence can be a good raw material for this purpose. The colour of effluent, dissolved and suspended solids, COD & BOD can be reduced to a great extent. At the same time there is increase in the combustion value of coal ash which can fetch better price. However, there are practical problems in transporting and handling such large quantity of coal ash.

Use of Bamboo Dust

With the increasing scarcity and constantly rising cost of fibrous raw material, it has become necessary and beneficial if some fraction of waste fibrous material can be utilised in the existing processs.

In view of the conservation of fibrous raw material by using bamboo dust, laboratory scale investigations were carried out to assess the suitable fraction of bamboo dust which can be used by cold caustic pulping process. Experiments reveal that about 40.0% (4.0 MT) bamboo dust (+20 mesh fraction) can be utilised out of 10 MT. bamboo dust produced per day at the chipper house.

It is observed that the strength properties of cold soda pulp (75 to 80% yield) produced from +20 mesh fraction of bamboo dust is lower than bamboo cold soda pulp, but higher than the salai pulp. The bleachability is almost equal to that of cold soda pulp from bamboo.

Bamboo dust cold soda pulp was blended with other newsprint furnish, which indicate the strength properties of all blends are suitable for newsprint manufacturing . The bamboo dust can be utilised in both ways either by mixing with bamboo chips in the ratio of 7:93 or treating separately with caustic solution, then refined and mixed with bamboo cold soda pulp in the ratio of 5:95.

From the economic point of view, utilisation of bamboo dust gives a saving of 1200 MT of bamboo per annum.

Result and Discussion

a) Fractionation of bamboo dust indicates that the fraction which can be retained on 20 mesh is 42.12% and it is the sum of the fractions retained on 16 and 20 mesh.

b) Strength properties of this pulp is lower than that of bamboo cold soda pulp but higher than the strength of salai ground wood pulp.

c) The strength properties of different blends of bamboo dust cold soda pulp compared with other newsprint furnish shows that acceptable newsprint can be produced with the help of this pulp.

d) Bamboo dust economics indicates that present earning by selling it is much lower than what it will be even it is used as a fuel in our power boiler. The earning can be increased further by producing bamboo dust cold soda pulp from plus 20 mesh fraction.

However the operation problems that are faced by using higher dust percentage will have to be sorted out.

Conclusion

It has been proved by the above study that waste and

pollutants can be utilised in an economic and convenient way. The special feature of coal ash treatment is that no chemicals are required for the treatment of the effluent.

Acknowledgement

Authors are thankful to Nepamills Management for permitting them to publish this article.

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