Opportunities for Cleaner Production in the Pulp & Paper Industry

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1. **Reducing sawdust in the chip manufacture;**

2. **Changing the chip length to reduce sawdust and oversized chips;**

3. **Finding suitable and economical usage for the sawdust and bark;**

4. **Reducing the amount of bark and soil coming into the mill;**

5. **Reducing chemical usage, including hazardous chemicals in the wood digesting, pulp bleaching, etc;**

6. **Recycling knots and screening rejects back to digester;**

7. **Finding uses for the ashes originated in the burning of wood, coal or other fuel. Searching higher heat value fuels;**

8. **Optimization in the selection of junk materials, leading to commercial sales of the selected garbage;**

9. **Sorting of all residues and garbage. Internal recycling, procedures to avoid at the source, sales of waste paper, etc;**

10. **Sorting different waters that are blended "with innocence" to make up an effluent;**

11. **Recovering good fibers and good minerals from wastewater. Recovering good waters as well;**

12. **Better washing prior to bleaching to avoid unnecessary use of chemicals along bleaching. Reducing carry-over as a goal;**

13. **Reducing COD losses along all mill, and sludge generation as a consequence;**

14. **Optimizing sheet breaks in the paper-machine, re-winder and finishing room to reduce broke generation;**

15. **Sales of second grade papers (reels or cut-sized), instead of returning them to the pulper to recycle;**

16. **Reducing wire utilization in the pulp bales;**

17. **"Closing" lubricant oil leaks;**

18. Developing utilization for sealing and cooling waters and waters from hydraulic pistons;

19. Developing utilization for condensates;

20. Condensing vapor from flue gases to recover water;

21. Replacing showers by aspersors;

22. Recovering boiling out waters;

23. Recycling waters counter-currently;

24. Controlling pH and temperature automatically to avoid deposits that usually represent actions as sewering or boiling outs;

25. Prohibition of fibers discards by overflows and drainages (a commandment to all);

26. Using recovered water replacing treated water in many utilizations in the mill (example: recovered water from Krofta flotation cell);

27. Efficient maintenance to reduce leaks in gaskets, overflows, holes in equipments, etc;

28. Reducing overloaded operation via creativeness;

29. **Improve material specification (example: wires, chemicals, mineral fillers, fuels, etc);**

30. **Regular inspection of heat exchangers, steam traps, tubes, etc;**

31. **Recycling used core-board in paper reels;**

32. **Recycling whitewater, recovered or not;**

33. **Developing agricultural or other uses for solid wastes;**

34. **Do not re-slush pulp bales, for quality reasons. Better to sell them to customers in the neighborhood not so demanding in these specifications;**

35. **Promoting very "good housekeeping" all around the mill;**

36. **Reducing of unnecessary internal recycling (water, pulp, refills, broke, etc);**

37. **Controlling very strictly the consistency on the hydro-cyclones, washing filters outlets, etc;**

38. **All efforts to retain COD, sodium, heat, water, fibers, minerals, etc, in the system;**

39. **Monitoring the type of residues on the pulp screenings;**

40. Reducing packaging, wrappers, sacks, drums, wood pallets, etc;

41. Controlling very efficiently the temperature in the drying cylinders;

42. Closing the water cycle;

43. Avoiding losses of lime mud in the causticising area;

44. Raising the white liquor activity;

45. Raising the free/net CaO content in the burnt lime, reducing the circulation of inert chemicals;

46. Optimizing the temperatures in cooking, bleaching, drying, etc;

47. Utilizing recovered waters to wash tanks, floor, etc;

48. Reducing kappa number of the pulp prior to bleaching line (oxygen delignification, acid washing, better washing to remove COD carry-over, etc);

49. Following-up the performance of raw materials, fuels, etc;

50. Following-up the logistics involved , the bottle-necks, the inefficiencies, and all points in the system where residues or re-works are being generated etc;

51. Devolution of packaging materials to the suppliers ;

52. Analysis and otimization of truck flows;

53. Control of effluent pH with residues from areas (acid or alkaline);

54. Sales of waste material as source of additional income and recycling (example: refractory tiles for bar-b-q making);

55. Utilization of low sulfur fuel oil;

56. Efficient maintenance on potential hazardous equipments to minimize the risk of spills, leaks, etc;

57. Recovery of the water used to wash the floor;

58. Avoid the clogging of the sealing water tubes, leading to burning of gaskets, and leaks on pumps, filters, etc;

59. Elimination of of dirt / contaminated fiber stock purges;

60. Don’t use compressed air to broom the floor;

61. Recycling the fibers collected when brooming the floor;

62. Attention to the steam traps;

63. Utilization of the condensates from the drying cylinders or heat exchangers;

64. To find a way to eliminate the oil leaks in the paper machine basement, what causes enormous contamination in paper broke sheets;

65. Do not run hydro-cyclones when consistency is over the limit. Find a creative way to solve this problem.

66. Control the sealing cable in vacuum filters. Recycling of the contaminated leaks, when sealing is inefficient;

67. Control the pH of the sealing water, to avoid contamination with high or low pH liquids, giving as consequence, a low life time to gaskets;

68. Recovering fibers from scrubbing waters;

69. Work in a material balance to figure out very accurately the fiber losses in the mill;

70. Do not overload capacity;

71. Do not underload your equipment capacities (f.e.: to run a high energy demanding engine to process a few tons of pulp stock);

72. Do not run your equipments with "no load" (f.e.: to keep an air-heater burner "running for fun");

73. Search the reasons for excellent figures on your statistic control sheets, not only the ones with problems;

74. Combine your storage tanks to separate contaminated pulp stocks to avoid drainages of such kind of contaminated stocks;

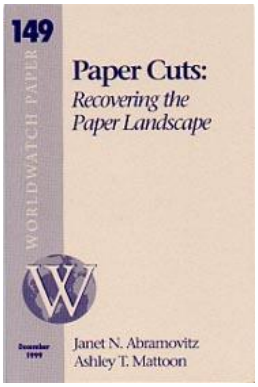
75. Try to find some available pulp washer to use it as a filter for removing "good fibers" from filtrates and effluents, in order to re-introduce them to the process;

76. Try to go further on the recovery of fibers discarded in the effluents from hydro-cyclones cleaners ;

77. Separate primary and secondary sludges at the sources (primary effluents are rich on fibers , and secondary rich on organic flocks);

78. Avoid "foolish savings" on purchasing "cheap materials" (gaskets, tubes, valves, seals, o-rings, etc);

79. Improve the dialogue among production, purchasing and maintenance people;



80. Pay attention to holes and leaks on tubes, pipes, heat exchangers, screens, filters, etc (they mean losses of fibers, steam, water, liquor, filtrates, condensates, etc.);

81. Start a good program of preventive maintenance;

82. Improve the efficiency of scrubbers, stack gases filters, electrostatic precipitators, etc;

83. Do not discard contaminated effluents in pluvial streams;

84. If you think that just buying a new technology is enough to clean up your operation, please reconsider, because you are to make a big mistake;

85. Evaluate very carefully all your process bottlenecks;

86. In some geographical regions, the recovery of rain-water is a good opportunity;

87. Press separately the broke, and other sorted residues from waste-paper cleaning operation;

88. Insulate high temperature equipment/ tanks to avoid losses of heat;

89. Measure flows and concentrations, and establish mass balances in a sound basis;

90. Sort, according to the contamination level, the different flows that are making up an overall effluent;

91. Use and recycle condensates as much as possible;

92. Introduce water flows to the process via gas scrubbers;

93. Find uses (in heat exchangers, f.e.) to the hot exhaust flue gases;

94. Pay attention to drying cylinders (they may be full of condensate);

95. Find uses to the ashes coming from boilers;

96. Control residual CO e O_2 ;

97. Raise the retention in the wet end to reduce suspended solids and COD concentrations in the white water;

98. Evaluate the position to add pigments and fillers: in case they are added prior to hydrocyclones you may be discarding some of them to the sewer;

99. Teach the surrounding community and paper collectors how to better sort wastepaper;

100. Evaluate bottlenecks and process capabilities;

101. Train and develop the purchasing people about cleaner buying;

102. Develop in all people the commitment to reduce personal wastes;

103. Close water cycle without dumping more solid wastes to landfilling;

104. Find sustainable and safe uses for de-inking sludges: fertilizer, ceramics, bricks, etc;

105. Reduce intermediate warehousing;

106. Do not blend different solid wastes in a not so sanitary landfill;

107. Search leaks in valves, gaskets, o-rings, and fix the problem as soon as possible;

108. Control residual oxygen in flue gases as a way to reduce smoke and odor, and to improve combustion;

109. Keep pipe insulation in good condition;

110. Provide good maintenance to level indicators to avoid spills and overflows in tanks, etc.;

111. Replace toxic products (or those responsible for generating toxic contamination) for others not harmful to environment;

112. Used water may be just good to wash logs in your pulp mill;

113. A well-designed and maintained spills / losses recovery system is of fundamental importance in cleaner production;

114. Reuse white water to adjust consistencies;

115. Improve the pulp washing prior to bleaching line;

116. Reduce active chlorine addition by the use of oxygen delignification or/and acid washing;

117. Take a careful look in the motors all along the mill to check the real correspondence between the required power and the available ones;

118. Find way to recover the heat losses via condensates and flue gases;

119. Monitor the fiber and mineral losses in the screening rejects;

120. Distillate contaminated condensates to use the heat value of the low molecular weight organic compounds;

121. Close in a vacuum pipe circuit all vents responsible for odor gas losses;

122. Burn VOC's and odor gases in the boiler , lime kiln or captive incinerator;

123. Recycle the digesting condensates;

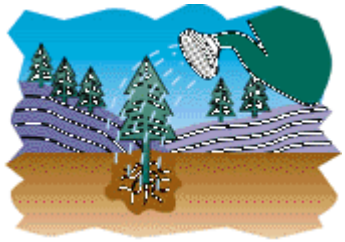
124. Keep condensates in closed tanks;

125. Do all efforts to recover fibers in the points they are more abundant and cleaner;

126. Don't consider fibers as na auxiliary medium for filtration. They are too expensive to fulfill this role;

127. Optimize the water flows in scrubbers. Recover this used water in some other place in the mill;

128. Recycle the water used to wash the logs. Search water coming from scrubbers, clean effluents, treated effluents or cooling waters to do this job;



129. Avoid water and pulp overflows and drainages. One simple way is to interconnect twin towers or tanks;

130. Recover the suction roll water;

131. Reuse the water used to wash the felts;

132. Find a use to the boiler blow-down waters;

133. Plan procedures to follow in emergency shut downs;

134. Use the steam condensate to wash the pulp or as hot water in the process;

135. Use the recycled water from the reverse osmosis plant as sealing water, monitoring salinity;

136. Avoid drainages of demineralization liquids from regenerations;

137. Use the water treatment sludge as an auxiliary flocculant;

138. Send the effluent from the pulp machine straight to the water treatment plant, as raw water;

139. Do not purge ashes to effluents. Develop a good use to this residue, as valuable by-product;

140. Improve the log washing to avoid the build up of minerals and ash in the process liquids;

141. Use the dirtier condensates in the causticising and the cleaner ones in the pulp washing line;

142. Segregate effluents to treat them as separate flows;

143. Pay attention to high concentration, but small flow rate effluents;

144. Monitor origin and concentration of non process waters (chemical preparation, cooling of chemicals, ionic exchange, etc)

145. Recover as maximum as possible the clean steam condensate, in rates preferably over 65%;

146. When more than one paper machine is available, try to discipline the use of most broke in the machine with lower-valued product, keeping more uniformnly supplied the machine with more-difficult-to-make paper;

147. Develop a feasible and economical system with your paper customers to receive back the pre-consumer broke generated by them when converting the paper;

148. Write the "TEN COMMANDMENTS" about cleaner production to be known by everybody in the mill;

149. Be curious , creative; committed and please, talk to the process and to the wastes to better understand them and their relation to environment.