

## Questionnaire to the Lecture

**Puu-23.4000 Pulp Mill Fibre Line Processes**

1. (a) Differences in morphology between the primary wall and the S2 layer and their position within the cell wall structure; (b) the thickness of a wood chip represents which direction in the tree?
2. (a) Under which circumstances is a rotary debarker advantageous over a drum debarker and why (wood species, which bark properties, etc) and (b) how can the chip thickness be controlled by using a disc chipper (what are the parameters to control chip thickness)?
3. Which of the three wood polymers, cellulose, glucomannan and xylan, show the highest degradation rate in the very beginning of softwood kraft cooking and why?
- ④ How can the (a) heating rate of wood chips during steaming be calculated and how can the (b) existence or non-existence of heat transfer resistance on the chip surface be estimated (which physical parameters are decisive)?
5. Steps to achieve air removal? In which direction air removal takes place predominantly?
6. What are (a) the factors affecting liquor penetration during the impregnation process and which is (b) the predominant factor at a moisture content beyond FSP?
7. After complete penetration the transfer of cooking chemicals occurs through diffusion. (a) In which wood direction the diffusion process occurs faster and (b) what does this mean with respect to wood chip dimensions?
- ⑧ Calculation of the downflow velocities of the liquor and the chips in a continuous digester? Formula?
9. Five rules of modified cooking?
10. Basic steps of displacement batch cooking?
11. Describe the downflow LoSolids cooking process?
12. Principle of Andritz Turbofeed System?
13. Explain the effect of anthraquinone (AQ) regarding delignification and carbohydrate stabilization during alkaline cooking?

14. Explanation of a steam explosion process (what is the prerequisite for a steam explosion process)?
15. Explain the steps or parameters necessary to initiate oxygen delignification and what is the reactive oxygen species?
16. What is the reason for the low stability of hydrogen peroxide? Which factors influence the stability of hydrogen peroxide?
17. Describe the elements of the Dualox Oxygen stage?
18. Which chlorine-containing bleaching chemical can be attributed to the same category of oxidants than oxygen? It reacts as an electrophile in acid conditions.
19. What is the major reason for the instability of ozone in aqueous conditions (which species initiates ozone decomposition)?
20. Difference between nucleophilic and homolytic reactions?
21. Which pH-range promotes chlorite formation during chlorine dioxide bleaching? Why should the pH in D<sub>1</sub> or D<sub>2</sub> be higher than in D<sub>0</sub>?
22. Which conditions during chlorine dioxide bleaching favour the AOX formation?
23. List the advantages of D/Z- and a Z/D-stages in a MC stage (they are different!)?
24. List the components of a medium consistency ozone bleaching stage? Why is it necessary to compress the gas?
25. Explain the observation that alkaline extraction following ozone treatment results in a significant reduction in pulp viscosity? Which additives after ozone treatment stabilize pulp viscosity to some extent?
26. What is the optimal pH in hydrogen peroxide bleaching and why should the ratio alkali-to-hydrogen peroxide be reduced with higher hydrogen peroxide charges?
27. Describe an on-site peracetic acid production? What is its major by-product?
28. What are the *kidneys* discussed to remove the NPEs in a closed water cycle mill?
29. Which particles can be removed by a centricleaner?
30. Describe the operating principle of an airborne dryer?

Evaluation criteria:

Each question will be graded as 0 (wrong answer), 0.5 (partially correct) and 1 (totally correct). The grade is determined according to the sum of points as follows:

26.....30 points	5
22.5... < 26 points	4
18.5... < 22.5 points	3
15.... < 18.5 points	2
12.... < 15 points	1
0.... < 12 points	0 (fail)