



Amina GHORBEL

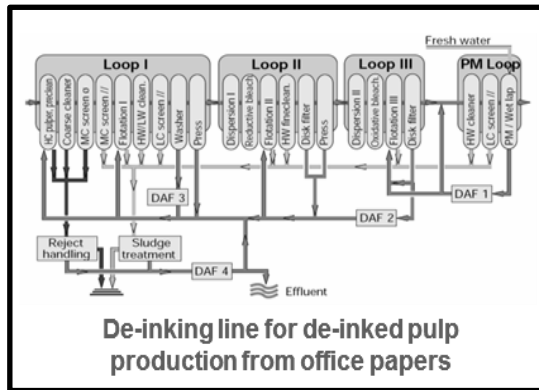
Ph.D. thesis (2016-2019)
LGP2 (M. Arousseau, N. Marlin, A. Boyer)
ARC Environnement –
RégionAURA

Toward an eco-efficient deinking: The use of ozone for an eco-friendly process and for recovered cellulosic fibres of high quality

Vers un désencrage éco-efficent : l'ozone pour un procédé propre et des fibres cellulosiques de récupération de qualité – ECO-Z-DIPline

Context

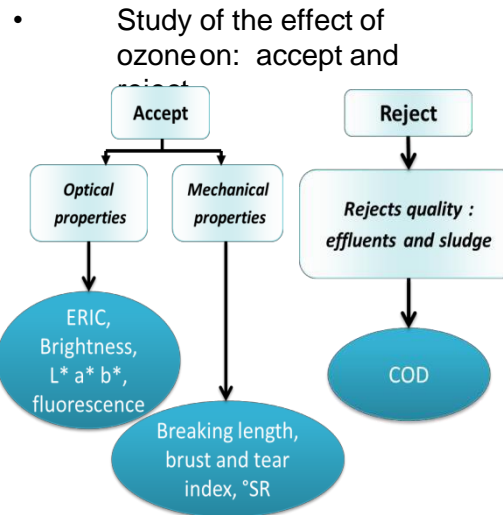
Recycling of mixed office papers (MOW) into paper of high brightness or market deinked pulp is limited since it requires complex deinking lines with many unit operations that consume energy, water and chemical products (recycling rate of MOW=10%)



These unit operations generate also a lot of rejects: in this context, the incorporation of ozone in different unit operations of a deinking line is studied at LGP2.

Methods

- Simulation of a deinking line in the laboratory with the sequence: “pulping – deinking”, adding ozone successively in each operation and synergetic effect of ozone in one unit operation on the performances of the others



- Achievement of a comparative life cycle analysis between ozone-based deinking line and a conventional line towards the development of a Best Available Technology (BAT).

Results

Conventional air flotation and ozone based flotation were compared, the O₃ dose tested was 160 g/Nm³, i.e. 3.2 % /oven-dried pulp:

	Brightness UV _{EXC} , %	Brightness, with UV, %
Air	54.9	58.7
O ₃ /O ₂	53	54.3

- Reduction in brightness gain caused by “yellowing” due to chromophore creation by ozone on fibers (reaction of ozone with lignin of mechanical pulp), and the degradation of optical brighteners.

Yield, %	pH	COD, mg/L
86.2	8.4	945
87,1	6.8	341

- The yield was slightly higher in the case of O₃ (1 point gain): addition of O₃ modified the foaming behavior of the flotation, influencing the yield
- pH strongly decreased: ozone reacted with recycled pulp components (fibers and/or contaminants) and created some acid by products
- The effluent COD decreased: more than 60 % reduction of the global pollution

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