Experience With The "MAC" Type Deinking Cell

Thierry LE Guillou & Alain Lascar

A TECHNOLOGICAL BREAKTHROUGH: THE MAC CELL

A prerequisite for designed a new deinking cell is analysis of flotation mechanisms.

A deinking cell is typically geared to selectively eliminating inks, while losses in materials must be kept to a minimum. We then asked ourselves how to go one step further by:

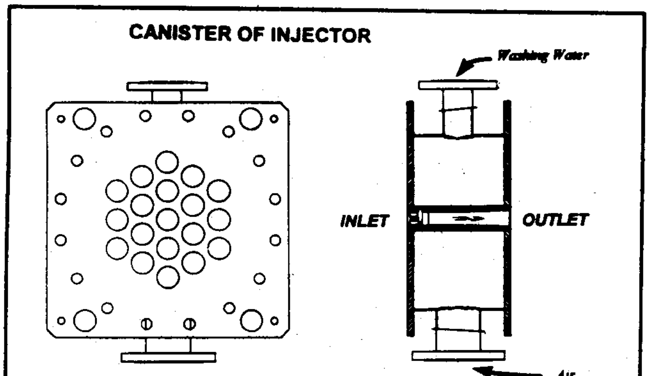
- improving ink removal efficiency rates.
- separating fillers more selectively,
- having concentrated foam with a minimum of residual fibre,
- having a user-friendly design, as environmentally sound as possible.

In this connection, we have analysed the main mechanisms of selective flotation:

According to Mr. F. Julien Saint Amand - CTP, the mechanisms could be separated into three phases:

- an aeration phase during which the mix of air and fibre suspension is being controlled; the size of bubbles thus generated and the air percentage are important parameters.
- a collection phase during which the ink or particles to be removed stick to the air bubble.

  This phase is characterised both by extensive collision probabilities and physico-chemical phenomena.



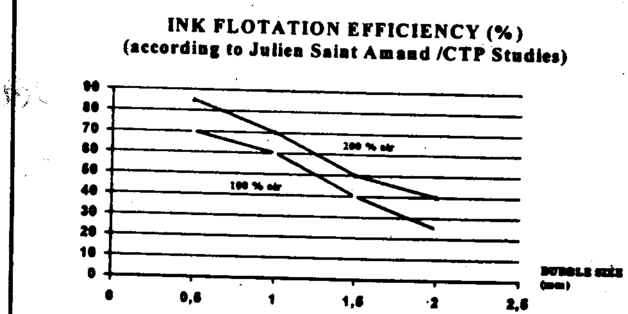
- a separation phase of the particles to be removed and of the fibre suspension.

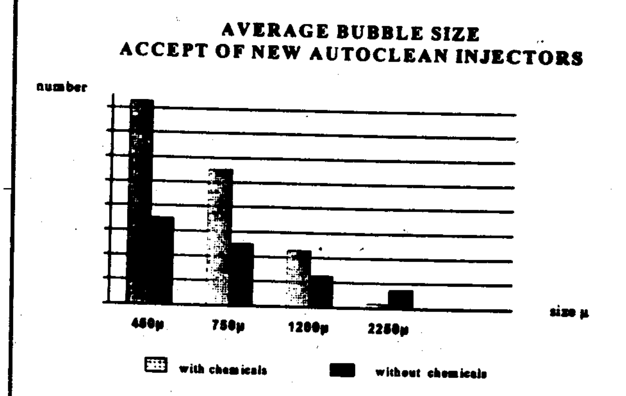
  Turbulence and possibilities or re-mixing or re-fixing ink to the bubbles are extensive.

Our aim has been to optimise these phases.

a) Autoclean injectors:

On the basis of our long-standing experience, we have devised the Autoclean injectors, which do not plug, while generating bubbles of small diameters.





These injectors are arranged in canisters and separated from the cell tub to enable a better air/stock mix.

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b) Optimisation of the collection phase by applying the collition theory:

According to Mr H.J. SCHULZE,

$$\frac{dN_p}{dt} = - Z_c\ N_p\ N_b \times P$$

whereby N_p = Number of particles by volume unit

N_b = Number of bubbles by volume unit

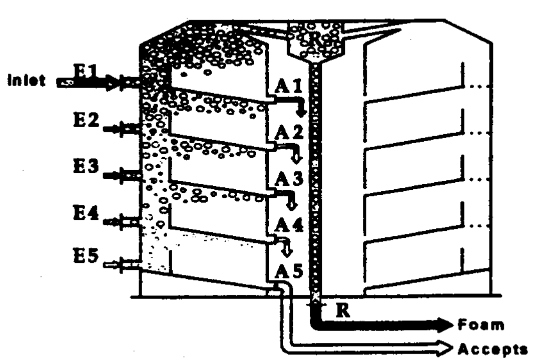
Z_c = Number of collisions by volume unit

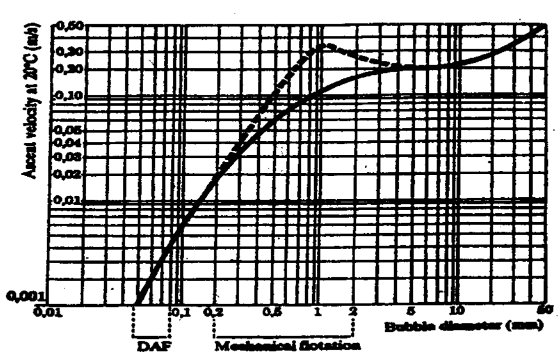
P = Probabilities of interactions

Therefore, the more we generate collisions and air bubbles, the more we increase the probabilities of interactions and thus of taking out the particles incriminated.

By adopting this principle, we have come up with a cell featuring several aeration stages.

MAC CELL: principle diagram





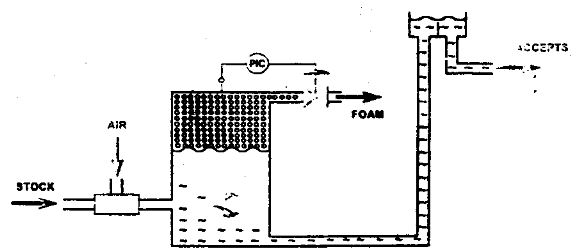
PURE WATER - - - CONTAMINATED WATER ———

c) Optimisation of the separation phase:

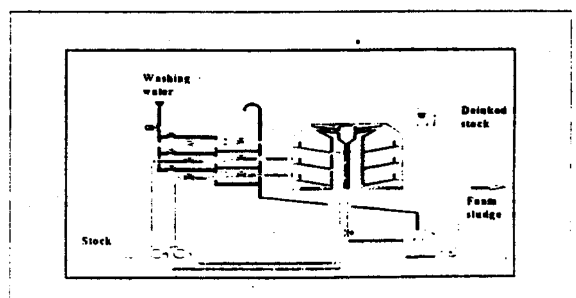
We first have optimised ascending velocities according to sizes of bubbles generated by the Autoclean injectors.

On the other hand, in order to limit fibre loss and to concentrate foam to a maximum, we have chosen the following foam discharge system.

Foam blowing principle



MAC CELL
Process Flow Diagram

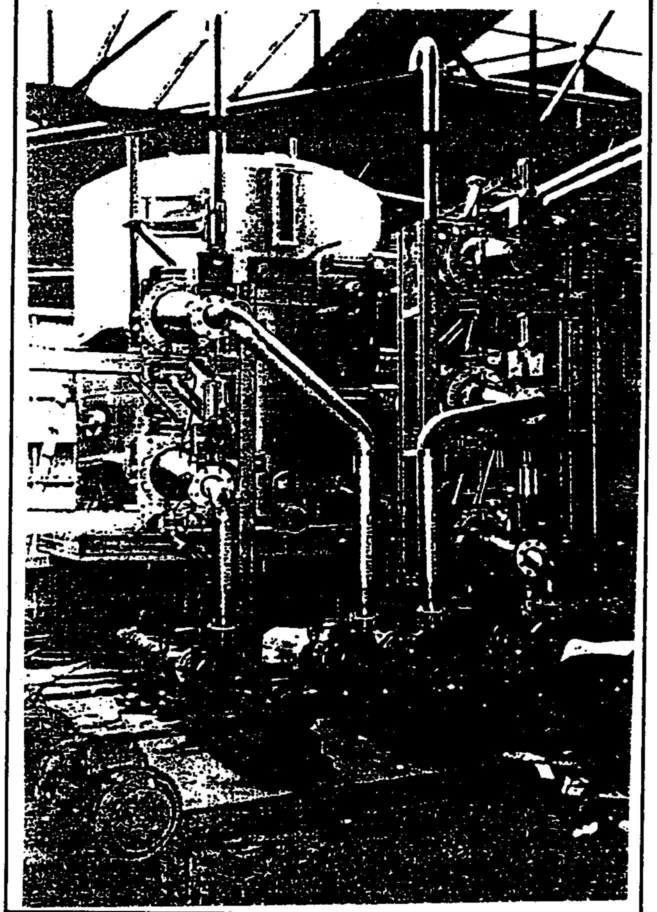


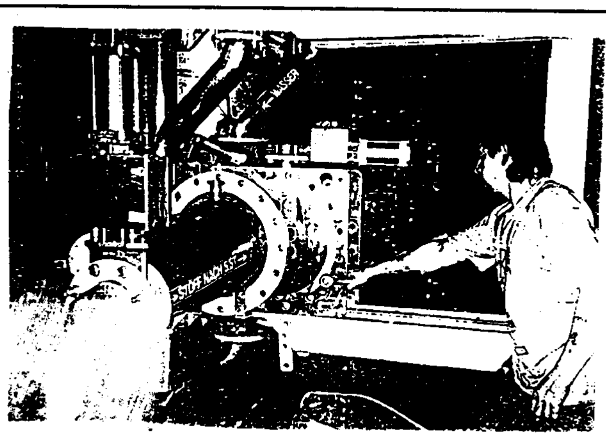
All this led to the development of the MAC cell.

INDUSTRIAL INSTALLATIONS AND PERFORMANCE DATA COMPARED TO CELLS CURRENTLY ON THE MARKET

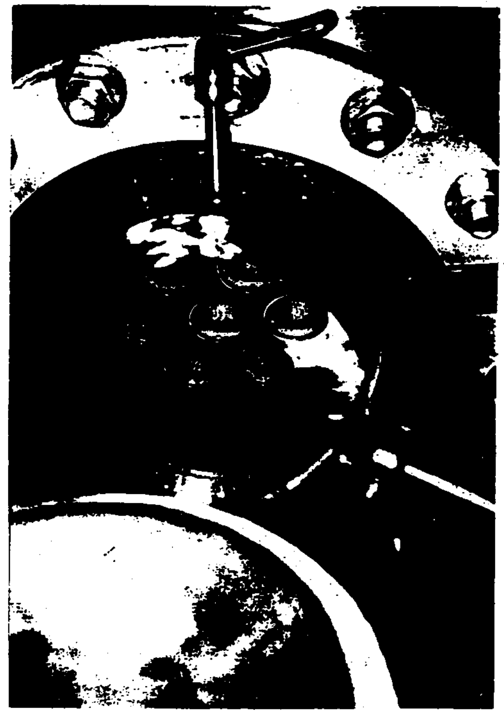
These photographs show you some examples of MAC cell installations.

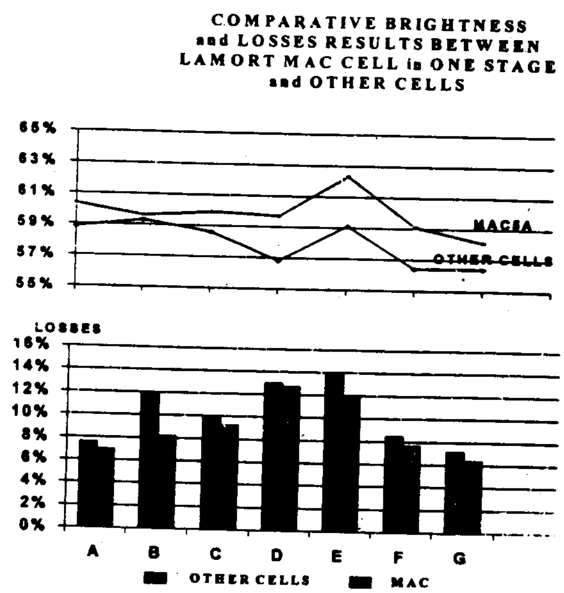
We have compared the performance of the MAC cell to performance data from competing builders.





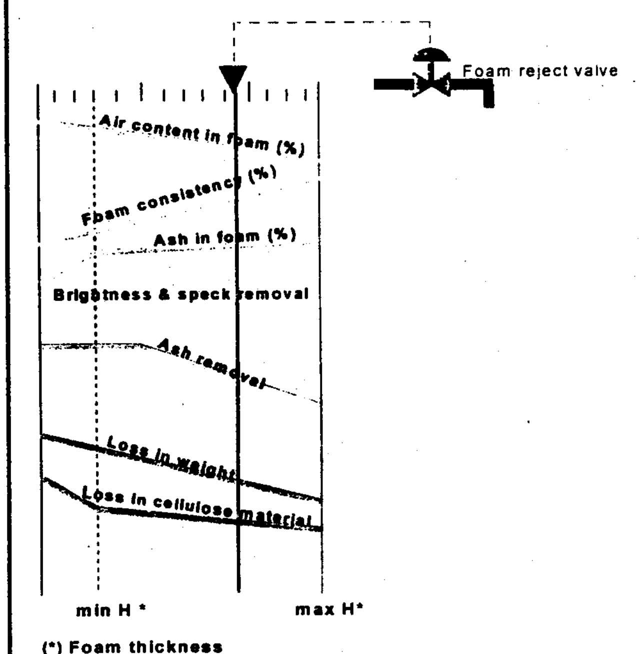
We have also noticed that the Mac Cell is less sensitive to infeed consistency.





COMPATATIVE FOAM CONSISTENCIES BETWEEN MAC CELLand OTHER CELLS

FOAM CONSISTENCY	OTHER CELLS	LAMORT MAC CELL IN I STAGE
AVERAGE VALUE DURING TRIALS	1,5-3 %	6-10 %

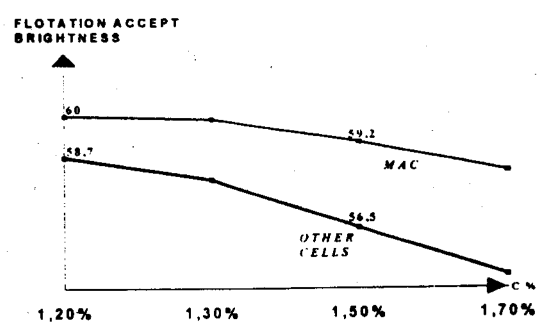


CONSISTENCY INFLUENCE

ON

FLOTATION ACCEPT

BRIGHT NESS

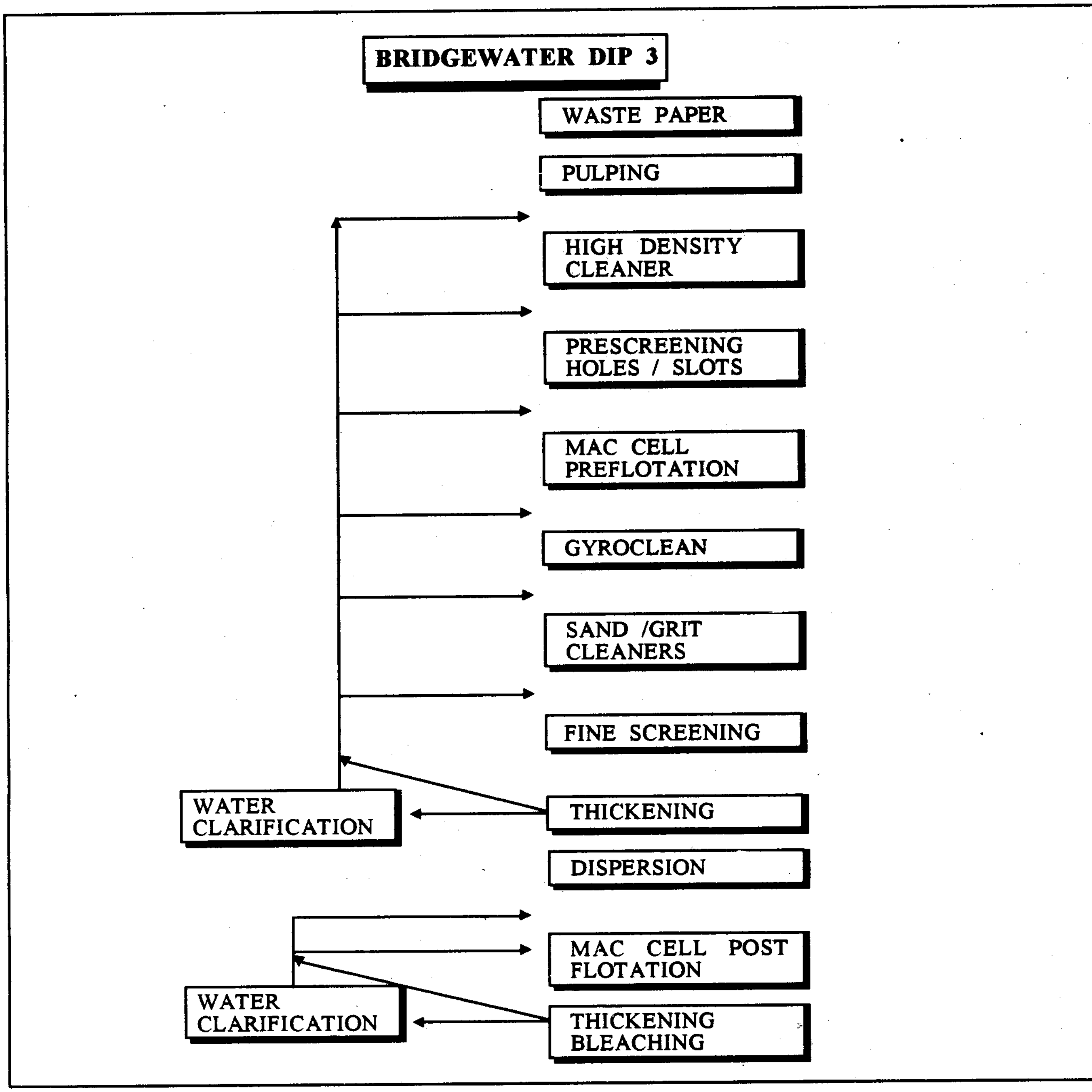


With the same rate of losses or with fewer ones, we achieve higher deinking efficiency rates at very high foam concentrations.

The optimisation of losses is quite easy as only the foam valve has to be adjusted.

INDUSTRIAL EXPERIENCES

Newsprint production

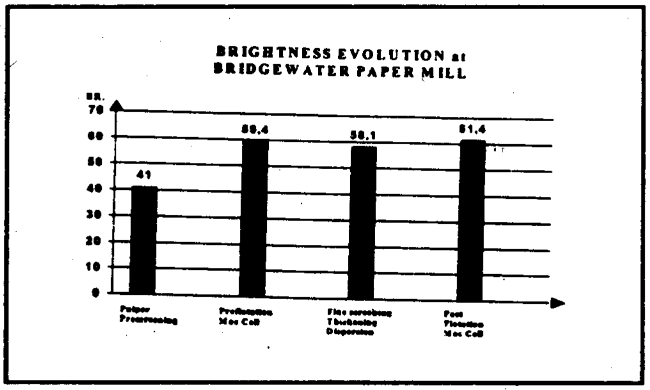


We have chosen Bridgewater Paper Company to present the industrial results achieved with the MAC cells.

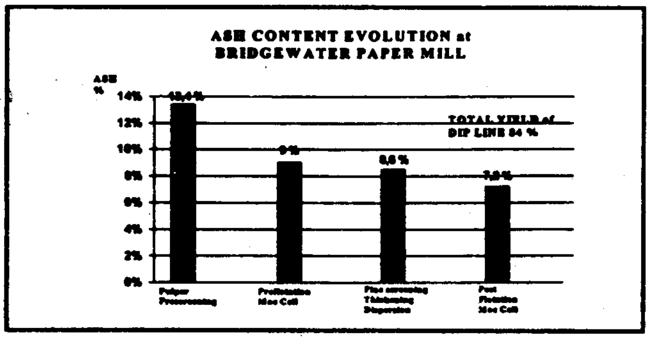
Bridgewater Paper Company has three deinking lines. They produce newsprint paper with 100% aeinked stock. The third DIP line recently installed by Bridgewater Company has MAC cells in the preflotation and postflotation. The process diagram of this DIP line is as follows:

This DIP line can produce stock with a brightness from 60 to 70. This brightness will depend on the chemicals added in the bleaching sequence and on the magazine percentage in the waste papers.

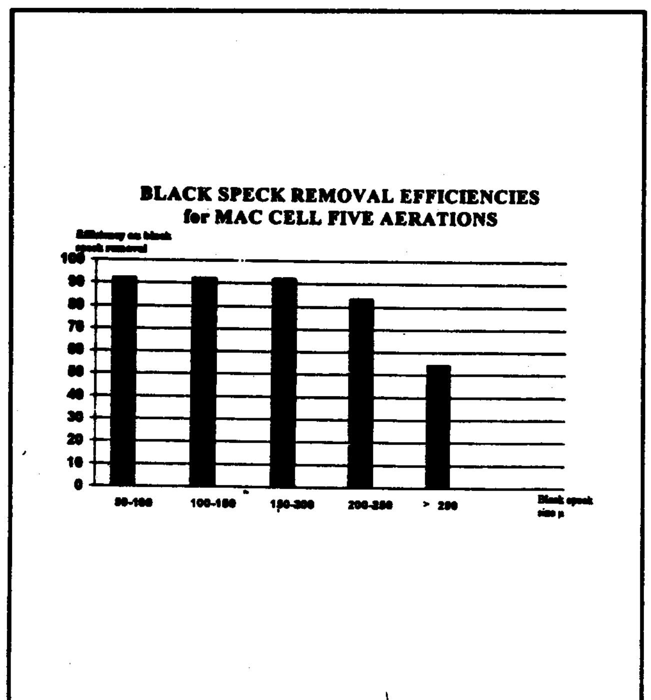
With 100% household collection (85% news, 15% magazines) and with a low amount of peroxyde



Under the same conditions, ash content evolution is as shown in the following chart:



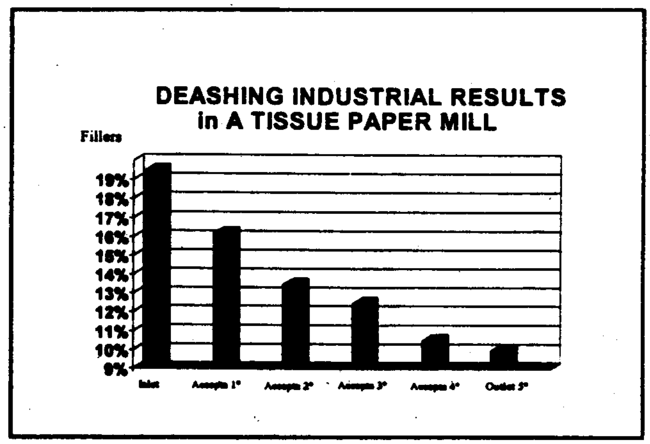
We are grateful to Mr. Phil CLAYDON for all the information received from the BRIDGEWATER Company.



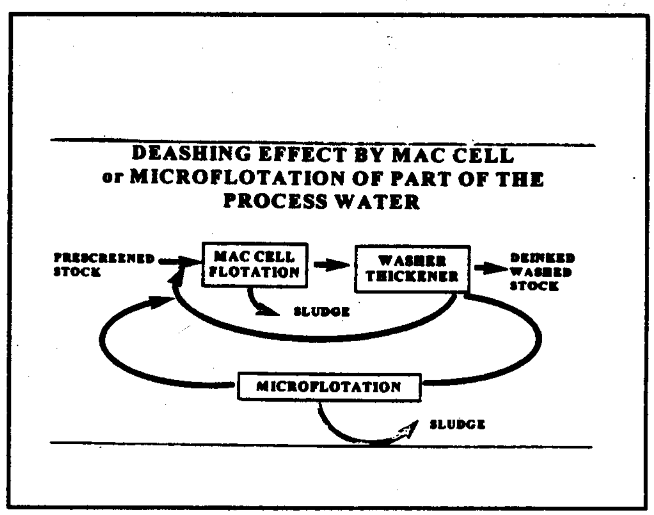
in the disperger, this line has a brightness lift as described in the following curve:

TISSUE PRODUCTION

In tissue applications, selective deashing and removal of black spots are two very important parameters. To illustrate how MAC cell flotation could help in these subjects, the following chart shows some industrials results of speck removal efficiency rates and deashing results for each stage of the MAC cell.

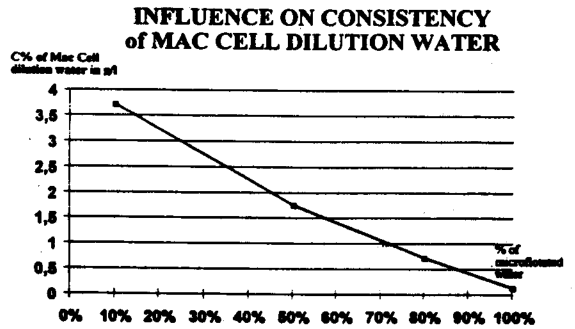


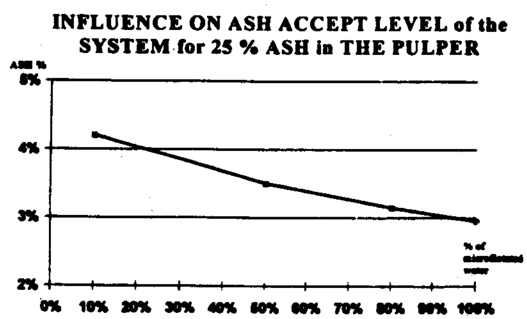
The deashing effect will vary according to the adjustment of the foam valve.



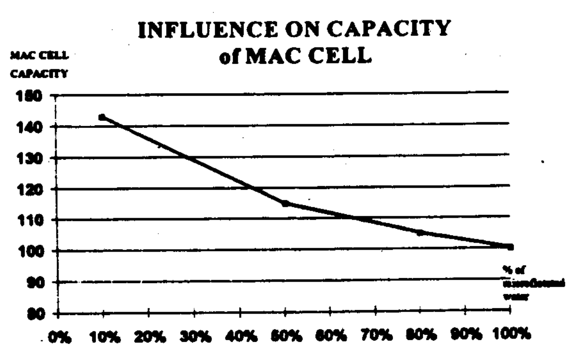
Due to this selective filler removal possibilities of the MAC cell, it is possible to design deinking lines for tissue differently. We have studied the possibility of treating only one part of the washer filtrate. We have then shown how that will influence consistency of the dilution water, ash level at the end of the system, capacity of the MAC cell.

For this we have simulated the flow-sheet as shown above and have drawn these curves:





New avenues of designing deinking lines are opened by this new capability of the MAC cell.



MULTIPLY BOARD PRODUCTION

Used for the underlayer and intermediate layers, the MAC cell, in addition to ink removal, allows to take out stickies and hydrophobic particles that could prevent some boards from being used in the food industry.

It is then possible, while meeting the quality standard of the board, to use less valuable furnishes.

CONCLUSION

The MAC cell is a closed cell with several aeration stages. In addition to its very efficient ink and speck removal, it also enables.

- selective elimination of fillers,

- elimination of hydrophobic stickies,

- delivery of deaerated foam at high consistency figures (5 to 14%) and recirculation of air from the foam,

- low efficiency loss at high inlet consistency (1.5 to 1.8 %).

For all these reasons, by integrating this "advanced deinking MAC cell", it is possible to go one step further in the design of deinking lines.