

**ABTCP 2015**

48º CONGRESSO E EXPOSIÇÃO  
INTERNACIONAL DE CELULOSE E PAPEL

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1ª CONFERÊNCIA IBEROAMERICANA SOBRE BIOECONOMIA



# Evaluation of Surfactants in the Recycling of Newspaper and Magazine

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REALIZAÇÃO

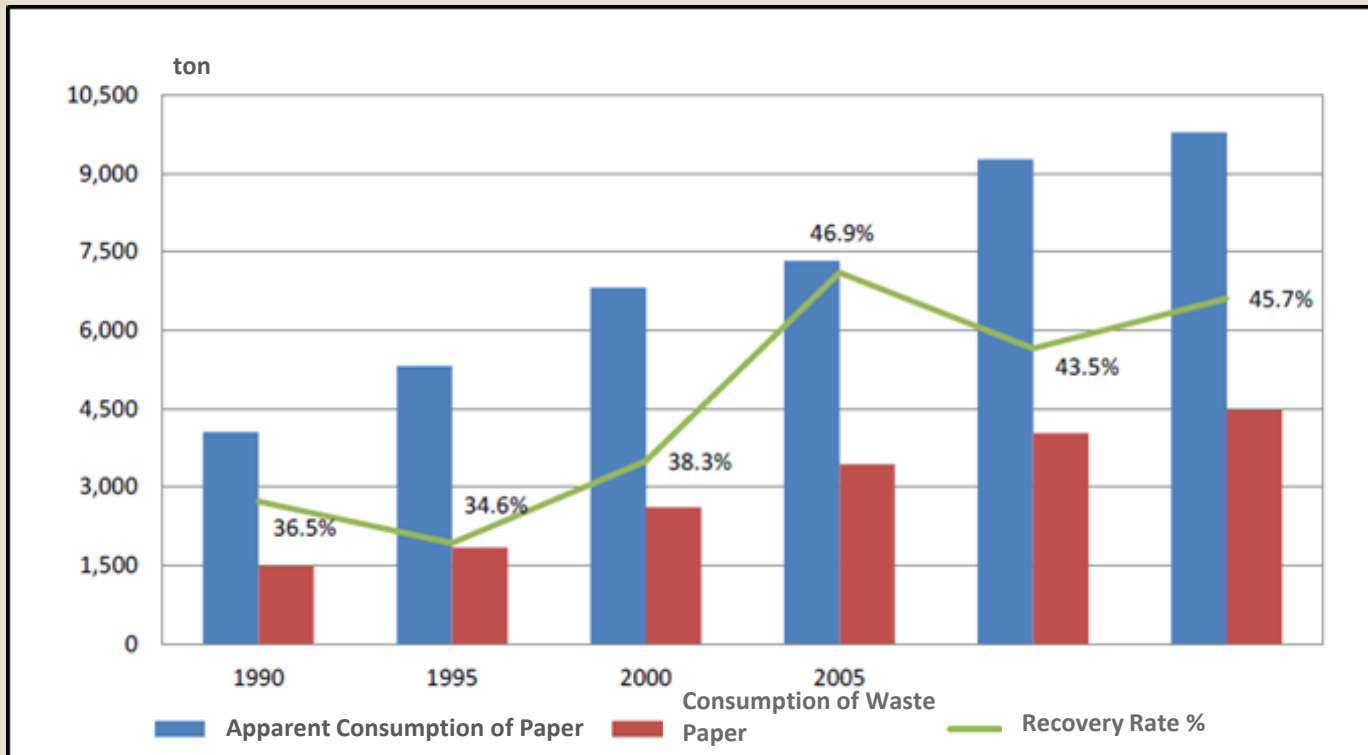


CORREALIZAÇÃO





# Recyclable paper in Brazil



**Recovery Rate of Recyclable Paper**



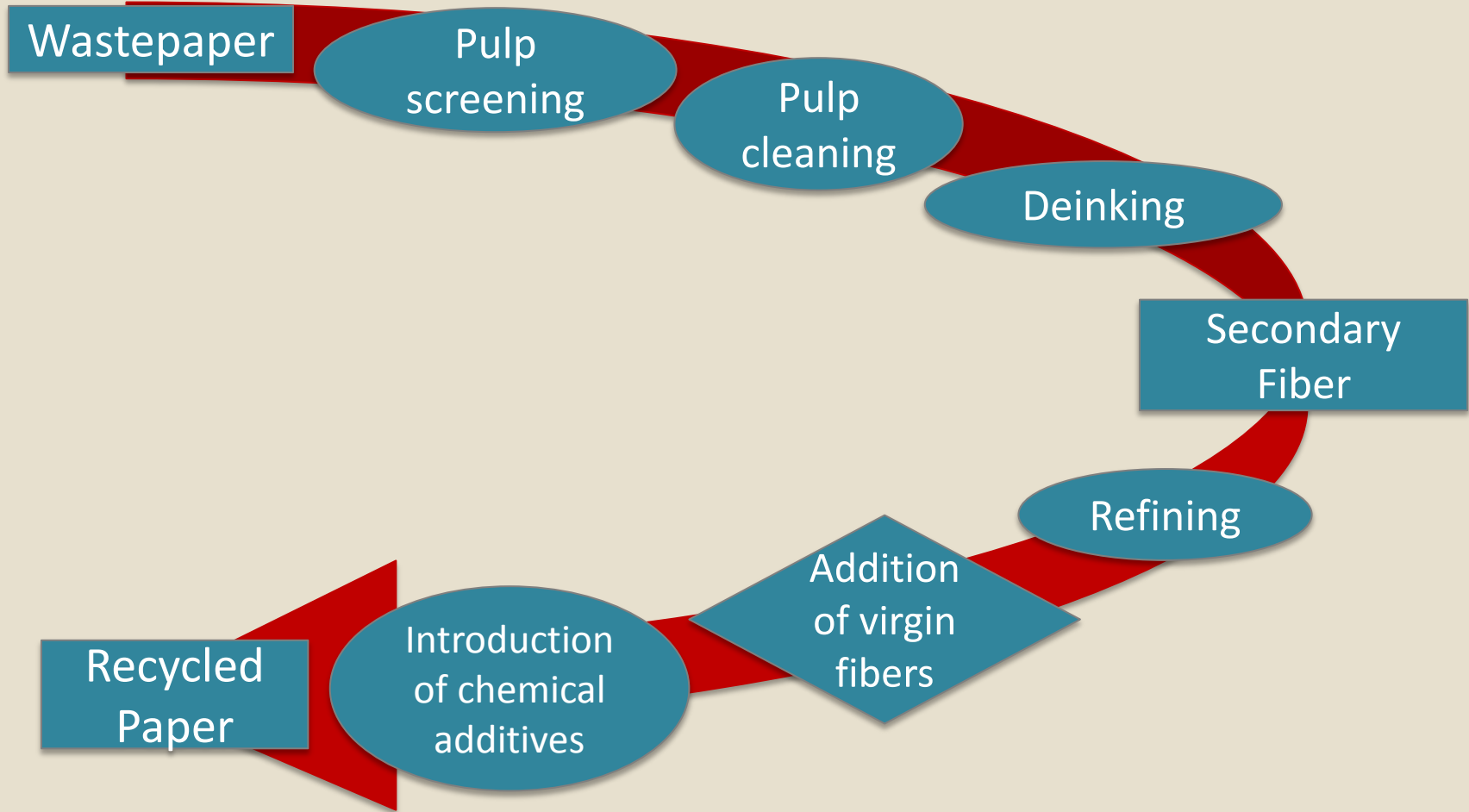
# Recyclable paper in Brazil

## Recyclable Paper consumption in Brazil (2002)

TYPES	CONSUMPTION (mil t)	TOTAL PARTICIPATION (%)
Corrugated board	99.2	32.9
Newspaper	124.2	4.1
Magazine	23.7	0.8
Total	3,017.4	100.0

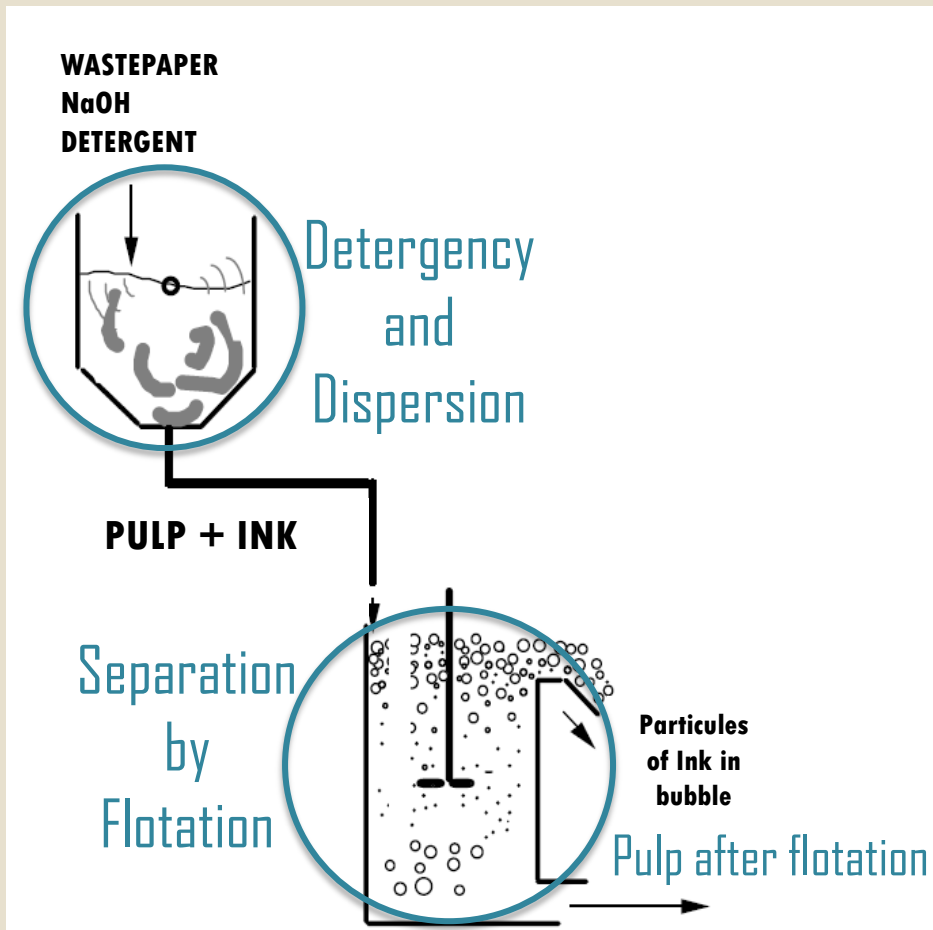


# Process of Paper Recycling





# Flotation Stage



Fonte: DUGARTE et al. (2002)

## Scheme of Flotation Procedure



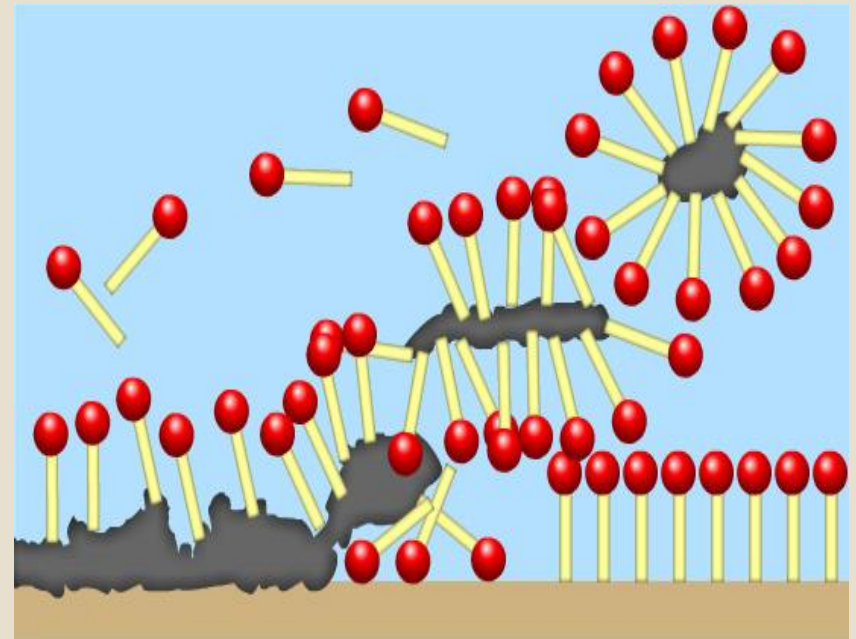
# Additives in Detergent





# Importance of surfactant in Flotation

“Surfactants are a large group of surface active substances with a great number of (cleaning) applications. They reduce the surface tension of water so it can wet the fibers and surfaces, they loosen and encapsulate the dirt and in that way ensure that the soiling will not re-deposit on the surfaces.”



www.rsc.org

## Mechanism of Flotation:

<https://www.youtube.com/watch?v=ltpM1ZY2uxs&list=PLMXuhelKyFoKci44cKxJOSsyjNZtsjHvN&index=3>

(from 06:20 to 07:20)



# Objective

- Evaluate the efficiency of surfactant in deinking pulp in the recycling process. The method applied is the flotation.





# Experimental Section

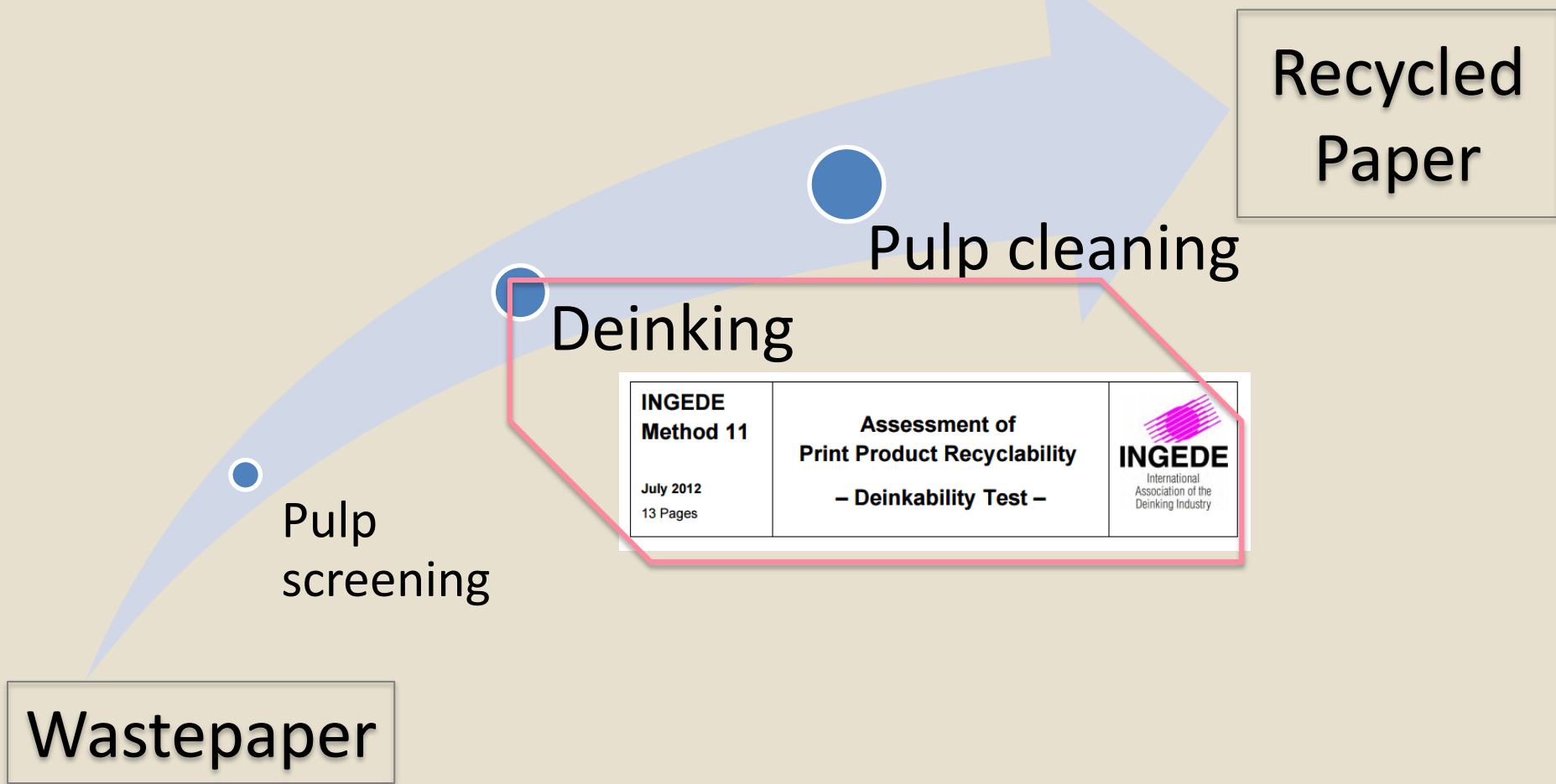
- Wastepaper of old magazine (OMG) and newspaper (ONP) were recycled and the handsheets produced before and after flotation were tested.

## Standards Used

Pulp - Determination of Drainability using Schopper-Riegler apparatus	ABNT NBR 14031:2004
Paper – Determination of tearing resistance – Elmendorf method	ABNT NBR 1974:2001
Paper - Determination of tensile properties	ABNT NBR 1924-2:2001
Paper – Determination of bursting strength	ABNT NBR 2758:2007
Effetive Residual Ink Concentration (ERIC)	Internal proceeding of the company based on the standard TAPPI T 567 om-09



# Experimental Section – Recycling process





# Experimental Section – Flotation solutions

## Ingede's Detergent Solution

0.6% Sodium Hydroxide

Swelling of the pulp

1.8% Sodium Silicate

Dispersion of Ink

0.7% Hydrogen Peroxide

Bleaching of the pulp

0.8% Oleic Acid

Tensoactive

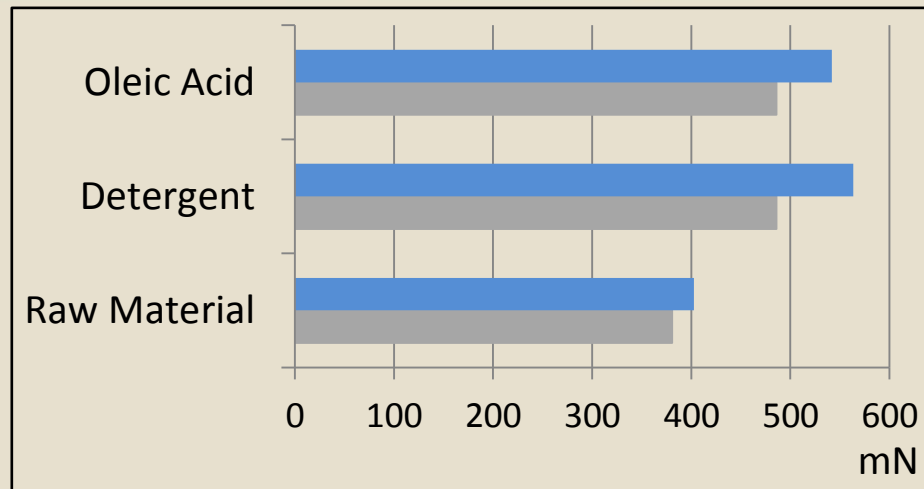
## Comercial Detergent

Lineal Alkyl benzene Sulphonic acid (LAS)

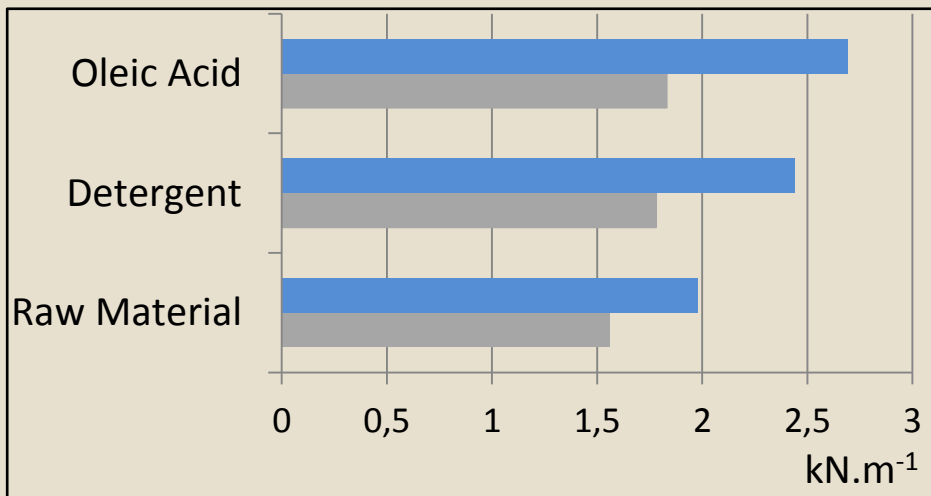
Tensoactive



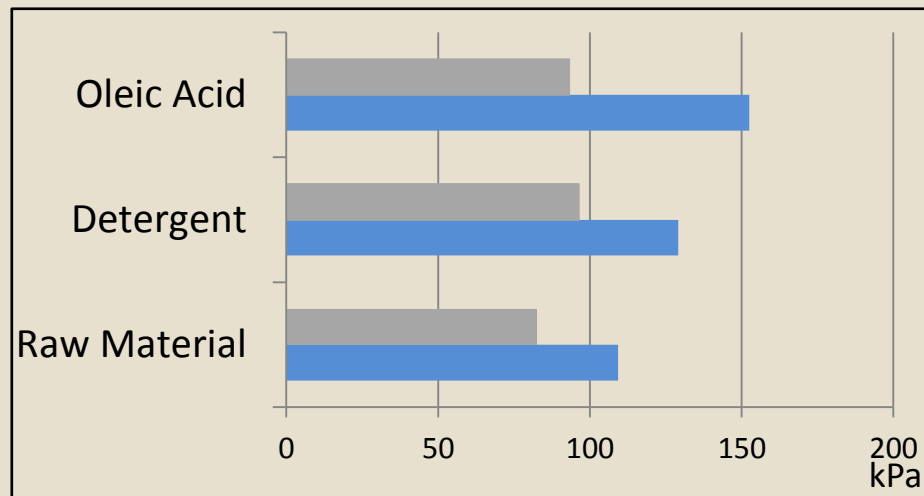
# Results and Discussion



Tearing Resistance



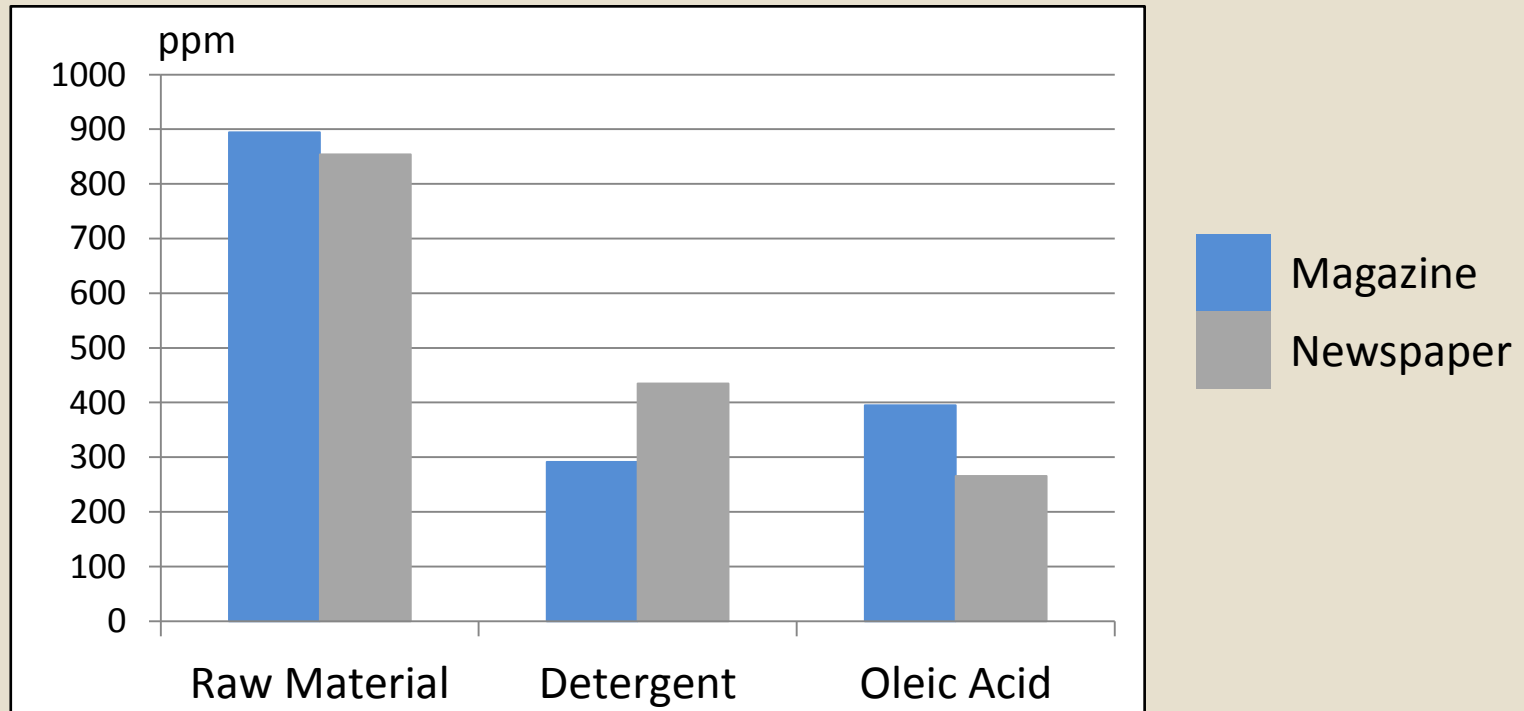
Tensile Strength



Bursting Strength



# Results and Discussion – Optical properties

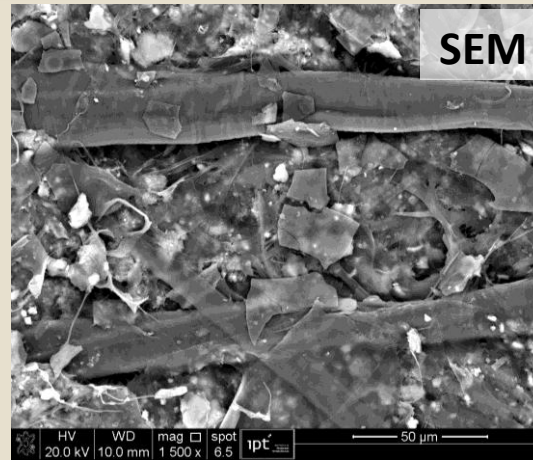
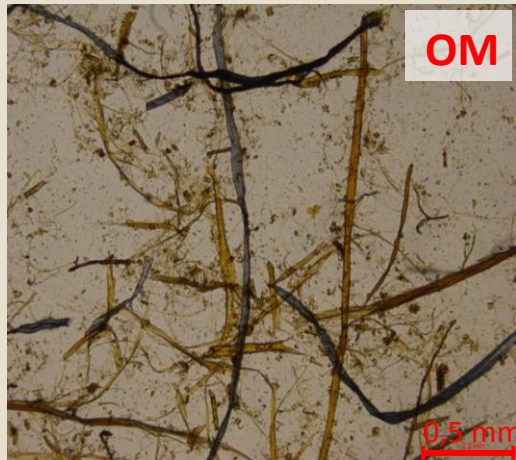


**ERIC: *Effective Residual Ink Concentration***

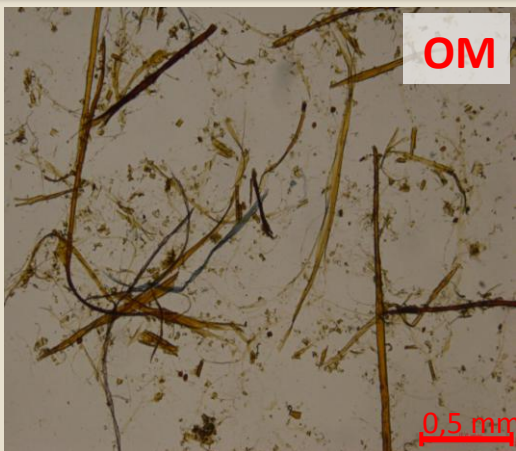


# Results and Discussion – Microscopic aspects

Magazine



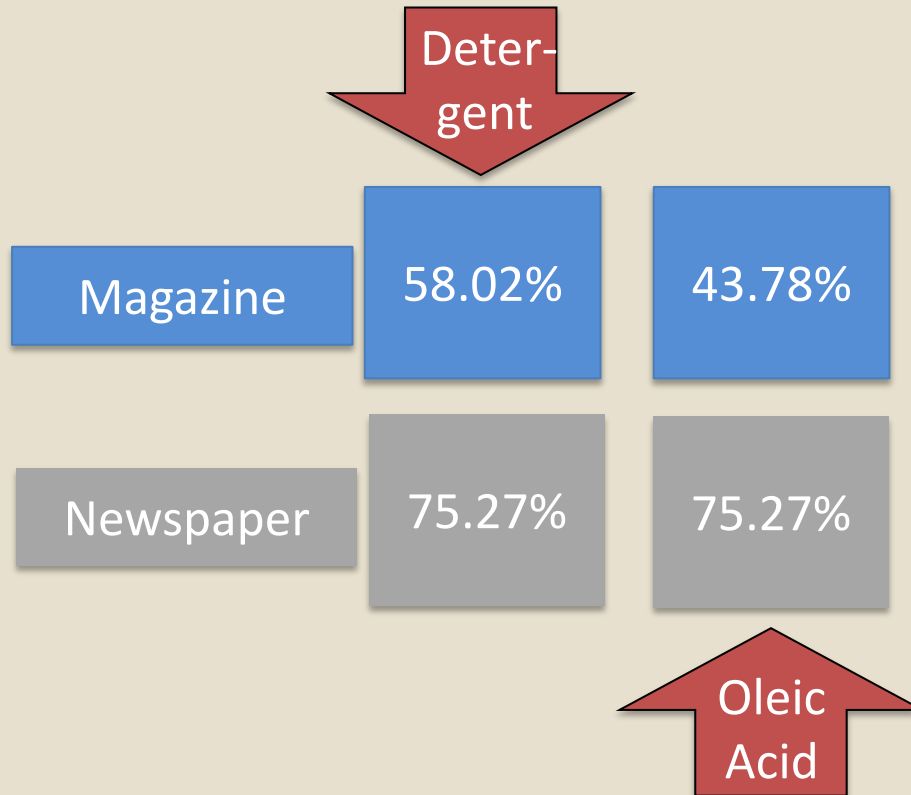
Newspaper





# Results and Discussion - Yield

Yield of the Processes Before and After the Flotation





## Conclusions and Future Work

Increase the element brightness (Y) and the significant decrease in the value of residual ink (ERIC).

For the oleic acid, it is noticed better detergency, i.e. removal of ink, while the detergent has advantages regarding the formation of foam, which is essential for the flotation stage, in addition to its cost-benefit.

For future studies the goal is to optimize the deinking process by adjustment of the pH to the basic suspension and flotation foam as in the INGEDE method. The basic pH increases the hydration of the fibers, due to breakage of hydrogen bonds.

Another goal is the application of the procedure to other types of wastepaper with different kinds of printing.





# Acknowledgements



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