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**THE NEW ENVIRONMENTAL FRIENDLY NEWSPAPER DEINKING APPROACH**

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“Paradigms for the Pulp and Paper Industry in the XXI Century: Opportunities for a Sustainable Future”

The objective of this research was to evaluate new type of alkali media for use in ink removal from recycled newspaper via flotation deinking. Hardwood (oak and beech tree) as the raw material for this new type alkali media was chosen because it is used in paper industry for obtaining virgin fibres as well. This naturally gained alkali, named Eco-alkali, was prepared as follow. Domestic by-product wood fly ash collected after hardwood ignition was cooked in tap water till boiling. Suspension was cooled at room temperature, decanted and then filtrated by Büchner funnel with appropriate vacuum device. The chemical composition of Eco-alkali was obtained by ion chromatography (IC) and inductively coupled plasma mass spectrometer (ICP-MS), Table 1.

Table 1. Eco-alkali composition; pH=12.08, conductivity = 20.0 mS/cm

Anion (IC method), mg/L	Element (ICP-MS method), mg/L			
	concentration > 1,0 mg/L		concentration < 1,0 mg/L	
F <sup>-</sup> (3.78)	K (5781)	Mg (4.45)	Al (0.35)	As (0.01)
Cl <sup>-</sup> (27.2)	Na (162.6)	Fe (2.30)	Ag (0.10)	Mn (0.03)
NO <sub>3</sub> <sup>-</sup> (46.1)	Ca (10.65)	B (5.73)	Cu (0.105)	Zn (0.06)
SO <sub>4</sub> <sup>2-</sup> (675.9)	P (7.1)		Pb (0.01)	

The aim was to minimize the environmental impact of chemicals for conventional flotation deinking by applying green chemistry approaches. In the purpose of achieved efficiency various deinking processes were compared. Worldwide accepted method for flotation deinking, INGEDE Method 11, was done as a control method for defining deinking efficiency of new flotation deinking approaches. Accompanied by a conventional deinking process, three more trials were done (Table 2.).

Table 2. Experimental trials

Trial	Chemicals	Disintegration and flotation temperature
T1	NaOH, Na <sub>2</sub> SiO <sub>3</sub> , H <sub>2</sub> O <sub>2</sub> , Oleic acid (INGEDE Method 11)	45°C
T2	Eco-alkali (composition Table 1.), Oleic acid	45°C

T3	Eco-alkali, Na <sub>2</sub> SiO <sub>3</sub> , H <sub>2</sub> O <sub>2</sub> , Oleic acid	45°C
T4		24°C

The pulp for all deinking trials was produced from offset-printed daily Croatian newspaper. Lab scale flotation deinking efficiency was controlled by image analysis and spectrophotometric handsheets measurements (brightness and ERIC) before and after flotation.

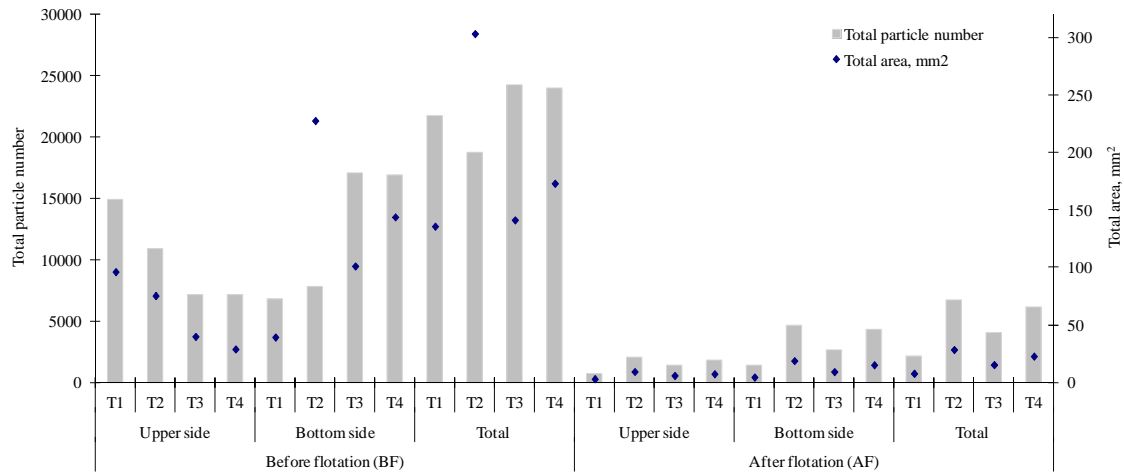


Figure 1. Image analysis results for handsheets formed before and after flotation  
 Table 3. Handsheet optical data

Trial	Flotation	ERIC	$\frac{ERIC_{BF} - ERIC_{AF}}{ERIC_{BF}} \times 100$	ISO Brightness	$\frac{R_{460BF} - R_{460AF}}{R_{460BF}} \times 100$
T1	BF	636,3	43%	46,34	15%
	AF	361,3		53,43	
T2	BF	892,2	32%	46,07	6%
	AF	603,9		49,11	
T3	BF	738,0	35%	48,88	6%
	AF	476,4		51,88	
T4	BF	817,7	40%	47,22	6%
	AF	493,5		49,89	

According to presented results (Figure 1 and Table 3) this investigation implicates:

- Successfully usage of Eco-alkali in newspaper recycling process,
- Possibility of process temperatures decreasing,
- Needs for further detail investigations to achieve optimal process conditions (especially disintegration and homogenisation temperature and surfactant concentration).