BROCHURE

Neobor® for autocausticizing

Patented Partial Borate Autocausticizing (PBAC) technology is implemented in pulp mills to supplement conventional lime causticizing, with little or no capital investment. PBAC uses *Neobor*® to react with sodium carbonate in the kraft pulping furnace to form intermediate borates

In kraft and soda pulp mills, *Neobor* is an inexpensive source for sodium metaborate ($NaBO_2$), which causes in situ production of caustic soda for wood chip digestion. Each ton of *Neobor* added to the pulp-making process replaces 10 to 50 times its weight in lime. This translates to lower operating costs, lower energy consumption, lower CO_2 emissions, and lower lime mud quantities for disposal. The technology can also increase pulp production without equipment upgrades.

The chemistry is straightforward: *Neobor* converts to sodium metaborate in alkaline solutions. Sodium metaborate reacts with sodium carbonate to form an intermediate borate during the combustion of the black liquor. This intermediate borate is then hydrolyzed to form caustic and to regenerate the sodium metaborate in the smelt dissolving tank. The borate materials recirculate within the pulp mill. The amount of lime replacement per ton of *Neobor* will depend on several operational parameters, but it is primarily based on the efficiency of the brownstock washing for a given kraft or soda mill.

Experience shows that the use of *Neobor* to causticize up to 25% of the sodium carbonate in the smelt is economical. Mills around the world have used *Neobor* to help improve recovery cycle operations, create cost-savings by off-loading lime kilns and by reducing fresh lime and/or lime stone purchases, or to increase white liquor production capacity with little or no capital investment. Examples of actual operating improvements are shown below. Benefits are dependent on variables at the mill and may not be consistent with these findings.

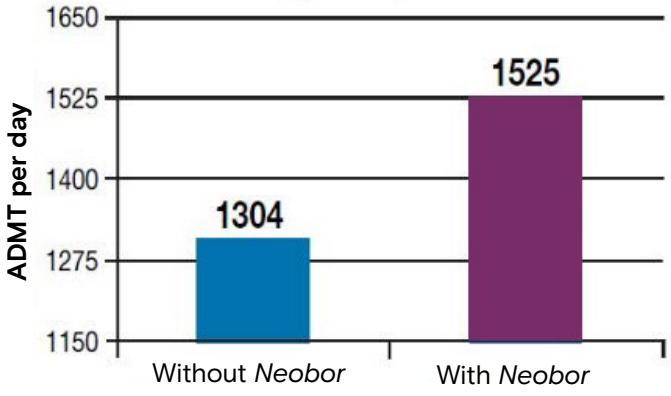
Adding borates to your process without performing changes to your analysis could be catastrophic. Always consult a professional to avoid serious issues.

Neobor is a stable crystalline product which does not change chemically under normal storage conditions. If wetted, it reacts exothermically with the water, forming borax decahydrate. Care should therefore be taken to prevent exposure of the product to moisture, and to avoid wide fluctuations in temperature and humidity during storage. This can also cause the product to cake. It is, of course, essential to maintain the integrity of the packaging.

Dissolved in water, *Neobor* hydrolyzes to give a mildly alkaline solution. It is thus capable of neutralizing acids. It also combines with strong alkalis to form compounds of lower pH. The relatively constant pH of *Neobor* solutions makes it an excellent buffering agent.

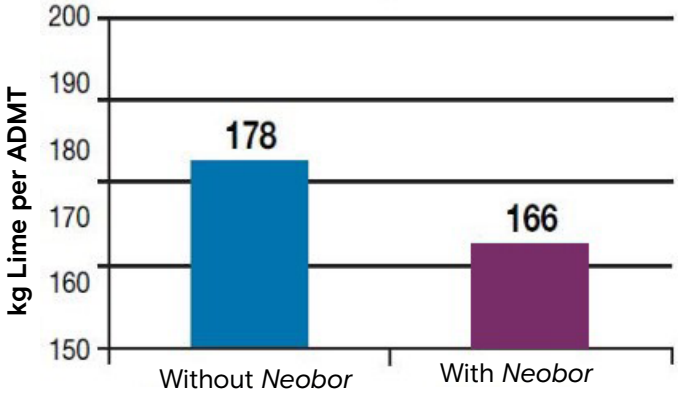
Daily bleached pulp production

Eucalyptus pulp producer



Lime usage per ton pulp

Softwood pulp producer



Solubility in water

Temperature °C (°F)	*Neobor* % by weight in saturated solution
0 (32)	1.52
5 (41)	1.88
10 (50)	2.36
15 (59)	2.90
20 (68)	3.59
25 (77)	4.43
30 (86)	5.50
35 (95)	6.89
40 (104)	8.57
45 (113)	10.86
50 (122)	13.68
55 (131)	17.73
60 (140)	23.16
65 (149)	25.88
70 (158)	28.21
75 (167)	30.69
80 (176)	33.85
85 (185)	37.06
90 (194)	40.62
95 (203)	45.02
100 (212)	50.13

Solubility in other solvents

Organic solvent	Temp °C (°F)	*Neobor* % by weight in saturated solution
Methanol	25 (77)	16.94
Propylene glycol	25 (77)	21.86
Ethylene glycol	25 (77)	31.12
Diethylene glycol	25 (77)	9.99

Theoretical chemical composition

% B_2O_3	47.80
%Na_2O	21.28
%H_2O	30.92
Anhydrous equivalent $Na_2B_4O_7$ %	69.08

Characteristics

Molecular weight	291.30
Specific gravity	1.88
Onset of water loss	88°C (190.4°F)
Heat of solution (absorbed) 1 wt % at 35°C (95°F)	2.57 x10^5 J/kg (110 BTU/lb)

Comparative pH of some common alkalis @ 20°C (68°F)

Weight %	0.1	0.5	1.0	2.0	5.0
Caustic soda	11.90	12.70	13.10	13.30	13.80
Sodium metasilicate	11.30	12.10	12.30	12.70	13.10
Trisodium phosphate	11.50	11.55	11.60	11.70	11.80
Soda ash	10.70	11.30	11.40	11.50	11.60
Neobor	9.25	9.22	9.23	9.25	(9.32*)

* pH of *Neobor* saturated solution (4.70%)