

Alkaline stage E

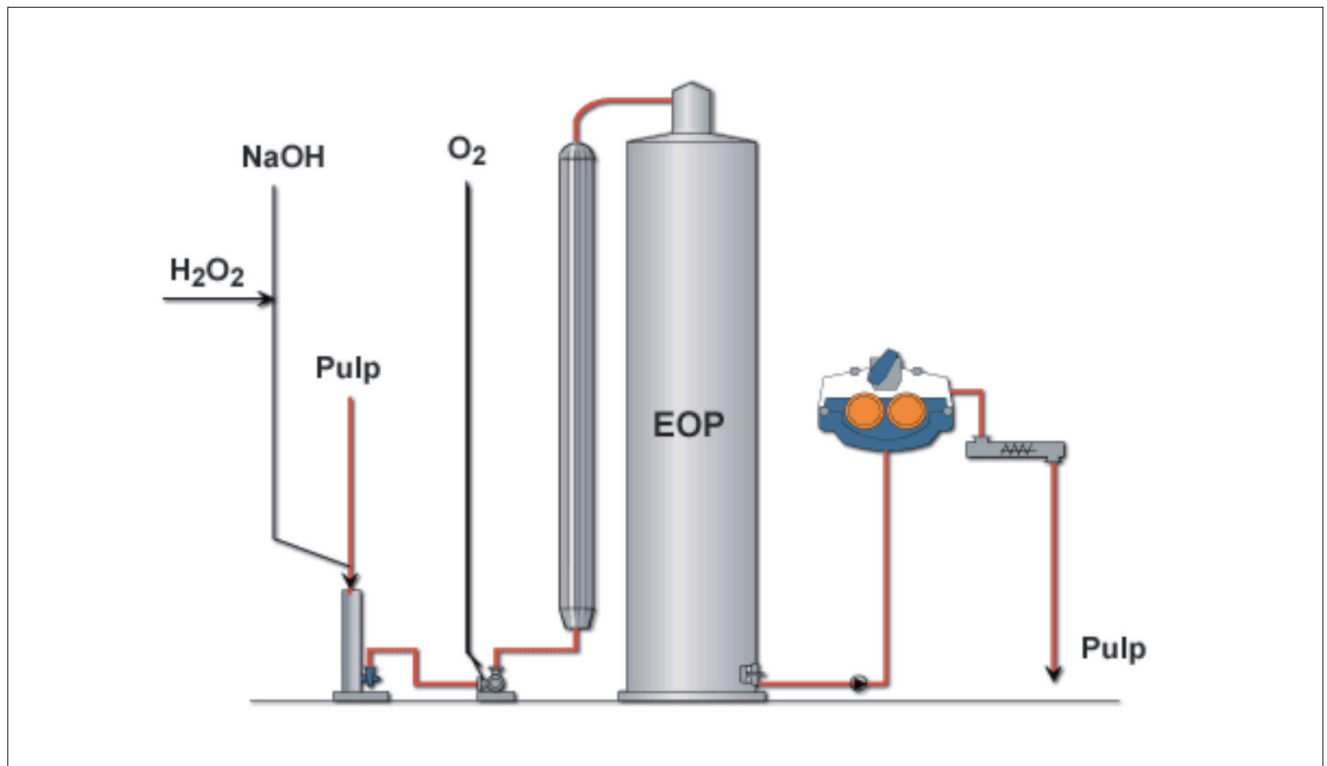


Fig. 1. Alkaline stage E.

Introduction

Bleaching is usually done in 3 - 5 sequences with intermediate washing between stages. One or two chemicals are used in one stage. An alkaline stage E is usually located after the initial stage D_0 . Depending on the used oxidants the stage is called alkaline stage E, EO or EOP. Figure 1 shows a typical alkaline stage that uses oxygen (O) and hydrogen peroxide (P).

The process

The purpose of E stage is to neutralize the degraded residual lignin fractions and other reaction products, because most of the reaction products from the initial stage D_0 are still in the pulp. About 90 % of lignin is removed in the washer after the alkaline stage because of the neutralization.

The alkaline stage can be performed in two phases, when the last stage is located between D_1 and D_2 . However the last stage is often replaced by neutralization because it is much cheaper solution. Usually the amount of lignin is so small after the D_1 that almost as good results can be achieved by neutralization that raises pH.

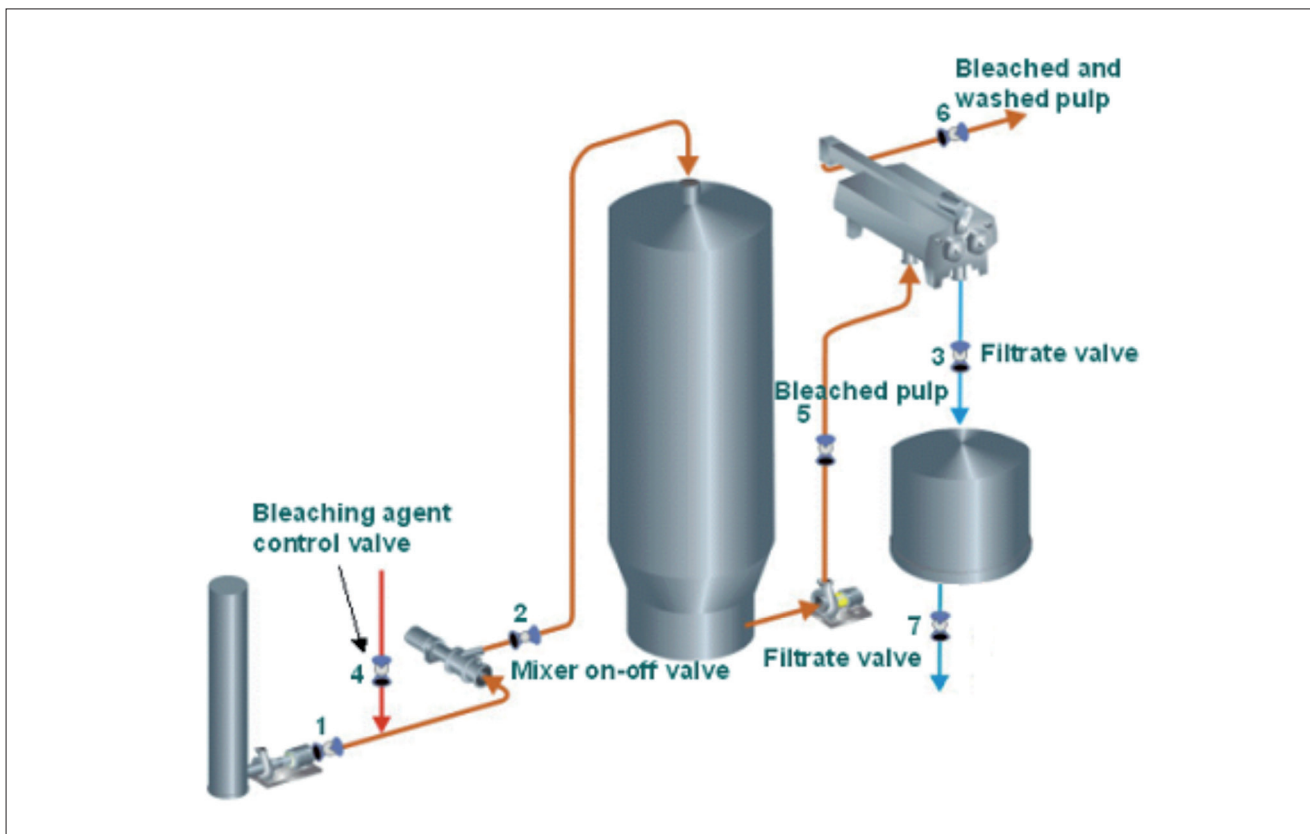


Fig. 2. Valves in alkaline stage.

The alkali is usually dosed in relation to the chlorine dioxide stage charge in D1, because the purpose of the alkali is to dissolve and remove reaction products formed in the previous stage. If the alkali is dosed only according to the pH value, it may escape notice that the charge is needlessly large, because in this pH zone the pH value changes slowly. Table 1 gives the typical conditions in the alkaline stage.

Table 1. Conditions in alkaline stage.

final pH	10 - 11.5
temperature	55 - 90 °C
consistency	10 - 15 %
time	1 - 2 h

The effect of the alkaline stage can be enhanced by oxygen and/or peroxide. The plain alkaline stage is performed in a non-pressurized tower. However pressurized reactor is needed if oxygen is used to reinforce bleaching. Usually a downflow tower is used in alkaline bleaching where reaction time can be controlled by changing the filling degree of the tower. Reaction time in the non-pressurized tower is usually about one hour while reaction time in pressurized reactor is 1 – 2 h.

Valves

Figure 2 shows valves in the alkaline stage.

Valve material in the alkaline stage is mostly stainless steel. Table 2 gives the most common valves and materials (example materials are in brackets) used in the alkaline bleaching.

Table 2. List of valves.

Valve	Name	Type	Material	E.g.
1	MC control valve	Segment	CG8M (317 SS)	R2_S...CJJK
2	Mixer on-off valve	Ball	CF8M (316 SS)	M1_B...AP
3	Filtrate valve	Segment or butterfly	CF8M	LW7_BA...AAJAT
4	Bleaching agent control valve	Segment	CF8M	RAA...AS
5	Bleached pulp	Ball or segment	CF8M	RE_A...AJJST
6	Bleached and washed pulp	Segment or ball	CF8M	RAA...AS
7	Filtrate valve	Segment or butterfly	CF8M	LW7_BA...AAJAT

Pulp is led to the system with MC control valve. Often MC control valve is made of CG8M, which tolerates corrosion a bit better than CF8M that is used in other valves in the E stage. Oxidants are added into the pulp before the tank when pulp and oxygen and/or peroxide are mixed as a homogenous mixture. The mixture is fed to the tank with mixer on-off valve.

Bleached pulp is pumped through a ball or a segment valve to the washer. Washing system removes chemical left over and water soluble reaction products from the pulp. Washed pulp and used chemicals are dosed with segment or butterfly valves. Depending on the process, valves 3, 5 and 6 are not always used.

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