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Recommended pulp bleaching stage designation method

Scope

The practice of designating bleaching stages and sequences using a symbolic shorthand has evolved through the years. Concurrent evolution of variations, combinations, and complexity in bleaching practice, coupled with variations in symbolism, has caused misunderstanding and errors regarding bleaching practices. This has created the need for a bleaching stage designation method. The following recommendations establish a coherent standard method for representing bleach plant stages and sequences. Adherence is urged to facilitate clarity in communication.

To accommodate new developments in the rapidly changing field of bleaching process technology, additions, variations, or exceptions will most certainly be required. In such an event, the symbolic representation should be made very clear early in the corresponding presentation.

Safety precautions

There are no particular safety precautions associated with this TIP

Basic sequence designation rules

Individual bleaching stages are designated by single uppercase letter symbols. Recommended letter symbols are listed in “Recommended Letter Symbols.” Any of the recommended letter symbols, if used without the modifications described in subsequent sections, implicitly denotes a series of four operations: chemical addition, mixing, retention and washing. Each of these is generic, and no particular equipment or mode is to be inferred. Mixing, for example, could be by a washer repulper or by a high-shear mixer; retention could be by a length of pipe as well as by a retention tower.

A multistage bleaching sequence is designated by an ordered list of letter symbols. Example: ODED denotes a sequence consisting of oxygen delignification, chlorine dioxide, caustic extraction and chlorine dioxide stages, in that order. Each stage consists of chemical addition, mixing, retention, and washing.

Letter symbols enclosed in parentheses, (), represent stages in all but the last of which chemical addition and mixing are not followed by significant (more than one minute) retention or washing. Most frequently, only two stages will be shown in parentheses, indicating that the first is conducted without the usual retention and washing steps. Example: (DZ) denotes chlorine dioxide addition followed by ozone addition after a retention time of less than one minute and without intermediate washing. The ozone addition is followed by the usual mixing, retention, and washing steps.

Letter symbols enclosed in parentheses and separated by a "+" sign denotes simultaneous addition of two chemicals with no intermediate retention time, the symbol for the predominant chemical being shown first. The chemical corresponding to the symbol following the "+" sign is added simultaneously with the one corresponding to the symbol preceding the "+" sign. Example: (D+C) denotes simultaneous addition of chlorine dioxide and chlorine.

A slash ("/") occurring between stage symbols enclosed by parentheses explicitly denotes significant (more than one minute) retention in the stage denoted by the letter symbol preceding the slash. Note, however, that the stages separated by a slash are conducted with no intermediate washing, as indicated by the parentheses surrounding their letter symbols. Example: (D/E) denotes chlorine dioxide addition, mixing and retention (e.g., in a tower) followed, without washing, by a caustic extraction stage.

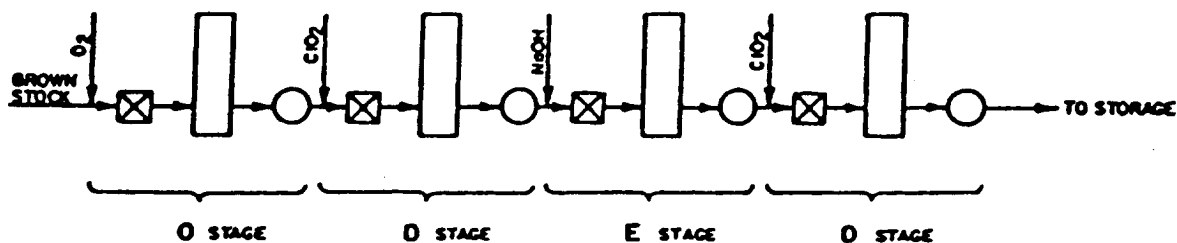


Fig. 1. ODED sequence.

Recommended letter symbols

A	Acid Wash/Treatment
B	Unassigned
C	Chlorine
D	Chlorine Dioxide
E	Alkaline Extraction
F	Unassigned
G	Unassigned
H	Hypochlorite
I	Unassigned
J	Unassigned
K	Unassigned
L	Unassigned
M	Chlorine Monoxide or Hypochlorous Acid
N	Unassigned
O	Oxygen
P	Peroxide
Pa	Peracetic acid
Q	Chelating Agent
R	Unassigned
S	Unassigned
T	Unassigned
U	Unassigned
V	Unassigned
W	Unassigned
X	Xylanase enzymes
Y	Dithionite (Hydrosulfite)
Z	Ozone

Unassigned letters may be employed for bleaching agents not shown, but must be clearly defined early in the presentation.