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BSI Standards Publication

Pulps — Basic guidelines for laboratory refining

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National foreword

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Foreword

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The committee responsible for this document is ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 5.

Introduction

It is well known that the current standardized methods (PFI, Valley, Jokro, …) for refining/beating have only limited value in the evaluation of chemical pulps. They were originally developed for quality control purposes and have no counterpart in real mill operations.

The biggest shortcomings involved are the following:

— refining mode (energy consumption, refining intensity) is different from mill-scale refining processes;

— no possibility to adjust refining parameters for specific pulps;

— no direct measure for specific energy consumption.

These well-known standardized methods have fairly good reproducibility and repeatability and the equipment is easily handled. Nevertheless, many laboratories have replaced these methods by the use of so-called simulating laboratory refiners, which allow the evaluation of pulps for various mill-scale refining applications. No uniform methods for simulating refining have so far been established on an international scale.

TECHNICAL REPORT ISO/TR 11371:2013(E)

Pulps — Basic guidelines for laboratory refining

1 Scope

This Technical Report gives guidelines for the laboratory refining of various pulps intended for paper production including:

— unifying terms and parameters for the simulation of industrial refining processes and laboratory refiners;

— treating pulp samples in a (semi) continuous operation in contrast to quasi-stationary laboratory beating equipment such as the PFI mill or Valley Hollander;

— evaluation of chemical market pulps under close-to-reality conditions in terms of refining intensity and refining energy consumption;

— optimizing of fibre furnishes in terms of cost, quality, and energy requirements;

— this Technical Report only considers refiners operating at low consistency.

2 Basics of pulp refining

Chemical pulps are seldom suitable for a specific end use as such. Refining is the most important process where the fibre properties are tailored to meet the demands of various paper and paperboard products.

The main target of refining is to improve the bonding ability of the fibres to enhance runnability and to give the paper good printing properties. Other targets can be, for example, to shorten fibres which can be too long, to give good sheet formation or to develop specific paper properties such as porosity or optical properties.

The most common refining method for chemical pulps is to treat the pulp suspension with metallic bars at low consistency. The bars are attached to a stationary element (stator) and to a rotary element (rotor). The pulp fibres pass through the gap between the rotor and the stator receiving impacts with varying number and intensity. In industrial refiners, the refining elements (fillings) can be disks, cones, or cylinders.

The fibres are affected by refining in several ways; the most common ones are as follows:

— cutting of the fibres;

— formation of fines by removing parts from fibre walls;

— external fibrillation giving the fibres a “hairy” look;

— internal changes in the fibre wall (internal fibrillation, swelling, or delamination);

— straightening or curling the fibre;

— creating or removing kinks, nodes, or microcompressions in the fibre wall;

— dissolving or leaching out colloidal material into the water phase;

— redistribution of hemicelluloses in the fibre wall from the interior to the exterior parts;

— formation of a gelatinous layer at the fibre surfaces.