



BSI Standards Publication

## Pulps — Basic guidelines for laboratory refining

**bsi.**

...making excellence a habit.™

Currently in preview, click buy full version

### National foreword

This Published Document is the UK implementation of ISO/TR 11371:2013.

The UK participation in its preparation was entrusted to Technical Committee PAI/11, Methods of test for paper, board and pulps.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2013. Published by BSI Standards Limited 2013

ISBN 978 0 580 81414 3

ICS 85.040

**Compliance with a British Standard cannot confer immunity from legal obligations.**

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 October 2013.

### Amendments issued since publication

Date	Text affected
------	---------------

---

# TECHNICAL REPORT

# ISO/TR 11371

First edition  
2013-10-15

---

---

## **Pulps — Basic guidelines for laboratory refining**

*Pâtes — Lignes directrices pour le raffinage de laboratoire*



Reference number  
ISO/TR 11371:2013(E)

© ISO 2013

Currently in preview, click buy full version

License: Tech Street, ISO Exchange - Michigan, Version correct as of 14/10/2013, (c) The British Standards Institution 2013

Currently in preview, click buy full version



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2013

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Basics of pulp refining</b> .....	<b>1</b>
<b>3 Terms, abbreviation and definitions</b> .....	<b>2</b>
3.1 Machine parameters.....	2
3.2 Refiner fillings parameters.....	3
3.3 Refining process parameters.....	3
3.4 Definition of refining intensity.....	3
<b>4 Laboratory refining procedures</b> .....	<b>6</b>
4.1 Pulp preparation.....	7
4.2 Refining system.....	8
4.3 Measurements.....	9
4.4 Sample evaluation.....	10
4.5 Parameters.....	11
4.6 Maintenance.....	11
4.7 Quality assurance.....	11
<b>5 Summary and guidelines</b> .....	<b>12</b>
<b>Annex A (informative) Trial Report</b> .....	<b>13</b>
<b>Annex B (informative) Report on pulp testing</b> .....	<b>15</b>
<b>Bibliography</b> .....	<b>17</b>

License: Tech Street, ISO Exchange - Michigan, Version correct as of 14/10/2013, (c) The British Standards Institution 2013

Currently in preview, click buy full version

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

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.

Currently in preview, click buy full version

# 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.