

Industrial laundry machinery —

Part 1: Methods for the assessment of the effect of rotary washing machines on textiles

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The preparation of this British Standard was entrusted by the Textiles and Clothing Standards Committee (TCM/-) to Technical Committee TCM/25 upon which the following bodies were represented:

- British Interlining Manufacturers Association
- Consumers Association
- Home Laundering Consultative Council
- International Institute for Cotton
- International Wool Secretariat
- Lambeg Industrial Research Association
- Man-made Fibres Producers Committee
- Ministry of Defence
- Soap and Detergent Industry Association
- Textile Research Council

The following body was also represented in the drafting of the standard, through subcommittees and panels:

Department of Health and Social Security

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Foreword

This Part of BS 6246 has been prepared under the direction of the Textiles and Clothing Standards Committee. The rapid technical development of laundry machinery and the changes in the pattern of purchasing have led to a need for a standard for machine performance testing. It has therefore become necessary to draw up standard methods of test for rating or assessing the performance of the principal types of industrial laundry machines.

Two different approaches to the provision of the necessary information were considered:

- a) verification of the claims made by the manufacturer on the performance of the machine, using conditions arbitrarily agreed between the manufacturer and the user;
- b) preparation of standard methods of test for rating and assessing the performance of the principal types of machines, so that the test results obtained on machines of similar type could be compared directly wherever the machines were located and whenever they were tested.

It was agreed to adopt the second of these options in the preparation of the various Parts of BS 6246 since the need was for procedures which could be used on a range of machines to evaluate their performance in reproducible conditions, including specification of the loads to be used. Thus it will be possible to compare the basic performance of one machine against another and a machine against a specification quoted in a contract.

No performance level is set. Another advantage in the approach adopted is that the tests can be conducted at any location where the necessary services are available. In some parts of the standard information is given on the number and qualification of the personnel required where this is considered to be relevant.

There are, at present, no existing British Standards in the laundering industry on any facet of the work, although a few standards exist in the related textile and chemical fields.

This lack of published work has led to the problem of breaking new ground and great use has been made of original work by the former British Launderers' Research Association (now incorporated into the Fabric Care Research Association).

This British Standard consists of the following four Parts:

- *Part 1: Methods for the assessment of the effect of rotary washing machines on textiles;*
- *Part 2: Methods for the assessment of the effect of extracting machines on textiles;*
- *Part 3: Methods for the assessment of the effect of flatwork ironing machines on textiles;*
- *Part 4: Methods for the assessment of the effect of batch drying tumblers on textiles.*

It is hoped that with the advance of techniques, and widespread use of this standard, updated methods can be incorporated.

Use has been made of the recently developed MA (mechanical agitation) test pieces in the assessment of mechanical agitation in washing. The preparation and use of the MA test pieces are described in Appendix D and clause 5.

The tests will generally be conducted within an operating laundry and require the use of other equipment that is normally available. Particular attention is drawn to the care necessary in the organization of these test procedures. Adequate provision should be made for the time that will be taken and the procedural rehearsal.

At the time of publication of this British Standard no corresponding International Standard exists. However, an International Standard is in preparation which on publication may lead to amendment of this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 22, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of BS 6246 describes methods for assessment of industrial laundry machinery and their effect on textiles of rotary washing machines, including washer-extractors.

Methods are described for determining mechanical agitation, rinsing effectiveness, mixing time and consumption of water, heat and power. Certain other effects such as chemical damage and retention of whiteness may be evaluated using the methods in BS 2610 and BS 5377.

The standard applies, in the case of batch washing machines, only to machines with a gross cage volume in excess of 100 L.

The methods can be used separately and therefore any combination of the various methods can be agreed between the interested parties.

NOTE 1 A method that may be used for determination of machine production is given in Appendix A. Since this method depends on the efficiency of operators it is not sufficiently reliable to be included in the body of this standard.

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Part of BS 6246 the following definitions apply.

2.1

air-dry mass (ADM)

the total mass of clean textile articles including the mass of the moisture absorbed from the ambient atmosphere

2.2

alkalinity

the concentration of alkali in a liquor

2.3

batch washing machine

a washing machine that, in a washing sequence, discontinuously washes and rinses textile articles

2.4

bone-dry mass (BDM) (Moisture content between 0.5 % and 1.0 %)

the mass of textile articles after being dried in a specific manner, when successive determinations of mass, after several drying procedures, show no progressive change in mass of the textile greater than 0.5 %

NOTE Specified drying procedures include repeatedly processing the articles in a heated tumbler, from which the exhaust air reaches a temperature of not less than 80 °C and not more than 120 °C, or repeatedly passing the articles through a heated flatwork ironing machine. These temperatures are appropriate to cotton fabrics which constitute the test loads and test pieces specified in this standard.

2.5

cage

that part of a washing machine which rotates and contains the load during the washing and rinsing processes

2.6

carrier

cotton fabric in which “windows” are cut for attachment of the MA test pieces, to effect proper movement during washing and ease of identification after processing

2.7

compartment

a subdivision of a cage

2.8

continuous washing machine

a washing machine in which textile articles pass continuously or intermittently from the loading point, through the machine, to the discharge point

2.9

dwelt time

the time during which the cage is stationary between reversals

2.10

extraction

the mechanical removal of liquor from wet textiles

2.11

final extract

in a washer-extractor, the final stage of a process during which the cage rotates at its highest speed in order to achieve low moisture retention within the load

2.12

feed time (continuous machines)

the corresponding timed period in minutes as given in A.4.2.1

2.13

gross cage volume

the nominal volume within the major internal dimension of the cage

NOTE For a cylindrical cage of internal diameter d cm and internal length l cm, the gross cage volume (in litres) is given by the expression:

$$\frac{\pi d^2 l}{4\,000}$$

2.14

hydroextractor

a machine in which water is removed from wet textile articles by mechanical means

2.15**intermediate extract**

in a washer-extractor, the extraction between process stages

2.16**lifter**

a step or ledge on the internal periphery of the cage which is usually parallel to the cage axis

2.17**load**

the textile articles with which a washing machine is charged

2.18**loading factor**

the air-dry mass of load in kilograms per litre of net cage volume, expressed as a numerical ratio

2.19**MA test piece**

a cotton fabric of specified construction and dimensions, in which five circular holes of specified diameter and location are cut

2.20**MA figure**

the number of unbroken loosened threads in the five holes of the MA test piece after processing, which gives an indication of the degree of mechanical agitation during processing

2.21**net cage volume**

the gross cage volume less the aggregate of the volumes occupied by, e.g. lifters, recessed loading doors

2.22**outer cylinder**

the part of a washing machine that encloses the cage and the liquor

2.23**process time**

the total time taken for washing, associated rinsing and extraction (where applicable) of the agreed process

2.24**recovered water**

effluent from washing machines which is made available for re-use

2.25**reference washing machine**

a washing machine of specified characteristics in which a reference washing process is carried out

2.26**regain**

the difference between air-dry mass and bone-dry mass expressed as a percentage of bone-dry mass

2.27**rinsing**

the freeing of textile articles from wash products by dilution with water

2.28**running dip**

the mean depth of liquor in the cage during any specific stage of a washing process, which is measured vertically through the cage axis and is expressed as a percentage of the cage diameter

2.29**sheets**

plain weave white cotton sheets of mass per unit area $185 \pm 10 \text{ g/m}^2$ (determined in accordance with BS 2471)

2.30**standing dip**

the depth of liquor in the cage, which is measured vertically through the cage axis, when the cage is stationary and without load

2.31**steady state**

in a continuous washing machine, the state in which the rate of flow of textile articles, the temperature, the chemical conditions and the rates of flow of the appropriate services are stabilized to the conditions required for the specific tests to be carried out

2.32**transit time**

the time that elapses in a continuous washing machine between a textile article entering and leaving the cage

2.33**washer-extractor**

a batch washing machine in which liquors are centrifugally extracted from the textile articles

2.34**washing**

the freeing of textile articles from dirt in an aqueous medium with the assistance of washing materials, heat and mechanical energy

3 Preliminary procedures

3.1 Machine identification

The data required for the identification of the test machine and of any other ancillary equipment directly associated with and necessary for the operation of the test machine shall be recorded as specified in 10.1. The reference numbers of any diagrams, drawings or photographs necessary to supplement these data shall also be recorded.

3.2 Availability of test loads and other materials

Sheets and all other materials required for a particular method of test shall be assembled in sufficient quantities to ensure that the test is carried out in full without interruption.

3.3 Installation and test running conditions

3.3.1 The manufacturer of the test machine shall provide, wherever practicable, a complete statement of requirements in respect of the installation conditions of the machine and of the running conditions required. Wherever practicable, each requirement shall be expressed as a range of values within which the test procedure is acceptable rather than as a single specific value.

3.3.2 The manufacturer shall be informed and invited to inspect, check and certify in the test report that the machine and all relevant aspects of its installation and functioning under test conditions are satisfactory.

3.3.3 If the installation and/or running conditions are outside the limits stated by the manufacturer they shall be agreed by him or his authorized representative. Failing such guidance or agreement, the installation and/or test running conditions shall be acceptable to the party commissioning testing. Where appropriate spaces are not provided in the test report forms, particulars of any differences between the manufacturer's stated limits and the actual conditions as measured or observed during testing shall be clearly set out as an appendix and attached to the test report.

3.3.4 The power rating of the electric motor or motors, the function which each motor performs and the manufacturer's stated peak loading and running load in kW shall be recorded in a table with the format shown in Table 5.

The manufacturer's stated or recommended requirements in respect of electric power supply, water, steam or heat transfer fluid and any other external services (e.g. compressed air) shall be obtained and recorded in a table with the format shown in Table 6.

NOTE See clause 8 for the measurements of the actual conditions of supply services to the test machine during the tests and for the provision for the recording of such measurements against the figures recommended by the manufacturer.

3.4 Assessment of accuracy of automatic controls and instruments

Where the operation of controls and/or the readings of instruments forming an integral part of the machine affect the derivation of test results their accuracy shall be tested and, where necessary, correction factors established. These shall be determined as described in Appendix B.

4 Relationship between liquor quantity and dip level for batch machines

4.1 Principle

The quantity of liquor required to produce pre-established running dip levels with different loading factors is determined by adding water through a meter and observing the water level through a sight glass.

4.2 Apparatus

4.2.1 *Sight glass* fitted to the washing machine (see Figure 1).

4.2.2 *Water meter*

4.2.3 *Cotton test sheets*, which have been laundered previously, and of a quantity to load the machine to the recommended loading factors of 0.100 kg/L, 0.083 kg/L and 0.067 kg/L to within an accuracy of $\pm 5\%$.

4.2.4 *Other textiles*, as may be agreed between the parties concerned.

4.3 Procedure

4.3.1 Add water at $15 \pm 10^\circ\text{C}$ through the meter (4.2.2) to the machine, with the cage stationary, until the water is level with the bottom of the cage.

4.3.2 Mark the sight glass (4.2.1), denoting this level as zero, and make two further marks to represent 10 % and 33 % of machine cage diameter.

4.3.3 Record the quantity of water Q_0 , in litres, added to the zero level.