



**SLOVENSKI STANDARD**  
**SIST ISO 8858-2:2005**

01-november-2005

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Hard coal -- Froth flotation testing -- Part 2: Sequential evaluation

**iTeh STANDARD PREVIEW**

Houille -- Essais de flottation -- (Partie 2: Évaluation séquentielle)

Ta slovenski standard je istoveten z: **ISO 8858-2:2004**

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**ICS:**

73.040

Premogi

Coals

**SIST ISO 8858-2:2005**

**en**

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# INTERNATIONAL STANDARD

**ISO**  
**8858-2**

First edition  
2004-08-15

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## Hard coal — Froth flotation testing — Part 2: Sequential evaluation

*Houille — Essais de flottation —*

*Partie 2: Évaluation séquentielle*

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Reference number  
ISO 8858-2:2004(E)

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## ISO 8858-2:2004(E)

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Published in Switzerland

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## 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 8858-2 was prepared by Technical Committee ISO/TC 27, *Solid mineral fuels*, Subcommittee SC 1, *Coal preparation: Terminology and performance*.

ISO 8858 consists of the following parts, under the general title *Hard coal — Froth flotation testing*:

- *Part 1: Laboratory procedure*
- *Part 2: Sequential evaluation*
- *Part 3: Release evaluation*

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## Introduction

The froth flotation of coal has a widespread application for the recovery of fine coal particles and their separation from unwanted mineral matter. The response of coal to the froth flotation process is measured initially by a laboratory scale test. ISO 8858-1:1990 provides a means of evaluating the general flotation characteristics of a coal under a set of specified conditions and will not necessarily indicate the full potential of that coal. It is accepted that variation of the many parameters in the froth flotation process can be used to effect the beneficiation of the product. This part of ISO 8858 describes a procedure for the more complete determination of the flotation characteristics of a coal, using the apparatus and basic procedures described in ISO 8858-1. The purpose of this extended procedure is to provide information similar to that provided by the sink/float curve, which is the basis for density separations. The data obtained are expressed as a yield/ash curve. The information can be used to define the limitations on the cleaning of fine coal by froth flotation.

The procedures specified in this part of ISO 8858 are of practical significance in the development and evaluation of coal-preparation-plant flotation circuits, although engineering design aspects, such as flotation kinetics and the selection of size and type of cell, are not addressed.

The flotation response curve (yield/ash) indicates the maximum possible yield at any specified ash content. The general shape of the curve indicates the sensitivity of flotation performance to the nature of the coal and to operating conditions.

The procedure may be modified to test and compare the performance of different frother and collector types, the assessment of liberation by grinding, and the comparison of alternative feed size ranges. However, results of such tests should clearly indicate any use of non-standard procedures.

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# Hard coal — Froth flotation testing —

## Part 2: Sequential evaluation

### 1 Scope

This part of ISO 8858 sets out a laboratory sequential procedure for the froth flotation testing of fine coal, e.g. coal having a particle size of less than 0,5 mm. The procedure provides a means of evaluating for a coal the flotation characteristics (expressed as a yield/ash relationship) that may be expected from the froth flotation process.

Pulp samples that cannot be dewatered without the use of heat or chemical additives are not covered by this part of ISO 8858; nor does it cover procedures for the investigation of flotation kinetics.

The test is not intended to provide plant design data.

This part of ISO 8858 should be read in conjunction with ISO 8858-1.

### 2 Normative references

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The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 589:2003, *Hard coal — Determination of total moisture*

ISO 1171:1997, *Solid mineral fuels — Determination of ash*

ISO 1213-1:1993, *Solid mineral fuels — Vocabulary — Part 1: Terms relating to coal preparation*

ISO 1953:1994, *Hard coal — Size analysis by sieving*

ISO 7936:1992, *Hard coal — Determination and presentation of float and sink characteristics — General directions for apparatus and procedures*

ISO 8858-1:1990, *Hard coal — Froth flotation testing — Part 1: Laboratory procedure*

ISO 13909-4: 2001, *Hard coal and coke — Mechanical sampling — Part 4: Coal — Preparation of test samples*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1213-1 and the following apply.

**ISO 8858-2:2004(E)**

**3.1 higher rank coal**  
 coal having a gross specific energy of 21,00 MJ/kg or greater on an ash-free, moist (afm) basis *and* 27,00 MJ/kg or greater on a dry, ash-free (daf) basis

**4 Principle**

A sequence of laboratory flotation tests is carried out on a single coal sample, using a procedure based on that described in ISO 8858-1. Variations on that procedure are made to generate a number of products, by refloating concentrates and tailings a number of times. The masses and ash percentages of the various products are used to construct a yield/ash curve showing the flotation response.

**5 Sample**

The history and method of preparation of samples can affect the flotation characteristics of the coal considerably. The history of the sample should be recorded, and care should be taken to ensure that samples for comparison purposes are prepared in a similar manner and, where applicable, in accordance with the sample preparation procedures specified in ISO 13909-4.

A size analysis of the sample shall be carried out in accordance with ISO 1953.

**6 Apparatus**

The apparatus shall be as specified in ISO 8858-1.

**7 Flotation conditions****7.1 Collector dosage**

To establish well-defined flotation response curves, it is necessary to extend the range of conditions specified in ISO 8858-1. Different coals will require different conditions to display the attainable range of yields and corresponding product ash levels. To obtain a preliminary guide to the appropriate flotation conditions for this extended test, it is recommended that a sample of the coal be first tested according to the procedure specified in ISO 8858-1.

NOTE It is suggested that the collector increments referred to in 8.3 be selected on the basis of the result of the ISO 8858-1 test in Table 1.

**Table 1**

ISO 8858-1 yield %	ISO 8858-1 suggested collector dosage (fraction of dosage used in ISO 8858-1)
< 40	As in ISO 8858-1 = 1 ml/kg
≥ 40 < 60	25 % = 0,25 ml/kg
≥ 60 ≤ 80	10 % = 0,10 ml/kg
> 80	2,5 % = 0,025 ml/kg

The final result is largely independent of the selected increment size. Experienced operators may prefer to use other dosage rates.

## 7.2 Frother dosage

Frother addition at each stage may be made at approximately half the dosage specified in ISO 8858-1, i.e. at 0,05 ml of 4-methyl-2-pentanol (formerly called methyl isobutyl carbinol MIBC) (50 ml of 0,1 % aqueous solution) per kilogram of dry solids in the initial sample.

NOTE Frother dosages are not critical beyond the initial separation. Operator judgment may be used to maintain an adequate froth.

## 7.3 Solids content

The solids content for the first flotation stage shall be as specified in ISO 8858-1. For all subsequent stages, the mass of solids shall be that which results from the previous flotation stage.

## 7.4 Air flow rate

The air flow rate shall be as specified in ISO 8858-1.

## 7.5 Test temperature

The test temperature shall be as specified in ISO 8858-1 and shall be reported with the test results.

## 8 Procedure

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### 8.1 Initial procedure

The moisture content, size analysis and other parameters specified in ISO 8858-1 shall be determined.

### 8.2 Initial separation

The initial separation shall be carried out generally following the principles given in ISO 8858-1 with the exceptions that

- a) no collector shall be used,
- b) no conditioning time is required, and
- c) no frother shall be used.

Both concentrate and tailings shall be retained as pulps for subsequent refloitation.

NOTE Experience has shown that omission of frother and collector permits selective recovery of low-ash rapid floating particles and better definition of the low-yield end of the curve.

To ensure that the cell volume for subsequent tests is not exceeded, care should be taken to use a minimum of wash water in collecting the two products.

### 8.3 Subsequent separations

After performing an initial flotation, the resultant tailings shall be successively refloated, generally following the procedure given in ISO 8858-1, with incremental collector addition to recover any floatable particles that may not have been collected with the concentrate. This process shall be continued until it is estimated that refloitation of the successive tailings fraction has resulted in nil or negligible concentrate mass (approximately less than 5 % of the initial feed sample mass).