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Coal preparation plant — Principles and conventions for flowsheets

Ateliers de préparation du charbon — Principes et conventions relatifs aux schémas de traitement

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Foreword

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This document was prepared by Technical Committee ISO/TC 27, *Coal and Coke*.

This third edition cancels and replaces the second edition (ISO 924:1989), of which it constitutes a minor revision.

The main changes are as follows:

— changes to update other nominated standards in the text;

— minor changes to some units and ISO normal set up;

— the list of informative terms in Clause 3 were deleted.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

At various stages in the design of a complete plant, it is necessary to illustrate by flowsheets the process steps covering the operations to which the raw coal will be subjected in the preparation plant. In order that these may be more readily and universally understood, it is desirable that flowsheets should conform to a standard pattern and that various conventions should be well understood and adopted.

Coal preparation plant — Principles and conventions for flowsheets

1 Scope

This document sets out principles and conventions for use in the preparation of basic process and equipment flowsheets for the design of a coal preparation plant.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 561, *Coal preparation plant — Graphical symbols*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1213-1 and the symbols in ISO 561 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Types of basic flowsheet

In order to cover the various stages leading to the final design of a plant, two basic flowsheets are needed, one based on the process and the other on the equipment.

Examples of process and equipment flowsheets are shown in Figures 1 and 2 respectively. It is emphasized, however, that these flowsheets are included for information only and may be altered to suit the parties concerned. However, in the interests of standardization, it is recommended that the examples shown in Figures 1 and 2 be followed, unless it is essential to do otherwise.

NOTE More detailed flowsheets are likely to be required as planning proceeds, for example, where cleaning of the coal is involved. It may also be necessary to illustrate the water (or other medium) circuits and indicate the quantities at various parts of the plant. These and other specialized flowsheets are not dealt with in this document but it is assumed that insofar as is appropriate the same principles and conventions would be applied in them as in the basic process and equipment flowsheets.

5 Grouping of operations and products

In order to prepare a flowsheet it is necessary that the preparation process be subdivided into a number of headings, so that stages coming within the scope of a particular heading are grouped together. The stages

from the point where the raw coal enters the plant to the disposition of the products can normally be summarized under the following headings:

a) pretreatment of feed coal;

b) cleaning;

c) subsequent treatment of products (including separation of solids from water);

d) storage and loading of products;

e) characteristics of products;

f) destination of products.

NOTE In certain cases it can be desirable to indicate in the equipment flowsheet the destination of products under d) and to omit e) as shown in Figure 2.

6 Conventions for use on flowsheets

It is necessary that certain conventions be adopted to avoid risks of confusion and to ensure that the standard flowsheets are simplified as far as possible. The following conventions shall be adopted:

a) The raw coal entering the plant shall be shown at the top left-hand corner of the flowsheet;

b) As far as possible, the flowsheet should be arranged so that the size of products decreases from the top downwards. Where size ranges are shown, the largest size shall be given first (for example −125 mm + 16 mm, −16 mm + 0,5 mm and −0,5 mm + 0 mm). Similarly, where possible, a vertically descending order should be used for cleaned coal, middlings and discard;

c) Lines indicating flow of material shall be horizontal or vertical only. They shall enter the squares, rectangles or symbols from the top or left side and leave from the bottom or right side, giving in general a left to right flow, except that lines indicating products for retreatment within the installation shall leave from the right side, pass upwards and then proceed from right to left and joint the line of entry to the retreatment operation. Where more than one flow enters or leaves an item of plant, the number of entry and exit arrows shall be varied accordingly;

d) Junctions of flowlines shall be indicated by spots. Where there is no junction of materials the lines shall cross. As an alternative to this method, loop cross-overs may be used and for uniformity it is recommended that the loops should be either in the horizontal or vertical planes and all on the same side of the flowlines;

e) Sizes of material shall be indicated by the addition of "mm" after the appropriate figures and figures without qualification shall be used for rate in tonnes per hour, but quantities (for example bin capacities) shall be appropriately indicated by mass using "t" for tonnes;

f) A standard method of expressing and defining capacities should be adopted. It is recognized that considerable variations are likely to occur in the rate of supply of a coal to a preparation plant and that variations also occur in the quality because of changes in the size distribution and proportion of impurity. The object of defining capacities is that at all stages, from the inception of a project to the final design, there should be a clear understanding of the load conditions throughout the plant which will be associated with performance guarantees in the later stages.

The standard capacities should be indicated on flowsheets in the following manner:

— the nominal capacity should only be used in the title of the flowsheet;

— the design capacities relating to particular processes or items of equipment in the flowsheet should be written above horizontal lines or to the left of vertical lines. Where maximum and minimum rates are given for design capacity, these may be separated by an oblique stroke or a dash;

— the mechanical maximum capacities relative to particular items of equipment in the flowsheet should be written in parentheses below horizontal lines or to the right of vertical lines.

In the process flowsheet, the only figures noted should be the upper limits of design capacities which are written above the horizontal flowlines or to the left of vertical flowlines. Examples of capacity figures are shown on the flowsheets in Figures 1 and 2.

If the divisions between categories of process steps are indicated by vertical lines as in Figure 1 and Figure 2, then care shall be taken to distinguish them from the flowlines, for example by a thicker line.

On the process flowsheet the processes and stages shall be indicated by rectangles, roughly equivalent in size and elongated vertically or horizontally, whichever suits the originator. The identification of the processes and stages shall be written the rectangles, as shown in the example of process flowsheet in Figure 1. Plant symbols should not be used in process flowsheets.

On the equipment flowsheets, the machines or items of plant should be indicated as far as possible, by standard symbols (see ISO 561) which minimize the use of written descriptions. If a written reference is necessary, then it is recommended that this briefly indicates the size and number of units corresponding to the appropriate symbol.

The lines forming the rectangles on process flowsheets and the symbols on equipment flowsheets shall be shown by thick full lines and the product flow by slightly thinner full lines. The flowlines for other minor circuits such as fluid only shall be distinguished by relatively thinner full lines.

Code numbers referring to particular items of plant should not normally be used on a process flowsheet. If it is appropriate to show them on an equipment flowsheet, the numbers should be made distinct from other figures and, for example, could be enclosed in circles.

Many plants are designed so that, at some future time, they may be extended or a separate operational stage (for example froth flotation) may be added. When it is desired to illustrate such an extension or addition, the appropriate plant and circuits should be indicated by characteristic lines, for example chain dotting.