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R 309

METHODS OF SAMPLING MANGANESE ORES

PART I — ORE LOADED IN FREIGHT WAGONS

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BRIEF HISTORY

The ISO Recommendation R 309, *Methods of Sampling Manganese Ores—Part I—Ore Loaded in Freight Wagons*, was drawn up by Technical Committee ISO/TC 65, *Manganese Ores*, the Secretariat of which is held by the Komitet Standartov, Mer i Izmeritel'nyh Priborov pri Sovete Ministrov SSSR.

Work on this question by the Technical Committee began in 1954 and led, in 1957, to the adoption of a Draft ISO Recommendation.

In October 1958, this Draft ISO Recommendation (No. 257) was circulated to all the ISO Member Bodies for enquiry. It was approved by the following Member Bodies:

Austria	Germany	Poland
Bulgaria	Hungary	Portugal
Burma	India	Romania
Chile	Ireland	Spain
Czechoslovakia	Italy	United Kingdom
France	Netherlands	U.S.S.R.

One Member Body opposed the approval of the Draft: Japan.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in July 1963, to accept it as an ISO RECOMMENDATION.

METHODS OF SAMPLING MANGANESE ORES

PART I — ORE LOADED IN FREIGHT WAGONS

1. SCOPE

The method described in this ISO Recommendation is intended for the sampling of ore loaded in freight wagons, and should be used at the place of shipment and at the place of acceptance. The method is applicable to the sampling of all manganese ores.

2. GENERAL CONDITIONS

2.1 The varied nature of the types of ore and of the conditions governing their sampling makes it impossible to lay down strict rules for sampling. In order to make the samples representative, it is necessary to be guided by the principles given below. It is important that sampling should be done by qualified samplers.

2.2 This ISO Recommendation covers methods of selection and preparation of samples of

(a) ore containing lumps of sizes not exceeding 50 mm;

(b) ore containing a proportion of lumps larger than 50 mm.

Ore loaded in freight wagons may be arranged in

flat layers,

conical mounds, or

combinations of flat layers and conical mounds.

2.3 Certificated samples should consist of increments which have been uniformly taken, by agreement between the parties concerned, from each freight wagon or group of freight wagons loaded with ore.

2.4 Each certificated sample should consist of the necessary number of increments, each increment being taken from one point.

2.5 The recommended number of increments constituting the certificated sample of manganese ore, depending on the mass of the ore being sampled and its uniformity (determined mainly by ore size and manganese content), is calculated from the following formula:

$$N = C \sqrt{Q}$$

where

N = number of increments;

C = coefficient depending on the uniformity of ore and equal to

(a) 1.5 for uniform ore;

(b) 2.5 for ore of average uniformity;

(c) 3.0 for ore which is not uniform;

Q = total mass of the ore being sampled, in tonnes.

The number of increments constituting a certificated sample as calculated from the above formula is shown in Table 1 below.

TABLE 1

Mass of ore being sampled	Number of increments for ores of different uniformity		
tonnes (t)	Uniform size < 50 mm manganese content > 43 per cent	Average uniformity size < 50 mm manganese content < 43 per cent	Not uniform-containing lumps > 50 mm irrespective of manganese content
up to 100	15	25	30
100 to 200	20	35	40
200 to 300	25	40	50
300 to 400	30	50	60
400 to 500	35	60	70
500 to 600	40	65	75
600 to 700	40	65	80
700 to 800	40	70	85
800 to 900	45	75	90
900 to 1000	50	85	100
1000 to 1250	50	90	105
1250 to 1500	60	100	120
1500 to 1750	60	105	125
1750 to 2000	70	110	135
2000 to 3000	80	140	165
3000 to 4000	90	160	190
4000 to 5000	105	175	210
5000 to 8000	135	225	270
8000 to 10000	150	250	300

NOTES

1. Subject to agreement between the parties concerned, the number of increments may be increased, but may not be decreased.

2. Each increment should have approximately a volume of 1 litre, or a mass of 2 kg.

2.6 The minimum number of increments necessary may be calculated from the following formula:

$$N = K \frac{V^2}{P^2}$$

where

N = minimum number of increments necessary;

K = coefficient guaranteeing the accuracy of the test being equal to not less than 1 (for K = 1 guaranteed accuracy = 68.3 per cent);

V = coefficient of variation in the constituent of ore being sampled (e.g. degree of variation in the manganese content);

P = limits of tolerance on sampling equal to the limits of tolerance for the adopted method of determination of the constituent of ore to be controlled, expressed as a percentage.

2.7 Points selected for taking increments should be located chequer-wise, whether for one freight wagon or for a given number of freight wagons.

2.8 For ore lying in flat layers, Figures 1, 2 and 3 illustrate examples of the location of points for taking the increments from one freight wagon and from a given number of freight wagons.

FIGURE 1.—**Example of location of points for taking 15 increments**
comprising the certificated sample for one freight wagon
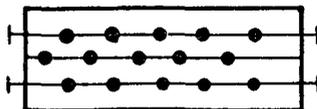(ore lying in flat layers)

FIGURE 2.—**Example of location of points for taking 54 increments**
comprising the certificated sample for a group of 6 freight wagons of 50 t each
(ore lying in flat layers)
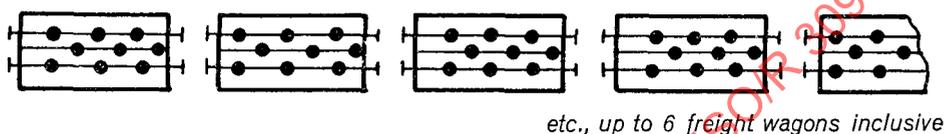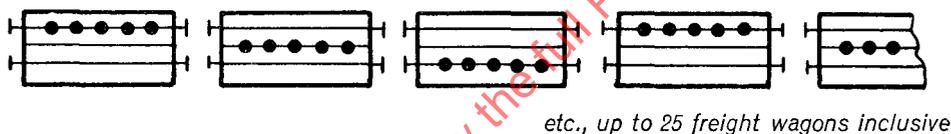

etc., up to 6 freight wagons inclusive

FIGURE 3.—**Example of location of points for taking 125 increments**
comprising the certificated sample for a group of 25 freight wagons of 60 t each
(ore lying in flat layers)

etc., up to 25 freight wagons inclusive

NOTE. If the group consists of freight wagons of different load capacities, the number of sampling points is determined according to the capacity of the wagons.

2.9 For ore lying in conical mounds, the location of points for taking the increments is given in Figure 4.

The sampling points are located:
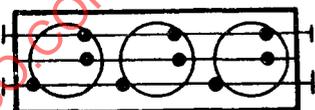
at $^1/_3$ of the mound height,
at $^2/_3$ of the mound height,
at the mound base.

FIGURE 4.—**Location of points for taking increments**
(ore lying in conical mounds)

2.10 For ore lying in combinations of flat layers and conical mounds, the increments are taken at uniformly distributed points:

(a) for ore lying in flat layers,   along the lines shown in Figures 1 to 3.
(b) for ores lying in conical mounds,   at the points shown in Figure 4.

2.11 Sampling is carried out immediately after the freight wagons together with the ore have been weighed.

2.12 Samples are taken by samplers appointed by the supplier and the user. Samplers must keep the selected samples under constant observation.

2.13 The chemical analyses of the ore at shipment and acceptance should be carried out according to the particular standard laid down for the supplier and the user. The number of constituents to be determined in the chemical analysis of manganese ores should be in accordance with the contract concerning the delivery of ore.

2.14 The following tools are used for taking samples:

(a) a scoop for taking increments, dimensions:

110 mm × 150 mm × 40 mm;

(b) a probe having a diameter of not less than twice the diameter of the largest lumps of the ore being sampled.

3. SAMPLING METHODS

3.1 For ore of a size not exceeding 50 mm, the following sampling method is used:

(a) a number of hollows to a depth of 200 to 400 mm are made at points described in clauses 2.7 to 2.10 of this ISO Recommendation;

(b) along the sides of the hollow, on a straight line from the bottom upwards, the increment is taken with a scoop, in one or two portions. Care should be taken to prevent the ore from spilling over the edges of the scoop. The contents of the scoop are poured into a bucket with a cover, or another container. While sampling, care should be taken that the average granulometric composition of the samples is as near as possible to the composition of the ore being sampled, and in particular in accordance with the proportion of size categories from 12 to 50 mm, and below 12 mm. Samples should not be taken from the bottom of the hollows.

The increments taken in this way from one freight wagon or from a group of freight wagons constitute the certificated sample.

NOTE. A probe is recommended for sampling ores smaller than 12 mm.

3.2 For ore of a size larger than 50 mm, the samples are made up in the same proportions in which the ore to be sampled contains the following three size categories:

small .... smaller than 12 mm,
medium .... 12 mm to 50 mm,
large .... larger than 50 mm.

3.3 The relative quantities of large, medium and small ore in the freight wagon or in the group of freight wagons are determined visually by agreement between the parties. If agreement has not been reached, samples for determination of size are taken.

The method of sampling and the number of samples required for this purpose and also the visual evaluation of samples according to size are determined by agreement between the parties concerned.

If agreement has not been reached, a screen analysis is made. The minimum weight of the samples for screening, depending on the size of the largest lumps in the ore sampled, is shown in Table 2:

TABLE 2

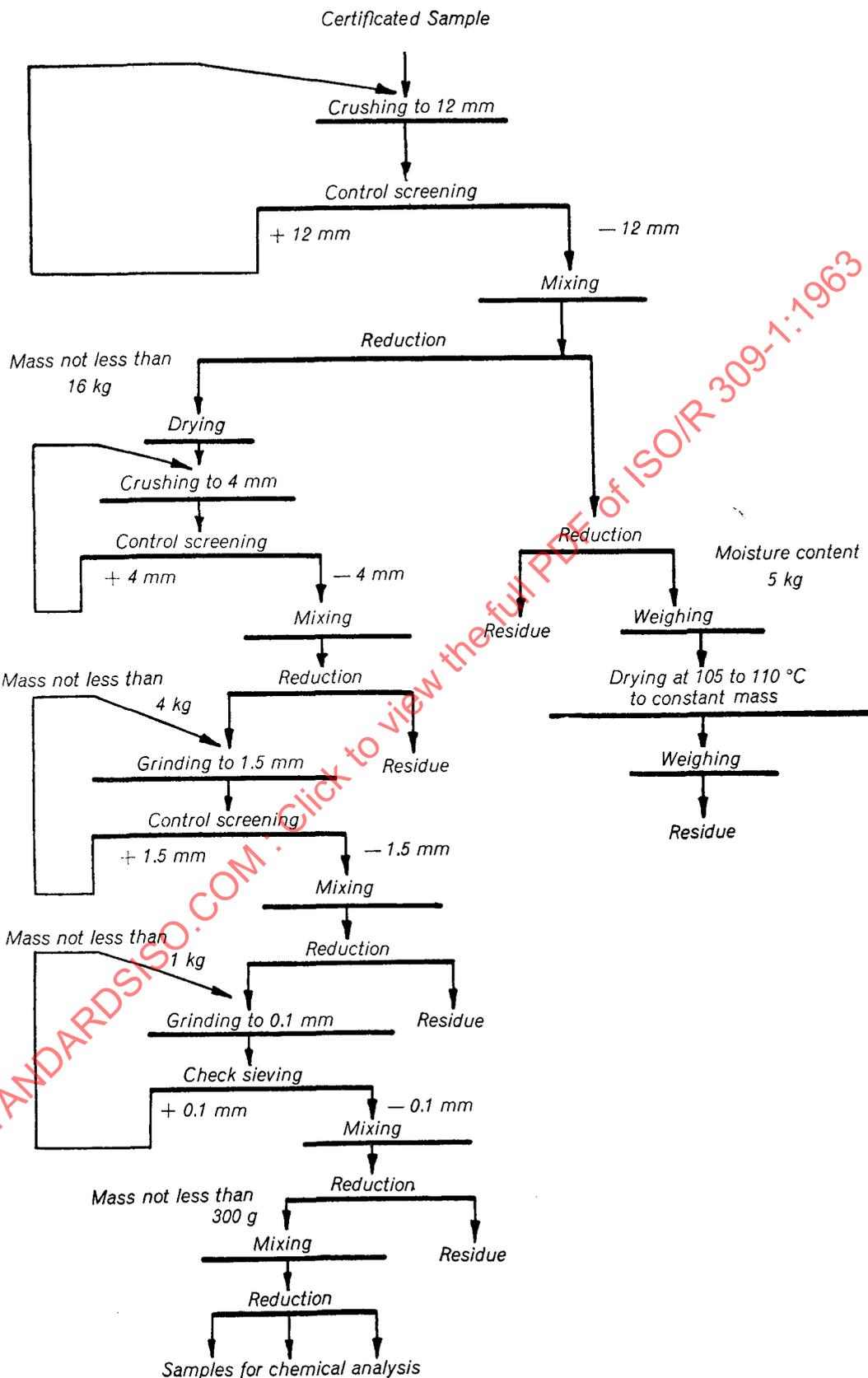| Size of the largest lumps	Minimum mass of samples for screening analysis
millimetres	kilogrammes
400	4000
250	1500
150	600
75	200
50	100
25	25

DIAGRAM OF PREPARATION OF SAMPLES

Certificated Sample

Crushing to 12 mm

Control screening

+ 12 mm   — 12 mm

Mixing

Reduction

Mass not less than
16 kg

Drying

Crushing to 4 mm

Control screening

+ 4 mm   — 4 mm

Mixing

Mass not less than
4 kg   Reduction

Grinding to 1.5 mm   Residue

Control screening

+ 1.5 mm   — 1.5 mm

Mixing

Mass not less than
1 kg   Reduction

Grinding to 0.1 mm   Residue

Check sieving

+ 0.1 mm   — 0.1 mm

Mixing

Mass not less than   Reduction
300 g

Mixing   Residue

Reduction

Samples for chemical analysis

Reduction

Residue

Moisture content
5 kg

Weighing

Drying at 105 to 110 °C
to constant mass

Weighing

Residue

FIGURE 5