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MINES BRANCH INVESTIGATION REPORT IR 61-56

STANDARDIZATION OF SIEVES FROM CANADIAN INGERSOLL-RAND COMPANY LIMITED, SHERBROOKE, QUEBEC

by

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MINERAL PROCESSING DIVISION

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SUMMARY OF RESULTS

A set of screens from Canadian Ingersoll-Rand was standardized against a set of Master Sieves retained at the Mines Branch. The variation in sizing with the two sets of screens was slight, never exceeding a few tenths of one per cent.

The Master Correction Factors to be applied to the Canadian Ingersoll-Rand screens in no case exceed one per cent.

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INTRODUCTION

Shipment

A set of W. S. Tyler sieves having the U.S. Series equivalent numbers of 6, 12, 20, 30, 40, 50, 70, 100, 140, 200 and 270, and a sample of foundry sand weighing 100 lb, were received at the Mines Branch laboratories in Ottawa on March 23, 1961, from Canadian Ingersoll-Rand Company Limited, 375 Courcelette Street, Sherbrooke, Quebec.

A visual inspection indicated that the 3 finest sieves having U.S. equivalent numbers of 140, 200 and 270 contained cloth so loose and uneven that their standardization would be pointless.

On the recommendation of the Mines Branch, Canadian Ingersoll-Rand Company Limited purchased three sieves to replace the defective ones, from Canadian Foundry Supplies and Equipment Ltd.

Nature of Investigation Requested

In a covering letter dated March 6, 1961, Mr. W. K. Baldwin, metallurgist for the company, requested that the sieves be checked for accuracy against a set of Mines Branch master sieves.

DETAILS OF INVESTIGATION

Since the Mines Branch does not possess master sieves coarser than 48 mesh (U.S. Series equivalent 50), the investigation concerned those sieves having U.S. Series equivalent numbers 50 to 270 inclusive. (48 mesh to 270 mesh).

For each sieve to be standardized the procedure followed was that outlined in the Mines Branch Bulletin, Technical Paper No. 16, 1956*.

The comparison sieves used in the investigation were those designated "Mines Branch Second Sub-master No. 3".

During the investigation an attempt was made to determine the minimum rotapping time necessary for accurate standardization.

The results showing the percentage retained on each of the sieves, the per cent coarseness (+) or fineness (-) as compared with the Mines Branch sieves, and the total rotapping time are summarized in Tables 1 to 6.

Sample Preparation

The 100 lb sample of foundry sand was mixed and riffled down to approximately 12 lb. The remainder was retained in bags. The 12 lb sample was ground in a porcelain mill using steel balls in lots of 1000 g for 10 min. This ground material was used in the standardization of all the sieves with the exception of the 270 mesh sieve.

In the case of this finest sieve a fresh sample of foundry sand was riffled out and ground to a variable percentage of -270 mesh.

In every case the ground material was rolled at least 100 times before each test sample was weighed.

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*Master Sieves at the Mines Branch for Standardization of the Sieves of the Mining Industry, by J. Brannen and L. E. Djingheuzian, Mineral Dressing and Process Metallurgy Division, Mines Branch, Department of Mines and Technical Surveys, Ottawa, Canada.

1. Standardization of 48 Mesh Sieve

(a) A 100 g sample was weighed, pulped and washed on a 200 mesh sieve.

(b) The +200 mesh fraction was dried, re-washed on a 200 mesh sieve and dried.

(c) The +200 mesh fraction was screened on 28-, 35-, and the standard 48 mesh sieves for 25 min on the Rotap.

(d) Each plus fraction was then washed on the standard 48 mesh sieve, dried, returned to their respective sieves and screened another 5 min on the Rotap.

This procedure was repeated twice for the standard and the Ingersoll-Rand 48 mesh sieves, the only difference being a reduction in the Rotap time.

TABLE 1

Results of Sieve Standardization, 48 Mesh

Test No.	Sieve Designation	% Retained	% Coarseness	Screening Time, min	★Correction Factor, %	% Retained, Corrected
1-a	Mines Standard	10.6	-	25+5=30	+0.27	10.87
1-b	Ingersoll-Rand	10.4	+0.2	" " "		
2-a	Mines Standard	11.2	-	20+5=25	+0.27	11.47
2-b	Ingersoll-Rand	11.0	+0.2	" " "		
3-a	Mines Standard	11.0	-	15+5=20	+0.27	11.27
3-b	Ingersoll-Rand	11.3	-0.3	" " "		

★ See Table V, Mines Branch Technical Paper No. 16

2. Standardization of 65 Mesh Sieve

(a) A 100 g sample was weighed, pulped and washed on a 200 mesh sieve.

(b) The +200 mesh fraction was dried, re-washed and dried.

(c) The +200 mesh fraction was screened on 35, 48, and the standard 65 mesh sieves for 25 min on the Rotap.

(d) Each plus fraction was then washed on the standard 65 mesh sieve, dried, returned to their respective sieves and screened another 5 min in the Rotap.

This procedure was repeated twice for the standard and the Ingersoll-Rand 65 mesh sieves, the only difference being a reduction in the Rotap time.

TABLE 2

Results of Sieve Standardization, 65 Mesh

Test No.	Sieve Designation	% Retained	% Coarseness	Screening Time, min	Correction Factor,% ✱	% Retained, Corrected
4-a	Mines Standard	35.7	-	25+5=30	+0.06	35.76
4-b	Ingersoll-Rand	35.0	+0.7	" " "		
5-a	Mines Standard	35.4	-	20+5=25	+0.06	35.46
5-b	Ingersoll-Rand	35.9	-0.5	" " "		
6-a	Mines Standard	35.5	-	15+5=20	+0.06	35.56
6-b	Ingersoll-Rand	35.9	-0.4	" " "		

✱ See Table IX, Mines Branch Technical Paper No. 16

3. Standardization of 100 Mesh Sieve

(a) A 100 g sample was weighed, pulped and washed on a 200 mesh sieve. Three washings were given this sample.

(b) The +200 mesh fraction was screened on 48, 65, and the standard 100 mesh sieves for 15 min on the Rotap.

(c) Each plus fraction was washed on the standard 100 mesh sieve, dried, returned to their respective screens and screened another 20 min on the Rotap.

This procedure was repeated twice for the standard and the Ingersoll-Rand 100 mesh sieves, the only difference being a reduction in the Rotap time.

TABLE 3

Results of Sieve Standardization, 100 Mesh

Test No.	Sieve Designation	% Retained	% Coarseness	Screening Time, min	*Correction Factor, %	% Retained, Corrected
7-a	Mines Standard	60.1	-	15+20=35	+0.12	60.22
7-b	Ingersoll-Rand	60.6	-0.5	" " "		
8-a	Mines Standard	60.8	-	10+15=25	+0.12	60.92
8-b	Ingersoll-Rand	60.5	+0.3	" " "		
9-a	Mines Standard	61.4	-	10+10=20	+0.12	61.52
9-b	Ingersoll-Rand	60.2	+1.2	" " "		

*See Table XIII, Mines Branch Technical Paper No. 16

4. Standardization of 150 Mesh Sieve

(a) A 200 g sample was weighed, pulped and washed on a 200 mesh sieve. Three washings were given this sample.

(b) The +200 mesh fraction was screened on 65, 100, and the standard 150 mesh sieves for 15 min on the Rotap.

(c) Each plus fraction was washed on the standard 100 mesh sieve, dried, returned to their respective sieves and screened another 25 min on the Rotap.

The procedure was repeated twice for the standard and the Ingersoll-Rand 150 mesh sieves, the only difference being a reduction in the Rotap time.

TABLE 4

Results of Sieve Standardization, 150 Mesh

Test No.	Sieve Designation	% Retained	% Coarseness	Screening Time, min	* Correction Factor, %	% Retained, Corrected
10-a	Mines Standard	65.6	-	15+25=40	+0.06	65.66
10-b	Ingersoll-Rand	65.2	+0.4	" " "		
11-a	Mines Standard	65.7	-	15+20=35	+0.06	65.76
11-b	Ingersoll-Rand	65.2	+0.5	" " "		
12-a	Mines Standard	65.8	-	10+15=25	+0.06	65.86
12-b	Ingersoll-Rand	65.6	+0.2	" " "		

* See Table XVIII, Mines Branch Technical Paper No.16

5. Standardization of 200 Mesh Sieve

(a) A 200 g sample was weighed, pulped and washed on the 200 mesh sieve to be standardized. Three washings were given this sample.

(b) The +200 mesh fraction was screened on 100, 150, and the standard 200 mesh sieves for 15 min on the Rotap.

(c) Each plus fraction was washed on the standard 200 mesh sieve, dried, returned to their respective sieves and screened another 20 min on the Rotap.

(d) Each plus fraction was again washed on the standard 200 mesh sieves, dried and screened a final 5 min on the Rotap.

This procedure was repeated twice for the standard and the Ingersoll-Rand 200 mesh sieves, the only difference being a reduction in the Rotap time.

TABLE 5

Results of Sieve Standardization, 200 Mesh

Test No.	Sieve Designation	% Retained	% Coarseness	Screening Time, min	Correction Factor, %	% Retained, Corrected
13-a	Mines Standard	83.4	-	15+20+5=40	+0.45	83.85
13-b	Ingersoll-Rand	83.2	+0.2	" " " "		
14-a	Mines Standard	83.5	-	15+10+5=30	+0.45	83.95
14-b	Ingersoll-Rand	83.4	+0.1	" " " "		
15-a	Mines Standard	83.6	-	15+10 = 25	+0.45	84.05
15-b	Ingersoll-Rand	83.8	-0.2	" " "		

* See Table XXII, Mines Branch Technical Paper No. 16

6. Standardization of 270 Mesh Sieve

(a) A 200 g sample was weighed, pulped and washed on a 325 mesh sieve and dried. This sample was given 3 washings on the sieve.

(b) The +325 mesh fraction was screened on 150, 200 and the standard 270 mesh sieves for 15 min on the Rotap.

(c) Each plus fraction was washed on the standard 270 mesh sieve, dried, returned to their respective sieves and given 25 min screening on the Rotap.

(d) Each plus fraction was again washed on the standard 270 mesh sieve, dried, returned to their respective sieves and given a final 5 min screening on the Rotap.

TABLE 6

Results of Sieve Standardization, 270 Mesh

Test No.	Sieve Designation	% Retained	% Coarseness	Screening Time, min	*Correction Factor, %	% Retained, Corrected
16-a	Mines Standard	25.4	-	15+25+5=45	+0.91	26.31
16-b	Ingersoll-Rand	25.5	-0.1	" " " "		
17-a	Mines Standard	25.5	-	15+20+5=40	+0.91	26.41
17-b	Ingersoll-Rand	25.0	+0.5	" " " "		
18-a	Mines Standard	26.9	-	15+15=30	+0.91	27.81
18-b	Ingersoll-Rand	26.7	+0.2	" " "		

* See Table XXVII, Mines Branch Technical Paper No. 16

MASTER CORRECTION FACTORS

Table 7 gives the master correction factors to be applied to the respective Ingersoll-Rand sieves. These factors were determined from the results of tests in which the longest rotapping time was used.

From the corrected values for percentages retained on Mines Branch Second Sub-master No. 3 sieves and the percentages on Ingersoll-Rand sieves in Tables 1 to 6, the master correction factors are readily determined as in the following example from Test No. 1-a and 2-a:

% of sample retained on Ingersoll-Rand 48	= 10.4
Corrected % of sample retained on Mines Standard 48	= 10.87
% correction factor	= 0.47

ie. add 0.47% to weight per cent retained, or

subtract 0.47% from weight per cent passing.

TABLE 7

Master Correction Factors to be applied to the Respective Ingersoll-Rand Sieves

Test No.	Mesh Size	Master Correction Factors to be applied to Weight Per Cent Passing
1-b	48	-0.47 %
4-b	65	-0.76 "
7-b	100	+0.38 "
10-b	150	-0.46 "
13-b	200	-0.65 "
16-b	270	-0.81 "

CONCLUSIONS

The Master Correction Factors to be applied to the respective Ingersoll-Rand sieves are shown in Table 7.

It is suggested that this report be read in conjunction with Technical Paper No. 16 referred to on page 2 of this report.