

VARIATION OF FILTERABILITY WITH BRIX

By R. D. ARCHIBALD

Introduction

In past years a considerable amount of research has been directed towards an empirical expression for the filtration rate of sugar solutions. This term, filterability, has become important as a major criterion for the refining quality of raw sugars.

The methods available for the determination of filterability compare the flow rates of a solution of the test sugar and of a sucrose solution, both at 60° Brix. Since most refinery liquors have concentrations greater than 60° Brix, dilution is necessary before the determination is made, and the filterability figure thus obtained may not be a reflection of the filterability at its natural Brix. This is especially true of carbonated liquors, which, because of their composition do not lend themselves to satisfactory investigations on dilution.

Alternate procedures are:

1. Comparison of the flow rate of liquor at its natural Brix, with the flow rate of sucrose solution at 60° Brix.
2. Comparison of the flow rate of liquor at its natural Brix, with the flow rate of sucrose at the same Brix. Both procedures have been investigated.

For the purpose of this report, "filtration rate" refers to rate of filtration through refinery filters, and "flow rate" refers to rate of filtration through laboratory test apparatus.

Methods Used

Filterability was determined using a modification of the Colonial Sugar Refining apparatus. Details of this apparatus may be found in I.C.U.M.S.A. Proceedings 12th Session (Subject 10), Washington, 1958.

The apparatus was fitted with a water jacket and water circulated at 80° C. The modifications in the method, given by Alexander and Graham (1) are:

- (a) Filter cloth, identical with that used in the Sugar Milling Research Institute bomb filtration apparatus was used instead of filter paper.
- (b) 0.35% on solids of Laboratory Standard Filter Cel was used in place of Celite 505.
- (c) The test solution was pre-heated to 80° C, and the filter aid thoroughly dispersed by mechanical stirring.

Results of Investigations

Graphs 1, 2 and 3 illustrate the variation of flow rate with brix, of sucrose solution, washed sugar solution and saturator supply liquor.

Table 1 indicates the filterabilities of washed sugar and saturator supply, with varying brix, expressed as:

A	m solution

	m sucrose solution at 60° brix
B	g solution

	g sucrose solution at 60° brix
C	g solids solution

	g solids sucrose at 60° brix

TABLE 1
Filterability

BRIX	WASHED SUGAR 1			SATURATOR SUPPLY		
	A	B	C	A	B	C
66.0	13.9	14.1	15.5	12.3	12.5	13.8
65.0	15.4	15.6	16.9	13.3	13.5	14.7
64.0	17.0	17.0	18.1	14.2	14.4	15.4
63.0	18.5	18.4	19.3	15.0	15.2	15.9
62.0	19.9	19.7	20.4	15.9	15.7	16.2
61.0	21.3	21.0	21.4	16.6	16.0	16.3
60.0	22.7	22.3	22.3	17.3	16.5	16.5

Graph 4 and Table 2 illustrate filterabilities of two washed sugar solutions, brown liquor and saturator supply between 60 and 66° brix where filterability is expressed as:

m solution filtered

m sucrose solution filtered at same brix

TABLE 2
Filterability

BRIX	WASHED SUGAR 1	WASHED SUGAR 2	BROWN LIQUOR	SATURATOR SUPPLY
66.0	19.3	27.0	26.5	17.1
65.0	20.0	27.0	26.6	17.2
64.0	20.8	27.1	27.0	17.4
63.0	21.4	27.3	27.3	17.4
62.0	21.8	27.4	27.4	17.4
61.0	22.3	27.7	27.9	17.4
60.0	22.7	28.0	28.3	17.3

Discussion of Results

It is evident that greater variations occur when filterability is expressed as the comparison with 60° brix sucrose solution (Table 1), than with sucrose solution at the same brix (Table 2). If, by definition, the value of filterability is given by a comparison at 60° brix, the percentage error for the filterabilities in Table 2 is as follows:

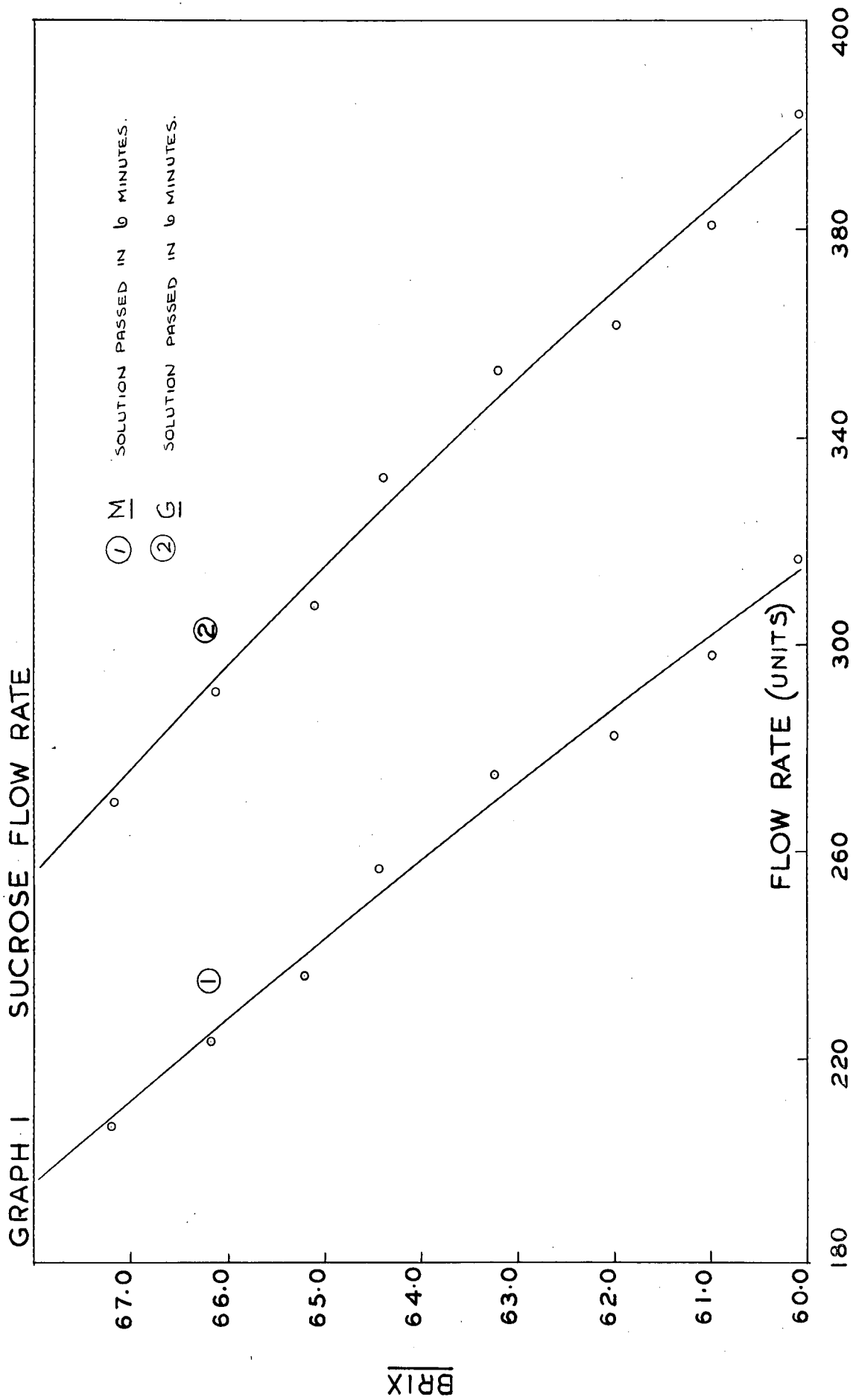


TABLE 3
Percentage Error for Filterabilities of Sugar Solutions with Varying Brix

BRIX	WASHED SUGAR 1	WASHED SUGAR 2	BROWN LIQUOR	SATURATOR SUPPLY
66.0	14.9	3.6	6.4	1.2
65.0	11.9	3.6	6.0	0.6
64.0	8.4	3.2	4.6	0.6
63.0	5.7	2.5	3.5	0.6
62.0	4.0	2.1	3.2	0.6
61.0	1.8	1.1	1.4	0.6

The percentage error of the first washed sugar represents a difference of only 3.4% in filterability. This is not a serious discrepancy when the practical requirements of a filterability determination are considered. Since the numerical expression of filterability should serve only as a guide to the filtering properties of a sugar solution, it is thought that little accuracy will be lost in determining the filterability of refinery liquors (especially carbonatated liquors) by comparing the flow rates of the liquors with sucrose at the natural brix.

Summary

The filterability of a sugar solution has been expressed by means of a comparison of the flow rate of the liquor at its natural brix with:

1. Sucrose solution at 60° brix, and
2. Sucrose solution at the same brix as the test solution.

For practical purposes it is recommended that the filterability of Refinery liquors be expressed as the flow rate at natural brix relative to the flow rate of sucrose at the same brix, under the same conditions.

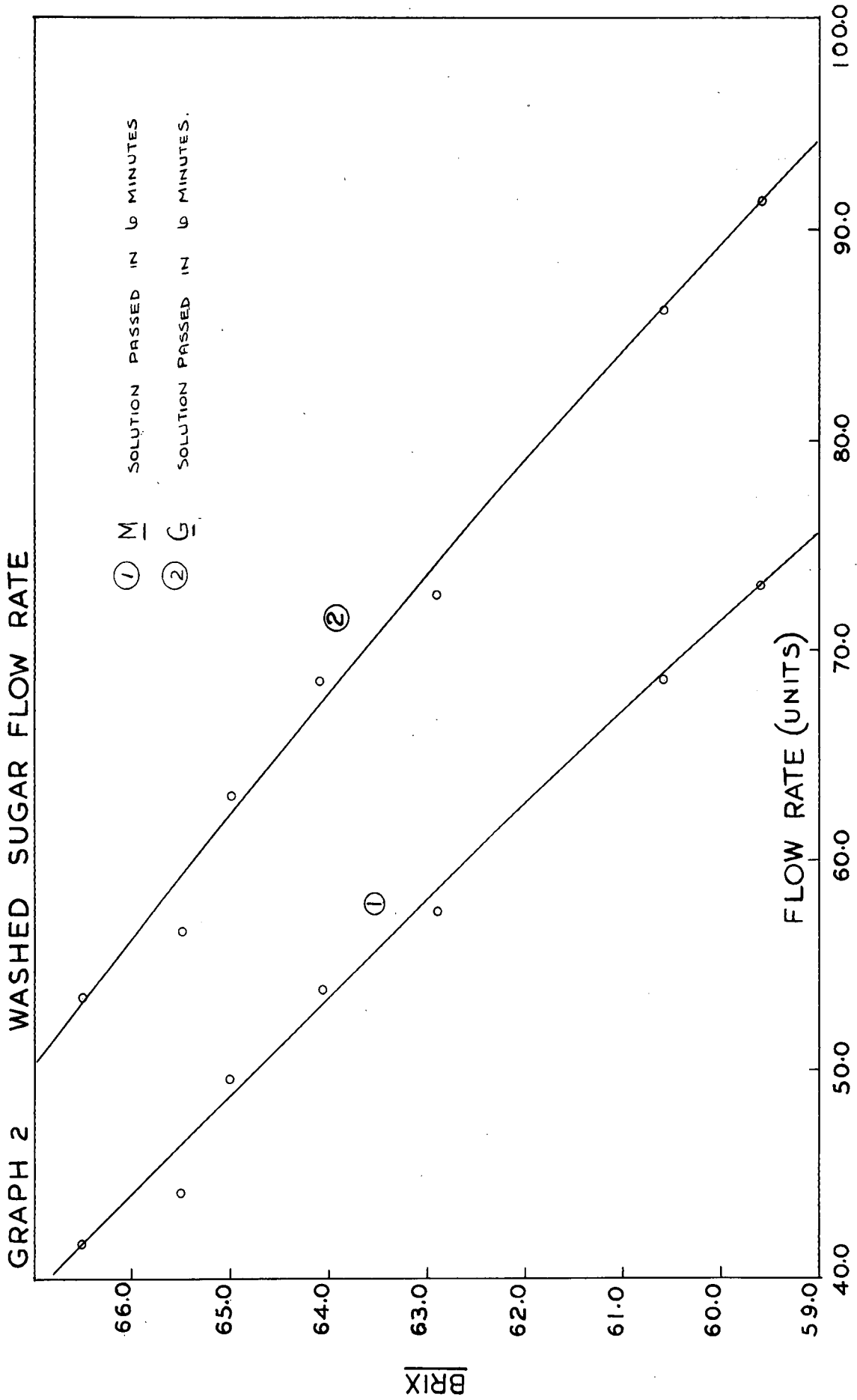
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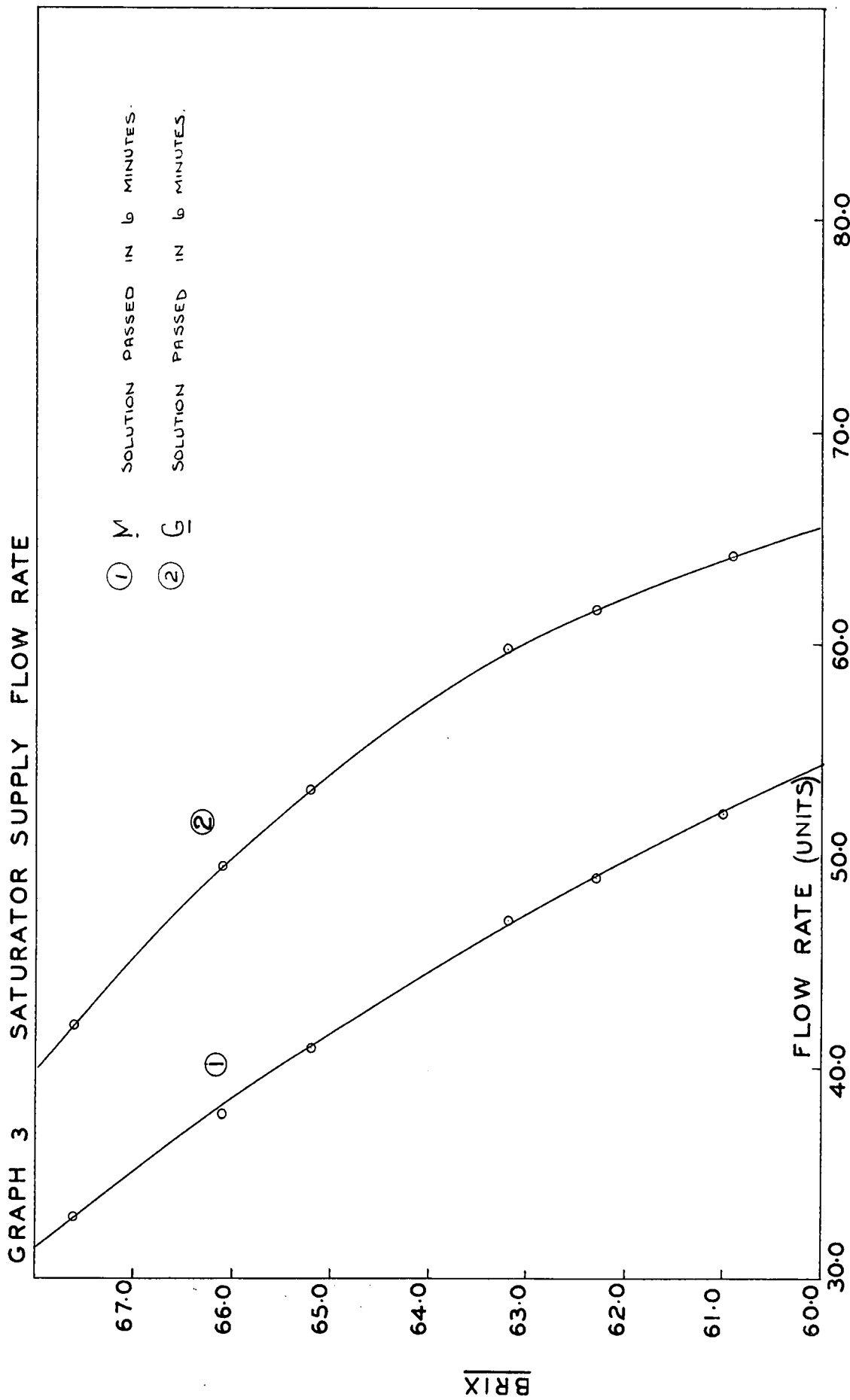
I wish to thank the Directors of Hulett's South African Refinery for their permission to make known the results expressed in this report.

Reference

1. Alexander J. B. and Graham, W. S. (1964). Unpublished reports.

For discussion on this paper, see page 57.





GRAPH 4 COMPARATIVE FILTERABILITIES

