BUREAU OF SUGAR EXPERIMENT STATIONS

QUEENSLAND, AUSTRALIA

Mill Technology Division

EVALUATION OF HIGH OPEN AREA SCREENS

by BSES staff in cooperation with
Bundaberg Sugar Company and
Sugar Research Institute

June 1987
Bundaberg

CONTENTS

BUREAU OF SUGAR EXPERIMENT STATIONS

EVALUATION OF HIGH OPEN AREA SCREENS

1. INTRODUCTION

Following the offer from ANI-Sargeants of several sets of high open area screens for testing, trials were arranged at Fairymead and Millaquin Mills, as it has been the contention that higher open areas would allow higher fugalling rates for the same purging efficiency and purity rise.

At Fairymead, two identical BMA K1100 machines were used, one being fitted with standard Balco screens with 60 micron slots and approximately six per cent open area, the other with Vecoflux screens with 60 micron slots and approximately 15 per cent open area.

At Millaquin two identical BMA K1000 machines were used in two series of trials, one series comparing the 15 per cent open area Vecoflux with the standard six per cent open area Balco, and the other the 15 per cent open area Vecoflux with a higher open area, 10 per cent, Balco.

The trials lasted from mid October until the end of the season in mid to late November. The first set of Vecoflux screens at Fairymead failed by folding and stretching after some ninety hours of operation, as shown in Figures 1 and 2 in the Appendix. This would appear to have been caused by either an abnormal screen, or a fitting misalignment, as the second set of screens ran for some 470 hours without further problems.

2. PROCEDURE

The screens as received, together with new sets of standard K1000 and K1100 Balco screens, were sent to Sugar Research Institute for measurement of slot size, open area, and screen permeation rate.

After being returned from Mackay, Vecoflux 15 per cent and Balco six per cent screens were installed at Fairymead, and Vecoflux 15 per cent and Balco 10 per cent installed at Millaquin. Testing commenced at Millaquin on October the 13th, and at Fairymead on the 14th. On November 6th the screens at Millaquin were changed. New sets of Vecoflux 15 per cent and Balco six per cent screens were installed.

Testing ended at Fairymead on November 15th, and at Millaquin on November 21st. The screens were then returned to Sugar Research so that the measurements could be redone, to evaluate wear during the tests.

Two different testing regimes were used :

At Fairymead, the fugals were operated at the maximum rate at which target sugar purity could be maintained. At Millaquin, motor loads and water rates were maintained constant, and the influence of screen open area on sugar and molasses purity was studied.

At Fairymead, it was possible to install a molasses measuring device in the molasses outlet from each centrifugal. This consisted of a sample cup which could be lowered into the molasses outlet pipe, as shown in Figure 3 in the Appendix, and the time to fill the sample cup recorded. Samples were taken of C sugar and molasses and analysed on a shift basis. C Massecuite analyses were obtained from the analysis of the strike being fugalled at that time. Motor amps, water flows and sample cup filling times were also recorded on a shift basis.

At Millaquin, it was not possible, because of the physical configuration of the molasses outlets, to use molasses sample cups. Furthermore, each centrifugal had an upper and a lower molasses outlet, giving four molasses samples per trial. A sample of the mixture from both outlets could not be obtained. Initially in each series of trials samples were taken and analysed on a shift basis, but once the trial settled down samples of C sugar and molasses were composited for 24 hours. Massecuite samples were obtained for the relevant strikes. Motor loads and ring and probe water flows were kept as constant as possible and equal for both machines.

3. RESULTS AND DISCUSSION

The results of the tests are seen in Tables I to IV in the Appendix, where results of individual trials, average values, and statistical analyses are tabulated. The results of screen measurements are shown in Tables V to VIII in the Appendix.

3.1 Fairymead

For the Fairymead trials, the first Veco screen was removed, after severe stretching in one section was detected, after trial No. 12. The results up to this trial are therefore suspect as the stretched screen could have caused higher losses of crystal to molasses than would normally be expected. A comparison of the results of trials 1 to 12 with those of trials 13 to 32 showed some significant differences, and conclusions have therefore been based on the results of trials 13 to 32.

A statistical analysis of these results, using paired 't' tests, showed that in fact the difference in sugar purity between the two machines was not statistically significant, and the aim of achieving equal sugar quality from both machines was attained.

A study of the other results from the trials showed there to be no statistically significant differences in motor load, water flow, molasses flow, molasses brix or molasses purity. The only significant difference was a difference in sugar brix of 0.6 units between the machines, a small difference in practical terms, the machine fitted with the Balco screen giving the higher figure.

Therefore, for all practical purposes, there was no difference between the performance of the two machines.

3.2 Millaquin

At Millaquin, the first series of trials compared the Veco 15 per cent open area screen with a 10 per cent open area Balco screen.

A statistical analysis of the results showed a slight advantage for the machine fitted with the Veco screen. The sugar purity was higher by 0.7 units, the brix of molasses from the top half of the fugal was 0.9 units higher and its purity 0.5 units lower. There was no statistically significant difference between the results for the molasses from the lower half of the fugal.

In practice this would mean a purity difference in mixed molasses of some 0.2 units, about 0.04 units of recovery. This would be 40 tonnes of 94 n.t. for a 100 000 tonne per season factory, - worth about $10 000 p.a., a return which has to be offset by the added cost of screens. The Veco screens are said to be approximately twice the cost of conventional screens. These costs would need to be considered. The result is also somewhat compromised by the brix difference, which, if caused by water ingress into the massecuite in the machine fitted with the Balco, could explain some or all of the purity difference.

The second series of trials compared the Veco 15 per cent open area screen with a six per cent open area Balco. The results and averages are shown in Table III.

In this series of tests there is evidence of unexplained water ingress into the machine fitted with the Balco screen. In spite of the rotameter readings for both ring and probe water being equal, there is a difference of 0.7 units of brix in favour of the Veco in the molasses from the top of the basket and a large difference, in the same direction, of 6.7 units of brix in the molasses from the bottom of the basket. There are no significant differences between sugar purities from the two machines or the purities of molasses from the top of the basket. There is a significant difference of 0.5 units in purity of molasses from the bottom of the basket, the machine fitted with Veco screens being the lower. This would give an improvement in recovery of the same order as that in the previous trial, but this factor must be discounted, as it would have been influenced by the brix consideration mentioned earlier.

3.3 Screen measurements

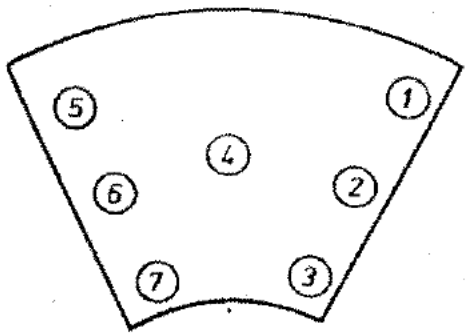
Tests conducted on the screens before and after the evaluation trials included :

(a) water flow resistance, and
(b) slot width measurements.

Both procedures are detailed by Wright et al (1985). To ensure proper reassessment of the same locations on each screen after use, a template was used to identify seven test sites on each screen at which to measure the

screen characteristics. The distribution of the sites is shown in the sketch below.

Screens measured after the trials were first soaked in hot EDTA solution and washed with a high pressure water spray.



3.3.1 Water flow resistance

The water flow resistance measurements were conducted at each test site on each of the new screens. These results are summarised in Table V in the Appendix. As expected, the resistance to flow of liquid through the gauze is lower for the higher open area screens. All screens showed similar variation in resistance values about the mean for each set.

After the fugalling trials two screens in each set were selected for reassessment. The screens which were selected were those that had resistance values at positions 1 and 3 which were close to the average resistance of the set. The average value of the resistances measured at the seven locations on the selected screens are presented in Table VI in the Appendix for both before and after use in the fugal trials. The results indicate that the flow resistance levels remained relatively unchanged over the operational period except for the Vecoflux screens used in the K1100 machines. Here microscopic examination of the screens revealed some slot bridging which was not removed by the cleaning process was present and this is the likely cause of the increased resistance.

3.3.2 Slot width measurements

The slots were sized on the Nikon Projection Microscope at the two test sites 1 and 3 on the two selected 'average' screens and also at the positions of highest and lowest water flow resistance for each set. The same test site numbering scheme applied. Screen and slot dimension details are given in Tables VII and VIII in the Appendix. Unfortunately, there is some doubt on the validity of the slot width measurements for the Vecoflux screens taken before the trials and these results have not been presented.

In general, the width of the slots for all screen types was close to the nominally specified width of 60 microns. For the higher open area screens, the slots were slightly narrower than specification and consequently the open area measurement was below specification. Overall, the average variation of measurements along the slots was small indicating the slots were quite uniform. The slots on the Vecoflux screens in particular showed smooth edges and were not flared towards the ends.

3.3.3 Photographs

Photographs of the two test sites 1 and 3 on the two selected 'average' screens were taken but these lack sufficient detail to allow for any quantative assessment. An example of each type of screen supply is given in Figures 4, 5 and 6 in the Appendix.

3.3.4 Discussion on screen wear

Apart from localised damage to some screens caused presumably by foreign body impacts, the screens were still in good condition after completion of the performance trials. From a visual assessment, the Balco K1000 10 per cent open area screens deteriorated to the greatest extent due to distortion into the profile of the backing gauze. This would not be unexpected, as the results in Table VII show it to be the thinnest of the three screen types. The Vecoflux screens displayed only minimum distortion.

Generally the results of the water flow resistance and slot measurement tests indicated no significant wear of the screen slots. Also, from the limited service period each set of screens was subjected to, no one type of screen appeared to be more susceptible to deterioration than another.

4. CONCLUSIONS

Taking into account results from the three series of tests, the authors conclude that there is no difference in performance or capacity of any magnitude evident between the different open areas of six per cent, 10 per cent and 15 per cent, and the added expense of using a higher open area screen would not seem warranted.

These results reinforce observations from a short series of trials done by Sugar Research in a previous season, and must pose the question :

If six per cent open area is as effective as 15 per cent, can we use a more robust screen with less than six per cent open area? Between the value of six and 15 per cent, screen open area does not appear to be the controlling factor in low grade centrifugal performance.

5. ACKNOWLEDGEMENTS

Although this work was done under the auspices of BSES, staff of Sugar Research and staff members of Bundaberg Sugar Company were also involved. As well as the joint authors, other staff of both Fairymead and Millaquin Mills were active on the project and their assistance is gratefully acknowledged.

Thanks are also due to ANI-Sargeants for provision of screens, and of molasses measuring facilities at Fairymead.

6. REFERENCE

WRIGHT, P.G. et al (1985) Automated Screen Slot Measurement. Proc. Aust. Soc. Sugar Cane Technol., 169-177.

P.G. Atherton, BSES
R.J. Steindl, Sugar Research Institute
G.F. Longden, Fairymead
R.A. Jones, Millaquin

APPENDIX

TABLE I

Fairymead trials

Veco 15% open area versus Balco 6% open area*

Test No.	Massecuite		Balco Screen			Veco Screen			Balco Screen				Veco Screen			
									Molasses		Sugar		Molasses		Sugar	
	Brix	Purity	Load amps#	Water flow L/min	Time sec	Load amps	Water flow L/min	Time sec	Brix	Purity	Brix	Purity	Brix	Purity	Brix	Purity
1	99.50	63.23	94	5.9	3.6	100	2.6	3.2	91.46	46.30	98.08	77.75	93.46	47.90	99.08	79.41
2	99.06	65.02	95	6.6	4.9	100	4.8	2.5	90.88	44.74	97.34	77.34	92.28	45.53	97.74	81.69
3	99.58	66.19	96	6.0	3.0	95	3.8	3.2	90.76	49.21	97.58	81.23	91.76	49.03	98.38	83.07
4	99.28	66.89	98	5.3	3.5	105	3.1	3.2	91.08	45.75	97.10	78.93	92.28	46.25	97.50	80.06
5	99.84	62.31	87	4.8	3.7	78	1.8	4.9	91.00	46.56	97.62	82.05	93.00	46.13	97.82	83.30
6	99.94	63.75	90	5.5	4.6	85	2.0	5.9	90.50	47.97	97.48	80.00	94.86	48.45	97.68	86.49
7	99.90	63.87	100	7.2	3.4	110	9.1	2.9	88.46	43.75	97.08	77.26	89.46	43.73	97.48	79.26
8	99.94	63.25	97	7.4	2.9	101	6.6	2.7	89.54	43.73	97.38	81.45	90.36	44.65	97.98	82.12
9	100.14	61.32	100	6.2	3.1	110	6.6	2.4	90.76	46.98	97.56	79.48	91.96	46.89	97.72	79.51
10	100.74	63.34	92	7.2	3.5	110	9.2	3.0	88.28	44.11	97.54	76.95	88.74	45.29	97.54	77.59
11	101.08	62.83	83	7.1	3.9	89	7.5	3.7	89.26	46.85	98.24	79.23	90.26	46.90	98.28	79.98
12	100.70	63.37	90	6.8	4.0	110	8.8	3.9	90.10	45.34	98.16	83.92	90.90	45.98	97.72	77.20
13	100.02	63.20	100	7.9	2.6	100	6.1	2.7	89.26	42.84	97.68	80.16	90.46	42.80	97.28	79.07
14	100.26	62.15	100	7.0	4.4	100	7.0	4.8	89.42	45.93	97.78	76.30	90.56	46.14	97.38	77.86
15	99.26	64.08	100	9.0	3.0	108	9.7	2.4	88.10	43.03	97.52	84.23	89.50	42.94	98.12	85.16
16	99.90	61.67	80	6.8	6.3	80	6.0	5.3	88.02	45.41	97.64	79.21	90.16	45.94	97.78	80.43
17	99.78	61.55	95	9.0	3.1	110	8.6	2.9	87.06	43.10	96.68	76.54	88.86	43.75	96.72	76.41
18	99.98	62.22	90	9.0	3.2	80	7.0	5.0	86.70	43.67	97.68	79.28	87.30	44.63	97.72	79.82
19	98.82	63.36	100	5.9	2.9	105	7.7	2.4	89.10	45.53	97.72	83.85	89.10	44.99	95.52	79.12
20	100.24	62.76	100	5.0	2.7	105	7.0	2.6	91.82	46.55	97.64	80.56	90.42	46.79	96.44	78.31
21	100.28	62.43	90	6.7	3.5	90	3.7	5.7	88.56	45.51	97.98	84.75	88.96	46.70	95.84	75.42
22	98.90	63.41	100	3.7	3.2	105	10.0	2.5	91.26	43.59	96.92	78.68	85.90	43.71	96.12	80.11
23	99.44	63.06	100	6.0	3.1	90	7.3	3.9	88.62	39.82	97.24	80.79	87.22	40.13	97.44	82.94
24	99.52	62.71	95	6.0	3.6	100	5.8	2.9	87.36	41.07	95.60	76.40	87.40	41.53	96.20	78.21
25	98.36	64.98	100	6.7	3.3	90	10.0	3.0	88.50	45.91	96.90	77.11	84.28	45.29	97.90	84.62
26	97.52	65.54	95	5.8	2.6	100	8.0	2.8	87.30	49.10	97.16	88.66	87.36	47.89	96.16	85.27
27	96.68	67.04	105	12.0	2.0	100	6.5	3.2	84.08	47.74	97.72	88.91	86.10	48.55	96.92	86.59
28	98.72	63.42	85	3.8	3.9	100	6.4	3.4	90.66	46.91	97.48	81.00	88.46	46.80	96.68	80.97
29	98.32	64.80	100	12.0	2.7	100	9.2	3.1	83.76	43.65	98.38	87.42	85.96	43.92	96.58	82.32
30	99.18	61.51	90	4.9	3.5	90	9.0	3.3	89.66	42.86	97.28	78.17	87.06	42.68	96.88	84.14
31	98.68	61.52	95	9.5	4.7	95	8.5	4.0	86.66	44.73	98.88	85.30	88.46	44.84	97.52	80.64
32	98.98	62.85	100	4.8	3.0	100	7.6	2.9	90.16	42.38	97.24	81.10	88.56	43.81	96.04	81.13
Averages																
1-32	99.45	63.43	95.1	6.80	3.48	98.2	6.78	3.45	89.00	45.02	97.51	80.75	89.42	45.33	97.25	80.88
1-12	99.97	63.78	93.5	6.33	3.68	99.4	5.49	3.46	90.17	45.94	97.60	79.63	91.61	46.39	97.91	80.81
13-32	99.14	63.22	96.0	7.08	3.37	97.4	7.56	3.44	88.30	44.47	97.46	81.42	88.10	44.69	96.86	80.93

* Screen operating hours Vecoflux, first set 92.5, second set 474 and Balco 548.
\# Maximum allowable load 125 amps.

TABLE II

Millaquin trials

Veco 15% open area versus Balco 10% open area*

Motor amps = 35
Ring water rotameter setting = 2.0 L/min
Probe water rotameter setting = 2.0 L/min for each machine

Test No.	Molasses								Sugar		Massecuite
	Balco top		Veco top		Balco bot.		Veco bot.		Balco	Veco	
	Brix	Purity	Brix	Purity	Brix	Purity	Brix	Purity	Purity	Purity	Purity
1	83.7	48.5	85.3	48.5	73.8	52.6	79.6	49.2	-	-	68.0
2	79.8	49.6	85.6	47.6	74.2	50.0	83.2	48.1	-	-	67.1
3	87.6	52.7	88.4	51.5	86.4	52.7	88.0	52.2	84.8	87.5	67.9
4	88.2	51.9	87.8	51.1	86.6	51.9	87.5	51.5	-	-	67.8
5	86.5	50.9	87.5	49.5	86.1	49.8	86.9	50.3	86.8	87.3	68.0
6	87.6	50.7	88.8	49.6	83.8	50.4	84.6	50.8	87.7	88.2	70.0
7	87.8	47.3	89.9	47.0	85.3	47.2	88.9	47.5	86.9	88.2	69.6
8	87.6	47.4	88.6	46.4	84.6	46.8	88.2	47.1	87.1	88.3	67.9
9	89.4	46.8	90.0	46.4	87.8	46.8	90.4	47.1	84.4	87.0	68.7
10	88.3	45.8	88.3	45.3	85.7	45.9	83.8	46.9	85.7	87.6	67.4
11	88.2	45.8	88.8	45.8	88.2	45.8	79.6	46.6	86.3	87.1	66.7
12	89.0	47.0	90.4	47.1	88.4	47.7	84.8	48.5	82.9	86.5	68.9
13	87.6	46.9	89.2	46.1	86.0	47.0	83.0	46.9	85.9	88.6	68.4
14	89.6	45.9	89.9	46.1	83.6	45.7	83.1	46.4	87.2	86.4	67.5
15	87.1	46.4	87.5	44.9	84.2	46.2	86.1	45.2	88.3	87.0	67.1
16	87.0	45.5	88.4	45.2	83.2	45.9	82.8	46.1	86.0	86.7	66.8
17	89.0	47.0	89.2	47.3	87.7	47.7	87.0	47.6	88.6	87.9	68.7
18	89.5	46.7	89.2	46.5	85.9	47.0	86.0	47.3	88.1	86.9	68.7
19	88.7	45.5	89.7	45.8	86.1	45.6	85.5	46.0	82.7	83.2	68.0
20	88.2	45.4	89.2	45.3	83.6	45.7	84.0	45.4	84.6	85.1	66.9
21	90.7	44.5	90.7	44.1	84.4	44.3	87.1	44.7	84.1	83.9	65.5
22	87.4	43.7	87.0	43.0	78.0	44.2	82.4	43.7	84.8	83.9	67.0
23	89.5	44.7	88.3	44.5	80.2	44.9	82.4	45.0	83.8	83.7	65.8
Average	87.7	47.2	88.6	46.7	84.1	47.5	85.0	47.4	85.8	86.6	67.8

* Screen operating hours, 334 both machines

TABLE III

Millaquin trials

Veco 15% open area versus Balco 6% open area*

Motor amps = 35
Ring water rotameter setting = 2.0 L/min
Probe water rotameter setting = 2.0 L/min for each machine

Test No.	Molasses								Sugar		Massecuite
	Balco top		Veco top		Balco bot.		Veco bot.		Balco	Veco	
	Brix	Purity	Brix	Purity	Brix	Purity	Brix	Purity	Purity	Purity	Purity
1	89.0	44.9	90.2	44.8	84.0	45.0	85.6	45.0	85.5	86.5	66.2
2	89.9	46.2	90.3	46.7	83.1	48.1	89.7	46.3	86.3	88.0	65.9
3	89.1	44.4	90.8	44.5	75.2	45.3	83.6	45.2	85.8	83.6	66.7
4	90.4	44.7	91.4	44.5	79.8	45.5	86.8	45.3	82.2	81.8	66.7
5	90.4	43.0	90.3	43.1	76.2	44.4	89.4	43.1	83.2	82.5	65.6
6	90.6	43.7	90.8	44.5	78.0	45.1	87.6	45.2	82.3	83.0	66.9
7	88.8	42.6	87.6	41.9	80.0	42.6	83.6	42.6	81.7	81.8	64.6
8	88.8	45.0	89.8	44.1	77.8	46.3	82.4	45.4	84.2	83.6	66.0
9	91.1	44.5	90.9	44.4	79.3	44.9	90.7	44.5	82.7	83.9	66.2
10	89.2	43.2	91.0	43.2	80.6	43.7	86.4	43.8	83.1	83.5	65.6
11	85.2	44.8	86.6	45.7	77.8	46.7	82.6	44.4	85.4	84.8	66.3
12	86.8	44.8	87.8	45.1	86.0	45.2	85.2	45.7	85.7	84.9	66.2
13	88.8	43.8	89.6	44.6	79.0	45.6	88.6	45.1	84.6	85.9	66.8
14	88.8	43.4	89.4	42.7	77.2	44.2	85.2	43.5	82.9	84.9	65.5
Average	89.1	44.2	89.8	44.3	79.6	45.2	86.2	44.7	84.0	84.2	66.1

* Screen operating hours, 254 both machines

TABLE IV

Statistical analysis of results
Paired 't' tests

Fairymead trials 13-32

Variable 1	Variable 2	Mean Difference 1-2	Standard error	Degrees freedom	t	Significance
Motor Load Balco	Motor Load Veco	-1.4	1.56	19	0.90	N.S.
Water Flow Balco	Water Flow Veco	-0.48	0.62	19	0.77	N.S.
Molasses Pot filling time Balco	Molasses Pot filling time Veco	-0.075	0.192	19	0.39	N.S.
Molasses brix Balco	Molasses brix Veco	0.20	0.48	19	0.41	N.S.
Molasses purity Balco	Molasses purity Veco	-0.22	0.14	19	1.61	N.S.
Sugar brix Balco	Sugar brix Veco	0.59	0.20	19	2.94	< 1%
Sugar purity Balco	Sugar purity Veco	0.49	0.86	19	0.57	N.S.

Millaquin trials, Veco 15% versus Balco 10%

Molasses brix Balco Top	Molasses brix Veco Top	-0.86	0.28	22	3.08	< 1%
Molasses purity Balco Top	Molasses purity Veco Top	0.52	0.13	22	4.04	< 1%
Molasses brix Balco Bottom	Molasses brix Veco Bottom	-0.95	0.73	22	1.31	N.S.
Molasses purity Balco Bottom	Molasses purity Veco Bottom	0.07	0.20	22	0.37	N.S.
Sugar purity Balco	Sugar purity Veco	-0.72	0.32	19	2.26	< 5%

Table IV (Continued)

Millaquin trials, Veco 15% versus Balco 6%

Molasses brix Balco Top	Molasses brix Veco Top	-0.69	0.22	14	3.15	< 1%
Molasses purity Balco Top	Molasses purity Veco Top	-0.06	0.15	14	0.37	N.S.
Molasses brix Balco Bottom	Molasses brix Veco Bottom	-6.67	1.01	14	6.59	<0.1%
Molasses purity Balco Bottom	Molasses purity Veco Bottom	0.54	0.21	14	2.52	< 5%
Sugar purity Balco	Sugar purity Veco	-0.22	0.31	14	0.71	N.S.

TABLE V

Summary of water flow resistance measurements for the new screens

Screen type	Average resistance* $kg.m^{-2}s^{-1} \times 10^{-3}$	Coefficient of variation	Range $kg.m^{-2}s^{-1} \times 10^{-3}$
Vecoflux K1000	8.5	0.21	4.9 - 13.4
Vecoflux K1100	9.6	0.24	5.8 - 17.0
Balco K1000	18.2	0.18	11.6 - 29.9
Balco K1000 (Millaquin)	38.0	0.27	24.5 - 61.1
Balco K1100 (Fairymead)	38.7	0.13	25.0 - 50.4

* Resistance = $A \Delta P/Q$

Where A = area of the screen under flow test, m^2
ΔP = applied pressure difference across the screen, Pa
Q = volumetric flowrate of liquid, $m^3.s^{-1}$

TABLE VI

Water flow resistance results

Screen type	Screen No.	Mean flow resistance $kg.m^{-2}s^{-1} \times 10^{-3}$		Change $kg.m^{-2}s^{-1} \times 10^{-3}$
		Before	After	
Vecoflux K1000	1	8.5	7.6	-0.9
	4	8.5	7.6	-0.9
	5	8.0	9.4	1.4
	7	8.5	8.9	0.4
Vecoflux K1100	12	11.6	13.4	1.8
	14	9.8	11.6	1.8
	15	10.7	18.7	8.0
	18	10.3	17.4	7.1
Balco K1000	23	17.0	15.2	-1.8
	24	14.7	13.8	-0.9
Balco K1000	32	29.0	29.5	0.5
(Millaquin)	34	37.9	35.3	-2.6
Balco K1100	42	39.7	33.9	-5.8
(Fairymead)	44	35.3	32.6	-2.7

TABLE VII

Screen and slot characteristics

Screen type	Nominal open area %	Mean measured open area %	Average slot length mm	Mean coefficient of variation for individual slots		Screen thickness mm	Remarks (slots)
				before	after		
Vecoflux K1000	15	13.4	2.18		4.7	0.29	smooth, straight edges rounded ends
Vecoflux K1100	15	12.8	2.17		4.7	0.28	as above
Balco K1000	10	8.9	2.84	6.4	7.2	0.24	ragged edges flared ends
Balco K1000 (Millaquin)	6	6.7	2.33	6.4	7.7	0.33	as above
Balco K1100 (Fairymead)	6	6.6	2.34	6.3	7.7	0.33	as above

TABLE VIII

Slot width measurements before and after performance trials

Screen type	Screen No.	Test site	Slot width µm		Change µm
			Before	After	
Vecoflux K1000	1	1		51.3	
		3		56.2	
	2	2*		65.7	
	3	5*		46.4	
	4	1		55.0	
		3		55.5	
Vecoflux K1100	10	3*		61.7	
	12	1		53.2	
		3		55.9	
		6*		39.4	
	14	1		50.0	
		3		56.5	
Balco K1000	21	5*	77.4	79.3	1.9
	22	3*	46.5	44.2	-2.3
	23	1	58.1	57.0	-1.1
		3	55.9	53.0	-2.9
	24	1	61.9	63.2	1.3
		3	61.2	58.4	-2.8
Balco K1000 (Millaquin)	32	1	59.1	60.5	1.4
		3	63.1	61.7	-1.4
		6*	66.3	68.2	1.9
	33	1*	47.8	46.5	-1.3
	34	1	52.9	56.2	3.3
		3	53.7	52.0	-1.7
Balco K1100 (Fairymead)	41	2*	52.5	56.7	4.2
	42	1	54.2	55.3	1.1
		3	49.9	52.9	3.0
	44	1	54.2	54.8	0.6
		3	58.4	59.8	1.4
	45	5*	71.3	75.8	4.5

* Test sites of extreme water flow resistance.

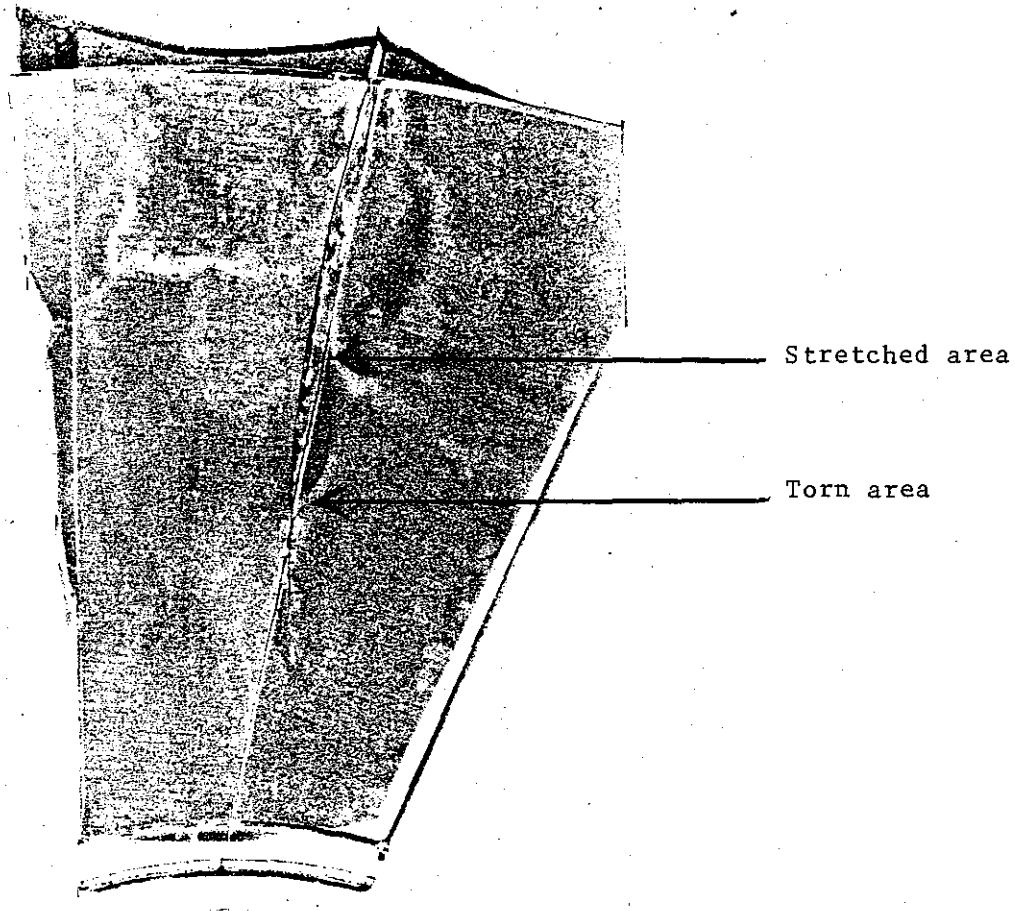


FIGURE 1 General view of screen with stretched and torn section

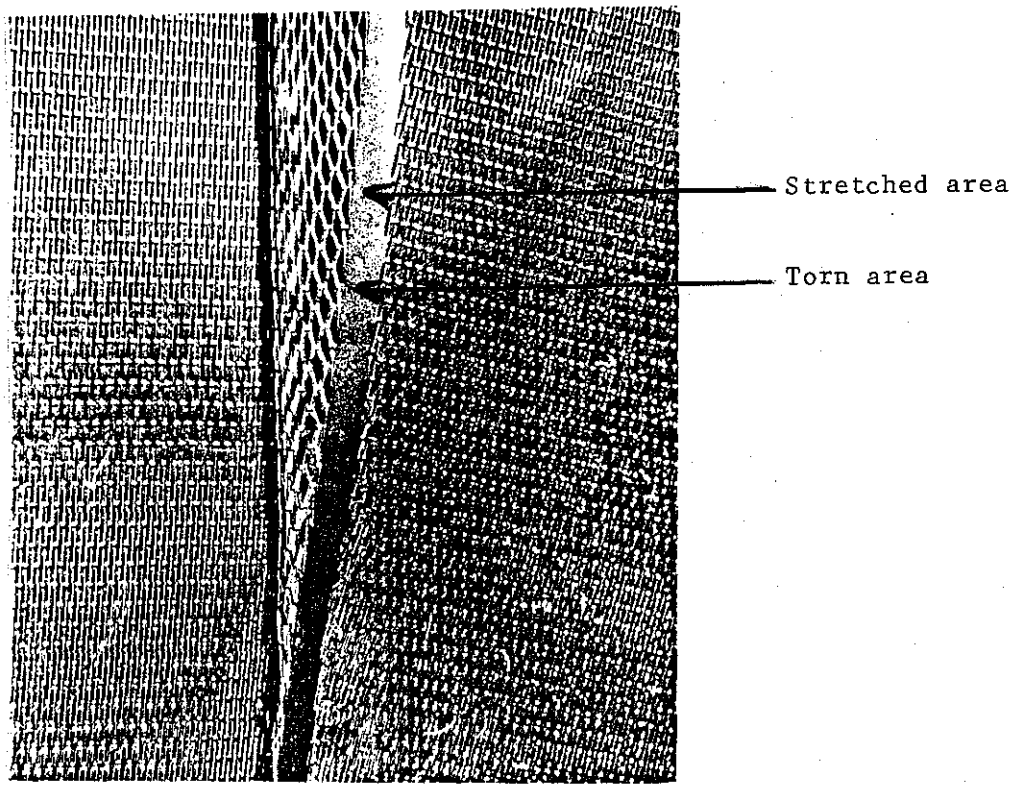
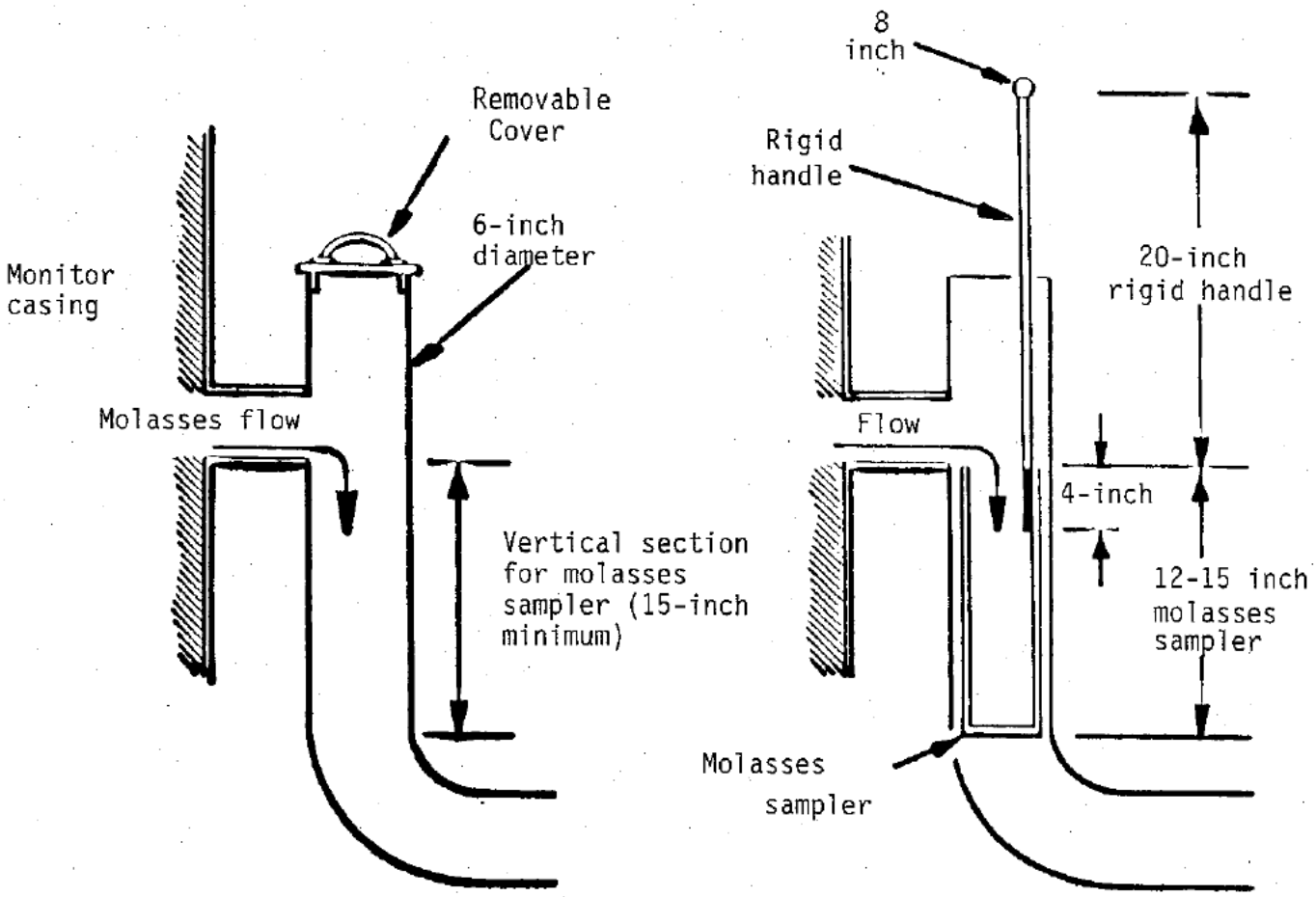


FIGURE 2 Close up of stretched and torn screen section



Normal Operation :

Removable cover in place on top of tee.

During test only :

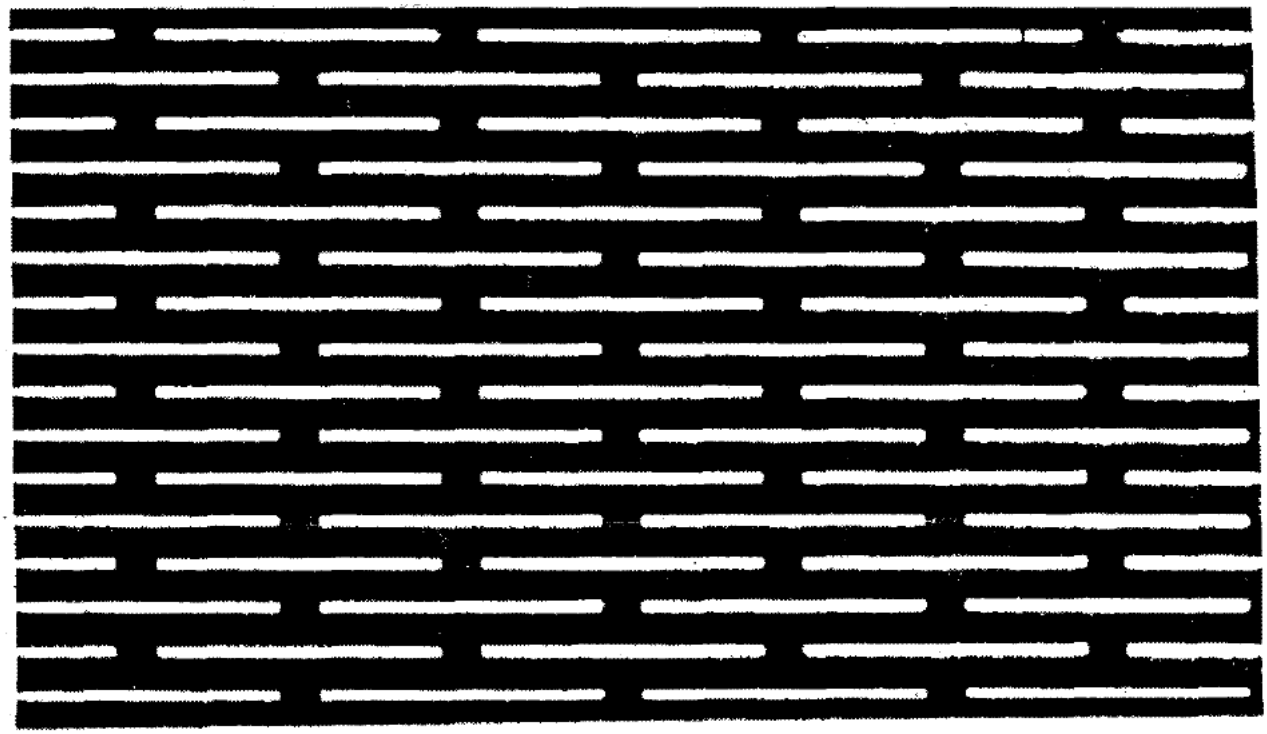
Removable cover removed, and molasses sampler inserted for timed molasses rate test.

NOTE : (i) 5½ inch diameter pipe sampler fits into a 6 inch diameter molasses outlet tee.

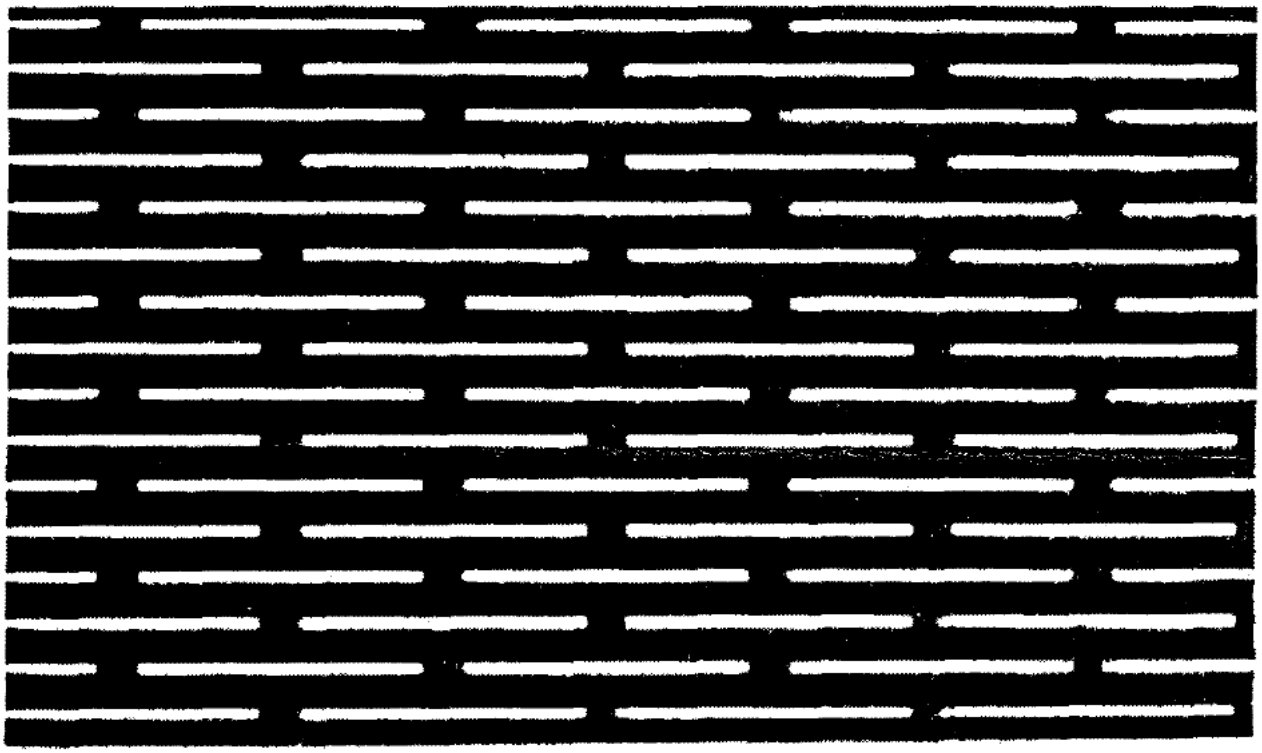
(ii) 0.5 inch diameter rod welded about 4 inches into the inside of the 5½ inch diameter sampler provides a rigid handle for the molasses sampler. The handle projects about 20 inches and a 8 inch cross handle is attached.

(iii) Cup volume 4 570 cm^3

FIGURE 3 - Arrangement of molasses sampler



a. K1000



b. K1100

FIGURE 4 - Photographs showing Slot Details of the Vecoflux Screens
(Magnification : approximately x30)

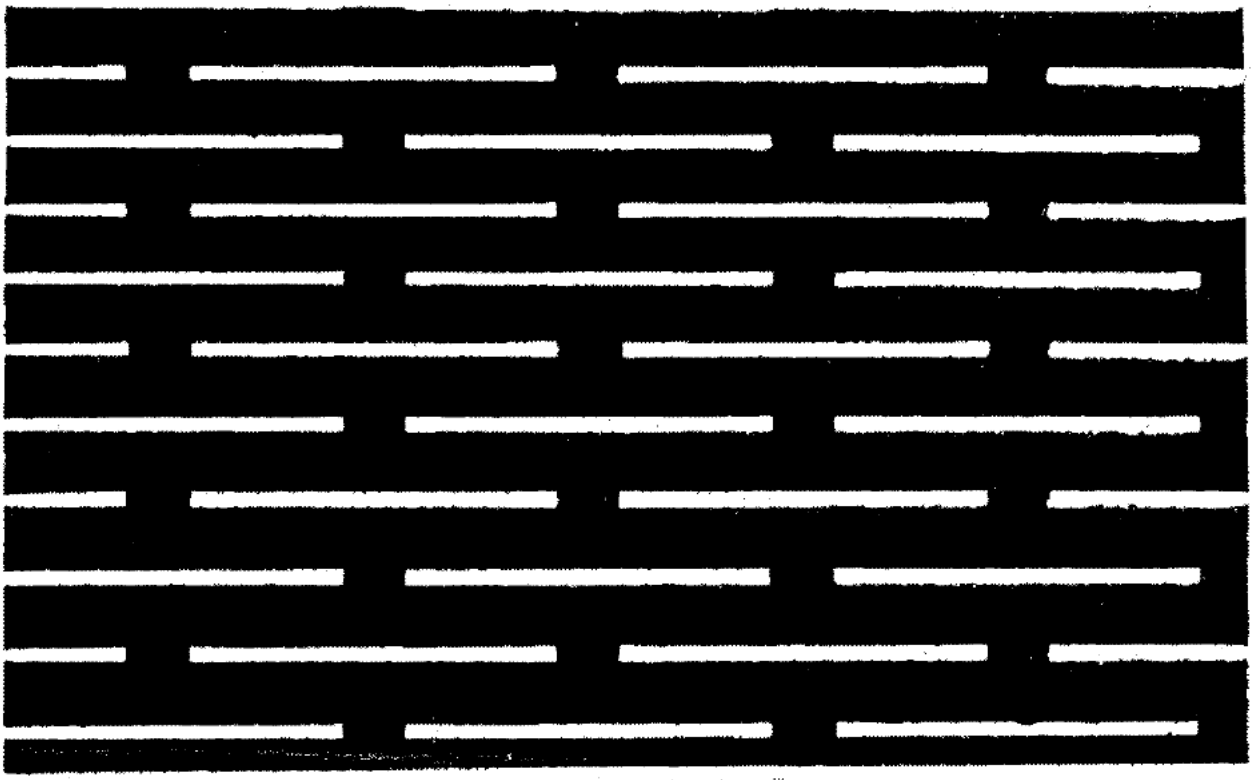
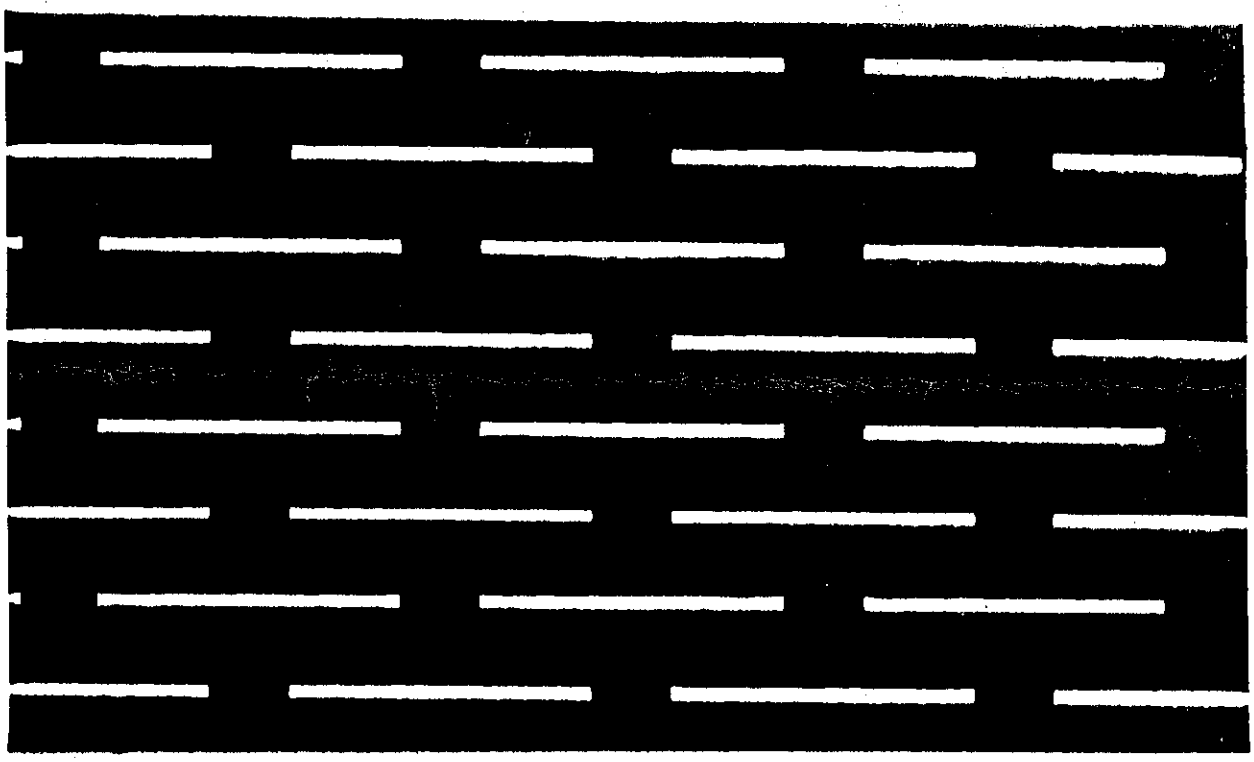
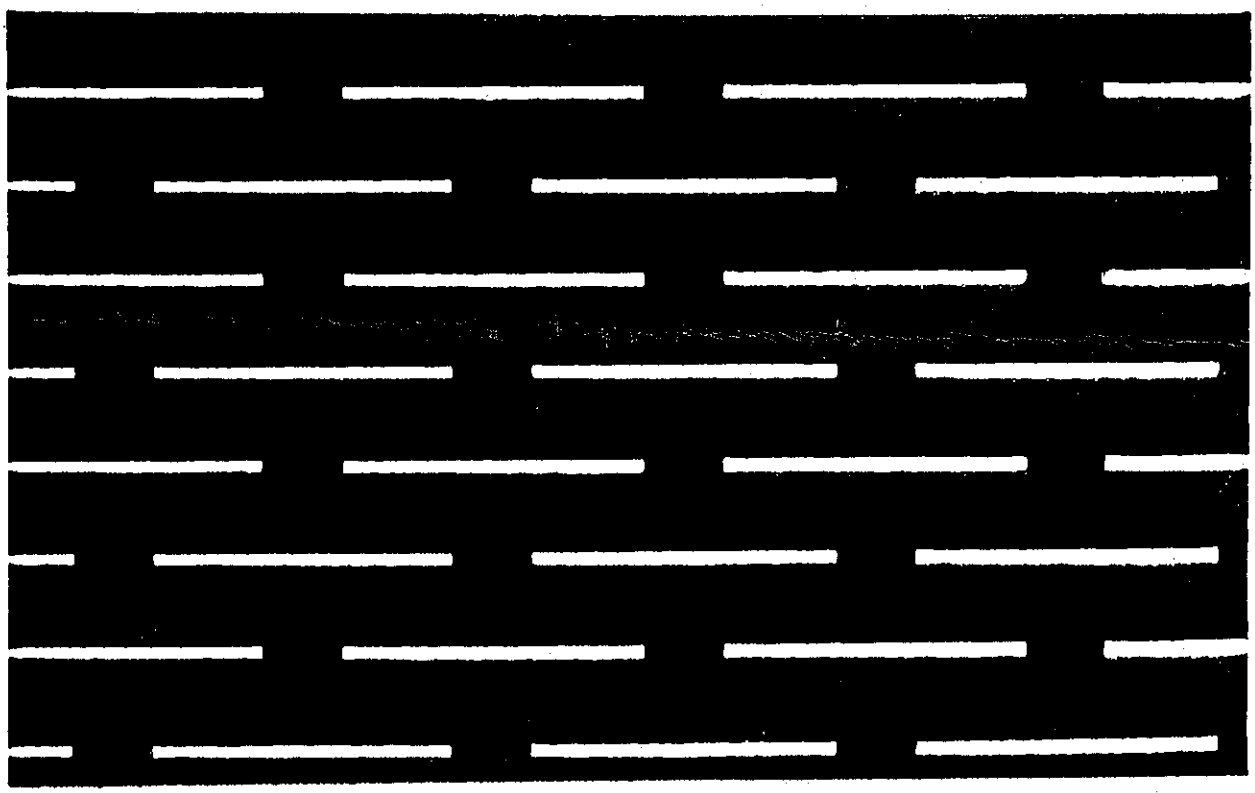


FIGURE 5 - Photograph showing Slot Details of the Balco 10% Open area K1000 screens

(Magnification : approximately x30)



a. K1000



b. K1100

FIGURE 6 - Photographs showing Slot Details of the Balco 6% Open Area Screens
(Magnification : approximately x30)