FUEL RESEARCH INSTITUTE OF SOUTH AFRICA.

TECHNICAL MEMORANDUM NO. 14 OF 1963.

ESTIMATION OF RESIDENCE TIME DISTRIBUTION WITHIN THE DREWBOY WASHER.

BY:

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ESTIMATION OF RESIDENCE TIME DISTRIBUTION.

OBJECT OF EXPERIMENT.

The object of the experiment was to ascertain the order of the residence time distribution within the Drewboy washer.

EXPERIMENTAL PROCEDURE:

The dense medium circuit of the Drewboy washer was brought into operation and the dense medium circulated through the system to establish equilibrium conditions, The specific gravity of the medium was adjusted to a value of 1.50. The feed rate of medium at the top of the bath is of the order of 200 gal./min. and an underflow of approximately 80 gal./min.

Wooden blocks of dimensions 3"x3"xl" were employed to estimate the order of the residence time distribution on the surface of the bath.

When equilibrium conditions were established, the experiment proper was started. The wooden blocks were introduced into the bath one at a time, via the entrance feed launder. The time spent by each wooden block in the system was then determined by use of a stop watch.

This process was repeated several times, ensuring that the blocks entered the bed at the same point.

RESULTS:

The results given below are merely an indication as to the variation in residence times observed.

DISCUSSION ..../

DISCUSSION:

As may be seen from the results, there exist a considerable distribution of surface residence times. These results may or may not be representative of actual times within the bed, but may be assumed to indicate the magnitude of residence time distribution.

No coal was fed to the Drewboy washer during the test and hence these results are not representative of conditions to be expected in practice. How the presence of solid matter will affect the solid free flow pattern, is as yet unknown.

From the results it can be concluded that streamlines exist within the bath which nearly "short-circuits" the bath while other streamlines exist which tend to back-mix considerably.

This effect could also be observed visually on the side of the bath opposite the discard extraction wheel. Back-mixing occurs to such an extent on the surface that residence times tend to the order of minutes.

It must thus be concluded that "stagnant" portions exist within the bed which would probably give rise to density gradients.

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RESULTS:

Trial No	Mean Residence Time in seconds.
1	3.5
2	3.6
3	3.2
4	3.1
5	2.9
6	3.0
7	3.5
8	4.5
9	3.6
10	5.8
11	5.3
12	5.1
13	8.5
14	3.1
15	45.0
16	41.2
17	3.2
18	4.5
19	42.3
20	4.6
21	4.9
22	2.8
23	6.7
24	2.9
25	2.8
26	3.1
27	4.4
28	3.1