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Short Communication

Distribution disc for dumping the packings in columns

A. V. RAO* AND M. S. MURTHY
Department of Chemical Engineering, Indian Institute of Science, Bangalore 560 012, India.

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Abstract

A simple and effective disc has been developed which has been tested for liquid distribution in packed columns. Liquid distribution results obtained with this disc are consistent and reproducible. The advantages in dumping the packings in the column with this distribution disc are indicated.

Keywords : Liquid distribution, distribution disc, packed columns.

The performance and efficiency of packed towers depend on the liquid distribution in the packing across the diameter of the tower and along the height of the Packing This liquid distribution depends to a considerable extent on the orientation of packing pieces which in turn depends on the way the column is dumped with the packing material.

Hoftyzer[1] while studying the liquid distribution observed that the distribution of liquid across the diameter is influenced by the way the packing material is dumped in the column. Stanik and Kolar[2] observed that the mean values of radial spreading of liquid differ for each repacking of the column and this difference is more for Raschig rings. This may be due to the fact that the ability of Raschig rings to transfer liquid radially depends on the orientation of the individual rings in the bed. Also, the values of volume fraction of voids may vary appreciably with the method of packing the tower even for the same packing.

* Present address : Gammon Nirman Limited, 19, Ballygunge Road, Calcutta 700 019.

A close and careful observation of dumping large quantities of packing pieces (Raschig rings) of various sizes ranging from 0·3 to 1·25 cm in different glass columns (for visual observation) of 2·5, 5·00 and 10·0 cm diameter containing water, revealed that the packings settle uniformly across the diameter. When the packing pieces of smaller size (especially) are dumped slowly one after another in a bigger size column full of water, it is clearly observed that the packing pieces tend to settle along the periphery of the column and an inverted cone type upper surface is formed. This may be due to free settling (less density of the packing numbers in the column of water at a time). In this method of packing wet (dropping the packing pieces in column with water), the recommended height is 120 cm of water over the packing support layer[3].

In industrial columns, it is difficult to provide a space of 120 cm of water over the top layers ; and dumping slowly one after another will take a long time and is not practicable. Further, in fundamental and research work, it is very essential to obtain consistent and reproducible results in repacking. It is observed that if the liquid height over the packing support layer is less than 5D (D is the diameter of the column) the settling is not uniform and for heights greater than 5D, the settling is on to the periphery of the column. In other words, the packings will have orientation (an inclination) towards the centre of the column. Centre-oriented packing directs the liquid from the column wall towards the centre. Hence a better distribution of liquid across the diameter of the column and in turn height is obtained.

In this investigation, a simple and effective device has been fabricated and tested in our laboratory. This has been named as 'distribution disc'. This device (Fig. 1) consists of a disc (s) of 6 mm thick M.S. plate coated with epoxy paint to protect it from corrosion, four lugs (L) located diametrically opposite to keep the disc in position centrally and a rod (R) (10 to 12 mm round) fixed at the centre of the disc of suitable height. Lugs are projections to keep the disc at equal distance in all directions from the wall of the column. A small gap has been provided between the column wall and lugs so that the disc can move freely up and down in the column.

Fxperiments were carried out with different sizes of discs and lug lengths and volume fractions of flow were collected along the radius in a collecting device. This device consists of equally spaced and circular baffles to facilitate collection of liquid fraction across the diameter.

By physical observation in different columns and using various packing sizes, it was found that for laboratory columns the disc size of (D-4d) (where d is the size of the packing) gives satisfactory and reproducible results. Normally only one packing piece (maximum two) can pass through along the periphery. This is true for a column to packing diameter ratio of 8 : 1. For large sized packed columns (> 15 cm diameter) or of higher ratio, the disc size of (D-8d) will also be satisfactory. In this at a time three or four packing pieces can pass through the gap between the column wall and the disc and still satisfy the condition of free settling.

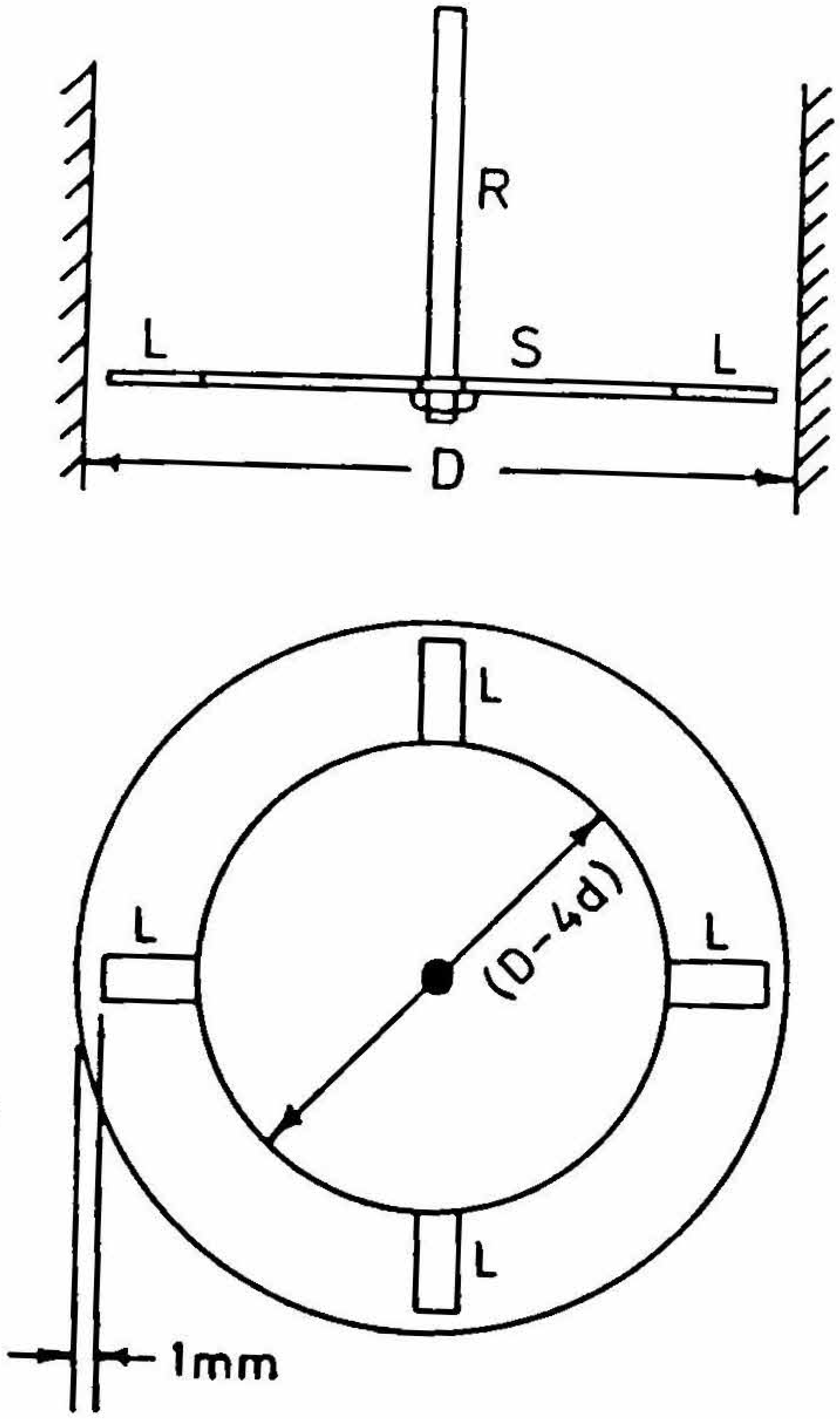

FIG. 1. Distribution disc.

Experimental results as a representative example are presented in fig. 2 based on experiments carried out by dumping Raschig rings of 1·25 cm size of various materials (ceramic, carbon and glass) using water and the distribution disc in position in a 10 cm dia pyrex glass column. The disc (fig. 1), kept at one diameter height from the packing support, slowly raises as the height of the packing increases with the help of the rod. Liquid distribution results are consistent and reproducible as shown in fig. 2. Also, 1·25 cm plastic Raschig rings were dumped in 10 cm pyrex glass column without water but using only the distribution disc ; the same distribution results were reproduced with insignificant variation. For comparison, the results obtained with only packing wet method are given in fig. 2.

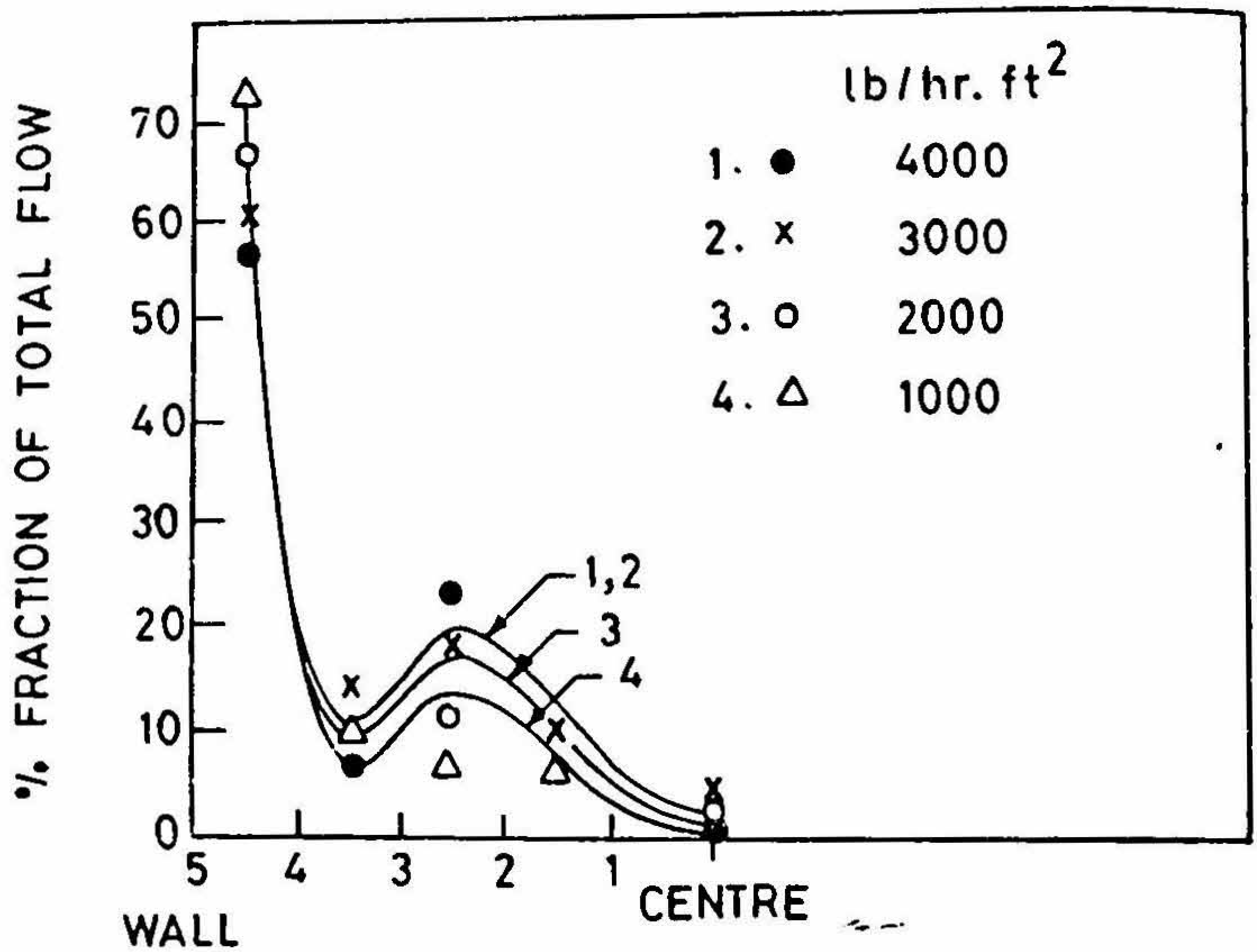

FIG. 2. Liquid distribution. Line reproducible results with the distribution disc points with 'packing wet' procedure.

The advantages in dumping the packings in the towers or columns with the disc are:

1. Liquid distribution results are consistent and reproducible.
2. Liquid height need not be of certain value (*i.e.* 5D) over the packing support or packing.
3. Polyethylene and other lighter packing pieces can also be dumped with orientation towards the center of the column (without water).

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