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THE SURFACE APPLICATION OF FOAM TO PETROL FIRES IN A 7 FT. SQUARE TRAY

by

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Summary

The results obtained in experiments on the surface application of foam to petrol fires in a 7 ft. square tray were similar to those of previous small-scale experiments (1). Moreover foams of similar expansion factor and critical shearing stress produced from the same compound by either a branchpipe or the laboratory compressed air foam generator have a similar performance although the bubble size distribution may differ.

Introduction

In a previous note (1) on the surface application of foam to petrol fires the need to extend the range of sizes of fire was suggested and further experiments have been carried out using a 7 ft. $1\frac{1}{2}$ in. square tray. At the same time experiments have been carried out using a number of model foam-making branchpipes in order to compare the performance of similar foams produced by a branchpipe and the compressed air foam generator using the criterion of time to control a fire. This was of particular interest as it is realised that foams of the same expansion factor and critical shearing stress produced by the two methods may differ in bubble size distribution and consequently might give different performances on an actual fire.

Experimental procedure

The technique was similar to that used for the previous experiments (1) on the 25 in., 36 in. and 50 in. diameter trays, except that the experiments described here had to be carried out in the open air. The foam was applied through a change-over valve system similar to that previously used but suitably enlarged to carry the larger quantities of foam involved. The size of the applicator was increased to 2 in. internal diameter to give the same ratio between the applicator size and tray size. The foam from the model branchpipes was delivered through the same applicator and valve system.

It was pointed out in the previous report that the unshielded radiometers used were sensitive to draughts and consequently they could not be used for these experiments and modified instruments were constructed. These are described in F.R. Note No. 42/1952 (2).

Details of experiments carried out

Experiments were carried out to obtain the relationship between the control time and the rate of application of a branchpipe quality foam produced by the laboratory generator using a protein compound. (Compound A in the previous report[1]).

Foam was also applied from two of the model branchpipes. One was operated at a pressure of 80 lb per sq. in. using 4·67 gal. of solution per minute and the other at pressures of 90 and 40 lb per sq. in. using 2·08 and 1·48 gal. of solution per minute. The control time was obtained for each of these rates of application.

Results

Fig. 1 shows the relationship between the control time and the rate of application obtained for the 7 ft. square tray plotted with the results previously obtained, for similar foams, for the 25 in. and 36 in. diameter trays.

In Fig. 2 the results obtained for the foams produced by the model branchpipes are shown together with the results obtained for foams of comparable critical shearing stresses produced by the laboratory generator.

Discussion of results

Allowing for the fact that the larger tray was square and was consequently more difficult to cover with foam than the round trays and that the larger experiments were performed out of doors where wind speeds of 4 to 8 ft. per second were measured, good agreement with the previous results was obtained. This substantiates the previous conclusion that there is little scale effect and gives more evidence that the results of these small-scale experiments should be applicable to considerably larger fires.

It was demonstrated in the previous report that the expansion factor of a foam does not affect the control time - rate of application relationship and therefore from Fig. 3 it was evident that the performance of similar foams produced by the practical and laboratory methods are very similar though their bubble size distributions, which were not compared, may differ. The critical shearing stress measurements given on the graph were obtained from samples of the foam after passing through the valves and applicator. Some change in shear strength was noticed as a result of this but as shown in the previous report the effect of critical shearing stress at these lower values does not have any very great effect upon the control time.

References

(1) FRENCH, R. J., HINKLEY, P. L. and FRY, J. F. The surface application of foam to petrol fires. Department of Scientific and Industrial Research and Fire Offices' Committee Joint Fire Research Organization. F.R. Note No. 21/1952.

(2) HINKLEY, P. L. and FRENCH, R. J. A radiometer for determining the control points in experiments on the application of foam to petrol fires. Department of Scientific and Industrial Research and Fire Offices' Committee Joint Fire Research Organization. F.R. Note No. 42/1952 (in preparation).

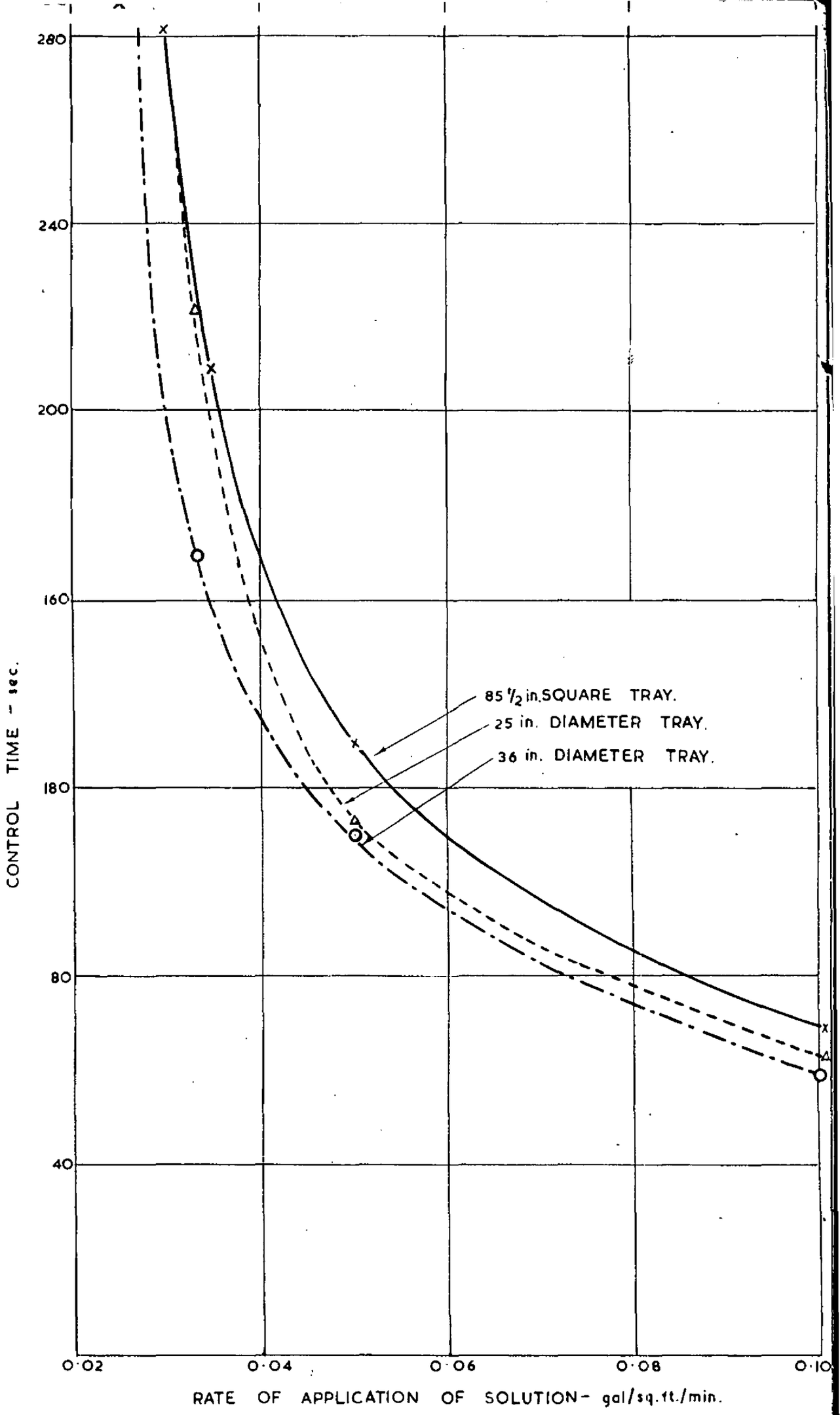
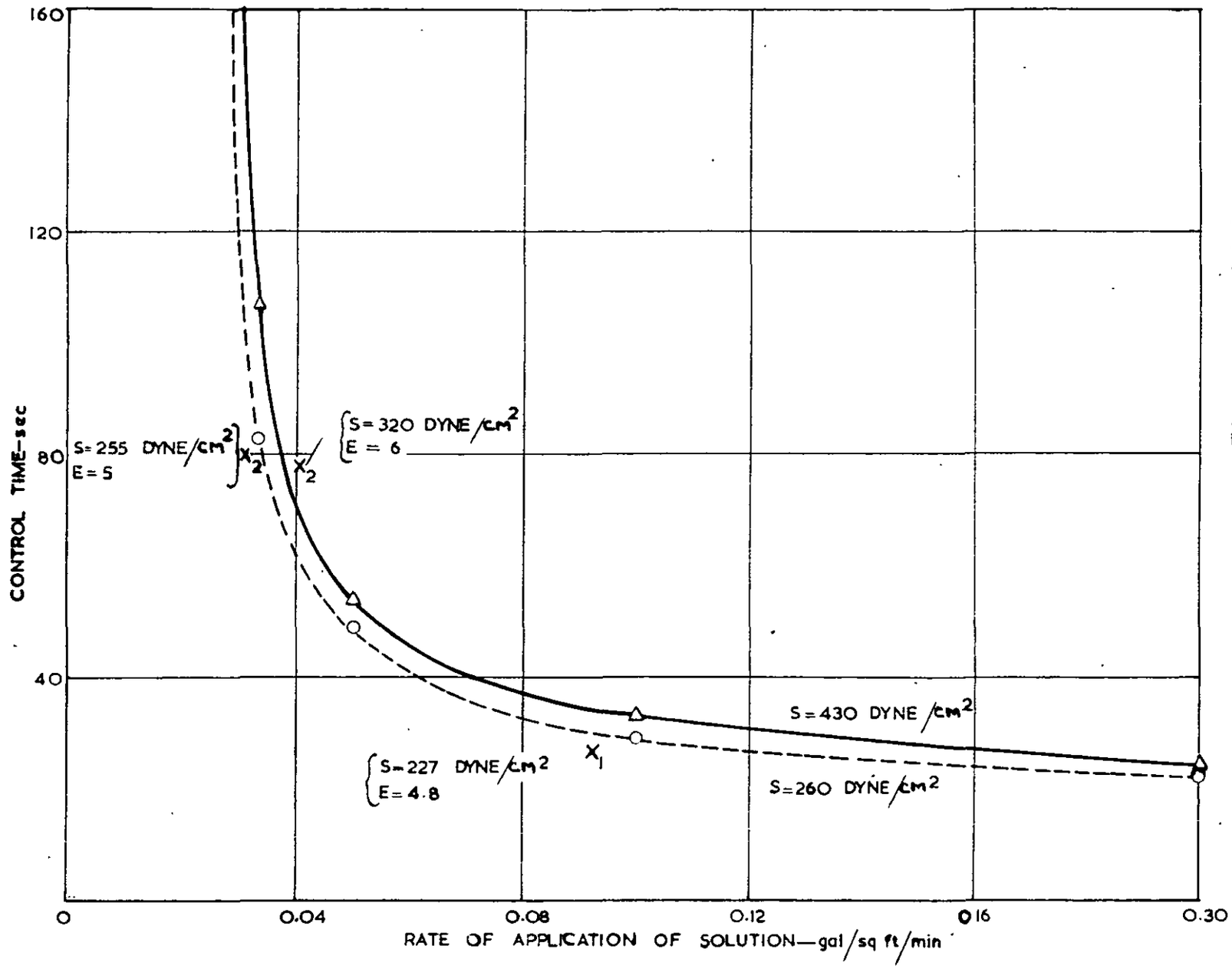


FIG. 1. COMPARISON OF EFFECT OF RATE OF APPLICATION OF SOLUTION ON CONTROL TIME FOR THREE SIZES OF TRAY. COMPOUND A. BRANCHPIPE QUALITY FOAM. EXPANSION FACTOR = 7·5. CRITICAL SHEARING STRESS = 690 DYNE / cm^2.



CURVES ARE FOR FOAM PRODUCED BY COMPRESSED AIR GENERATOR AT TWO VALUES OF CRITICAL SHEARING STRESS (S) EXPANSION FACTOR E = 7.5.

POINTS X_1 AND X_2 ARE FOR FOAM PRODUCED BY THE LARGER AND THE SMALLER MODEL BRANCHPIPES RESPECTIVELY.

FIG. 2. COMPARISON OF FOAM PRODUCED BY (a) COMPRESSED AIR GENERATOR. (b) MODEL BRANCHPIPES.