RESULTS OF A QUESTIONNAIRE ON SMOKE-CURING OF RUBBER.

BY

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Towards the end of last year a questionnaire was circulated among some fifty estates in various parts of the country with the object of collecting information on the smoke-curing of sheet rubber. The drying of sheet rubber in smokehouses according to present practice involves the use of a simple type of plant and to some extent the methods employed are crude. The process is analogous to that used for the curing of fish, in so far as smoking and drying are effected by the slow combustion of wood fuel in a simply designed building, the object being to dry and at the same time to preserve the product in good condition. But this analogy must not be carried too far, since in the case of rubber the conditions during drying must as nearly as possible be such as to give a product which conforms to more definite and rigid standards of quality. In the first place there is the standard imposed by the market, which is based largely on cleanliness and general appearance and secondly there is that demanded by manufacturers, which is based principally on the physical quality of both the raw and vulcanised rubber. Considering, therefore, present methods of smoke-drying rubber in relation to the high standards of quality demanded of the product, it may be said that the process is somewhat crude, since it is not of such a nature that conditions during drying can be controlled with a great degree of exactitude. If, for example, the heating unit at present employed were replaced by a system of steam-heated pipes, the temperature inside the building could be maintained between the required limits with greater ease, and the risk of contamination of the product with dirt would be greatly lessened. Of course, in such a case probably additional antiseptic treatment would have to be given to the sheets to prevent the growth of fungi, and questions of economy have still to be considered.

This enquiry was conducted in order to obtain comparative figures for the efficiency of various types of smokehouses and for fuel consumption. As regards the latter point, it is well known that most estates obtain wood fuel for smoke-curing from rubber trees felled according to "thinning out" programmes, and few are so fortunately situated as to be able to obtain adequate supplies of jungle timber at reasonable cost. It is not claimed that the data here given for fuel consumption are representative of the whole of Malaya, but it is hoped that they will provide the practical planter and business man with a useful figure to incorporate in an estimation as to future fuel supplies.

It is hardly necessary to point out that there are many difficulties to be encountered in drawing conclusions from statistical data collected on such a subject as smoke-curing, since not only are there a very large number of factors affecting the variation of each group of measurements, but also in some cases the factors cannot be measured quantitatively. The results are set forth in Tables I A and I B and an explanation of the scheme of tabulation follows.

SCHEME OF TABULATION. TABLE I A.

Column (1) Estate Number.—Each estate is referred to numerically, and where there is more than one smokehouse on the estate, the numerical headings are sub-divided by suffixing letters of the alphabet e.g. 11A, 11B.

Column (2) Design of House.—In referring to the smokehouse according to design of the building a division into different groups has been made. The houses in two of the groups conform to standard types, viz. "Devon" (1) and "Third Mile" (1), but in the case of all the others the design varies so considerably that it is possible to refer to them only according to the number of storeys in the building.

Column (3) Design of Fire-Chamber. In referring to the fires, the use of the word *furnace* has been purposely avoided. The use of this term is to be deprecated in that it suggests intense heat, whereas the ideal to aim at with smokehouse fires is the slowest combustion of the fuel which is consistent with the maintenance of the temperature between the desired limits. Instead the word *fire-chamber* or fire box is used.

In a few cases the fires are not enclosed, but are placed on open hearths on the ground floor of the building. Apart from these, the fire-chambers have been classified firstly by making a distinction between those in which the stoking operations are conducted inside the building and those which provide for stoking outside the house. These classes are then sub-divided as follows:—

Inside Stoking	Pit firing. Fixed iron fireboxes Brickwork chambers.	*Outside Stoking*	Trolley fire-boxes. Brickwork chambers. "Third Mile" Type. External chamber with flue distributors.

Pit firing covers those cases where the fuel is burnt in brick-lined pits sunk in the ground, the pits being covered with a perforated iron plate.

Fixed iron fire-boxes refer to chambers of the cylindrical drum type placed in contact with the ground floor, while in trolley fire-boxes the drum is mounted on a truck so that it may be wheeled outside the house for stoking and cleaning. In a few cases the fire-box is rectangular in section and has a hinged door opening on one of the sides to facilitate stoking. In all cases openings at the base of the box—if any—are small in size, so that there is little ventilation through the fire from the bottom upwards.

Brickwork chambers are usually rectangular in section and vary considerably in design. As a rule they are more elaborate than the iron fire-boxes just described and a hinged door opens on one of the sides to allow of stoking. The top may be covered with a lid of perforated sheet iron, while in other cases various forms of chimney distributors are provided as outlets at the top. For outside stoking a covered way is usually provided leading to the outer wall of the building when the fire-chamber itself projects some distance into the interior.

The "Third Mile" or fixed horizontal drum type is well known and requires little comment. Stoking operations are conducted outside the building and a flap ventilator, controlled from the outside is provided for adjusting the aperture of the chimney exit.

In one case the fire-chamber itself is situated just outside the building and the hot gases and smoke from the fire are led underground through a system of flues to the interior.

Column (4) House Ventilation.—This refers only to vents at the top of the building. Mention is not made of ventilation at the foot of the house, since it is difficult to refer to it briefly in tabular form. The construction of a smokehouse is not such as to render it air-tight. For example in the "Third Mile" type a slow current of air passes through the fire-chamber, and in the general case air vents are unintentionally provided by chinks in the walls and round the edges of the doors leading to the ground floor. Reference will be made later to the advantages to be gained by providing special air-inlets at the base of the walls as a precautionary measure.

Provisions for ventilation at the top are referred to under the following heads:—

1. Space between eaves of roof and walls.
2. Jack-roof.
3. Chimney Ventilators.

Column (5) Fire-Box Ventilation.—In iron fire-boxes, whether fixed on the floor or mounted on trolleys, there are generally no openings designedly made in the sides and bottom, although the box may not fit very closely on the ground or on the floor of the trolley carriage. The top is, however, open to the air and these conditions are referred to briefly in the table as "Open." The same applies to combustion of the fuel in pits sunk in the ground.

In other cases a current of air passes *through* the fire by means of openings in the stoking door, in some cases special adjustable air vents being provided as in the "Third Mile" type of fire-chamber. A few iron fire-boxes also come under this heading.

Column (9) Limits of Temperature.—This refers to the temperature maintained inside the drying rooms in which the sheets are hung.

Table I B.

Column (3) Average Curing Period in Days.—This gives the figure for the average number of days which elapses between the time that the sheets are transferred to the smokehouse and the time when they are completely dry and of the desired depth of colour. This period, therefore, includes the time when the smokehouse is open and the fires are "damped" for purposes of filling with fresh charges of sheet and removing dry rubber.

Column (4) Capacity of Drying Chambers.—This is expressed as the weight of dry rubber in lbs. per cubic foot of space in the drying chambers, when the smokehouse is filled with the maximum charge of sheet. The numbers in this column are obtained by dividing the figure for the maximum weight of dry sheet which can be hung in the smokehouse by the total volume of space in the drying chambers in cubic feet, the space above the walls bounded by the roof not being included. Thus the greater the space left between the racks, for example such as is occupied by gangways, the lower the figure for capacity, other things being equal.

Column (5) Monthly Output.—The figures here given are a measure of the comparative efficiency of the various designs of smokehouses irrespective of the type of fire-chamber employed, since, as will be seen from Table I A column (9), the limits of the temperature of drying are practically the same in each case. They give the monthly output of dry rubber in lbs. per cubic foot of drying space, and are obtained by multiplying each figure in Table I B column (4) by the corresponding number of complete charges of sheet which can be cured per month. The number of charges is obtained by taking the number of days in a month as 30 and dividing this by the corresponding figure in column (3) for the period of curing in days. For example in the case of Estate No. 9, the figure for monthly output or efficiency is:—

$$1.6 \times {}^{30}/_{3} = 4.8$$

Although not all the smokehouses are working to full capacity these figures represent the maximum output obtainable in each case and so they are fairly comparable among themselves.

Column (6) Fuel Consumption.—Each estate was asked to weigh the wood fuel consumed in the smokehouse over a period of one month, and the figure for fuel consumption is obtained by dividing the weight of fuel in lbs. by the total weight of dry rubber in lbs. smoke-cured during the same month. In other words, fuel consumption is expressed as lbs. of wood consumed per lb. of dry rubber.

Column (7) *Thickness of sheet.*—Each estate was requested to send a representative sample of the product. The average thickness of the sheets was then obtained by cutting a piece of the same surface area from each (about 40 square cms.) and obtaining the weight of each piece in grammes. From these data and the known specific gravity of rubber, the average thickness of each sheet was calculated in millimetres.

Column (8) *Depth of colour of cured sheet*—The representative samples of smoked sheet sent to us by the various estates were compared roughly as to depth of colour, the terms light, medium, and dark being used in this connection. This comparison, however was not intentionally related to the grading of the market as to depth of colour and is purely arbitrary.

Column (9) *Complaints re Mouldiness.*—The estates were asked to state whether or not complaints had recently been made by buyers as to mouldiness of consignments of smoked sheet.

Comparison of the Efficiency of the Smokehouses.

As has been pointed out, the figures given in Table I B column (5) for efficiency are fairly comparable among themselves, since they represent the maximum output obtainable. Moreover, efficiency as here defined refers to the design of the smokehouse building and is independent of the design of the fire-chamber employed, the temperature of drying being almost the same in each case. It takes no account of fuel consumption. Hence what we are about to compare is the efficiency of the various designs of building.

For this purpose the various designs have been divided into three groups—"Devon" type, "Third Mile" type, and Miscellaneous. The houses in the first two groups conform to a standard type as regards design although, as will be seen from Table I A the design of the fire-chamber varies somewhat. In the majority of cases, however, the designs of the houses are so miscellaneous that it is possible only to class them as such.

In Table II, the figures given in Table I B for monthly output in lbs. of dry rubber per cubic foot of drying space, are set forth under each group heading, and at the foot of each column the results of the analysis are given, the symbols having the usual statistical significance.

It will be seen that there are 12 "Devon" smokehouses, 17 of the "Third Mile" type, and 32 of miscellaneous design. Hence in making a comparison of efficiency due weight must be given to the fact that there are not the same number of observations for each group.

TABLE II.

MONTHLY OUTPUT IN POUNDS OF DRY RUBBER PER CUBIC FOOT OF DRYING SPACE.

" Devon " Type	"Third Mile" Type	Miscellaneous Type
8.6	2.4	3.9
11.0	2.2	2.3
4.3	6.0	2.3
6.3	3.8	3.0
7.3	4.9	2.4
5.1	4.2	2.7
6.0	5.5	4.8
6.9	2.3	2.6
6.0	4.3	1.6
6.0	2.4	1.9
5.4	3.8	3.8
6.4	3.6	3.7
	5.2	3.8
	4.5	2.3
	3.3	2.0
	3.3	2.0
	3.3	2.4
		2.2
		3.7
		5.1
		1.8
		2.1
		4.2
		2.7
		3.5
		4.8
		2.7
		2.7
		2.7
		4.1
		2.5
		2.0
N = 12. Mean = 6.7	N = 17 Mean = 3.8	N = 32. Mean = 2.9
S.D. = $\sqrt{\frac{\Sigma D2}{N}}$ = 1.7	S.D. = $\sqrt{\frac{\Sigma D2}{N}}$ = 1.1	S.D. = $\sqrt{\frac{\Sigma D2}{N}}$ = 0.9
C. of V. = $\frac{100xS.D}{Mean}$ = 25.4	C. of V. = $\frac{100xS.D.}{Mean}$ = 28.9	C. of V. = $\frac{100xS.D.}{Mean}$ = 31.0
p.e. = 2/3 S.D. = 1.1	p. e. = 2/3 S.D. = 0.7	p.e. = 2/3 S.D. = 0.6

A comparison of the coefficients of variation (C of V) for the three groups shows that the figures vary most with those of miscellaneous design and least with the "Devon" type, those for the houses of "Third Mile" design being intermediate in this respect. There is however not much difference between the coefficients themselves and hence the mean values for each type are fairly comparable. The figures for probable error (p.e.) give the following results:—

1. The value for the "Devon" type lies between (6.7 ± 1.1) i.e. between 7.8 and 5.6.
2. The value for the "Third Mile" type lies between (3.8 ± 0.7) i.e. between 4.5 and 3.1.
3. The value for houses of miscellaneous design lies between (2.9 ± 0.6) i.e. between 3.5 and 2.3.

The results therefore show that, of all the smokehouses examined, efficiency, as here defined, is significantly greatest for those of the "Devon" type.

It must be pointed out that among those houses classed as miscellaneous are a few giving higher figures for efficiency than the mean value of the "Third Mile" type, although none are higher than the mean value for the "Devon" type. This means that "Devon" houses take precedence over all the others examined, but one is not justified in saying that those of "Third Mile" design are second in order of merit, for the classification of the others under one head does not imply that they all conform to a standard design, but that so few are of the same type that it is not possible further to sub-divide into groups of the same class. For example it will be seen from Table II that in one case classed as miscellaneous a figure of 5.1 was obtained, and had there been a sufficient number of others of the same design as this, the mean figure for the class might have compared favourably with that for the "Third Mile". One can say, however, that the efficiency of the "Third Mile" design of building as shown by this enquiry is fairly satisfactory although considerably lower than the "Devon".

The higher output of "Devon" smokehouses depends on several factors. In the first place smoke-curing is here a continuous process since the fires are not closed down during the time that freshly machined sheets are being hung in the smokehouse and the dry rubber removed. Any rack may easily be wheeled to the outside verandah for inspection, and for emptying and filling operations, without disturbing the continuity of smoke-curing in the rest of the building, whereas in all other cases the fires must be "damped" or extinguished in order that the coolies may enter the building. The total period of curing for the Devon house is therefore less. Again practically the whole of the drying space is occupied by racks carrying the rubber, and hence a greater weight of rubber is packed per unit of drying space than in other cases. Furthermore the dimensions of the building are such that efficient ventilation is easily attained, for the building is tall, the height being somewhat greater than the length or breadth, no account of course being taken in this consideration of the dimensions of the verandahs, which are external to the house.

RELATION BETWEEN EFFICIENCY AND THICKNESS OF SHEET.

From a comparison of the figures given in Table I B columns Nos. 5 and 7 for monthly output in lbs. of dry rubber per cubic foot of drying space and thickness of sheet respectively, one finds a correlation coefficient of 0.1 taking all those estates for which both figures have been determined. This figure is very low and shows that within the limits observed the average thickness of the sheet has no appreciable effect on the efficiency. The average thickness of the sheets examined is 3.0 mm. If however the sheets are much thicker than this in places—for example at the edges—the period of drying is increased.

FUEL CONSUMPTION.

It will be seen from Table I B that the figures for fuel consumption vary very considerably, the average being 1.6 lbs. of fuel per 1 lb. of dry rubber. From the data collected, it is not possible to grade the various types of fire-chambers according to their economy in fuel consumption as has been done in the case of design of the smokehouses themselves, since as has been pointed out, in the latter case the figures for efficiency are independent of the type of heating plant employed, since the temperature of drying is almost constant. In the case of fire-chambers, however, the rate of fuel consumption is dependent not only on the ventilation of the fuel container but also on the ventilation of the building as a whole. Again all the smokehouses are not working at their maximum capacity and it is not possible to make an allowance for this so that a fair comparison may be made. In order to obtain fairly comparable results, one would have to test various types of fire-chambers in the same smokehouse working as nearly as possible under the same conditions, and of course no great advantage would accrue from such an experiment, since it is obvious that all that is required of the heating unit is that it shall work with the slowest combustion of the fuel which is consistent with the maintenance of the desired temperature of drying. Slow combustion of the fuel involves the production of more smoke than when combustion is rapid. From this point of view, therefore, one type of fire-chamber is as good as another provided the ventilation is adjusted so as to give the optimum conditions, and this is a matter which must be decided by the experience of the operator for the individual smokehouse.

The variation in the figures for fuel consumption is to some extent due to variation in the capacity of the drying chambers expressed as lbs. of dry rubber per cubic foot of drying space—in other words the closeness of the packing of the sheets in the building. As pointed out it is also due to the fact that not all the smokehouses are working to full capacity. The efficiency of the smoke house is also affected by the stoking and the capacity of the fire box.

PERIOD OF CURING.

From the data set forth in Table I B one finds that the average period of smoke-curing is 10½ days. Here again there is considerable variation in the figures and again a large number of factors are responsible. Within the limits of thickness observed there is no relation between thickness of the sheet and rate of curing nor are variations in the depth of colour of the product responsible to any considerable extent except in one case (Estate No. 47) where the curing period is 20 days. In this case, it was ascertained that the long period of curing was necessitated by the fact that the sheets were very thick at the edges owing to faults in manufacture. The finished product was therefore very dark in colour.

Among the more important factors responsible for the variation may be mentioned the following:—

(a) Ventilation depending on the design of the building.
(b) Temperature of drying—although in the present investigation the limits of temperature reported are practically the same in each case.
(c) Time occupied daily in filling the house with the fresh crop and removing dry rubber.
(d) Closeness of packing of the sheets in the smokehouse.

As regards factor (d) theoretically an increase in the closeness of packing of the sheets in the house tends to increase the period required for drying since the atmosphere inside the building is more moist. However, in practice the closeness of packing is not so great as to affect the rate of drying since as is seen from Table I B column (4), the weight of rubber per cubic foot of space is highest for the Devon smokehouse, yet the rate of drying is also high. That is to say, the closeness of packing of the sheets would have to be very great indeed in order to produce an appreciable decrease in rate of drying.

VENTILATION OF THE HOUSE.

It will be seen that in the majority of cases exit for the damp air and smoke is provided at the top of the building by means of a jack-roof.

MATERIAL OF WALLS AND OF ROOF.

In most cases the walls are of timber and the roof of corrugated iron or tiles.

NATURE OF FUEL.

In the large majority of cases, it will be noted that rubber wood alone is used as the fuel and to a less extent a mixture of rubber and jungle wood.

TEMPERATURE REGISTRATION APPARATUS.

In almost all cases registration of the temperature inside the building is obtained by means of a maximum-and-minimum thermometer.

DEPTH OF COLOUR OF CURED SHEETS.

It will be seen that the depth of colour of the cured sheets is in the large majority of cases described as medium.

COMPLAINTS RE MOULDINESS.

It is interesting to note that practically no complaints were received as to the mouldiness of consignments and it may be mentioned that the majority of estates reported that the use of para-nitrophenol as an antiseptic had been discontinued. During the restriction period a great deal of trouble was experienced with mould on smoked sheet, and hence it may be presumed that the present satisfactory state of affairs is due to the fact that estates are not now holding stocks for such a long period in the hot moist atmosphere of the tropics, which is very favourable to the growth of fungi.

DISCUSSION OF RESULTS.

It has been made clear from the foregoing that the "Devon" type of smokehouse proved to be the most efficient of all those examined in this investigation. As houses of such design are well known and are described in detail by Morgan, (1) a few brief comments will here suffice. The special feature of the "Devon" type of building, as has already been pointed out lies in the provision which is made for wheeling with ease from the drying-chambers any of the racks nolding the sheets outside on to a verandah without affecting the continuity of the smoke-curing of the sheets in the rest of the building-ing. There is thus no necessity to stop firing during filling and emptying operations, which may be carried out with ease, ample space being provided on the verandah. The installation may consist of a single house with verandah or of two houses accommodated under one roof with a common verandah. It is a system which lends itself very easily to expansion, and is such that it can be used to deal with a crop of almost any size. It may be mentioned that the name merely indicates the design of the house and does not specify the material of the walls or roof, or the type of fire-chamber.

The "Third Mile" smokehouse consists essentially of a building having two storeys for accommodation of the rubber and a shallow inverted pyramidal base ending on the ground in a fire-chamber, the design of which is the chief distinguishing mark of this type. The fire-chamber itself is outside the building and consists of an iron cylindrical drum set horizontally in brickwork. At one end of the drum is a hinged door for stoking provided with adjustable air-inlets and at the other end a door for removal of the ash. The drum communicates with the interior of the building by means of a short chimney provided inside with a "damper" adjustable from the outside, and immediately over the chimney is suspended an iron baffle-plate. This system of firing is easy to operate and provided the doors fit fairly tightly the required amount of ventilation at the foot of the building is obtained by adjustment of the various air vents.

In what follows is given a summary of features of construction which should be common to all smokehouses including the special types just discussed. They are considered under appropriate headings.

General Design.

From the point of view of efficiency of ventilation a tall building is to be preferred, the height being greater than either the length or breadth. The height, however, is limited chiefly by the extent to which it is possible to maintain the required temperature of drying throughout the building and uniform colour of the product. If for example the house were of excessive height rubber in the lower storeys could be maintained at the desired temperature, but that in the upper would probably be far below the optimum conditions. Generally speaking, the number of storeys should not exceed three, the ground floor accommodating the fire-chambers and the upper two storeys containing the sheets.

There is also the question of size of the building. On a large estate, from a consideration of the risk of damage by fire, it is suggested that it is a safer policy to work with a larger number of small units than to accommodate the whole of the crop in one large building.

VENTILATION.

The ideal to aim at is the production of a slow current of warm smoke-laden air passing from the bottom to the top of the building. The current should not be too rapid, since in that case the rate of of combustion of the fuel will be too great, dust would be raised from the ash formed, and the temperature of drying would be increased beyond the optimum limit. The draught should be just sufficient to carry off the moisture-laden air in the drying chambers. Since the required degree of ventilation can be obtained only as a result of practical experiment with the individual smokehouse, there should be sufficient provision for its adjustment. Ordinarily the construction of a smokehouse is not such as to render the lowest storey air-tight, air vents being unintentionally provided for example by chinks in the wall and round the edges of the doors. In order to minimise the risk of producing too great a draught, windows should not, therefore, be provided for the ground floor. Air-vents, provided with adjustable doors, which may be made to slide vertically in the apertures, should always be made at the base of the walls. As a guide it may be said that openings are made about 6 inches square at intervals of 4 feet all round the building. If not required the openings are kept closed, but in the majority of cases adjustment by means of such vents is a necessity. Another factor affecting ventilation at the base is the site of the building. If practicable the house should be situated on fairly level ground so that there is an open space for a considerable distance all round. When the smoke-house has to be placed on a steep gradient earth embankments should be cleared away in the immediate vicinity.

As regards ventilation at the roof, the top of the walls should fit tightly at the eaves of the roof, otherwise a counter current of air will at times be produced in the building. The construction of a low jack-roof over the main roof ridge provides a very simple and efficient method for the exit of the damp air and smoke. Alternatively chimney ventilators may be constructed, and if the fitting between the cap and body is sufficiently low interior swinging flaps for adjustment of the openings are not required. A ceiling should be provided protecting the whole of the racks and gangways and of such material that the condensation products of the smoke may be absorbed, thus preventing drops of tarry matter from falling on the sheets. For this purpose the ceiling is best made of wood; sacking would serve the same purpose without, however, being so permanant. One or more central openings in the ceiling, depending on the size of the building are provided for exit of the damp air and smoke to the roof ridge.

Constructional Materials.

The object in all drying houses is to conserve the heat as much as possible within the building. In this connection it is evident that different considerations enter into the choice of constructional materials in the case of smokehouses than in the case of crepe drying-sheds. In the latter case there is no internal heating installation, the heat being supplied from an external source by the sun's rays and hence crepe drying-sheds are constructed of a heat-conducting material such as corrugated iron. In the case of smokehouses constructed of corrugated iron additional benefit is obtained from the heat of the sun during the day but heat is rapidly dissipated outside the building during the night, when it is more difficult to ensure that the smokehouse attendant is keeping the fires going properly. Moreover the fires alone are capable of maintaining the temperature between the desired limits. Hence the use of non-conducting materials such as brick, wood or asbestos lining is recommended. The choice of constructional materials is of course regulated largely by questions of economy and in this connection it may be pointed out that timber soon becomes impregnated with tarry matter, the preservative properties of which confer a very long life on wooden walls, although there is then the risk of damage by fire to be considered. For the material of the roof brick tiles are very satisfactory provided they are fitted well together so that there is no leakage and so that ventilation is confined to the jack-roof or chimney ventilators on the roof ridge. For cleanliness of operation inside the building, the ground floor is best constructed of cement.

Fire-chambers.

The construction of the fire-chambers must be such as to ensure the slowest combustion of the fuel which is consistent with sufficient smoke production and the maintenance of the temperature between the required limits and it is known that the optimum temperature lies between 110° and 130° F. The choice of a fire-chamber depends therefore on the ease with which these conditions can be obtained. From this point of view probably iron drums or boxes either placed in contact with the ground floor or mounted on a trolley leave least room for errors in ventilation and require least attention in smoking, provided the sides and bottom are almost closed to the air. Special openings near the base are usually unnecessary and a door for stoking should not be made unless it fits closely round the edges. At the top is fitted a perforated iron plate or a cowl for distribution of the smoke. One or more of these boxes, depending on the size of the house, may be placed at intervals on the ground floor so as to give the most uniform distribution of heat and smoke. Greater freedom from dust in the building may be attained when the boxes are mounted on wheels for removal outside for cleaning and stoking. This type of fire-chamber is suitable for use in a house of any size and particularly so in the case of small holdings where the building is often of a very temporary nature.

With brickwork ovens, whether stoked from the inside or outside, a hinged door must be fitted for cleaning and stoking and there is always difficulty in obtaining a closely fitting door. If this can be obtained, however, one or more "butterfly" ventilators should be provided in the door for provision of the required draught. Nothing elaborate is required for slow combustion fires and they should be built essentially on the same lines as iron boxes. The hearth may be of clay so as to make the fire-chamber completely closed to the air at the bottom. Obviously it is of advantage to arrange for stoking to be done from the outside of the building. Brickwork fire-chambers are of course more permanent than iron boxes but it is doubtful if the additional expense involved is justified except in the case of very large and permanent buildings.

Reference has already been made to the "Third Mile" type, the chief advantage of which lies in the ease with which efficient adjustment of the ventilation may be obtained.

The use of pits sunk in the ground floor as fuel containers is not to be recommended since they provide a small surface for the radiation of heat.

It will be seen from Table I A that in a few cases the fire-chamber itself is outside the building, the heat and smoke being distributed to the inside of the house by means of underground flues. Such an arrangement is very wasteful for not only is a considerable amount of heat dissipated during the passage of the hot gases from the fire-chamber to the interior but a certain amount of tarry matter from the smoke is condensed in the flues and smoke-curing is then much less efficient.

In the majority of cases iron baffle-plates suspended a few feet above the fire-chambers from the first floor are required for uniform distribution of the smoke within the building.

In all cases it is important to note that large fire-chambers are not desirable. The object should be rather to work with a larger number of small units than vice versa. Capacious fire-chambers require a bigger charge of fuel and slow combustion is not then easily attained. In small houses it is quite frequent to find that the fire-chamber is much bigger than is warranted by the size of the building. In illustration of this point a brief account is given below of an experiment which was conducted in a small smokehouse belonging to the Institute.

The installation is built on the lines of a small "Devon" smokehouse and has a capacity of about 1,500 lbs. per month, the average period of curing being 7 days. The fire-chamber consists of an iron cylindrical drum with perforated lid placed centrally on the ground floor. Starting with a container approximately of the size of an ordinary 40 gallon oil drum, the smoke-house was filled with sheets to its maximum capacity, the temperature of drying being registered by a thermograph. The sheet was completely smoke-cured in 7 days the limits of temperature being 110° and 120° F. and the fuel consumption was 5.0 lbs. per lb. of dry rubber. The same drum was cut so as to reduce the height by about one third and the experiment repeated under the same conditions. In the two experiments the rubber wood fuel was air-dried before use, the ventilators were adjusted to the same position, and the smokehouse was filled to full capacity with sheets of approximately the same thickness in both cases. In the second experiment the fuel consumption was 2.7 lbs. per lb. of dry rubber, the period of curing being again 7 days.

Lastly it may be said that the test of slow combustion in any fire-chamber is the nature of the residue after the wood has burnt. The most desirable results are obtained when there is the least ash and most charcoal, provided of course that the required temperature has been maintained.

SMOKEHOUSES IN JAVA:—

It may be of interest to describe briefly the results obtained from fifty five estates in Java from a similar questionnaire by Dr. C. Knaus, published in Archief voor Rubbercultuur 12th Year No. 4, April 1928.

The consumption of fuel varied from 0.44 to 9.0 lbs. of fuel per lb. of dry rubber as shown below.

Type of smoke houses.		*Fuel consumed per lb. of dry rubber.*	
Barker	...	1—2	lbs.
Old Coffee drying houses	...	1.5—9	,,
Chamber system (outside furnace)	...	0.6—3.75	,,
Chamber system (inside furnace)	...	0.7—6	,,
Zimmerman system,	...	0.44	,,

Twenty-two estates consume only from 1 to 1.5 lbs. of fuel per lb. of rubber, while another thirteen consume about 2 lbs. of fuel per lb. of rubber.

The temperature variations in the smoke house were from 35°C to 55°C=97°F to 131°F.

The smoking time and total drying time were as follows:—

Barker smoke houses,	...	6—9 days.	6—20 days.
Old Coffee drying houses,	...	6—14 ,,	9—14 ,,
Chamber system (outside furnace),	...	4—15 ,,	6—16 ,,
Chamber system (inside furnace),	...	4½—12 ,,	5—12 ,,

On 36 estates the smoking period was 9 days or less and on another 15 estates the period was from 10 to 12 days On seventeen estates, however, a supplementary drying was carried out.

It is concluded that the chamber type of smoke house, whether fitted with a Zimmerman heating installation, with ovens, smoke pots or fire trolleys is to be preferred.

Note:—The Zimmerman process consists of a hot water pipe system of drying plus an oven or smoke pot to produce smoke. The fuel consumption on the only estate on which this was installed is given as 44 lbs. per 100 lbs. of dry rubber which is low.

By comparing the results of the Malayan questionnaire with the results obtained in Java, it will be seen that both in respect of the amount of fuel used and the period of smoke-drying, the Malayan figures are very satisfactory, especially since no supplementary drying is carried out on estates in Malaya.

CONCLUSIONS.

Cleanliness in the smoke-curing process is as important as in other branches of factory practice. Where the fire-chambers are stoked from the inside of the building it is inevitable that dust is raised and to protect the sheets in the upper storey wooden frames fitted with wire gauze may be installed in the floor below each set of racks. The gauze must be cleaned and renewed from time to time.

The broties may be of bamboo or smooth hard wood, rotatable in grooves to enable different parts of the sheet to be placed in contact with the support, thus avoiding bar marks as much as possible. The minimum distance between the broties from centre to centre should be 3 inches since closer packing makes it difficult to keep the sheets apart from one another.

As regards the registration of the temperature the use of a self-recording thermograph has the advantage that it provides a check on the efficiency of the smokehouse attendant, who tends to heap on large fires instead of stoking frequently with small quantities of fuel.

The following factors are of importance:—

(1) Each day's production should be placed in a separate chamber in order to prevent wet and partially dried sheets being hung in the same space.

(2) The fire box should be arranged so that it can be easily attended and controlled.

(3) Sufficient gangways must be allowed for thorough inspection of all the sheets on the racks, or preferably an exterior verandah is provided, so that the racks can be removed from the smoke chamber for inspection.

(4) The smoke house must be constructed of solid material to avoid loss of heat and ventilation must be arranged so that the current

of hot moist air is upwards, by the provision of openings in the lower part of the smoke house, which can be regulated and a jack roof or roof ventilators.

Further work is in progress with the object of establishing the results obtained from this enquiry.

ACKNOWLEDGEMENT.

I desire here to express my thanks for the valuable assistance given by those estates and estates' agency houses which took part in the enquiry.

REFERENCES TO LITERATURE.

(1) "The Preparation of Plantation Rubber" by Morgan and Stevens.

TABLE I A.

1 Estate Number	2 Design of House	3 Design of Fire-Chamber	4 House Ventilation	5 Fire-box Ventilation	6 Material of Walls	7 Material of Roof	8 Temperature Registration Apparatus	9 Temperature Limits	10 Wood Fuel
1	Two Storeys	——	Jack-roof	—	Corrugated iron	Corrugated iron	Max. & Min. Thermometer	110°-130°F	Rubber only
2	Two Storeys	Fixed fire-box	Space between eaves of roof and walls	Open	Wooden planks	Corrugated iron	do	110°-120°F	Mixture of equal parts rubber and jungle
3A	Three Storeys	Internal brickwork chambers sunk in ground. Inside stoking	Jack-roof	Open	Wooden planks	Corrugated iron	do	110°-130°F	Jungle only
3B	Two Storeys	Fixed fire-box	Jack-roof	Open	Wooden planks	Corrugated iron	do	110°-130°F	Jungle only
4A	Three Storeys	Movable fire-box	Space between eaves of roof and walls	Through	Wooden planks	Corrugated iron	do	110°-120°F	Mixture of equal parts rubber and jungle
4B	Three Storeys	Movable fire-box	Space between eaves of roof and walls	Through	Wooden planks	Corrugated iron	do	110°-120°F	do
4C	Double Devon	Movable fire-box	Space between eaves of roof and walls	Open	Wooden planks	Chinese tiles	do	110°-120°F	do

TABLE I A—(contd.)

1 Estate Number	2 Design of House	3 Design of Fire-Chamber	4 House Ventilation	5 Fire-box Venti-lation	6 Material of Walls	7 Material of Roof	8 Temperature Registration Apparatus.	9 Temperature Limits	10 Wood Fuel
5	Third Mile	Third Mile Type	Jack-roof	Through	Timber	Corrugated iron	Max. & Min. Thermometer	97°-125°F	Mixture 1 part jungle 2 parts rubber
6	Single Devon	Movable fire-box	Space between eaves of roof and walls	Open	Brick	Corrugated iron	Nil	110°-125°F	Rubber only
7	Third Mile	Third Mile Type	Jack-roof	Through	Timber	Tiles	Nil	100°-120°F	Jungle only
8	Third Mile	Third Mile Type	Jack-roof	Through	Timber	Tiles	Nil	100°F	Rubber only
9	Two Storeys	Brickwork-chambers. Inside stoking	Jack-roof	Through	Timber	"Italit"	Max. & Min. Thermometer	110°-115°F	Jungle only
10	Two Storeys	——	Holes at top of walls under eaves of roof	—	Corrugated iron	Corrugated iron	Thermograph	110°-140°F	Rubber
11A	Two Storeys	Fixed iron fire-boxes	—	Open	Brick	Iron	Max. & Min. Thermometer	115°-145°F	Rubber
11B	Two Storeys	Fixed iron fire-boxes	—	Open	Brick	Iron	do	115°-145°F	Rubber

TABLE I A—(contd.)

1	2	3	4	5	6	7	8	9	10
Estate Number	Design of House	Design of Fire-Chamber.	House Ventilation	Fire-box Venti-lation	Material of Walls	Material of Roof	Temperature Registration Apparatus	Temperature Limits	Wood Fuel
12	Three Storeys	Internal brick-work chamber. Outside stoking	Jack-roof and openings in walls under eaves of roof	Through	Brick	Chinese tiles	do	120°-135°F	Rubber
13	Three Storeys	Internal brick-chamber stoked from outside	Jack-roof	Through	Timber	Tiles	Nil	About 120°F	Rubber
14A	Two Storeys	Inside pit firing	Jack-roof	Open	Timber	Corrugated iron	Max. & Min. Thermometer	110°-120°F	Rubber
14B	Two Storeys	Inside pit firing	Jack-roof	Open	Timber	Corrugated iron	Max. & Min. Thermometer	110°-120°F	Rubber
15A	Three Storeys	External brick-work chambers with flue distri-butors	Jack-roof	Through	Timber	Corrugated iron	do	90°-130°F	Rubber
15B	Three Storeys	As in 15 A	Jack-roof	Through	Timber	Corrugated iron	do	90°-130°F	Rubber
16	Third Mile	Third Mile Type	Jack-roof	Through	Timber	Tiles	do	110°-120°F	Rubber

TABLE I A—(contd.)

1	2	3	4	5	6	7	8	9	10
Estate Number	Design of House	Design of Fire-Chamber	House Ventilation	Fire box Venti-lation	Material of Walls	Material of Roof	Temperature Registration Apparatus	Temperature Limits.	Wood Fuel
17	Double Devon	Movable iron fire-box	Jack-roof	Open	Timber	Tiles	Max. & Min. Thermometer.	About 110°F	Jungle
18	Third Mile	Third Mile Type	Jack-roof	Through	Timber	Tiles	do	90°-120°F	Rubber
19A	Third Mile	Third mile Type	Jack-roof	Through	Corrugated iron	Corrugated iron	do	100°-120°F	2 parts rubber and 1 part jungle
19B	Two Storeys	Internal brickwork chamber stoked from outside	Openings in roof controlled by flaps	Through	Corrugated iron	Corrugated iron	do	100°-120°F	Mixture 2 parts rubber and 1 part jungle
20	Two Storeys	Open fire	—	—	—	—	do	120°-130°F	Mixture of rubber and jungle
21	Two Storeys	Internal brickwork chamber stoked from inside	Space between eaves of roof and walls	Open	Timber	Corrugated iron	do	125°-135°F	Mixture of rubber and jungle
22	Third Mile	Third Mile Type	Jack-roof	Through	Timber	Tiles	do	110°-120°F	Jungle
23	Two Storeys	Fixed iron fire-box stoked from inside	Jack-roof	Through	Timber	" Italit "	do	110°-120°F	Mixture of rubber and jungle

TABLE I A—(contd.)

1 Estate Number	2 Design of House	3 Design of Fire-Chamber	4 House Ventilation	5 Fire-box Venti-lation.	6 Material of Walls	7 Material of Roof	8 Temperature Registration Apparatus	9 Temperature Limits	10 Wood Fuel
24	Third Mile	Third Mile Type	Jack-roof	Through	Timber	Tiles	do	90°-120°F	Jungle
25A	Three Storeys	Fixed iron fire-box	—	Open	Timber	Iron	do	110°-120°F	Rubber
25B	Double Devon	Fixed iron fire-box	Jack-roof	Open	Timber	Tiles	do	110°-120°F	Rubber and jungle mixed
25C	Third Mile	Third Mile Type	Jack-roof	Through	Timber	Tiles	do	110°-120°F	Rubber and jungle mixed
26	Two Storeys	Internal brickwork chamber stoked *from inside*	—	—	Timber	Attap	Nil	—	Rubber
27	Third Mile	Third Mile Type	Jack-roof.	Through	Timber	Tiles	Max. & Min. Thermometer	100°-130°F	Mixture of rubber and jungle
28	Third Mile	Third Mile Type	Jack-roof	Through	Timber	Iron	do	100°-120°F	Rubber
29	Three Storeys	Brick fire-chambers sunk below ground level-Stoked from inside-covered with an iron cowl on top	Jack-roof	Open	Timber	Iron	do	130°-135°F	Jungle

TABLE I A—(cont.)

1	2	3	4	5	6	7	8	9	10
Estate Number	Design of House	Design of Fire-Chamber	House Ventilation	Fire-box Ventilation	Material of Walls	Material of Roof	Temperature Registration Apparatus	Temperature Limits	Wood Fuel
30	Third Mile	Third Mile Type	Jack-roof	Through	—	—	Thermograph	About 115°F	Rubber
31	Three Storeys	Fixed iron fire-boxes	—	Open	Timber	Tiles,	Max. & Min. Thermometer	120°-130°F	Rubber
32	Two Storeys	Open fire sunk into ground floor	Chimney ventilators on roof	Open	Brick	Iron	do	About 125°F	Rubber
33A	Third Mile	Third Mile Type	Jack-roof	Through	Timber	Tiles	do	110°-120°F	Mixture of rubber and jungle
33B	Three Storeys	Internal brick fire-chamber stoked from inside—with ventilation door	Jack-roof	Through	Timber	Tiles	do	110°-120°F	Mixture of rubber and jungle
34	Two Storeys	External brick fire-chambers with under ground flue distributors.	Chimney ventilators on roof	Through	Timber	Tiles	do	About 100°F	Rubber
35A	Third Mile	Third Mile Type	Jack-roof	Through	Timber	Tiles	do	110°-130°F	Mixture of rubber and jungle

TABLE 1 A—(contd.)

1	2	3	4	5	6	7	8	9	10
Estate Number	Design of House	Design of Fire-Chamber	House Ventilation	Fire-box Venti-lation	Material of Walls	Material of Roof	Temperature Registration Apparatus	Temperature Limits	Wood Fuel
35B	Double Devon	Movable fire-boxes running on rails under-ground	Jack-roof	Open	Timber	Tiles	Max. & Min Thermometer	110°-130°F	Mixture of rubber and jungle
36	Double Devon	Internal fire-chambers with adjustable ventilators	Chimney ventilators on roof	Through	Brick	Iron	do.	90°-120°F	Rubber
37	Third Mile	Movable fire-boxes running on rails under-ground	Jack-roof	Open	Timber	Tiles	do.	About 110°F	Jungle
38	Third Mile	Third Mile Type	Jack-roof	Through	Timber	Tiles	do.	About 110°F	Mixture of 1 part rubber & 1 part jungle
39	Double Devon	Third Mile Type	Jack-roof	Through	Timber	Tiles	do.	116°-140°F	Jungle
40A	Two Storeys	Fixed iron fire-boxes	Jack-roof	Open	Wood and iron	"Genasco"	Nil.	—	Rubber
40B	Two Storeys	Fixed iron fire-boxes	Jack-roof	Open	Wood and brick	Iron	Nil	—	Rubber

TABLE I A—(contd.)

1 Estate Number.	2 Design of House	3 Design of Fire-Chamber	4 House Ventilation	5 Fire-box Venti-lation	6 Material of Walls	7 Material of Roof	8 Temperature Registration Apparatus	9 Temperature Limits	10 Wood Fuel
41	Third Mile	Third Mile Type	Jack-roof	Through	Timber	Tiles	Max. & Min. Thermometer	110°-120°F	Mixture of rubber and jungle
42	Three Storeys	Internal fire-chambers. Stoked from outside	—	Through	Iron	Iron	do	118°-128°F	Rubber
43	Two Storeys	Internal fire-chambers of brick. Stoked from outside	Jack-roof	Through	Brick	Iron	do	95°-130°F	Rubber
44	Two Storeys	—	—	—	Timber	Tiles	do	About 125°F	Mixture of rubber and jungle
45	Two Storeys	Internal fire-box	Adjustable ventilators on roof	Open	Brick and Timber	Iron	do	About 128°F	Rubber
46	Two Storeys	—	Chimney ventilators on roof	—	Iron	Iron	do	110°-125°F	Rubber
47	Three Storeys	Internal brick fire-chambers. Stoked from outside	Adjustable flap ventilators in ceiling	Through	Timber	Iron	do	90°-115°F	Rubber
48A	Third Mile	Third Mile Type	Jack-roof	Through	Timber	Tiles	do	About 120°F	Rubber
48B	Single Devon	Movable iron fire-boxes running on rails below ground level	Chimney ventilators on roof	Open	—	—	do	About 120°F	Rubber

TABLE I A—(contd.)

1	2	3	4	5	6	7	8	9	10
Estate Number	Design of House	Design of Fire-Chamber	House Ventilation	Fire-box Venti-lation	Material of Walls	Material of Roof	Temperature Registration Apparatus	Temperature Limits	Wood Fuel
48C	Double Devon	As in 48B	As in 48 B	Open	Brick	Tiles	Max. & Min. Thermometer	About 120°F	Rubber
49	Third Mile	Third Mile Type	Jack-roof. Adjustable flap-ventilators in ceiling	Through	Timber	Tiles	do	116°-120°F	Rubber
50A	Double Devon	Internal fire-box	—	Open	Timber	Tiles	do	About 120°F	Rubber
50B	Single Devon	do	—	Open	Asbestos	Asbestos	do	100°-130°F	Rubber
51A	Single Devon	do	—	Open	Asbestos	Iron	do	About 120°F	Mixture of jungle and rubber
51B	Single Devon	do	—	Open	Iron	Iron	do	100°-130°F	Mixture of jungle and rubber

TABLE I B.

1	2	3	4	5	6	7	8	9	10
Estate Number	Design of House	Average Curing Period in Days	Capacity of Drying-Chambers	Monthly Output	Fuel Consumption	Thickness of Sheet m.m.	Depth of Colour of Cured Sheet	Complaints re Mouldiness	Remarks
			Weight of dry rubber in lbs. per cubic foot space	Lbs. dry rubber per cubic foot drying space	Lbs. Fuel per lb. dry rubber				
1	Two Storeys	7	0.9	3.9	1.5	2.0	Light	None	
2	Two Storeys	13	1.0	2.3	4.0	2.3	Medium	None	
3A	Three Storeys	9	0.7	2.3	2.0	2.7	Light	None	Fig. in Col. 6 calculated on 3A & 3B together
3B	Two Storeys	9	0.9	3.0	—	2.7	Light	None	
4A	Three Storeys	10	0.8	2.4	1.0	3.0	Dark	—	Fig. in Col. 6 calculated on 4A, 4B & 4C together
4B	Three Storeys	10	0.9	2.7	—	3.0	Dark	—	
4C	Double Devon	7	2.0	8.6	—	3.0	Dark	—	
5	Third Mile	14	1.1	2.4	1.6	—	—	None	
6	Single Devon	6	2.2	11.0	1.3	—	—	None	
7	Third Mile	11	0.8	2.2	—	3.1	Light	None	
8	Third Mile	7	1.4	6.0	—	.2	Medium	Few	

TABLE I B—(contd.)

1	2	3	4	5	6	7	8	9	10
Estate Number	Design of House	Average Curing Period in Days	Capacity of Drying-Chambers: Weight of dry rubber in lbs. per cubic foot space	Monthly Output: Lbs dry rubber per cubic foot drying space	Fuel Consumption: Lbs. Fuel per lb. dry rubber	Thickness of Sheet m.m.	Depth of Colour of Cured Sheet	Complaints re Mouldiness	Remarks
9	Two Storeys	10	1.6	4.8	0.9	2.9	Light	None	
10	Two Storeys	8	0.7	2.6	3.2	2.4	Medium	None	
11A	Two Storeys	13	0.7	1.6	1.8	2.6	Medium	None	Fig. in Col. 6 calculated on 11A & 11B together
11B	Two Storeys	16	1.0	1.9	—	2.6	Medium	None	
12	Three Storeys	8	1.0	3.8	1.3	2.7	Medium	None	
13	Three Storeys	9	1.1	3.7	0.5	2.5	Light	None	
14A	Two Storeys	8	1.0	3.8	1.1	3.3	Medium	None	
14B	Two Storeys	13	1.0	2.3	4.0	3.3	Medium	None	
15A	Three Storeys	15	1.0	2.0	1.1	3.1	Medium	Few	
15B	Three Storeys	15	1.0	2.0	0.8	3.1	Medium	Few	
16	Third Mile	12	1.5	3.8	0.5	2.8	Medium	None	

TABLE I B—(contd.)

1	2	3	4	5	6	7	8	9	10
Estate Number	Design of House	Average Curing Period in Days	Capacity of Drying-Chambers	Monthly Output	Fuel Consumption	Thickness of Sheet m.m.	Depth of Colour of Cured Sheet	Complaints re Mouldiness	Remarks
			Weight of dry rubber in lbs. per cubic foot space	Lbs. dry rubber per cubic foot drying space	Lbs. Fuel per lb. dry rubber				
17	Double Devon	7	1.0	4.3	1.0	—	—	None	
18	Third Mile	8	1.3	4.9	0.6	2.6	Medium	Few	
19A	Third Mile	10	1.4	4.2	1.3	2.9	Medium	Frequent	
19B	Two Storeys	10	0.8	2.4	1.5	2.9	Medium	Frequent	
20	Two Storeys	11	0.8	2.2	3.8	3.2	Medium	Few	
21	Two Storeys	9	1.1	3.7	0.8	3.0	Medium	—	
22	Third Mile	9	—	—	1.0	2.9	Light	None	
23	Two Storeys	10	1.7	5.1	0.8	3.7	Medium	—	
24	Third Mile	12	2.2	5.5	0.8	3.0	Medium	None	
25A	Three Storeys	15	0.9	1.8	2.3	2.4	Medium	None	
25B	Double Devon	10	—	—	1.5	2.4	Medium	None	
25C	Third Mile	12	0.9	2.3	1.0	2.4	Medium	None	

TABLE I B—(contd.)

1	2	3	4	5	6	7	8	9	10
Estate Number	Design of House	Average Curing Period in Days	Capacity of Drying-Chambers Weight of dry rubber in lbs. per cubic foot space	Monthly Output Lbs. dry rubber per cubic foot drying space	Fuel Consumption Lbs. Fuel per lb. dry rubber	Thickness of Sheet m.m.	Depth of Colour of Cured Sheet	Complaints re Mouldiness	Remarks
26	Two Storeys	13	0.9	2.1	2.5	—	—	*Frequent*	
27	Third Mile	7	1.0	4.3	1.1	1.8	Medium	Few	
28	Third Mile	10	0.8	2.4	1.0	3.3	Medium	None	
29	Three Storeys	8	—	—	3.0	2.6	Light	None	
30	Third Mile	7	—	—	2.1	3.0	Medium	None	
31	Three Storeys	10	1.4	4.2	0.8	3.7	Medium	None	
32	Two Storeys	10	0.9	2.7	1.5	2.7	Medium	None	
33A	Third Mile	12	1.5	3.8	3.0	3.6	Medium	None	
33B	Three Storeys	12	1.4	3.5	1.2	3.6	Medium	None	
34	Two Storeys	10	1.6	4.8	1.0	3.7	Medium	None	
35A	Third Mile	10	1.2	3.6	0.5	2.8	Medium	None	

TABLE I B—(contd.)

1	2	3	4	5	6	7	8	9	10
Estate Number	Design of House	Average Curing Period in Days	Capacity of Drying-Chambers Weight of dry rubber in lbs. per cubic foot space	Monthly Output Lbs. dry rubber per cubic foot drying space	Fuel Consumption Lbs. Fuel per lb. dry rubber	Thickness of Sheet m.m	Depth of Colour of Cured Sheet	Complaints re Mouldiness	Remarks
35B	Double Devon	10	2.1	6.3	1.0	2.8	Medium	None	
36	Double Devon	7	1.7	7.3	0.6	2.8	Medium	None	
37	Double Devon	7	1.2	5.1	1.6	2.0	Medium	None	
38	Third Mile	11	1.9	5.2	1.5	3.6	Medium	None	
39	Third Mile	8	1.2	4.5	0.8	2.7	Medium	None	
40A	Two Storeys	13	—	—	0.8	2.2	Medium	None	
40B	Two Storeys	13	—	—	0.8	2.2	Medium	None	
41	Third Mile	12	1.3	3.3	0.6	3.2	Medium	Few	
42	Three Storeys	10	0.9	2.7	1.3	2.7	—	None	
43	Two Storeys	10	0.9	2.7	2.0	—	—	—	
44	Two Storeys	11	1.0	2.7	1.7	2.9	Medium	Frequent	

TABLE I B—(contd.)

1	2	3	4	5	6	7	8	9	10
Estate Number	Design of House	Average Curing Period in Days	Capacity of Drying-Chambers	Monthly Output	Fuel Consumption	Thickness of Sheet m. m.	Depth of Colour of Cured Sheet	Complaints re Mouldiness	Remarks
			Weight of dry rubber in lbs. per cubic foot space	Lbs. dry rubber per cubic foot drying space	Lbs. Fuel per lb. dry rubber				
45	Two Storeys	11	1.5	4.1	2.2	3.1	Medium	None	
46	Two Storeys	12	1.0	2.5	2.0	3.0	Medium	None	
47	Three Storeys	20	1.3	2.0	3.0	3.8	Medium	None	
48A	Third Mile	12	1.3	3.3	1.6	3.5	Medium	None	Fig. in Col. 6 calculated on 48A, 48B & 48C together
48B	Single Devon	18	1.7	6.4	—	3.5	Medium	None	
48C	Double Devon	18	1.7	6.4	—	3.5	Medium	None	
49	Third Mile	9	1.0	3.3	1.0	—	Medium	None	
50A	Double Devon	9	1.8	6.0	2.0	—	Medium	None	Fig. in Col. 6 calculated on 50A & 50B together
50B	Single Devon	7	1.6	6.9	—	—	Medium	None	
51A	Single Devon	8	1.6	6.0	1.3	—	Medium	None	Fig. in Col. 6 calculated on 51A & 51 B together
51B	Single Devon	8	1.6	6.0	—	—	Medium	None	