T.R.I. ADVISORY CIRCULAR No.PT 1

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TROUGH - WITHERING OF TEA

(This Advisory Circular replaces Circular No. T1, Serial No. 6/71)

1. Introduction

Trough withering of tea leaf is recommended for all tea growing districts in Sri Lanka. At the initial stages, tats were used for withering, but they are obsolete now.

This Circular addresses factories, which have trough installations. Those considering trough installations in new factories must request for advice specific to individual cases. They are therefore, excluded from the scope of this Circular.

2. Factors to be considered before troughs are installed in a loft

2.1. Dimensions of troughs:

The standard width of troughs is 6 ft. (1.8 m) but the length can be varied to suit the loft. Alternatively, the length could match the capacity of one roller (charge) or a small multiple thereof. The objective is to make the maximum use of the available floor space.

2.2 Trough capacity:

Trough capacity is computed on the basis of 2.5 kg/sq.ft. (approx. 27 kg green leaf per sq.m). For example, a trough 6' (1.8 m) wide and 50' (15.24 m) in length would have 300 sq.ft. (27.4 sq.m). of withering area and the following capacities:

Normal capacity 300 x 2.5 = 750 kg

The maximum could be at the rate of 3 kg/sq.ft. (32.3 kg/sq.m)

The maximum capacity 300 x 3.0 = 900 kg

2.3 Air requirements:

Fans should be capable of delivering 0.56 cu.m. of air per minute per kg (20 cfm/kg) of fresh leaf at a pressure of approximately 0.5 inches (13 mm) water gauge (WG). A fan coupled to a trough carrying 750 kg of green leaf should therefore, be capable of delivering a minimum throughput of 420 cu.m per minute (approx. 1500 cfm) at a pressure of 13 mm WG.

2.4 Other considerations:

- There should be a clearance of at least half a fan diameter between the cold air intake of each fan and any obstacle, of sizeable proportion.
- In the case of fans of two troughs facing each other, partitioning fan and chamber should be avoided to minimize fan starvation.
- Allow a working space at least 0.60 m between troughs.

- The area of the hot air intake should approximate that of the cold air intake.
- The trough should be sited in such a way that the hot air intake is not too distant from the drier discharge. First-floor lofts are the most convenient for trough installation. The floor should be devoid of damages. A floor sealed with an extra 26 gauge GI sheet is useful.

3. Use of troughs for withering tea leaf

The leaf should be sp`read at a rate of 2.5 kg/sq.ft[1] subject to a maximum of 3 kg/sq.ft immediately on arrival at the factory. It is very important that the leaf should be spread uniformly throughout the length of a trough and the fan turned on as soon as spreading operation is complete. If there is heat build up in the leaf, loading should done with the fan on.

3.1 Wet leaf:

Regulate the cold and hot air dampers to give the maximum throughput of air at a hygrometric difference of 8 to 10^{0}F (approx. 4.5 to 5.5^{0}C) for approximately 1 - 2 hours depending on the wetness. Surface moisture should have been removed by this time. The leaf can now be turned over gently loosening all 'lumps'. Reduce the hygrometric difference to about 4 - 6^{0}F (approx. 2.2 - 3.3^{0}C) at this stage and turn the leaf for the second time when the layer of leaf at bottom is almost withered.

3.2 Dry bulb:

Regulate the dampers as before to give an under-bed hygrometric difference of 4 - 6^{0}F. It would be adequate if the leaf was turned once when the layer of leaf at the bottom is almost withered. The fans should be switched off when the leaf is being turned over.

During periods of prolonged dry weather, ambient hygrometric differences may exceed 6^{0}F. Under these conditions, a short wither is inevitable and night manufacture may have to be resorted to, short withers would suit estates going through their quality season as they would invariably be conducting night manufacture, but elsewhere, if there is no justification for conducting night manufacture, the troughs should be operated with the hot air dampers fully closed and with the cold air dampers also partially closed. A higher spreading rate would also assist in delaying the wither.

If the wither is complete but the leaf cannot be immediately charged into a roller for some reason, and if there is heat build up in the leaf, it is preferable to operate the fans leaving the doors at the gable (fan) end of the trough full open. The trickle of air passing through the leaf in this condition would surface to keep the leaf from heating, but would not be adequate to permit any appreciable withering to take place.

[1] The spreading rate is intentionally given as kg/sq. ft, as factory staff are more conversant with this combination than kg/sq.m

Use of lofts

If there is no surface moisture in the leaf, the evening leaf should be spread on the 1st loft. If there is surface moisture in the leaf, the leaf could be spread on troughs with hot air intakes situated near the drier. Consideration can also be given to spreading the leaf on the troughs in such a manner as to prevent exposure of leaf to direct sunlight.

4. Energy usage

Bulk of electricity consumption in black tea processing takes place in the unit operation of withering. Installation of speed controllers to trough fans is recommended, to reduce the electricity consumption in withering, by about 40%. It is always recommended to use harmonic filters with these speed controllers to minimize the damage to the machinery. Capacitors/capacitor banks can cause harmonics in the power supply.

5. General

The practice of emptying leaf bags on the floor before loading the trough is discouraged. It is far better to empty these bags directly on the troughs because this ease the operation and minimizes handling and bruising of the leaf, which could lead to premature fermentation.

Reversible switchgear is of limited use in troughs and as such not recommended. Turning the leaf by hand gives a more satisfactory wither.

Wider troughs with more than 6' (1.82 m) are not recommended due to difficulties in handling green leaf during the operations of loading, loosening, turning and unloading. Such difficulties result in uneven withers and hence the quality of tea produced suffers.

Insurance regulations permit the installation of tube lights in lofts equipped with troughs. This is of great benefit.

All windows in the loft should be fitted with wire mesh or nylon netting to prevent birds entering. Insect traps too need to be fitted in the loft to prevent insect approaching the lights in the night.

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