Tea Bull. **10**(2), 03-08, 1990

SMOKE LEAK IN TEA DRYER HEATERS

S. Samarasingham

(Research Officer, Technology Division, Tea Research Institute of Sri Lanka, Talawakele, Sri Lanka)

INTRODUCTION

This article is written mainly for the benefit of the estates, which are having frequent smoke leak problems in the tea dryer heaters (also referred to as air heaters). The tea dryers that are presently used in Sri Lanka are fitted with indirect type dryer heaters and it is important that they are properly maintained and operated. The process of checking for smoke leaks in the dryer heaters and its repairs are specialized and tedious operations that are usually carried out by drier engineering firms.

Smoke Taints

Tea has the property to pick up taints. When smoke from a defective dryer heater is carried into the drying chamber by the main air-stream the tea absorbs the smoke taint. Noticeable smoke taints, or for that matter any form of taints, are factors that disqualify tea. The marketing potential of such teas are low.

There has been a noticeable increase in the incidents of smoke taints in teas from Upcountry estates after the switching over from dryer fuel to firewood. The source of smoke taint has been traced to the defective dryer heaters. If the tea factories had

correctly followed the instructions in the operation manuel of the dryer smoke, taints in the processed teas could have been avoided.

Tea estates are commercial ventures with the prime objective of earning maximum profits. Tainted tea will suffer in the competitive tea market. Hence utmost care should be taken to produce taint free teas to achieve profit targets.

Types of Dryer Heaters

In Sri Lankan tea factories two main types of dryer heaters are in use. They are the tubular and the tubeless dryer heaters. The tubeless dryer heaters came into use from about the 1970s.

The tubular types have two variations, the Sirocco and the CCC multi- tubular dryer heaters. But both types can be adopted for wood or liquid fuels. In the Sirocco type of multi-tubular dryer heaters the burnt gases are conducted through the tubes and evacuated through the chimney. In the CCC type multi-tubular dryer heaters , the burnt gases are conducted over the tubes and evacuated through the chimney. In the CCC type multi-tubular dryer heaters, the burnt gases are conducted over the tubes and evacuated through the chimney. Walker's driers are now not in use except in some small bought leaf factories. This dryer is fitted with a tubular dryer whose burnt gas evacuation system is identical to the CCC tubular dryer heater.

Tubeless types of drier heaters include the dual-fuel-heaters and the cylinderical types which are also referred to as the fin type worked on liquid fuel. The system of evacuation of burnt gases in the fin and the dual-fuel type dryer heaters is similar.

The oil fired heaters are easy to operate and the maintenance is also not difficult. In heaters fitted with low pressure burners a steady air temperature is achieved once the nozzle is set to produce the right flame. In heaters fitted with automatic burners a fairly steady air temperature is obtained with the aid of a thermostat. In the latter, the possibility of any rise in temperature to very high levels is eliminated.

The operation of dryer heaters utilizing fuelwood needs skill and attention and the efficiency of operation depends largely on the operator and the quality of firewood. Frequent smoke leak problems are encountered in fuelwood fired dryer heaters.

Causes for Dryer Heater Damage

Fuelwood dryer heaters need regular attention. Owing to a shortage of firewood as well as improper conditions of storage, firewood with a high percentage of moisture is sometimes used for the dryers leading to adverse effects. The products of combustion usually contain corrosive substances and these condense inside the dryer heater and damage the metal fuel gas passage, thus causing smoke leaks.

Incorrect operation of the furnace sometimes causes the metal plates and the tubes to crack. Further, after a period of usage the packings of the joints in the dryer heater too get loosened. It is through such damaged sections that smoke and burnt gases leak out.

In the CCC type tubular dryer heater the oval and round tubes in close proximity to the furnace are frequently damaged when firewood is rammed right up to the row of oval tubes over the furnace. Tubes which are steeped in hot flame get warped and damaged.

Methods for Checking Smoke Leaks

There are several methods available for detecting smoke leaks. Of these, smell, electric torch and candle methods are commonly employed which give satisfactory results. The whiting paint method is sometimes employed to locate the exact point of leak in the Sirocco type dryer heaters. There are also instruments for detecting smoke in the main air stream. The smoke detector instruments used at present by some engineering firms have not proved to be reliable instruments, because of their inability to detect very low concentrations of flue gases in the air stream. Even very low concentrations of flue gases have been known to cause taints.

In order to carry out tests for smoke leaks it is important that there is thorough cleaning of the dryer heaters. If the test has to be conducted on a tubular dryer heater, all tubes, front and back plates and arch (Sirocco dryer) should be cleaned with wire brushes. If it is a fin type dryer heater the inner surface of the cast iron shell, exhaust ports, and the exhaust gas manifold should be cleaned while if it is a dual-fuel-heater the inner surface of the cast iron casing over the furnace and the exhaust gas manifold should be cleaned.

1. Smell Method

Pile some brush-wood somewhat in the centre of the furnace and light them and once the flame catches on switch on the ID fan with the damper at the minimum open position. Once an adequate fire has formed place a small bundle of fresh tender branch clippings of the *Pinus* tree over the fire; this will produce an abundance of smoke. If the dryer heater under test is worked on fuelwood, the ash-pit and the furnace doors should be closed and all

openings including the area around the doors and the flue box lids should be covered with clay paste after which the ID fan should be switched off. Next those conducting the test should move into the drying room and open the inspection doors of the ECP drying chamber. If the drier is FBD the man-hole cover under the feed conveyor should be removed. The main fan should be now switched on with the damper sufficiently opened to allow a moderate flow of air. If there is a leak large enough to cause taints then the smell of the pine clippings could be detected.

2. Electric Torch Method

This method is quite useful but detecting minute leaks in the dryer heater is difficult. A torch could be employed to detect smoke leaks by the following methods depending mainly on the type of dryer heater. Among these, the general method is applicable to all dryer heaters.

a) General Method

The preparation procedure for testing smoke leaks is similar to the one used for the smell method. However, instead of trying to detect the smoke by smell, a torch beam is used to see whether there is smoke in the air-stream. In the case of an ECP dryer the beam is directed at the air-stream at the fan damper point while in the case of a FBD, the beam is directed inside the inlet air tunnel. If there is a smoke leak then the smoke can be seen in the torch beam.

b) Sirocco Tubular Dryer Heater

In this method, the light is shone on the tubes from the air intake openings, emergency cold air inlet openings and from the inspection door depending on the model. Initially, examine for smoke leaks with the main fan and the ID fan switched off. If no smoke is detected then it could be confirmed by examining with the main fan on.

3. Candle Method

This method is usually applied for tubeless dryer heaters, but it can be applied to CCC tubular dryer heaters and Sirocco dryer heater arches as well. In this method there is no need to fill the air heater with smoke. The dryer fan should be switched on with the fan damper fully open and a lighted candle is held at suspected points. If there is a crack or opening the flame of the candle will be drawn in due to the suction created by the dryer fan. The weak points are usually at the joints and bulges of tubes.

4. Whiting Paint Method

This method is usually applied in Sirocco tubular dryer heaters to locate the exact point of leak. Apply the whiting at the suspected places or points and fit back the covers of the dryer heater. Fill the dryer heater with smoke in a manner similar to that described under the smell method, but in this method any kind of fresh green leaves could be used to form the smoke. Switch on the main fan for a few minutes, remove the covers and carefully examine the points where the whiting was applied. If there is a leak, grey or black streaks or smudges caused by the exit of the smoke could be clearly seen at that point.

General Comments

It is to be noted that not only defective dryer heaters but also faulty operation techniques could cause smoke taints. In view of this, while cleaning the drying chamber, especially the inspection door glass panels, the dryer operator should keep an eye for smoke deposits.

Incorrect technique of cleaning the dryer heater too could lead to taints in teas.