AIR CONDITIONING IN TEA FACTORIES

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Rightly or wrongly, the idea that high temperatures in withering, rolling and fermenting are inimical to quality, is widely accepted amongst those engaged in the Ceylon Tea Industry. There is also a school of thought in Ceylon which extends this idea in practice by drying at much lower temperatures than the usual 190-200°F.

Since in tropical countries air conditioning is almost invariably associated with cooling, it is not surprising that it is becoming a matter of general interest in Ceylon.

In order to put matters quite clearly it should be pointed out that, strictly speaking, any change in temperature or humidity of the air brought about by artificial means constitutes air conditioning. The present method of tea manufacture is in fact largely dependent on air conditioning since artificial withering, rolling room humidification, and drying in the present form of tea drying machine all involve the conditioning of air. Air conditioning as a means of obtaining cool conditions will therefore only extend methods already in use and not involve radical changes in the principles of tea manufacture.

The purpose of this article is to discuss a more limited aspect of air conditioning confined almost entirely to cooling, and arises from a recent conference held at the Tea Research Institute at which two engineers with specialised knowledge and experience of air conditioning, two planters specially interested in the subject, the Director and the writer were able to discuss the subject from the point of view of the research work which is desirable in this field.

The scope of the article will be limited to generalities and will serve to indicate that this aspect of tea manufacture is receiving attention at St. Coombs.

Cool conditions of manufacture and their effect upon quality of tea have been the basis of two previous articles in *The Tea Quarterly*.

Hall and Dickson[1] put forward some impressive data relating to atmospheric conditions during manufacture and their influence on flavour and described their experiments with "cold withering."

Later Palmer[8] described experiments with the manufacture of low-grown leaf at higher elevations and *vice versâ*, in which the results were decidedly in favour of manufacture at the higher elevation.

A striking case of the apparent effect of cool conditions of manufacture occurred within our own experience through the initiative of Mr. Neville Rolfe who transported sufficient green leaf from the low-country to St. Coombs for manufacture on our experimental machinery. The leaf was carried in an open work basket on the back of a car and an equal amount of St. Coombs leaf was packed into a similar basket which was placed near the open doors of the bulking chamber; *both lots of leaf were* therefore subject to such conditions for the first five hours. When the low-country leaf arrived at St. Coombs both lots of leaf were spread for withering and thereafter manufactured under strictly comparable conditions.

Tasting opinion was unanimous that the manufacture of the low-country leaf at St. Coombs had produced a tea with up-country character and did not make any marked distinction between the two teas made from the two different batches of leaf. Comparison with teas made in the low-country from the same plucking revealed a marked change in character. This particular experiment has not been repeated but the results were so striking as to be worth mention.

These three cases were the only direct evidence available for discussion at the conference and, whilst appreciating the limitations of each case, we were struck by the fact that a common conclusion was reached by three different methods; as an eminent legal authority once pointed out, the value of circumstantial evidence increases in geometric progression. We agreed, therefore, that there appeared to be justifiable grounds for further discussion and opinion was unanimous to the effect that research into the relatively unexplored regions of low temperature conditions during manufacture was very desirable.

From the point of view of formulating research plans we had therefore to consider the stages of tea manufacture at which to experiment with air conditioning and these are best dealt with separately.

Obviously, withering is the first stage at which investigations are desirable.

The two engineers at the conference at once pointed out the cost which would be involved both in machinery and power for cooling and drying the large volume of air at present used in withering. If, however, a closed system were employed, that is to say,

reconditioning the air after use and recirculating, the scheme would be more feasible economically. A certain amount of fresh air could be admitted from time to time as desired.

Some time ago we built a small withering chamber in St. Coombs factory designed to run on the recirculation principle and to wither sufficient leaf to charge one of our experimental rollers. We found the difficulties with the air conditioning unit, which incidentally was made from an old domestic refrigerator, to be insuperable and subsequent long negotiations with certain air conditioning firms proved unfruitful. As a result of the conference, however, expert assistance with the mechanical problems was offered and very readily accepted.

After further discussion it was decided to obtain estimates for a suitable air conditioning unit to fit the chamber we have already built, in order to test the effects of a wide range or combinations of temperature and humidity conditions upon the withering process.

The next point for discussion was the application of cold air in rolling. Again it was pointed out that a closed system would be the only economic possibility for a commercial sized rolling room. Direct application of cold air into the rollers, and brine cooling of rollers, have already been tried on a commercial scale in Ceylon although we have not had the opportunity of testing these installations at St. Coombs. Bearing in mind that we were primarily interested in the investigation of general conditions we decided to obtain an estimate for another plant which would enable us to vary over a wide range the conditions in a cabinet built round one of our experimental rollers.

It is quite conceivable that a temperature low enough to inhibit entirely the fermentation which normally takes place during rolling would suffice in practice. In such a case fermentation could be controlled to a degree of exactness at present unattainable, and these conditions led us to the final point for discussion. namely fermentation.

A certain amount of heat is essential for the fermentation process and we decided that in the event of the installation for cold rolling becoming available the construction of a small fermentation cabinet in which a range of warm and humid conditions could be produced would not offer any great difficulties.

The engineers very kindly undertook to draw up the specifications for the installation which we had agreed upon and also to make representations to their principals on the subject of the cost of the experimental plant with a view to keeping this down as much as possible.

Those interested in tea manufacture in the low-country may be interested to know that we made tentative plans for tests with low-country leaf with which effects are likely to be the most marked. Such tests would be carried out in the low-country.

The meeting agreed however that technical experience of the plant should be gained at St. Coombs before embarking on more ambitious programmes.

Finally, attention must be drawn to the fact that even if certain low temperature conditions are found to be of marked benefit during certain stages of manufacture it does not follow that it will be *economic* to adopt them in practice and much will remain to be done on the problems involved.

If, however, we obtain complete data relating to low temperature effects, the commercial problems will be more clearly defined and the information will either encourage development of air conditioning or save waste of money on useless commercial installations.

Lastly, I wish to express my thanks to Messrs. H. Carlton, James Wilson, Neville Rolfe, and R. C. P. Adams for attending the conference.