CHANGE IN MOISTURE CONTENT OF FUEL SAMPLES IN SEALED AND UNSEALED TINS

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ABSTRACT

An experiment shows that the friction lids of sample tins may be sealed with contact tape to prevent moisture loss or gain.

The Fire Protection Section, Forestry Branch, Department of Northern Affairs and National Resources (1), in investigations of the relationship between the moisture content of fuel and weather conditions, collects a great many samples of forest fuels for moisture-content determinations. These may be gathered at the site of test fires, prescribed burn experiments, or actual forest fires. The fuels sampled include top- or full-layer duff, small twigs or branchlets, or full organic layer from the forest floor, ranging in moisture content from dry to dripping wet. The standard practice is to put the samples in ordinary pressed steel sample tins with tight-fitting friction covers. The samples are then brought to a field laboratory for moisture content determination. In many instances laboratory facilities are not close at hand and several days may elapse between the collection of a sample and determination of its moisture content.

An experiment was conducted at the fire research laboratory at the Petawawa Forest Experiment Station, Chalk River, Ontario, during 1958 to determine what change might take place in moisture content during a 10-day period, the maximum time samples might be in transit. Three large batches of top layer duff (red and white pine), western white pine match splints, and coarse mill sawdust were selected as specimen fuels. The latter two were chosen, instead of twigs or full organic layer, since they were naturally homogeneous and there would be less variation in the smaller samples selected from them than might be the case if only natural forest fuels were used.

Each batch of fuel was divided into four lots and conditioned to four moisture levels—dry, average, moist, and wet. New, dent-free numbered tins were used to hold replicate samples of each type of fuel at each moisture level. The containers were grouped for three different treatments: lids unsealed; lids sealed with cellulose tape; and lids sealed with a polyester film pressure sensitive tape². Grano (2) found the latter was more resistant to moisture than cellulose tape.

Half the tins of each type of lid treatment and of each fuel condition were left on a bench in the laboratory where the relative humidity remained comparatively constant between 45 and 65 per cent. The remainder were placed in a climate chamber cycled to simulate the changing temperature and relative humidity conditions that might be encountered in field practice—temperatures of 80° F to 90° F with 20 per cent to 40 per cent relative humidity for 12

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² "Scotch" Brand Polyester Tape, #850—3M Manufacturing Co.

hours, changing to temperatures of 32° F to 55° F with 90 per cent to 100 per cent relative humidity for the succeeding 12 hours.

The tins were weighed each day to determine the change in the gross weight of each sample. At the end of the test period, all samples were oven-dried, following standard procedures, to find the net weight of each sample, the tare weights of tins, and weight of tape where applicable. It was then possible to compute the moisture content of the various samples for any day during the experiment.

The value of sealing the tins with tape was quite evident. There was a negligible change in the moisture content of samples sealed with the polyester tape. There was some change in the cellulose-sealed samples but these showed much less variation than those in the unsealed tins. Expressed as a percentage of oven-dry sample weight, the polyester-sealed samples showed maximum average gains or losses of slightly less than 1 per cent; changes in the cellulose-sealed samples ranged between a 3 per cent gain and 2 per cent loss; and the unsealed samples gained up to 5 per cent and lost up to 14 per cent.

The advantage of sealing with the tape may be lost if it is not carefully applied. Wrinkles in the tape might permit passage of air into the tin. (Cellulose tape tends to stretch and wrinkle at high humidities). The best method of applying tape is to cut a length just long enough to go around the tin and leave about a 1-inch overlap at the ends. One end is pressed to the tin over the seam of the lid, held by thumb, and the free end pulled taut and wrapped around by rotating the tin. There is just enough stretch in the tape to permit a smooth seal.

Stocks of tape should be stored at a moderate relative humidity; if permitted to dry out it becomes brittle.

REFERENCES

1. BEALL, H. W. Research in the measurement of forest fire danger. Paper presented to Fifth British Empire Forestry Conference, 1947.
2. GRANO, C. X. A timesaving slide for trapping atmospheric pollen. *Forest Science*, Vol. 4, No. 1, March, 1958.