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Progress Report - W.P No. 24/77 - Retardent Durability.

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Aim

This working plan aimed at determining the effectiveness of a chemical retardent, namely Amguard Blended, on fuel flammability and fire behaviour. The study consisted of two parts;

a) to study the effect of the retardent on fire behaviour and fuel flammability once the water component was gone (Dry durability test).

b) to determine the amount of rainfall needed to effectively leach the retardent from the fuels.

Method

As per submitted working plan of the same number. The only exception being that Amguard Blended was the only retardent tested for rain durability.

Results

a) Dry Durability Test.

As would have been expected, "wet" retardent applied at approximately one litre/$m^2$ would not allow the ignition of needlebed fuels with fusees. Running fire, on hitting the wet retardent, was immediately extinguished. This was true for needlebed fuels varying from 4% moisture content (M.C.) to 15% M.C. (o.d.w.).

The following table summarises fire behaviour after the moisture component of the retardent was lost

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TABLE I HERE

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b) Wet Durability Test.

Rainfall (simulated using a herbicide sprayer) was applied to the amguard treated fuel bed after the amguard had dried off. The application rate of amguard varied a little but averaged 2L/$m^2$.

Figure I summarizes the results of some 15 test fires.

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FIGURE I HERE

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Discussion of Results

a) Dry durability.

There is no doubt that recently applied "wet" retardent does not allow easy ignition and does stop running fire - in the test-bed situation. The test-bed situation suggested that beyond 1l/$m^2$, the application rate was not important, all things being equal. That is, 1l/$m^2$ of retardent (phoscheck or

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amguard) had the same effect as 2.5l/$m^2$ of retardent. In the field, this may not be the case, especially when applied in the running fire situation. In this instance, the fire would be much hotter so the pre-heating effect would be greater.

As table 1 suggests, once the water component has evaporated from amguard blended, then the effect is to retard fire behaviour as opposed to extinguish it.

A number of interesting points arise out of Table 1. Firstly, the dry retardent, on average, reduces ROS by 30% and reduces flame height by 40%. Secondly, retardent treated fuels are up to 300% less inflammable than non treated fuels (based on the number of fusee matches to ignite the fuels). Thirdly, the deeper the needlebed, the less effective is the same application rate of retardent. The retardent becomes less effective in both reducing flammability and in reducing ROS's and flame heights. This is understandable as an application rate of 1l/$m^2$ is sufficient only to douse the top needles. When the lower needles ignite, they generate sufficient heat to ignite those needles covered with retardent. It must be stressed that this is what happens on the test bed for needlebeds of around 5 - 6cm in depth. These artificial needlebeds are not as compact as field needlebeds. Nor do they contain a profile of ageing needles and moisture contents.

b) Wet durability.

From Figure 1, a rough trend is evident. With increasing rainfall, the gap between treatment ROS and control ROS decreases. After approximately 3.0mm of rainfall, the retardent appeared to be non effective, presumably it had been, for the most part, leached out. Flame heights were similarly effected. Again it must be remembered that these figures are for laboratory type conditions and are not necessarily field results.

Conclusion

The retardent Amguard Blended is very effective in retarding ROS and reducing the flame heights of pine needlebed fires. It is also effective in reducing considerably, the flammability of pine needlebed, especially when applied at or in excess of 1l/$m^2$ (mixed according to job specifications manual). When the moisture component of the retardent has evaporated, its overall effect on reducing flame height and ROS is lessened. Even in the dry state, the retardent will reduce ROS's and flame heights by up to 40% and reduce the flammability of fuels at a moisture content of 10% to equivalent flammability of fuels at 15-20% M.C.

However, Amguard Blended is extremely soluble and is leached from fuels by as little as 3.0mm of effective rain (as opposed to canopy intercepted rainfall).

This study would be very incomplete without further field testing to add weight or otherwise, to observations to date.

TABLE 1

| | ROS (m/h) | MC% | $\bar{x}$ flame ht. (m) | Application rate ($l/m^2$) | Flammability (No. of fussees | Needle bed depth (cm) |
|---|---|---|---|---|---|---|
| A* | 5.4 | 10.0 | .2 | 2.4 | 3 | 3 |
| CC* | 12.2 | 10.4 | .8 | - | 1 | - |
| A | 8.4 | 10.1 | .3 | 0.7 | 3 | 3 |
| C | 14.0 | 10.1 | .7 | - | 1 | - |
| A | 4.2 | 14.3 | .1 | 1.4 | 4 | 3 |
| C | 11.1 | 13.5 | .6 | - | 1 | - |
| A | 12.6 | 10.2 | .7 | 1.7 | 1 | 6 |
| C | 14.4 | 10.0 | .9 | - | 1 | - |
| A | 8.8 | 10.1 | .4 | 2.7 | 1 | 6 |
| C | 12.7 | 10.8 | .8 | - | 1 | - |
| A | 7.7 | 10.1 | .4 | 1.6 | 2 | 3 |
| C | 13.5 | 10.8 | .7 | - | 1 | - |
| A | 12.6 | 10.5 | .8 | 1.2 | 1 | 6 |
| C | 13.4 | 11.0 | .9 | - | 1 | - |
| A | 9.7 | 11.6 | .5 | 1.0 | 1 | 6 |
| C | 12.2 | 12.2 | .7 | - | 1 | |
| A | 7.5 | 10. | . | 3.0 | 1 | 6 |
| C | 12.6 | 10.4 | .9 | - | 1 | - |
| A | 4.6 | 10.8 | .2 | 2.8 | 3 | 3 |
| C | 12.8 | 11.1 | .8 | - | 1 | - |

*A = Amguard

*C = Control