Technical Notes

A belt cleaner for small samples of tree seed¹

G. B. HERGERT

Engineering Research Service
Canada Agriculture, Ottawa

B. S. P. WANG and
C. W. YEATMAN

Canadian Forestry Service
Chalk River, Ontario

Following extraction from the cones, conifer tree seeds require cleaning to remove seed wings, empty seed, twigs, cone scales, needles, pieces of resin and other foreign material. Most debris can be removed from the seed by combinations of screens and air blast but spruce needles, specks of resin and other objects of similar diameter and density to the seed are difficult to remove by conventional means. The Ontario Department of Lands and Forests developed a 'Needler' with a moving canvas belt for removing irregular-shaped objects. The cleaner described here employs the moving belt principle, but also includes controls and adjustments designed specifically to permit cleaning of small seedlots of various tree species for research purposes.

Description

The main component of the cleaner (Fig. 1) is a 10 cm wide canvas belt (A) running on rollers (B) 60 cm apart. The frame (C) on which the belt rollers are attached is free to pivot on the main frame (D) and is fixed in

place by a locking device (E) operating in a long curved slot. Inclination is infinitely variable between 25° and 50° from the horizontal. The belt is 14 oz. cotton canvas and is hemmed and sewn together. Belts of other materials can easily be made. A sheet metal trough (F) is placed under the belt to raise the edges of the belt to keep seeds rolling off, and a scraper (G) is attached on the return side of the belt near the top roller to remove any particles sticking to the canvas. The cleaning belt is driven by a 1/50th horsepower d-c motor (H) with

30:1 ratio gear box controlled by a solid state motor controller² (J) providing infinite speed range from 6 to 58 rpm and a belt speed from 2.9 to 28 cm per second.

Seed is metered onto the belt by a vibrator feeder³ (K) with a special feeding tray (L). Seed is fed evenly across the belt and dropped a minimum distance to

²Bodine Motor NSH, 12R 30:1, Minarik control SH-14. Minarik Electric Co., 224 East Third Street, Los Angeles, California 90013.

³Syntron Vibra Feeder. F.00 Type, Syntron (Canada) Ltd., 930 Queenston Rd., Stoney Creek, Ont.

Fig. 1. The inclined belt cleaner: A) the belt, B) rollers, C) belt roller frame, D) main frame, E) adjusting nut and slot, F) belt trough, G) scraper, H) motor, J) motor controller, K) vibrator, L) vibrator tray.

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prevent seed and debris bouncing and rolling down the incline. An adjustable gate in the trough controls the feed rate.

Performance

Five seedlots each of white, red, blue, black and Sitka spruce (*Picea glauca* (Moench) Voss, *P. rubens* Sarg., *P. pungens* Engelm., *P. mariana* (Mill.) B.S.P., and *P. sitchensis* (Bong.) Carr.) were tested for efficiency of removing various foreign matter. The cleaner removed needles, pieces of cone scales, flat-shaped resin and twigs from these seeds effectively at angles of 28-35° and at belt speeds of 10-24 cm per second depending upon the size of seed. Each complete cleaning cycle for 10g of seed required between 3 and 5 minutes. However,

the cleaning efficiency decreased with incompleteness of de-wing-ing. Frequently a seedlot required three or four cleaning cycles to reach the clean stage. For black spruce seed the test result was poor because of the small size of the seed and the coarse texture of the canvas belt. In this case, a finer-textured canvas belt would solve the problem.

Conclusion

The belt type needle cleaner described here is effective in removing extraneous materials from small samples of tree seeds. Cleaning of any types of seeds where irregular-shaped objects must be removed from round or nearly round seeds could be carried out on this cleaner but may require a different texture for the

belt material. The open construction of the machine facilitates rapid inspection and cleaning to ensure that stray seeds from different seedlots are not mixed in successive cleaning operations. Cleaning then becomes a continuous operation and the apparatus is well suited to the preparation of laboratory samples.

Appareil à nettoyer les petits échantillons de graines d'arbre

Un appareil à nettoyer les petits échantillons de graines d'arbre est décrit. Les graines tombant sur une courroie inclinée à vitesse variable sont entraînées vers le haut alors que les débris glissent vers le bas. La marche de l'appareil est démontrée en utilisant les graines d'épinette noire.

Simulation of growth, yield and management of aspen

A semi-stochastic model was developed to simulate tree growth and stand yield information required for managing aspen (*Populus tremuloides* (Michx.)). The model is based upon new approaches for evaluating inter-tree competition effects, representing actual tree spatial arrangement, defining interactions between increments of height and dbh and competition measures, and representing random components of variation in tree growth and mortality.

In building the model, components of tree growth and mortality were identified and described mathematically or represented directly in the computer. Inter-tree competition, the most important component in the model, was extensively studied. The maximum zone of influence of a tree was derived from estimates of fully open grown crown width. A new hypothesis was advanced and mathematically expressed to describe competition effects on tree growth by exponential terms of ratios based on relative tree size.

I. E. BELLA

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Faculty of Forestry
University of British Columbia
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The model simulates height increments as if each tree was dominant or open-growing. The rate of height growth is a function of site quality. Simulated "potential" height increment is reduced, according to the tree's competitive status, to obtain height increment. Diameter at breast height increment is based on data from open grown aspen, then reduced in proportion to tree competition. Reductions from the maximum rate of growth are based on tree growth and mortality expected in normal aspen stands.

In the model, mortality is directly related to the tree's competitive status and inversely to its current increment, including random variation, in relation to a specified threshold value.

The model was calibrated with data from a normal stand growing on an above average aspen site in Saskatchewan. Input data were from a suitable permanent sample plot having fairly uniform clonal structure. After a few calibration runs and model refinements, simulated stand growth statistics

showed satisfactory correspondence with actual growth on the permanent sample plot, and with comparable yield table statistics. Simulations were made also for normal stands growing on poor sites and on the best sites in the same region. The model was generally satisfactory and could replace normal yield tables. After certain extensions, the revised model also simulated growth and development of initially open stands reasonably well.

The model also was used to simulate aspen stand growth and productivity in terms of tree component dry matter weights for normal stands on average sites with weight regressions determined in an associated study. For maximum production of wood fibre, the optimum rotation was 33 years for either volume or weight.

Although tested only for pure aspen stands, the model can be modified for use with other species. With further refinement, it may be possible also to simulate the growth of mixed stands and unevenaged stands.