ENGINEERING THE CONTAINER -- Panel Discussion

First of Nine Papers

TAR PAPER CONTAINERS 1/

Marvin D, Strachan 2/

Abstract -- Since the mid 1930's tar paper has been used as a potting container because of its ability to maintain itself during a first year root establishment period but will decay after one year in the soil. Tar paper is inexpensive and lends itself to machine operation but the labor involved in handling and forming the pots make it only competitive with plastics and other containers.

Nurserymen and soil conservationists in the Great Plains area have experimented with containerized seedling trees since the early 1930's. With the advent of the Great Plains Forestry Project (Perry 1942) and the subsequent demand for millions of seedlings throughout the plains, it was evident that the harsh climatic and soil conditions were not conducive to initial tree survival (Munns & Stoeckler 1946), especially bare root conifers.

As early as 1935 the Soil Conservation Service nursery at Albuquerque, New Mexico was potting trees on a bench type potting operation with a 6 man crew potting 2400 trees per day in 21/2" x 21/2" x 9" tar paper pots. Most of the potting was done between 1950 and 1955 at Albuquerque (Downs 1954). The Soil Conservation Service at Marietta, Kansas potted trees in tar paper pots in the early 1950's.

Between 1935 and 1955 the Agricultural Research Stations at Woodward, Oklahoma and Mandan, North Dakota were experimenting with various types of potting materials and containers (Johnson 1955) (Johnson & Vanderslice 1956). The Colorado Game, Fish and Parks Department nursery potted trees between 1954 and 1958 patterned after the experience in Kansas and New Mexico. Many types and shapes of pots were experimented with in the early years. Materials such as aluminum foil, metal beer cans, tar paper and waterproof Kraft paper were used.

Asphalt impregnated roofing felt, better known as tar paper, seemed to be the material most universally used by the nurserymen between 1930 and 1970 in the Great Plains States. Several reasons are apparent for selection of tar paper as a material for making pots.

1. Tar paper is readily available in most hardware or building material outlets or through the General Services Administration.
2. Fifteen (15) pound tar paper is available in 432 sq. ft. rolls - 36 inches wide x 144 feet long.
3. Tar paper can be cut, sliced, folded, stapled, creased or formed into a number of shapes such as a cylinder or square pot. Machines can be built to use pre-cut tar paper to make and fill pots.
4. Repels moisture or retains moisture within the cavity.
5. Will hold its structure and form during one growing season. It disintegrates after one growing season in the ground.
6. Tree seedling roots will penetrate through the tar paper pot during the first growing season and continue growth thereafter.
7. The choice of potting mix has no effect on the tar paper.
8. Tar paper lends itself to construction of a rather large container that retains its shape and form for one growing season.

The last advantage (No. 8) of the tar paper pot deserves further explanation. Seedlings planted on agricultural land in the Rocky Mountains and high plains areas need to be of rather large size. Conifers should be six to twelve inches in topheight with not more than a 2 to 1 top-root ratio by weight. Caliper should not be less than 6/32 inches. To accommodate seedlings of this size, a root cavity of not less than 30 cubic inches is required to maintain the top-root ratio. Tar

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2/ Nursery Manager, Colorado State Forest Service, Foothills Campus, Fort Collins, Colorado, 80523

paper, because of its composition and ease in handling, lends itself to construction of the large pot.

In 1957 the Colorado State Forest Service began development of its nursery at Fort Collins and also began development of a mechanical tree potting machine. The first system was discarded after two years of use (Shaw 1963). This system was too slow, too noisy and too dangerous. It included 3 molds on a circular conveyor and a hydraulic press. In 1964 another system was installed for potting 2-0 field grown seedlings in 2" x 2" x 7" pots. Each machine (figure 1) operates on an endless chain driven by an electric motor. The six steps require 6 persons to operate the machine. Step 1 - a 71/4" x 81/2" tar paper is inserted in one of the molds. Step 2 - the mold is half filled with potting mix. Step 3 - the seedling tree is properly positioned in the mold. Step 4 - the mold is completely filled with potting mix. Step 5 - after the mold is compressed mechanically, the tar paper flaps are stapled to form a square tube. Step 6 - the completed pot is removed from the machine. Three thousand seedlings per day - per six person crew - can be potted on each of these machines.

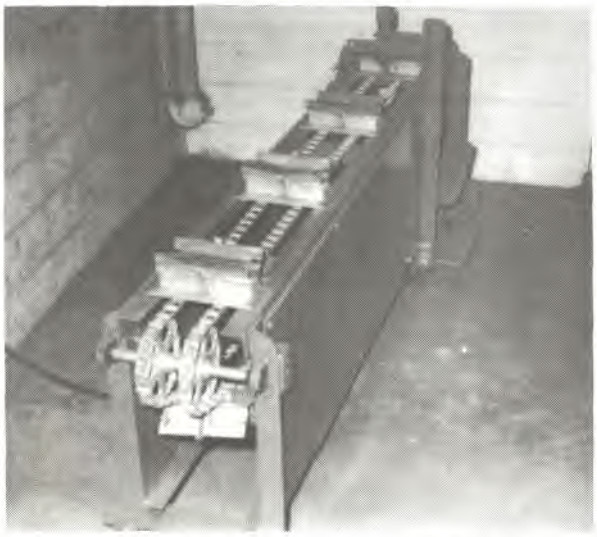

Figure 1.--Machine with endless chain, driven by electric motor, used for potting seedlings.

The same process can be used to form and fill pots for stocking the greenhouse with the elimination of step 3.

The cost of the 2-0 tar paper potted seedling can be determined best by computing costs for potting 9000 seedlings - one day's production. Supplies including the tar paper, peat, soil and decayed sawdust potting mix, staples, labor, utilities, amortization of equipment and administration come to $505 per day per 9000 pots or .055 cents per pot. If a 2-0 conifer is to be placed in the pot during the potting operation, which might cost at the rate of $50 per M, then the potted tree would cost 10.5 cents per pot.

A tar paper pot filled with potting mix and ready to seed in the greenhouse would thus cost 5.5 cents each. A comparable polyethylene pot which can be purchased would cost 7 cents filled with potting mix and ready to seed in the greenhouse. This includes all supplies, labor, utilities and administration and computed on a basis of 50,000 pots.

Tar paper pots have a few disadvantages:

1. Becomes brittle and tends to break in temperatures below 32 degrees F.
2. The roots grow through the tar paper and into adjacent pots which prohibits the potted tree, together with the potting mixture, to be removed from the pot before planting. Roots which go through the side of the pot are lost when the pot is moved.
3. The tar paper pot restricts soil moisture from entering into the root zone during rainfall or irrigation when field planted.

Even though the tar paper pot has been very successful in the Rocky Mountains and Plains states for over 40 years, the polyethylene pot will probably replace it. The costs are very comparable and the initial survival of field planted trees are comparable. However, the amount of labor required to make tar paper pots will give way to the ease of handling polyethylene or other manufactured pots.

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