RECYCLING BRUSH AND LOGS[1]

by Richard W. Boers

Introductory statement. This paper is intended to review the experiences of the City of Toledo, Ohio in setting up and operating a brush and log recycling facility.

History. Up until 1971 the City of Toledo Forestry Division disposed of most logs and brush through open burning. Some by-products were used such as brush chips for mulching in the tree planting program or as a surface for playground equipment areas in city parks. Attempts were also made to utilize some of the other by-products of the removal operation but re-use was a small percentage of the total volume of material.

On January 1, 1971 a new Ohio state law and local pollution control regulations went into effect that prohibited open burning. This new law coupled with a severe shortage of landfill space in the City of Toledo at that time meant that we had to undertake a salvage-type operation for materials generated through the process of tree maintenance and removal.

The problem was more far-reaching than just what was generated by our division. Other city divisions including parks, ditch maintenance, and streets (Christmas tree disposal) were also prohibited from dumping in City landfills. Private landfill operators refused to take tree debris from private tree removal contractors also.

Proposed facilities. Several months were spent by Forestry personnel investigating equipment that might be in production that could be utilized in a salvage or recycling operation. The very nature of Forestry operations, that of removal of dead or diseased material and undesirable trees, would indicate that the majority of the logs could be processed into only the crudest of end products. Because of the relatively small number of quality logs it would not have been economical to install a sawmill type of operation. We felt, however, that even these less desirable materials had a definite useful salvage value. That they were burned in the past was due to expediency because of costly processing operations. It was somewhat ironic that an agency boasting of the values of planting trees to reduce air pollution and visual pollution was directly contributing to that pollution at its burning site.

Equipment, capital cost, and personnel. After our initial investigation a brush and log recycling operation was proposed as follows:

Equipment	
1½ Ton Dump Truck	$ 4,000.
Power Saws (3)	800.
2-Man Saws (2)	1,000.
Front-end Loader Tractor	8,000.
Log Splitter	4,000.
Log Chipper — Morbark Metro Chipharvestor	87,033.
Sub-Total	$104,833
Capital Improvements	
Building-Operations Center, Equipment Storage, Office	$76,200.
Fencing and Site Improvements	8,000.
Sub-Total	$84,200.
Personnel	
Foreman — Forestry (1)	$12,776.
Heavy Equipment Operator (1)	11,654.
Tree Serviceman 1 (2)	20,908.
Sub-Total	$45,338.
Total Cost of Proposal	$234,371

This proposal was presented to the Council of the City of Toledo which subsequently approved the package and authorized the expenditure of the funds.

Annual operation. Annual operating funds predicted for the facility amounted to $56,940. It was fully anticipated at this stage that the facility would be self-supporting. Plans called for establishing a processing charge for users of the facility at $1.00/cubic yard of brush and logs and various prices for re-sale of recycled end-products.

The end-products anticipated included:

Brush Wood Chops. Chips would be used as a mulch for tree planting and landscaping operations, as well as a surface in playground areas of public parks. Sales were expected to private homeowners and nursery contractors for the same purposes.

[1]Presented at the International Shade Tree Conference in Detroit, Michigan in August 1975.

Log Wood Chips. Initial investigations had indicated a potential market for log chips from area paper companies.

Firewood. Available for sale to the general public.

Fencing and pavers. Available on demand.

Solid Logs. For use as playground equipment, sales to sawmills, etc. The facility officially opened for general use in May of 1971.

Figure 1. The log splitter operated by Ray Hutchinson at the Brush and Log Facility of The City of Toledo, Ohio.

Analysis of operation — success or failure? After four years of operation the City of Toledo has made many revisions of the facility and of its expectations. Perhaps the best way to deal with these changes is to list them, recognizing that all were made after extensive evaluation of the operation.

1. Addition of one additional employee (Tree Serviceman 2 — Cashier).

The scope of the operation indicated the need for an employee to operate a cash-register for collection of processing fees, to record charge account fees (available to private contractors and other City Divisions) and to handle cash sales of by-products.

2. Addition of *Bryant-Poff* Brush Shredder ($56,990.) and Morbark Heavy Duty Log Splitter ($9,680.).

Because the facility was open to the general public the Division received a great amount of "yard debris." It is difficult to police adequately the vast amounts of material that were entering the gates. Obvious violators of the rule, Brush and Logs Only, were rejected (with subsequent complaints to City Councilmen, etc.), but many loads with hidden foreign material did come in to the facility. The Metro-Chipharvestor proved to be an excellent machine for processing when the majority of the material was clean brush and logs. When fed with a diet of 75% brush which included grass clippings, leaves, wire, beer cans, basketball goal posts, and the like, we were experiencing a great amount of costly down time. Blade sharpening costs were approaching $5,000 to $6,000 per year and brush, logs, and general debris were beginning to engulf the facility. Investigation led to the purchase of a Bryant-Poff shredder for processing of brush material. We have found this machine to be moderately successful, producing a straw-like chip that is extremely popular for mulching pur-

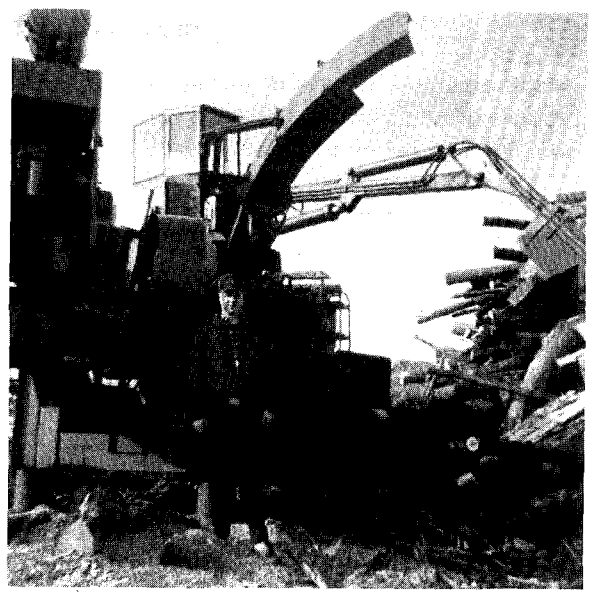

Figure 2. The Morbark Chipharvestor operated by Robert Tinnell of The City of Toledo, Ohio.

poses. We have found, however, that the machine does not process sledge hammers and goal posts either. After one-year in operation we are currently spending $10,000 for machine modifications. In addition $15,000 is anticipated for overhaul and modifications to the Morbark Chipharvestor.

3. Operating Costs vs. Revenues.

The original "bright" picture of revenues picking up all operating costs has changed drastically — for many reasons. Perhaps the most important reason has been the complexity of running the operation. With the volume of material, much of it undesirable, along with a high percentage of down time with equipment necessitating a high percentage of time spent on equipment repair, very little time can be spent on production of highly saleable products or in adequately packaging saleable end products. Expectations of large volume sales of wood chips to paper companies did not materialize because shipping costs were greater than profits. Some sales in tonnage were made to a roofing material manufacturer in the area but we had difficulty in guaranteeing delivery due to down time.

The home and nursery market still holds a high potential but again many obstacles must be overcome. Nurserymen will not be ready buyers as long as private tree companies give their chips away free.

Homeowners demand either a packaged product or home delivery. We experimented with bulk delivery but were too successful. Demands for the service exceeded our capacity to provide it as the personnel required were needed on the job. Some investigation is being made into subcontracting delivery.

We recently investigated small volume bagging of the material and found we had a highly saleable material. This method will be utilized more extensively in the future.

Firewood has had a tremendous sales appeal — but again the problem of insufficient personnel to produce the product has reduced the volume of revenue from that source.

Revenues from other City divisions, most importantly the Solid Waste Division, were reduced significantly when the City of Toledo adopted a weekly unlimited pick-up program for refuse. Loss of processing charges of Christmas trees, which had previously been a separate pick-up by the City, was a reduction of $6,000 annually in income. The homeowner may now also put all yard debris at the curb for City pick-up.

The table below indicates the annual operating costs vs. revenues for the period 1971-1975.

Year	Operating Expenses (does not include capital outlay)	Revenues
1971 (9 months)	$41,618	$15,143
1972	$65,828	$36,480
1973	$84,591	$36,870
1974	$91,668	$32,720
1975 (6 months)	$49,845	$14,815

Summary and future plans. It should be pointed out that while numerous problems have been experienced in establishing a brush and log recycling facility, we cannot forget the important environmental benefits of such a facility. Most problems were as a result of attempting to solve a problem "overnight" for which there was inadequate research information available. We have learned a great deal in Toledo and there remains a great deal more to investigate before a total package is available to every community that will solve this problem.

The City of Toledo has recently opened a new 250 acre sanitary landfill. Discussions are currently underway between the Division of Forestry and the Division of Solid Waste to determine the advisability of moving our recycling operation to that site to assist in elimination of the problem of the homeowner's mixed load. This could potentially eliminate many costly machine repairs as well as to allow for more efficient use of personnel.

Investigatory sessions are also being held with the Toledo Metropolitan Area Council of Governments which is establishing a Regional Solid Waste Authority and recommending the construction of a Recycling Operation in this landfill site. The main end product would be turning refuse into fuel and the equipment could accommodate reasonable quantities of brush, thus continuing the recycling of this material. Market demands would determine what quantities would be processed into wood chips. Logs would continue to be processed as at present.

It is estimated that the existing facility saved approximately two (2) acres of landfill space an-

nually, at a time when such space was physically unavailable in Toledo. Even though such space is now available it would be environmentally unconscionable for us to recommend a 100% return to that method. In many cities this is, in fact, a physical impossibility. We feel very strongly that the profession that sells its main product on the basis of its environmental benefits must be the leader in eliminating any aspect of pollution from its operations.

We know our by-products are useable; it is our challenge to devise the most efficient and economical method possible to assure that use.

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ABSTRACTS

Crist, Carey R. and D.F. Schoenweiss. 1975. **The influence of controlled stresses on susceptibility of European white birch stems to attack by Botryosphaeria dothidea.** Phytopathology 65(4): 369-373.

European white birch, *Betula alba* L., is a popular tree species for landscape plantings in Illinois. In recent years, however, extensive damage due to stem cankers has appeared on this species in the central and southern portions of the state. Seedlings of *Betula alba* inoculated with *Botryosphaeria dothidea* were exposed to controlled water stress, freezing stress, and defoliation stress. Susceptibility to canker formation, and to colonization of wood and bark by the pathogen, increased with decreasing water potentials, beginning at approximately the -12 bar level as measured by the pressure bomb method. Disease susceptibility induced by water stress was reversible; the rate of canker expansion declined and callus tissue formed at canker margins after seedling turgidity was restored by watering. Canker formation and bark colonization occurred following exposure of partially cold-hardened seedlings to a rapid drop in ambient air temperature from 5 C to -30 C. The extent of colonization of wood increased proportionally with exposure to minimum temperatures of -10 C, -20 C, and -30 C, respectively. Susceptibility of seedlings in a more advanced stage of cold hardiness was not affected by freezing in these tests. Canker formation, and colonization of bark and wood, occurred following 4 weeks of exposure of inoculated seedlings to defoliation stress, and increased with length of exposure. Wounding was found to be a prerequisite for invasion of stems by the pathogen in seedlings exposed to defoliation stress.

Anonymous. 1975. **Do antitranspirants improve transplant success?** Weeds, Trees, and Turf 14(10): 39-40.

Nurserymen didn't write the last word on transplanting when they developed balling and burlapping tree roots. T.T. Kozlowski, University of Wisconsin forestry researcher and some associates have just concluded research that reinforces common transplant practices in some cases but bursts other common transplant beliefs. "Trees undergo large water deficits even if they are not moved," explains Kozlowski. "But if they are moved . . . the danger of desiccation (drying out) and death is very great." Transplanted trees have a better chance to survive and maintain healthy growth if transpiration can be reduced, water absorption increased, or both. Water absorption can be improved by proper transplant timing, handling, root preparation, and site preparation. Transpiration can be reduced through antitranspirants, chemical agents that hinder water release by treating the stomata of the leaves. These treatments reduce the tree's water needs by limiting water loss during the stressful transplant period.