Manufacturing Densified Wood and Bark Fuels

Rapidly rising costs of conventional fuels have caused a renewed interest throughout the United States in the use of wood and bark residues for fuel. Many segments of the wood products industry, as well as other potential industrial users, and even homeowners are investigating the economies of wood fuels.

The wood products industry has long relied on bulk wood and bark residues (called hogged fuel) to help supply energy needs. Recent interest has focused on the densified form of these residues. Such densified products include the old familiar fuel logs, stoker fuel briquettes, and pelletized residues. It appears that these densified forms of renewable energy may be on the threshold of rediscovered popularity for industrial, commercial, and home heating applications.

Briquettes have been formed from sawdust, shavings, bark, and other renewable wood residues for the past 75 years. The U.S. Forest Products Laboratory publication R842 "Briquetting of Wood Waste" when written in 1945 indicated that wood densification operations had been conducted in the United States for at least 40 years. Several references they cite were written in the 1920's.

Densified wood or "wood briquettes" are defined in the textbook Forest Products as sawdust, shavings, and hogged wood residue compressed together without the aid of a binder for use as fuel. There are three types of wood briquettes; they are fuel logs, stoker fuel, and fuel pellets.

Fuel Logs. These are usually extruded in the form of a cylinder 2 1/2- to 4-inches in diameter and a foot or more in length. Typical of such products are the "Pres-to-logs" which originated about 1933. Although the company manufacturing the "Pres-to-log" machines (Wood Briquets, Inc., at Lewiston, Idaho) is no longer making new machines, many are still operating. Similar products are made by the Swiss-made "Glomera" or "Hausmann" briquettor and a Japanese-made extruding machine. Fuel logs are suitable for hand firing in fireplaces or stoves capable of using chunk fuel, but are not adaptable to stoker firing. A description of the process and equipment used to produce "Pres-to-logs" may be found in references 11, 16, 17, and 18, listed at the end of this paper. For a description of the Swiss-made machines, see references 13, 16, 17, and 18. Japanese-made log extrusion machines are discussed in reference 11.

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Stoker Fuel. Prior to 1950, the manufacturers of "Pres-to-log" machines developed a machine capable of continuously extruding eight 1-inch diameter rods of compacted wood residues. These rods were then cut to 1 to 2 inches in length and were capable of being fed through a standard coal stoker. An extensive study on stoker fuel including production, combustion, stoker firing, and a detailed cost analysis was conducted by Garland in 1950.

Another machine capable of extruding stoker fuel was constructed by Letts. His machines had either 8 or 16 forming tubes 1 1/8-inches in diameter. The "Glomera" or "Hausmann" machines also could be modified to produce stoker fuel. California Pellet Mill Company makes an extrusion machine called a "C.B. Cuber" which extrudes 2-inch squares of compacted material probably capable of being stoker fired. For more information concerning stoker fuels, see references 9, 11, 14, 16, 17, and 18 at the end of the paper.

Fuel Pellets. The third type of densified wood and bark fuel can be made using standard pellet mills originally designed to pelletize agricultural materials. The earliest known use of pelleted bark for fuel was reported by Sprout, Waldron and Company in July, 1961, and a complete description of the process including flow diagrams is contained in reference 1. Oak bark pellets 1/2-inch in diameter by 1-inch long replaced coal in an industrial boiler in Tennessee.

The Forest Research Laboratory at Oregon State University initiated research on pelleted bark and wood residues in 1967, and later, the project was funded by a grant from the Environmental Protection Agency. About 200 pelleting trials were made using bark or bark plus wood as raw material. A total of 16 species of bark plus numerous mixtures of species were formed into pellets 1/8- to 1/2-inch in diameter. Bulk density was increased by a factor of 2.0 to 3.8, and fuel trials were made in stoves and fireplaces.

Pelleting of bark for fuel purposes were also done by Steffensen, who describes the production process, its economics, and fuel values of the resulting pellets. See reference 20.

A list of known present manufacturers of wood and bark residue densification machines is appended to this leaflet.

Detailed information on fuel values of wood and bark as reported by Corder is available by contacting the Forest Research Laboratory, Oregon State University. Mingle and Boubel have also reported the proximate fuel analysis for several western wood and bark species.

As prices of conventional fuels continue to rise, there will be increased interest in bulk and densified wood and bark residues.

Manufacturers of Machines for Densifying Wood Residues

Company	Represents	Machine Type
Agnew Environmental Products P. O. Box 1168 Grants Pass, Oregon 97526	Fred Hausmann Briquettor	Extruder
The Bonnet Company 805 Lake Street Kent, Ohio 44240	Bonnet Lumberjack Extruders	Wood residue plus wax extruder
Briquettor Systems, Inc. P. O. Box 477 Reedsport, Oregon 97467	-----	Extruder
Canadian Car (Pacific) Box 4200 Vancouver, B. C. V6B 3Z6 CANADA	B. C. Research Council Fuel Log Process	Extruder
California Pellet Mill Co. 1800 Fulsom Street San Francisco, California 94013	-----	Extruder Pellet mills
Reydco Machinery Company P. O. Box 3545 Redding, California 96601	Wood Waste Extruder	Extruder
Sprout-Waldron Division Koppers Company Muncy, Pennsylvania 17756	-----	Pellet mills
Taiga Industries, Inc. 11120 Roselle Street San Diego, California 92121	Mod-log	Extruder

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Listing manufacturers does not constitute a recommendation of the equipment. This is a list of the known manufacturers at time of printing.

Additional information regarding densified fuel pellets can be found in references 1, 3, 4, 5, 6, 7, 8, 10, 12, 19, and 20.

Recommended Reading on
Densified Wood and Bark Fuels

1. Anonymous. 1961. Bark Pelleting . . . A New Solution to an Old Problem. Better Fibers, July 1961. Sprout, Waldron & Co., Inc., Muncy, Pennsylvania. 4 pp.

2. Anonymous. 1945. Briquetting of Wood Waste. USDA Forest Service, Forest Products Laboratory Report No. R842 (revised). 6 pp.

3. Corder, S. E. 1976. Properties and Uses of Bark as an Energy Source. Research Paper 31, Forest Research Laboratory, Oregon State University, Corvallis. 21 pp.

4. Corder, S. E. 1973. Wood and Bark as Fuel. Research Bulletin 14, Forest Research Laboratory, Oregon State University, Corvallis. 28 pp.

5. Currier, R. A. 1972. An Assessment of Current Bark Utilization Opportunities. 27th Proceedings, Northwest Wood Products Clinic. pp. 27-31.

6. Currier, R. A. 1971. Physical Considerations. Proceedings, Conference on "Converting Bark into Opportunities". Oregon State University, Corvallis. pp. 15-17.

7. Currier, R. A. and M. L. Laver. 1972. Utilization of Bark Waste. P B 221 876. National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22151. pp. 1-3, 7-11, 157-161.

8. Currier, R. A. and W. F. Lehmann. 1971. Bark as an Ingredient in Molded Items, Particleboards, Adhesives, and Other Products. Proceedings, Conference on "Converting Bark into Opportunities". Oregon State University, Corvallis. pp. 85-87.

9. Garland, H. 1950. Possibilities for the Production of Wood Briquette Stoker Fuel in Northern Michigan. Forest Products Research Division. Michigan College of Mining and Technology, Houghton, Michigan. 22 pp.

10. Gillie, J. 1977. New Fuel Tested at WSH Gives Officials Warm Glow. Tacoma, Washington. "The News Tribune", February 3, pp. B-2.

11. Hall, J. A. 1971. Utilization of Douglas-fir Bark. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. 138 pp.

12. Harkin, J. M. and J. W. Rowe. 1969. Bark and Its Possible Uses. USDA Forest Service, Forest Products Laboratory Report FPL-091. 41 pp.

13. Hausmann, F. 1974. Briquetting Wood Waste by the Hausmann Method. Modern Sawmilling Techniques, Volume 3:72-91. Proceedings of the Third Sawmill Clinic, Portland, Oregon, February 1974. Miller Freeman Publications, Inc., San Francisco, California.

14. Letts, W. W. 1951. Briquets from Sawdust, Bark, and Other Wastes. Proc. Forest Products Research Society, 5:202-203.

15. Mingle, J. G. and R. W. Boubel. 1968. Proximate Fuel Analysis of Some Western Wood and Bark. Wood Science 1(1):29-36.

16. Panshin, et al. 1962. Forest Products. Second Edition, 288-294. McGraw-Hill Book Co., New York, NY.

17. Reineke, L. H. 1964. Briquets from Wood Residue. USDA Forest Service, Forest Products Laboratory Report FPL-075. 7 pp.

18. Reineke, L. H. 1960. Briquets from Wood Waste. USDA Forest Service, Forest Products Laboratory Report No. 1666-13 (revised). 7 pp.

19. Steffensen, L. M. 1971. Charcoal--Fuel Logs--and Fine Constituents from Bark. Proceedings, Conference on "Converting Bark into Opportunities". Oregon State University, Corvallis. pp. 97-98.

20. Steffensen, L. M. 1973. Pellets from Sawmill Waste for Efficient Fuel. Proceedings, Northern California Section, Forest Products Research Society, Eureka, California, November 1-2, 1973. pp. 25-28.

Prepared by Raymond A. Currier, Associate Professor of Forest Products, Oregon State University. The author acknowledges the assistance of Stanley E. Corder and Terence D. Brown, School of Forestry, Oregon State University, for suggestions and review.