NON TRADITIONAL FUELS EXISTING
AND POTENTIAL DEVELOPMENT

1983

Coastal Zone Management Program

SUPERIOR BOARD OF HARBOR COMMISSIONERS

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EXISTING AND POTENTIAL DEVELOPMENT

June 1983

Prepared for:

The Superior Board of Harbor Commissioners, by Mark Olson, Staff Assistant, under a grant by the Wisconsin Coastal Management Program.

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I. ETHANOL POTENTIAL

In 1981 the City of Superior sought outside technical assistance to investigate the feasibility of developing a local Ethanol Refinery.

Many local factors supported the feasibility of Superior as a potential alcohol development site such as:

The Port of Superior transships five to six (5 to 6) million tons of various grains and sunflower seeds per year, hence a readily established source of feedstock materials. In addition, located within the City is the only petroleum refinery in the State of Wisconsin, capacity 36,000 barrels per day, hence a potential market for the ethanol production. There is a well established and diversified transportation infrastructure serving both grain facilities and petroleum industries, including ship, rail, truck and pipelines. Furthermore, during normal operations of Superior's five grain elevators and Duluth's three grain elevators, large quantities (between 14,000 and 20,000 tons) of grain dust and wastes are accumulated.. Several independent analyses indicated that the use of grain dust as an alcohol feedstock would be feasible.

The consultants encouraged the City to pursue this development potential. Unfortunately, the study was completed when gasoline prices were volatile, inflation was not under conrol, the market for ethanol was unclear and local capital availability for project construction was extremely tight. As a result this project is still in the proposal stage, but there are reasons to take a new look at it.[1]

RECENT ETHANOL DEVELOPMENTS

Originally ethanol was used as a gasoline extender. Marketed as "Gasohol" ethanol proved itself, after a few years and millions of driven miles, not only as a fuel extender but also as an octane enhancer. Furthermore, Ethanol has been proven as an environmentally safe substitute for lead compounds used to increase gasoline octane ratings. The Ethanol octane enhancing market is separate and different from ethanol's gasoline extender market. As an octane enhancer ethanol is valuable even in times of petroleum surplus.

Recently the U.S. Environmental Protection Agency (EPA) has adopted new lead phasedown regulations which will require refiners to reduce total lead usage by over 34 percent on an industry wide basis. In 1984 and 1985, the required lead reduction of 7.1 and 11.9 billion grams is the octane equivalent of 1.42 and 2.38 billion gallons of ethanol, respectively.[2] In addition the EPA has recently denied approval for use of methanol as an octane enhancer without co-solvents (the primary available co-solvent being ethanol). Thus, ethanol has become one of the major proven environmentally safe octane enhancers available in sufficient quantity to replace lead enhancers.3

In the past four years over 100 ethanol plants have been built, primarily in the Midwestern agricultural areas. This development is estimated at nearly $1 billion of new plant, equipment and construction.

Until three years ago, the industry was dominated by small local developers who were generally under-capitalized and highly leveraged. Thereby impeding a more rapid expansion in the industry. With larger more financially astute corporations entering the industry results are expected to be more impressive. Table 1 contains a list of major corporations that are already investors in the fuel and industrial ethanol industry.

All of the plants listed in Table 1 relied on State and Federal supports including energy tax credits, loan guarantees, excise tax exemptions and project development support from local authorities. These projects are now commercially successful businesses providing jobs, income and taxes for the communities in which they reside. Other major corporations are considering building similar ethanol plants in states other than Wisconsin.

It is estimated that over 50 major projects (each exceeding 20 million in capital cost) are currently in the final planning stages.[4] Ethanol production is expected to increase ten fold from the current 250 million gallons to two billion gallons over the next four years.[5]

Interestingly however, none of this growth is taking place in Wisconsin or Minnesota. Many of the most active firms in the industry are located within the adjoining states. Both states are fairly large grain producers. Both states have abundant water, land, raw materials infrastructure, transportation systems and substantial numbers of rudiment livestock. Iowa, South and North Dakota, Illinois, Ohio are all sites of major development. Once these industries establish and the market and transportation patterns become firm the industry and its industrialized support groups are virtually lost to Wisconsin. It appears as though the lack of State sponsored incentives has been a formidable barrier to the growth of this industry. The ethanol industry is proving itself both technically and financially. There is little any government program can do to distort the fundamental economics of the industry in the long run. In the short run, however, government incentives can impact the location and timing of a new industry.[6]

Wisconsin has virtually missed the boat on creating the necessary incentives to attract this industry to Wisconsin. Northern Wisconsin especially needs to develop a value added industry to its local and regional economy. The Port of Superior continues to act as an underdeveloped country by shipping out raw materials to be processed into products of higher value elsewhere. For decades the economic, social and political advantages of the prosperity generated from of value-added processing has been lost by the regional populations and local economies. Whereas ethanol

TABLE 1

MAJOR CORPORATE PARTICIPANTS
IN THE ETHANOL INDUSTRY

Firm	Involvement
Texas Oil Company	Co-owner of 50 million gallon per year (mmgpy) plant in Pekin, Illinois.
Ashland Oil Company	Co-owner of 60 mmgpy plant in South Point, Ohio. Announced plans for another 60 mmgpy plant in a location to be announced (Minnesota is being considered).
Publicker Industries	Co-owner of 60 mmgpy plant in South Point, Ohio.
Ohio Farm Bureau	Co-owner of 60 mmgpy plant in South Point, Ohio.
Chevron Oil Company	Co-owner of a 50 mmgpy plant under construction in Kentucky.
Corn Products Company (CPC International)	Co-owner of 50 mmgpy plant operating in Pekin, Illinois.
Archer Daniels Midland	Owns and operates 220 mmgpy of plant capacity in Illinois and Iowa.
A.E. Staley	Owner of 50 mmgpy plant recently completed in Loudon, Tennessee.
E.F. Hutton	Raised over $30 million and invested $15 million of own funds for co-ownership in the 50 mmgpy plant in South Bend, Indiana.
Midwest Solvents	Operates plants in Atchison, Kansas and Pekin, Illinois producing 20 mmgpy.
Kentucky Farm Bureau	Co-owner of Chevron Oil Plant at Franklin, Kentucky.

* Information Resources and DOE

was once viewed as an end product in itself, it is now understood to be the entry product into the diversified chemical and foodstuff manufacturing chains with far reaching economic potential.

It appears as though the ethanol industry is here to stay in the United States. Ethanol industrial products are used in chemical products such as plastics, inks, solvents, paints, printing etc. and as liquid fuel such as gasoline and diesel fuel (see Table 2 and illustration 1). The distillers dried substrate the by product of spent feedstock material is used as protein supplements for feeding livestock such as cattle, hogs, and poultry as well as human consumable protein supplements.

The long-term instability and uncertainty of petroleum and natural gas, together with world food shortage has created a favorable opportunity for ethanol development - a value added agri-processing and chemical industry (see illustration 2).

Wisconsin especially should be keen to this type of industrial growth. Wisconsin is heavily dependent on energy produced in other states and countries. Wisconsin spends over seven (7) billion dollars annually on energy and of that more that six (6) billion will flow out of the state to pay for imported energy.

ETHANOL MARKETING

The introduction of "Gasohol" in Wisconsin in the late 1970's and early 1980's meet with limited acceptance, not unlike other areas of the country. This marketing approach had been revised to introduce gasoline ethanol blends as an "unleaded premium" or "super unleaded". The market potential for ethanol appears to be strong. The incentives of temporary tax exemptions on ethanol fuels to establish a market and attract investors to the industry should provide the necessary stimulus for the industry to develop a strong base. The federal exemption on agriculturally derived ethanol has been extended to 1992 and many states have incentives that run concurrent with the Federal program (see appendix A). When the federal incentives expire the market potential for ethanol will depend on gasoline prices and feedstock material prices at that time.

In comparison to Wisconsin the State of Nebraska passed 14 pieces of legislation this last session in support of the Agri-Ethanol industry.[7] Appendix B is a comparison of state based enthanol incentives. Appendix C is a copy of a Wisconsin proposed bill (AB 358) supporting a partial motor fuel tax exemption for motor fuel that is at least 10% agriculturally derived alcohol.

PRODUCTION CHARACTERISTICS

The two primary feedstock materials for the production of agricultural ethanol today are corn and barley primarily for the production yield and market prices. The Superior ethanol feasibility study also considered the potential of grain dust and

TABLE 2

CHEMICALS FROM FERMENTATION PROCESSES

CHEMICAL	CHEMICAL
Ethanol	Methanol
N-Butanol	Gluconic acid
2.3-Butylene glycol	2-Keto-gluconic acid
Glycerol	Itaconic acid
Acetic acid	Tartaric acid
Acetone	Pyruvic acid
Isopropanol	d-Keto-glutaric acid
Fumaric acid	L-Isocitric acid
Succinic acid	L-Alloisoacetic acid
Citric acid	5-Keto-gluconic acid
Lactic acid	D-Araboascorbic acid
Propionic acid	Koji acid
Malic acid	D-Xylonic acid

Carbohydrates can be found in all forms of plant material, such as grains and other crops, agricultural residues, food processing wastes, forest residues, etc. After processing, carbohydrates can be substituted for petroleum as a feedstock (raw material) in the production of many fuels and chemicals. Also, the byproducts of carbohydrate processing are high protein feed products. These high protein feeds provide as much, or more, food value as the original feedstock when combined with animal feed rations. As a result, the ability of carbohydrate conversion technologies to replace many petroleum conversion technologies presents an unprecedented opportunity to meet the most pressing energy and nutritional needs of the future.

FIGURE - Several sources of carbohydrates (Clockwise from the top) - peat, sunflower hulls, rice hulls, grain sorghum (milo), corn, barley, flour mill waste, sawdust; Center) - molasses and wood chips.

FIGURE - Several uses of bioindustrial products. Shown are ethanol uses such as printing ink, vinegar, hairspray, industrial solvents, photographic supplies gasoline octane enhancers, toiletries and other general chemical uses. Also shown are corn oil, yeast, protein feed, CO2 and fructose (used in soft drinks) which are a few of the many valuable co-prodcuts of bioindustrail process technologies.

* Source: Butler Research and Engineering Company

Illustration 1

CHEMICALS FROM CORN

This advertisement appearing in chemical industry magazines represents a major effort to market carbohydrates as a substitute feedstock for petroleum. The advertisement summarizes the chemical industry's emerging view of opportunities facing bioindustrial chemical technologies. (Reprinted by permission of Trout and Ries Advertising.)

* Source: Bultler Research and Engineering Company

Illustration 2

waste generated from port elevator operation. Appendix D is an analysis of various elevator dust samples and indicates the potential for alcohol production from the dust derived from various whole grains. Currently Superior-Duluth elevator dust can be obtained at a fraction of the cost of the whole grain.

The Superior Ethanol Feasibility Study considered three plant size scenarios, 1.5, 5 and 15 million gallon per year facilities. The production of ethanol from corn is primarily achieved via either wet milling or dry milling of the grain to obtain the fermentable material from the other products. Wet milling plants tend to be large fully integrated and capital intensive. The economies of scale dictate that wet milling plants have a minimum annual production capacity of 20 million gallons of ethanol in order to be competitive in the wet milling industry.

Dry milling plants tend to be smaller less complex than wet milling plants and are less sensitive to location. Dry milling plants generally range between 5 and 20 million gallons per year, have greater flexibility in feedstock and have potential access to local cash grain markets and other off spec grains at lower prices.

POTENTIAL DEVELOPMENT

The Superior study indicated that a 10 million gallon per year facility could be justified according to feedstock availability and market potentials for ethanol and the distiller dry substrate and grains.

The first generation of alcohol plants were located in close proximity to either the farms, as in the dry mill plants, or the industrialized areas, as in the wet mill plants. Many in the industry expect that second generation plants will be located where sophisticated transportation networks exist allowing for access to world markets.

Ports are paticularily well suited for the alcohol industry. Superior-Duluth is the third largest grain export port in the nation with large quantities of surplus grains available. Competition for this generation of ethanol plants, however, will be severe.

II. PETROLEUM COKE & BRIQUETTING INDUSTRY DEVELOPMENT

Petroleum Coke is a by-product of the oil refining process. Petroleum Coke is produced in Minnesota by several refineries and transported to Superior-Duluth for further processing or transshipment to domestic or foreign markets.

The Murphy oil refinery in Superior, however, does not produce petroleum coke. Equipment modifications have enabled Murphy to reformat this product into products of higher value.

Minnesota produces about 1,000,000 tons of petroleum coke per year, of that 90% goes by River to Gulf Coast Ports for shipment to Europe.

About 100,000 tons of petroleum coke is delivered to Duluth for transshipment each year. About 75% of the total tonnage is transshipped to Europe the remainder being distributed to Canadian or U.S. East Coast markets.

The shipper has used direct shipment to Europe and in addition is utilizing experimenting with the mid stream transfer concept developed in 1981.*

TRANSPORTATION COSTS

The current rail rate delivery charge for petroleum coke from the Minneapolis-St. Paul area to Duluth (175 miles) is $8.59/per ton which includes a $400 per car switching charge. The switching charge takes place when the originating railroad transfers the loaded rail cars to the railroad that has switching rights to the dock in Duluth, and receives them back when empty.

As mentioned previously, 90% of the 1,000,000 tons of coke produced in Minnesota goes by River to Gulf Coast ports, this is due to lower transportation charges. According to company spokesmen the difference in rates are generally $1 to $1.50 per ton. The above mentioned switching charge adds approximately $4.00 per ton. [1,2]

To deliver Montana Coal to Superior is between 15 and 17 dollars per ton for a 1200 mile journey. The distance from Duluth to Minneapolis is 175 miles and the transportation cost is $8.95 per ton and approximately half of that total is the switching charge.
An additional 900,000 ton of cargo moving through the Port of Superior-Duluth would certainly produce some possitive economic results. There would be some additional ship traffic related impacts in the upper regions of the harbor as the frequency of vessel movements increase, however those impacts would not be considered serious.

*[Midstream Transfer - is the discharge of cargo from several self-unloading seaway size vessels into the hold of a larger ocean vessel which continues on to the port of destination.]

SUPERIOR BRIQUETTING INDUSTRY DEVELOPMENT

The Stott Briquet Company in Superior was puchased by Chemical Exchange Industry of Texas in 1982. Recently, the company has announced that they will be selling the company to a local investor. The company will be renamed the Superior Briquet Company Inc. The Superior Briquet Company is already the largest briquet company in the United States. The plant will be purchased for a total of $2.1 million. The local investor intends to update plant and equipment and expand the plant by making $500,000 worth of capital improvements. With the plant expansion will come an increase and the number of employees from fourteen (14) currently to a projected total of forty-two (42). The improvements are scheduled to be completed in September. The majority of new jobs will be in equipment operation.

The plant now operates on a half year basis and plans are to operate year round, current production is about 10,000 tons per year with planned market expansion to 120,000 ton per year. A significant portion of the increase would be for fuel in the industrial market. Currently, total production is for home heating fuel. The company has for the past several years been developing a low-sulfur fuel that will serve a variety of industrial purposes. The company will be concentrating on marketing to schools, factories, paper mills and mining companies with fuels to fit specific needs. The briquette has a unique characteristic in that it can be tailored to the specific wants and needs of a customer, such as a BTU range, sulfur content and particulate emission characteristics. [3,4]

The Superior City Council has tentatively approved a resolution to issue industrial revenue bonds not to exceed $825,000 for the new owner.

Appendix E is a synopsis of a recent report titled "Proposal for Aquistion and Development of Stott Briquet Company, Inc.."

III. PROCESSED WOOD FUELS

Northern Wisconsin, Minnesota and Michigan have long been major forest producing regions supply a variety of forest products to the nation, and to foreign markets since the opening of the Seaway in 1959.

The oil embargo and subsequent price increases in petroleum based fuels during the last decade has prompted several regional forest industries to develop fuel from unused forest products and processor residues. This product has proven highly competitive in the regional domestic market. To date little consideration has been given to the potential of developing an overseas market.

THE PRODUCTS

Generally, processed wood fuels are made from wood residues (saw dust, bark, shavings, etc.) by grinding, compressing and heating them. They are held together by the bonding properties and natural lignin present in the wood.

There are three basic styles produced in the region. One is a small cylindrical pellet, one is 3" x 18" cylindrical log, the other is quite similar to a hockey pucks dimensions.

This product has approximately 9000 btu/lb. with an 8% moisture content. Current regional production is over 60 tons per day. Dramatic production increases could be established if the demand warranted.

Preliminary estimates indicate that production costs are $50/ton. Travel cost estimates are $15/ton to transport to Superior and over seas shipment costs are approximately $30 per ton. These preliminary cost estimates bring the product to the foreign dock side at $95/ton. That price equates to $47/fireplace cord for maple or oak on an equivalent btu basis. [1]

The Danoka Report Summary in Appendix F established a overview of wood fuel problems common to target markets and other developing countries.

FOOTNOTES

ETHANOL

1. "Feasibility Study Report for the City of Superior Ethanol Refinery"; prepared by Ultrasystems Incorporated; April, 1983.

2. "Marketing Survey of U.S. Refiners and Gasoline Blenders," Herman & Associates; 1983 as sited in Opportunities for Minnesota Ethanol Production for Fuel and Industrial Use, Prepared by: Governor's Advisory Committee on Agri-Processing Ethanol and Rural Energy Park Subcommittee, March 4, 1983.

3. Opportunities for Minnesota Ethanol Production for Fuel and Industrial Use, Prepared by: Governor's Advisory Committee on Agri-Processing Ehtanol and Rural Energy Park Subcommittee, March 4, 1983.

4. Alcohol Fuels Industry Report, Information Resources, Inc., January 1983.

5. Third Annual Report on the Use of Alcohol in Fuels, U.S. Department of Energy Office of Alcohol Fuels, March 1982

6. Opportunities for Minnesota Ethanol Production for Fuel and Industrial Use, Prepared by: Governor's Advisory Committee on Agri-Processing Ehtanol and Rural Energy Park Subcommittee, March 4, 1983.

7. Personal Communications with Robert Butler, Butler Research and Engineering Company, Corporate President, July, 1983.

PETROLEUM COKE AND BRIQUETTING

1. Personnal communications with Coke Sales Inc., St. Paul, MN. July 1983.

2. Personnal communicatons with Hallett Dock Company Inc., Duluth Mn. July 1983.

3. A Proposal for the Aquistion and Development of Stott Briquet Company Inc., Robert C. Beaudin, President, Stott Briquet Company.

4. Personnal Communication with Robert C. Beaudin, President, Stott Briquet Company Inc., July 1983.

PROCESSED WOODFUELS

1. "Minnesota Processed Woodfuel Industry - A Study of International Opportunities" by Henri Heystek, Danoka International , Inc.

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- Feasibility Study Report for the City of Superior Ethanol Refinery; prepared by Ultrasystems Incorporated; April, 1983.

- Alcohol Fuels Industry Report, Information Resources, Inc. January, 1983.

- State Initiatives on Alcohol Fuels, U.S. National Alcohol Fuels Commission, August, 1980.

- Third Annual Report on the Use of Alcohol in Fuels, U.S. Department of Energy Office of Alcohol Fuels, March 1982.

PETROLEUM COKE & BRIQUETTING

- A Proposal for the Aquistion and Development of Stott Briquet Company Inc.

PROCESSED WOODFUELS

- Summary of "Minnesota Processed Woodfuel Industry - A Study of International Opportunities" by Henri Heystek of Danoka International, Inc. prepared by the Arrowhead Regional Development Commission

Appendix A

NET STATE TAX EXEMPTIONS FOR ETHANOL/GASOLINE BLENDS
IN THE UNITED STATES

(January 1983)
Expressed in cents per gallon

STATE	1982	83	84	85	86	87	88	89	90	91	92
Alabama	3	3	3	3	3	3	3	3	3	3	3
Alaska	8	8	8	8	8	8	8	8	8	8	8
Arizona	-	-	-	-	-	-	-	-	-	-	-
Arkansas*	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5/0	-
California	4	3	2	1	-	-	-	-	-	-	-
Colorado*+	5	5	5	5	-	-	-	-	-	-	-
Connecticut	1	1	1	1	1	1	1	1	1	1	1
Delaware	-	-	-	-	-	-	-	-	-	-	-
Florida	5	5/4	4	4/2	2	2/0	-	-	-	-	-
Georgia+	-	-	-	-	-	-	-	-	-	-	-
Hawaii*	4	4	4	4*	4*	4*	4*	4*	4*	4*	4*/0
Idaho*	4	4	4	4	4/0	-	-	-	-	-	-
Illinois+	3%	3/2%	2%	2/0	-	-	-	-	-	-	-
Indiana	4%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Iowa+	5	5/3	3/2	2/1	1/0	-	-	-	-	-	-
Kansas*+	2	2/1	1/0	-	-	-	-	-	-	-	-
Kentucky*	3.5	3.5	3.5	3.5	3.5/0	-	-	-	-	-	-
Louisiana*+	8	8	8	8	8	8	8	8/0	-	-	-

NET STATE TAX EXEMPTIONS FOR ETHANOL/GASOLINE BLENDS
IN THE UNITED STATES

(January 1983)
Expressed in cents per gallon

STATE	1982	83	84	85	86	87	88	89	90	91	92
Maine+	-	-	-	-	-	-	-	-	-	-	-
Maryland+	-	-	-	-	-	-	-	-	-	-	-
Massachusetts+	-	-	-	-	-	-	-	-	-	-	-
Michigan+*	5	5/4	4	2	1	-	-	-	-	-	-
Minnesota+	-	-	-	-	-	-	-	-	-	-	-
Mississippi+	-	-	-	-	-	-	-	-	-	-	-
Missouri+	-	-	-	-	-	-	-	-	-	-	-
Montana+	7	7	7	7/5	5	5/3	3	3	-	-	-
Nebraska+	5	5	5	5	5	5	5	5	5	5	5
Nevada	1	1	1	1	1	1	1	1	1	1	1
New Hampshire*+	5	5/0	-	-	-	-	-	-	-	-	-
New Jersey	-	-	-	-	-	-	-	-	-	-	-
New Mexico*	10	10	10	10	10	10/0	-	-	-	-	-
New York+	-	-	-	-	-	-	-	-	-	-	-
North Carolina	2	2/1	1/0	-	-	-	-	-	-	-	-
North Dakota	4	4	4	4	4	4	4	4	4	4	4
Ohio	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.
Oklahoma+	6.5	6.5	6.5/0		-	-	-	-	-	-	-
Oregon	-	-	-	-	-	-	-	-	-	-	-
Pennsylvania+	-	-	-	-	-	-	-	-	-	-	-
Rhode Island	-	-	-	-	-	-	-	-	-	-	-

NET STATE TAX EXEMPTIONS FOR ETHANOL/GASOLINE BLENDS
IN THE UNITED STATES

(January 1983)
Expressed in cents per gallon

STATE	1982	83	84	85	86	87	88	89	90	91	92
South Carolina+	7	-	-	-	-	-	-	-	-	-	-
South Dakota+	4	4/0	-	-	-	-	-	-	-	-	-
Tennessee*	-	4	4	4	4	4	4	-	-	-	-
Texas*	5	5	5	5	5/4	4/3	3/2	2/1	1	-	-
Utah*	5	5	5	5/0	-	-	-	-	-	-	-
Vermont	-	-	-	-	-	-	-	-	-	-	-
Virginia*+	8	8	8/6	6	6/4	4	4/2	2	2/0	0	0
Washington, DC	-	-	-	-	-	-	-	-	-	-	-
Washington, State+	1.5	1.5	1.5	1.5	1.5	-	-	-	-	-	-
West Virginia	-	-	-	-	-	-	-	-	-	-	-
Wisconsin+	-	-	-	-	-	-	-	-	-	-	-
Wyoming	4	4	4/0	-	-	-	-	-	-	-	-

* Qualifications apply
+ New Legislation Expected in 1983

Source: Information Resources Incorporated

Appendix B

STATE OF WISCONSIN PARTICIPATION

OTHER STATE'S PROGRAMS

In comparing the fifty states' initiatives on alcohol fuel as of January 1983, 32 states have some type of net state tax exemptions for ethanol/gasoline blends. The percentages of exemptions vary from state to state (see Table below). Wisconsin has no excise tax ememption; there is a bill currently pending. Wisconsin allows alcohol fuel production systems to qualify for individual and corporate income tax credits.

As of August 1980, nine states provided some type of sales tax forgiveness for ethanol/gasoline sales. The percentages varied from state to state.

Nine states provide a state property tax deduction or exemption for ethanol plants. One state, Kentucky, allows a local property tax deduction.

Four states provide income tax credits. Three states have income tax deductions and one state has an income tax reduction. North Carolina allows a 20% corporate and personal income tax credit.

The following provides a comparison of states which are similar to Wisconsin in crops, climate, geography and proximity.

Colorado

- Five cents per gallon excise tax exemption, expires July 1, 1985.
- Ninty-eight percent property tax reduction which is temporary and has a decreasing scale rate.
- Alcohol must be produced in Colorado.

Illinois

- Three cents per gallon decreasing excise tax exemption which will expire in 1986.

Indiana

- Five cents per gallon excise tax exemption.
- Has an income tax deduction.

Iowa

- Has a decreasing excise tax exemption which will expire in 1987.

Kansas

- Has a decreasing excise tax exemption which will expire in 1985.
- The alcohol must be produced from grain products grown in Kansas.
- Production of alcohol must utilize 10 less energy units than would be contained in the converted motor vehicle fuel.

Kentucky

- Has a decreasing excise tax exemption which will expire in 1987.
- Ninty-nine percent state property tax reduction.
- Ninty-nine percent local property tax reduction.
- Alcohol plants must burn coal produced in Kentucky or convert to such use within 2 years of certificate receipt to qualify for the exemptions.

Nebraska

- Five cents per gallon excise tax exemption.
- Alcohol must be produced in Nebraska.
- Beginning in 1982, the five cents excise tax exemption applies only to alcohol produced in a plant under construction or in operation by July 1, 1980.

North Dakota

- Four cents per gallon excise tax exemption
- Three percent sales tax exemption which only applies when the gasohol is used for agricultural or industrial purposes.

Ohio

- 3.5 cents per gallon excise tax exemption.

Oklahoma

- 6.5 cents per gallon excise tax exemption which expires on October 1, 1984.

Oregon

- One hundred percent income tax exemption.
- Fifty percent investment tax credit, which has a decreasing scale rate and expires on January 1, 1985.
- One hundred percent property tax reduction, which applies only to commercial plants and expires on October 3, 1985.

South Dakota

- o Four cents per gallon excise tax exemption which expires in June, 1983.
- o Four percent sales tax exemption which expires on June 30, 1985; legislation pending to extend exemption.
- o One hundred percent property tax credit which has a decreasing scale rate and has differing rates for small-scale and large-scale plants.
- o One hundred percent tax credit which expires on July 1, 1986.

There are four very common trends in state legislation:

1) Tax rates in most cases are decreasing with expiration dates in the mid to late 1980's.
2) Many states require that the alcohol be produced from products grown in that state.
3) Many states have alcohol promotion councils that promote the use of alcohol in the state or have a reciprocity clause with other states.
4) Most states have a program of testing alcohol fuels in state owned and operated vehicles.

SOURCE: Opportunities for Minnesota Ethanol Production for Fuel and Industrial Use, Governors Advisory Committee on Agri-Processing.

Appendix C

1983 ASSEMBLY BILL 358

April 14, 1983 – Introduced by Representatives JOHNSON, VANDERPERREN, SWOBODA, HEPHNER, HASENOHRL, SHOEMAKER, T. THOMPSON, ROGERS, R. THOMPSON, SCHNEIDER, COLEMAN, WIMMER, BRIST, SCHULTZ, TURBA, NEUBAUER, STOWER, LOFTUS, JAUCH, BECKER, ULICHNY, MATTY, LOOBY, POTTER, ROBINSON, GOODRICH and CHVALA; cosponsored by Senators OTTE, CULLEN, KREUL, CHILSEN, LASEE, McCALLUM, ROSHELL, THOMPSON and HARSDORF. Referred to Joint Survey Committee on Tax Exemptions.

AN ACT to amend 78.14; and to create 78.01 (2m) of the statutes, relating to a partial motor fuel tax exemption for motor fuel containing alcohol produced from agricultural commodities.

Analysis by the Legislative Reference Bureau

This bill creates a partial motor fuel tax exemption of 4 cents per gallon for motor fuel that is at least 10% alcohol produced in this state from agricultural commodities. That exemption or the exemption provided by another state for motor fuel that contains alcohol produced in this state from agricultural commodities, whichever is less, will also apply to motor fuel including alcohol produced from agricultural commodities in that other state.

This bill will be referred to the joint survey committee on tax exemptions for a detailed analysis which will be printed as an appendix to the bill.

The people of the state of Wisconsin, represented in senate and assembly, do enact as follows:

SECTION 1. 78.01 (2m) of the statutes is created to read:

78.01 (2m) PARTIAL EXEMPTION. (a) The tax under sub. (1) shall be reduced by 4 cents per gallon for motor fuel that is at least 10% denatured ethyl alcohol made from agricultural commodities as defined in s. 94.67 (2) if the alcohol contains no more than 1.25% water and if the alcohol is produced in this state.

(b) If the department of revenue certifies that another state provides an exemption, credit or refund from that state's motor fuel excise

tax or sales tax that applies to a blend of gasoline and fuel-grade alcohol distilled in this state from agricultural commodities and containing no more than 1.25% water, then any blend of gasoline and 10% denatured ethyl alcohol made from agricultural commodities and distilled in that state is eligible for an exemption from the tax under sub. (1) equal to the exemption, credit or refund allowed by that state or to the partial exemption under par. (a), whichever is less.

SECTION 2. 78.14 of the statutes is amended to read:

78.14 TAX PAID IS PUBLIC MONEY. Every wholesaler who sells or distributes any motor fuel for any purpose in this state shall collect from the purchaser at the time of the sale or distribution 13 cents per gallon, or the amount computed by applying the partial exemption under s. 78.01 (2m), on all motor fuel sold or distributed. All sums paid by the purchaser to the wholesaler as taxes upon the motor fuel, upon which the tax imposed by this chapter has not been paid previously, are public money, the property of this state.

SECTION 3. EFFECTIVE DATE. This act takes effect on the first day of the 2nd month beginning after publication.

(End)

1983 ASSEMBLY BILL 358

FISCAL ESTIMATE
AD-MBA-23 (Rev. 11/82)

1983 Session

☒ ORIGINAL ☐ UPDATED
☐ CORRECTED ☐ SUPPLEMENTAL

LRB or Bill No./Adm. Rule No.: AB 358

Amendment No. if Applicable:

Subject: Partial Exemption for Motor Fuel Containing Certain Alcohol

Fiscal Effect

State: ☐ No State Fiscal Effect

Check columns below only if bill makes a direct appropriation or affects a sum sufficient appropriation.

☐ Increase Existing Appropriation ☐ Increase Existing Revenues
☐ Decrease Existing Appropriation ☒ Decrease Existing Revenues
☐ Create New Appropriation

☒ Increase Costs – May Be Possible to Absorb Within Agency's Budget ☐ Yes ☒ No
☐ Decrease Costs

Local: ☐ No local government costs — See text of fiscal note

1. ☐ Increase Costs ☐ Permissive ☐ Mandatory
2. ☐ Decrease Costs ☐ Permissive ☐ Mandatory
3. ☐ Increase Revenues ☐ Permissive ☐ Mandatory
4. ☐ Decrease Revenues ☐ Permissive ☐ Mandatory
5. Types of Local Governmental Units Affected: ☐ Towns ☐ Villages ☐ Cities ☐ Counties ☐ Others _____

Fund Sources Affected: ☐ GPR ☐ FED ☐ PRO ☐ PRS ☐ SEG ☒ SEG-S

Affected Ch. 20 Appropriations:

Assumptions Used in Arriving at Fiscal Estimate

The fiscal effect of this proposal would depend primarily on the total gallonage of qualifying gasohol sold as a percentage of total motor fuel sales. In other states with gasohol tax incentives, gasohol sales range from 0.33% of total sales (in Connecticut) to 37% (in Iowa). The average in the 34 states with such an incentive is 7.2%.

Assuming total motor fuel sales of 2 billion gallons annually and using the 7.2% average figure, 4¢ per gallon tax difference would reduce motor fuel tax collections (seg.) by about $5.7 million annually.

In the first year or two after enactment, the fiscal impact may be lower than the full annualized effect, assuming that the market share of gasohol would increase gradually before reaching an on-going level.

Long-Range Fiscal Implications:

Agency/Prepared by: (Name & Phone No.)	Authorized Signature/Telephone No.	Date
Department of Revenue Allan Allweiss 266-3505	266-2700	5-23-83

A.B. 358

FISCAL ESTIMATE WORKSHEET
Detailed Estimate of Annual Fiscal Effect
AD-MBA-22 (Rev. 11/82)

1983 Session

☒ ORIGINAL ☐ UPDATED
☐ CORRECTED ☐ SUPPLEMENTAL

LRB or Bill No./Adm. Rule No.	Amendment No.
AB 358	

Subject: Partial Exemption for Motor Fuel Containing Certain Alcohol

I. One-time Costs or Revenue Fluctuations for State and/or Local Government (do not include in annualized fiscal effect):

II. Annualized Costs: Note: Treat fiscal costs like a "checkbook": increased costs reduce available funds (-); decreased costs increase available funds (+).

	Annualized fiscal impact on State funds from: Increased Costs FY 1984-85	Decreased Costs
A. State Costs by Category		
Salaries and Fringes	$ – 40,800	$ +
Staff Support Costs	– 3,100	+
Other State Costs	–	+
Local Assistance	–	+
Aids to Individuals or Organizations	–	+
TOTAL State Costs by Category	$ – 43,900	$ +
B. State Costs by Source of Funds	Increased Costs	Decreased Costs
GPR 20.566(1)(a) 42,500 20.566(5)(a) 1,400	$ – 43,900	$ +
FED	–	+
PRO/PRS	–	+
SEG/SEG-S	–	+
C. FTE Position Changes	Increased Pos. + (1.9)	Decreased Pos. – ( )

III. State Revenues- Complete this only when proposal will increase or decrease state revenues, such as taxes, license fees, etc.

	Decreased Rev.	Increased Rev.
GPR Taxes	$ –	$ +
GPR Earned	–	+
FED	–	+
PRO/PRS	–	+
SEG/SEG-S	– See text of fiscal note	+
TOTAL State Revenues	$ – See text of fiscal note	$ +

Net Annualized Fiscal Impact on State & Local Funds

State	Annual Increases	Annual Decreases	Local	Annual Increases	Annual Decreases
Total Costs	$ –	$ +	Total Costs	$ –	$ +
Total Revenues	+	See text of fiscal note	Total Revenues	+	–

NET Impact on State Funds	$	(+) or (–) See text of fiscal note	NET Impact on Local Funds	$	(+) or (–) None

Agency/Prepared by: (Name & Phone No.)	Authorized Signature/Telephone No.	Date
Department of Revenue	266-2700	5-23-83

Appendix D

GRAIN DUST SAMPLE ANALYSIS

Sample A	August 17:	Farmers' Union Sample #1-A
B	"	Burdick Elevator Sample #1-B
C	August 27:	Farmers' Union Sample #2-C
D	"	Farmers' Union Sample #3-D
E	"	Burdick Elevator Sample #2-E
F	"	Burdick Elevator Sample #3-F
G	"	Peavey Sample #1-G
H	"	Peavey Sample #2-H

Several of the samples were sent to Ingman Laboratories for proximate analysis and starch determinations. The following results were obtained.

Sample	Moisture	Protein	Fibre	Fat	Ash	CHO	NFE
A	12.2%	10.4%	14.2%	3.8%	10.2%	64.4%	48.7%
B	10.1	9.4	18.9	2.2	15.9	62.4	43.5
H	10.6	11.0	18.9	1.2	12.4	64.8	45.2

Sample	TDN	Starch
A	62.8%	28.1%
B	55.1	33.4
H	58.1	36.0

Based on starch tests, theoretical yields of EtOH would be

A	42.2 gallons/ton
B	50.2
H	54.1

Actual yields in lab experiments were:

A	30.8 gallons/ton	(31.0 by spectrophotometric assay)
B	10.8	(10.0 by spectrophotometric assay)
C	18.3	
D	20.1	
E	8.0	
F	11.5	
G	18.3	
H	31.6	

Since a large amount of chaff was present in most of the samples, a test was conducted to determine effects of separating the feedstock on a 16 mesh screen for two of the samples. Screening of sample A to remove chaff increased yield to 38.6 gallons/ton, but screening had little effect on the yield from sample B.

There is a great discrepency between theoretical yield (based on Ingman's starch analysis) and actual yield for samples A, B, and H. Apparently the chemical analysis picks up material which can not be converted to fermentable carbohydrate. It is important to actually go through the conversion and fermentation process to obtain reliable values.

The grain dust samples were generally full of fibers, and could not be processed at very high levels of solids. For example, the lab samples were fermented at the following initial solids concentrations.

A	15.7%
B	14.3
C	14.7
D	13.8
E	15.8
F	15.7
G	15.2
H	14.7

The fermentates were subsequently analyzed to obtain the following by-product yields per ton of feedstock:

A	.80 tons DDGS @	16.9% protein
B	.93	14.5%
C	.88	
D	.89	
E	.94	
F	.92	
G	.88	
H	.79	18.6% protein

* Analysis prepared by Butler Research and Engineering
* Samples collected by the Superior Harbor Commission Staff

Appendix E

A PROPOSAL
FOR
THE ACQUISTION AND DEVELOPMENT
OF
STOTT BRIQUET COMPANY INC.

BUSINESS HISTORY

Stott Briquet has been in business since the early part of this century. The current plant was built in the late 1920's. In the early part of its history Stott was very successful.

By the mid 30's stokers were being designed to eliminate the need for hand firing of furnaces. This trend towards stokering devices continued through the forties. Briquets which were made in larger sizes (two inches or greater) could not be fed through early stokering devices. The stokers, which were usually augers, would break the large briquets up and they would not feed properly.. The effect of stokering devices on briquetting was not immediately felt, however.

World War II distorted the need for energy world wide. Briquet plants, as every souce of energy, were running at or near capacity to meet the need. When the war was over the expansion in the supplies of energy was felt in the briquetting industry.

As gas and oil became more available and offered cheap and clean fuels, almost all homes were converted. This conversion and the expanded use of stokers began to force the closure of briquetting plants. Until the late 1940's there were five briquetting plants in the Twin Ports. All existed by briquetting coal fines from the many coal docks around the harbor. The only plants that remained open were those that were captive to coal companies and could therefore obtain cheap, ready supplies of raw materials. Of course in the Twin Ports when the coal docks began to close, so did the briquetting plants connected with them.

After the war, Stott, which was not connected with any coal dock and had no ready, cheap source of raw materials, was forced to make changes. In 1947, Stott decided to rebuild it's plant and increase its capacity. In addition, Stott began using petroleum coke as the major raw material in it's briquets. In the late 40's and early 50's, Stott's remodeling continued and was completed in 1952. During these years Stott shipped more than 200,000 tons per year, peaking at 253,000 tons. The added capacity and the conversion to petroleum coke as a raw material are the two reasons Stott is still in business today.

Petroleum coke is a residue from the oil refining process and the coking of those solids. Both fines (one-quarter inch and smaller) and larger chunks are formed. It is the fines which are used for briquetting. Petroleum coke is very high in BTU content (over 14,500 BTU per pound) and most of it is very high in sulfur content (three to five percent).

With their high heat content, petroleum coke briquets represented the highest heat value per dollar of any fuel in our area (see Minnesota Power analysis attached). Unfortunately, by the mid-fifties the only markets available to Stott were the hand fired markets because of briquet size and conversion to other fuels.

From 1953 to 1972, Stott's sales declined each year reaching a low of 6,000 tons in 1972. In 1972, Stott was sold to Lakehead Painting and Sign. Lakehead's intention was to dismantle the plant and use the property for their own business. This plan was never carried out because of the Arab oil embargo in 1973.

One year after purchasing Stott, Lakehead's business increased to 24,000 tons. All of this increase was directly attributable to the oil embargo and an increased awareness of the cost of energy. As the embargo ended and supplies and prices of energy eased, Stott's business again declined. In 1976, Stott introduced packaged sales which increased margins but did not markedly increase tonnage sold. By 1979, with sales of 6,000 tons Lakehead was looking for new directions.

After study, it was determined that four things needed to happen to secure Stott's future. They were as follows:

1. With increased environmental concern a product had to be developed which could meet pollution control standards, preferably without having to install pollution control equipment.

2. A new method would have to be developed to either manufacture a briquet useable in stokers or develop a new stoker which could handle larger briquets.

3. Stott would have to hire its own sales force rather than depend upon its largest competitor to sell its product. In 1979, Stott had no sales force of its own and depended on the C. Reiss Coal Company for eighty to ninety percent of its sales. C. Reiss's major business is the sale of its own coal. Briquets were only sold if the customer demanded them and couldn't be talked out of using them. Reiss also operates a briquetting plant in Sheboygan, Wisconsin. Reiss sales of Stott product was only in Minnesota and the Dakotas.

4. Stott should expand its effort in the packaged sale business where the margins were greatest.

With this plan in mind, Lakehead decided they would have to sell since they did not have the resources to accomplish the plan.

CXI INVOLVEMENT

On September 29, 1981, Stott was sold. Stott became a Wisconsin corporation affiliated with Chemical Exchange Industries (CXI), a Houston based petro-chemical company, through it's sister company Texas Lignite. CXI operates several companies on the fringe of the oil industry. They manufacture and sell products which the major oil companies do not want to manufacture. Their business in this area has been very successful. By 1981, CXI had decided to get into the same kind of business around the fringe of the solid fuel industry.

By September, when Stott was purchased, a good part of the sales season for heating fuels had passed. Most industrial and institutional business is done by bids which are awarded before September. In fact, most of the larger bids are awarded in the spring and summer for the following heating season. Stott, in any case, did not at this time have a stoker sized product for sale into these markets. After a month of establishing credit lines, obtaining raw materials, hiring employees, and carrying out maintenance at the plant, Stott began manufacture of product in November, 1981.

Sales for the first heating season with one salesman employed increased from 6,000 to 8,000 tons. All of this production was in 2¼" x 2¼" x 1" briquets made from high sulfur petroleum coke. Production during this first season continued into the spring because of specialized research orders that were taken.

During the spring and summer of 1982, Stott also began to bid on school and industrial contracts for delivery in the 1982-83 heating season. These orders were to be filled with a new size 1¼" x 1¼" x 1" briquet and in some cases required a low sulfur raw material. In the spring another decision was made which also would have a significant impact on Stott.

When Stott was purchased it had four employees at the Superior plant who were represented by the Coal and Dock Workers Union. When the plant started up with nine employees in September, 1981, it was felt that the previous contract with Lakehead was void. Over half of the employees were new and if they chose to have a union a new election would be required. CXI was adamant about staying away from a union shop and for this reason decided to provide the same benefits CXI employees had. CXI also decided to work the people all year, even though there wasn't any production in the summer, guaranteeing a loss for the first year.

In early 1982, work began to find a way to provide low sulfur pet-coke and smaller briquets. Bepex Corporation indicated that they could design a pocket and machine two new rolls at a cost of $37,350 per pair. - Koch Carbon, Stott's supplier of petroleum coke, indicated in August that they could supply a mixture of low sulfur petroleum coke and metalurgical coal fines. This mixture would guarantee the raw materials needed to fill orders if they were bought in shipload quantities at a laid in price of $41 per ton.

In the summer of 1982, Stott requested authorization from CXI to purchase the new rolls. That authorization was denied. Also in the summer of 1982 Stott was in need of additional credit line. The original credit line of $500,000 had been used. After negotiations with the First National Bank in Duluth, the credit

line was extended to $1,000,000. Because shiploads of raw materials would exceed the cash available, authorization to purchase raw materials was also denied.

As the new heating season began in September, 1982, Stott did not have the new rolls necessary for the smaller briquets, or raw materials to fill the commercial orders. On September 15, Hallett Forge indicated they could machine an existing set of rolls into the new smaller briquet design. Their quote was $8,000. A week later, Hallett informed Stott they could not machine the rolls as requested. Hallett then sent several patterns which were similar that they felt they could machine. One of these patterns was selected and Hallett told Stott on October 1, it would take two weeks. After numerous delays, discussions with Hallett management, and threats of law suit, the rolls were delivered in mid-December. It then took until January 24, 1983, to get the rolls on stream.

At the same time, because of the delay in the rolls and the lack of low sulfur raw material, it was necessary for Stott to purchase stoker coal. The stoker coal was used to fill orders Stott had bid and won. This was done at little or no profit.

Beginning in April, 1982, Stott had at lease two sales people on staff and sometimes three. One of these was devoted strictly to packaged sales. By September, this person had identified nearly 4,000 tons of sales and by the end of October had identified nearly 7,800 tons. With this in mind, Stott began the construction of a new packaging facility to increase production in this area. A first mortgage of $250,000 was authorized with First National Bank to pay for this expansion.

New bags were designed in August and were ordered in September. As soon as the bags were ordered, Greif Brothers of St. Paul, the supplier, went out on strike. After checking all over the country for the quickest delivery time, the order was placed with Werthan Industries of Nashville. After delays, discussions, and threats of law suits, the bags were finally delivered on December 23, 1982. Most of the packaged sales season had been lost.

All during this time, Stott was discussing with CXI the purchase of low sulfur raw materials. After December 1, with the shipping season drawing to a close, CXI finally agreed to authorize the purchase. On December 18 and December 22, two ships brought nearly 19,000 tons of low sulfur raw materials.

By the end of January, 1983, all of the ingredients for Stott's expansion finally were in place. Unfortunately, another heating season had nearly passed. In addition, aggravating Stott's cash flow was a one-third decline in larger briquet sales due to one of the warmest winters on record.

Stott is currently in a cash short position which the bank will not extend further and which CXI does not have the equity to put in. Because of this, Stott is currently for sale.

PROCESS AND PRODUCT

Stott briquets are heating fuels which compete, primarily, with coal and secondly, with wood.

Briquets are produced in a manufacturing process using granular and powdered fines. In the process fines are heated and dried, mixed with a binder, compacted between two rolls under great pressure (15,000 lbs.) forming the familiar pillow shaped briquet, cooled on moving conveyors until they are hard, and stored in hoppers or on the ground for shipment.

Stott uses as raw materials petroleum coke fines, bituminous coal fines, and anthracite coal fines. Fines are purchased at an average price of $43/ton at the Stott plant. The binder can be briquetting asphalts, petroleum resins, heavy oils or coal tars. The current binder, a petroleum resin, is purchased for $145/ton.

Fines are essentially a by-product and are available in great quantities. Coal fines are produced every time coal is mined, moved, or handled. Petroleum coke fines are the product of the coking of oil refining residues.

Briquets are unique in the solid fuel industry. Because of the way briquets are made the ingrediants can be adjusted to yield a product having specific characteristics. To a customer, this means a fuel can be designed to meet his needs whether they be pollution control, heat value, ash content, moisture, sulfur, ash fusion or any of the myriad other concerns that can be found in individual systems.

Stott currently has purchasing arrangements with Koch Carbon for petroleum coke and Gilberton Coal Company for anthracite coal fines. Another arrangement is currently being negotiated for bituminous coal. Binder is provided by the Pester Petroleum Company under a licensing agreement with Kerr Magee, Inc. The binder used is non-carcinogenic and Stott is the first briquetting company in the nation to use it.

Stott briquets are manufactured and sold in two sizes: 2½" x 2½" x 1" and 1¼" x 1¼" x 1".

The larger of the two sizes is sold for use in hand fired stoves and furnaces. It is manufactured in all three types of raw materials; petroleum coke, anthracite and bituminous. The large briquets are sold in bulk or packaged. Though only the petroleum coke and anthracite based briquets are packaged. Packaged product is sold under the protected trade name Sta-Hots. Package sizes are 10#, 20#, 40# and one-ton bags. Also available is a 25# or 35# box. Current sales of large briquets in bulk and packaged are approximately 7000 tons.

The smaller briquet is sold specifically for use in stokers. It is available in petroleum coke, bituminous, or mixtures of the two. To date, blends of 60% petroleum coke/40% bituminous and blends of 50% petroleum coke/50% bituminous have been manufactured. Stoker sized briquets are available in bulk only. They could, however, be packaged without changes in equipment should there be a demand. Stoker

briquets have only been available since January 24, 1983. The identifiable market for this product in Minnesota and Wisconsin is well over 600,000 tons.

Binders can also be adjusted or changed to suit specific needs. The University of Minnesota Duluth needs a high melt binder for briquets to be used in their gasifier. Coal tars having a melt of 190° F. have been tested. Our normal binder has a melt of 145° F.

Stott also manufactures product on research contracts. In the past, work has been done for the Bureau of Mines, the Department of Energy, General Electric and others. Currently contracts are being developed with Dow Corning and Davy McKee for additional work.

COMPETITION

Coal and wood suppliers are Stott's competition. In the various product lines the competition is as follows:

Stoker product - wood pellets, wood chips, and coal.
Large briquets, bulk - coal.
Packaged product - firewood (logs).

WOOD/BIOMASS

Wood pellets (including sunflower hulls, etc.) are manufactured by several firms in Minnesota and Wisconsin. Most are very small capacity 15,000 tons to 50,000 tons annual capacity. Total capacity combined is no more than 250,000 tons. The raw materials currently being used are old sawdust piles or other wood wastes which have been accumulated over the years. The wood pellet plants have proved to be unreliable producers. The primary reason for this appears to be the size of the operations; the equipment is too small for the production demands on it and the raw materials used. The wood waste used is in many cases adulterated with other materials; dirt, metal and excess moisture. Foreign matter in pellets has caused severe problems for some users.

The use of old wood waste has allowed wood pellets to be priced at $50 to $54 per ton. At a BTU content of 8500 per lb., this computes to a price of over $3 per million BTU's. Our current price is $2.28 per million BTU's. As old wood waste piles are depleted and pellet producers are forced into purchasing wood on the open market in competition with paper companies, this price will escalate markedly.

Wood pellet competition is strictly in bulk sales and always with smaller institutional users such as schools. Only one larger commercial user of wood pellets exists in our area and his use was mandated by the Wisconsin DNR, because of a problem with visual emissions. Our product has passed the Wisconsin DNR's opacity tests for visual emissions and we expect to enter a contract to supply this customer in 1983.

Wood chips are comparatively new in the market place. It appears as though the production problems associated with pellets are alleviated with the use of chips. Chips are usually supplied in the immediate area of production and therefore are not widespread. They do provide the alternative of using any part of the tree and so raw material costs if the market remains small, should remain stable. Chips do have even a lower BTU rating than pellets and so even with lower cost per ton the cost per BTU is comparable.

Both pellets and chips present handling and storage problems for users. The fuels cannot be stored outside and usually require changes in feed systems and sometimes boilers to be used.

Wood does enjoy a certain romance with users who are sometimes inexperienced with costs. Current efforts to get users to convert to wood sometimes include

advances by manufacturers for purchase of new boilers with payoffs to begin after a years use and government subsidies to pay the costs of conversion. In many cases, the boilers installed cannot burn another fuel. Reasons for these subsidies usually center on job creation and pollution control. Job creation by subsidy is a philosophical agreement which is not a subject of this report. Pollution control, as a reason for conversion, is contestable on a basis of fact. In several parts of the United States, in Colorado and Montana, for example, emissions from the burning of wood are a major problem. Missoula, Montana has banned entirely the burning of wood for heat. Other areas have instituted less severe restrictions.

COAL

Coal has by far the largest share of the heating fuel market in our area. Most commercial and industrial users burn coal either for heat or process in our market.

The largest supplier of coal in our segment of the market (30,000 tons and smaller), is the C. Reiss Coal Company. Another large supplier is Great Lakes Coal and Dock Company. Both of these companies are coal brokers. They buy coal from mines, add their costs/profits, and then sell.

C. Reiss operates docks in Sheboygan, Green Bay, and Ashland, Wisconsin. They also operate docks in Duluth and in the Twin Cities in Minnesota. They operate a small briquetting plant with an annual production capacity of 15,000 tons.

Great Lakes Coal and Dock operates several facilities in the Chicago area and one in the Twin Cities. They also have contracts with Hallett Dock and Con-Agra in Minneapolis.

C. Reiss and Great Lakes charge smaller customers higher rates in order to subsidize larger customers (30,000 to 100,000 tons). Rates charged smaller customers are $70 to $90 per ton. While larger customers using the same coal off the same docks will pay $55 to $70 per ton.

C. Reiss and to a lesser degree Great Lakes, buy in larger quantities and ship part to docks scattered around the market area. By doing this, freight rates are kept to a minimum while the benefits of bulk purchase is maintained. In some areas, C. Reiss is so close to the user they can charge up to $20 per ton more than competitors and still remain competitive because of freight charges the competition must pay to compete.

Except for the very largest users, who buy direct from mines, Stott is competitive with the coal companies. Their lowest price per million BTU's is $2.04. Our lowest price for the largest users is $2.09.

In the past, the coal companies have had the market to themselves. C. Reiss and Great Lakes were found guilty of collusion to fix prices and market shares in the past. Most users are familiar with their products, while ours is new and most customers require testing before placing orders.

Coal usually varies a great deal over a season. Moisture content varies considerably sometimes freezing into large chunks causing problems for customers. Coal docks without briquetting plants also ship fines along with full sized product presenting additional problems. Also, the analysis (heat content, ash content, moisture content, etc.) varies greatly depending upon which seam coal comes from and this causes variations through the year. Lastly, the coal companies bid prices to smaller users and then increase the price through the season as the coal price climbs.

Briquets, because they are manufactured, are consistent in quality and content. Price is maintained throughout the season because fines can be purchased on long term contracts at fixed prices, where sized coal cannot. Our coal competitors purchase coal on the spot market or under contracts that allow increases to follow the market price of coal. As the demand for coal increases in an improved economy, so will the price charged by our competitors; while ours remains essentially the same.

FIREWOOD

In the packaged fuel market there are few competitors who actually package product. Duraflame, the largest of these, has gone out of business. There are several other small packagers of logs and coal, but all are insignificant in the market place.

The biggest competition in the supplemental heating packaged fuel market is plain firewood.

Most customers start with the idea of using their fireplace, or adding a wood stove, to cut the cost of heating a home. In our area, many intend to cut wood themselves. After a period of time, they tire of the work, time, and dirt associated with cutting wood. Then they purchase firewood. Firewood is climbing rapidly in price and in some areas is running near $100 per cord. Firewood is low in heat value, burns rapidly, requires constant attention, leads to creosote deposits in chimneys, and can be purchased in stores.

Increasingly, stove manufacturers and their dealers are including samples of fuel that can be used in their appliances. Dealers also want a product that will bring customers back to their stores. Firewood can do neither.

There are also more and more people heating areas or homes entirely with hand fired stoves. For these people, briquets present a viable alternative to firewood.

For those who aren't interested in the amount of heat obtained and only in aesthetics, firewood can't be beat.

MARKETING

Stott's immediate (1983-84) marketing emphasis is on 65 customers and potential customers in Minnesota and Wisconsin. These users represent 665,000 tons of current annual solid fuel use. Some of these are larger paper plant users that we can't realistically expect to sell; at least not all of their needs. Many will take a period of time to develop, but it is clear the market exists for Stott products.

Sales efforts will be made in six distinct areas as follows:

1. Commercial/Industrial
2. Institutional
3. Residential
4. Research
5. Department of Defense
6. Export

In 1983-84, sales are projected in the first three of these areas, though they will be carried out in all of them. In 1983-84, sales are projected at 25,000 tons for commercial/industrial, 34,000 tons for institutional, and 7,000 tons for residential. We expect growth to 120,000 tons per year by 1985-86.

The commercial/industrial market clearly has the greatest annual sales potential. In this group of users, there are some smaller users of 100 to 500 tons per year. Most users in this group use 1,000 to 120,000 tons per year. Commercial users use the fuel strictly for area heating. Industrial users use the fuel for area heat, process heat, or both. The industrial users are the larger customers. Large customers buy strictly on price per BTU. Currently briquets are the cheapest fuel on the market for up to 15,000 ton users. Most large customers bid fuel needs in the spring and summer for use in the following year. Each of the commercial/industrial users has specific fuel specifications dictated by the stoker used, burning characteristics of specific boilers, capacity of the boiler, pollution control, or process. All of the large users require testing to verify use, while most of the small users want fuels of similar quality as they are using.

Stott has developed lists of users and has contacted all 65 in Minnesota and Wisconsin which are identified as prime customers. Tests to verify pollution control qualities have begun in Wisconsin at the Pope & Talbot Paper plant in Ladysmith. One test remains and then Pope & Talbot has indicated to Stott that they will purchase 13,500 tons for use in 1983-84. Consolidated Badger Creamery has indicated that they will purchase 10,000 tons based on a successful test at Pope & Talbot. The same is true at Norco Windows.

Current commercial customers include Denzler Florist, Reach-All Manufacturing, and Superior Wooden Yachts.

Contacts have also been made by letter and in person with 13 additional users. Prices have been quoted and samples delivered. Product presentation and information sheets have been developed. All of this occurred fairly recently due to the late January production of stoker briquets. All use in this market area is stoker briquets.

One sales person and management will stay in contact with these customers. It is also essential that raw materials be bought in shipload quantities to ensure a competitive price.

Institutional sales are those sales made to governmental units, be they state, city, county or school district. This is the second largest potential market area for briquets, though in 1983-84, it is the largest. This is because use is nearly always based on price alone. There isn't as much testing needed to complete sales. All of these customers in Minnesota and Wisconsin bid their fuel needs. Bids start in January and end in August. At $65 per ton, which Stott will bid in 1983-84, briquets will be the cheapest fuel in this market. In 1982-83, Stott won 10 bids at more than $65 per ton. Stott has already won a State of Wisconsin bid for 4500 tons. All use in this area is again stoker briquets.

Contacts have been made in person at all of the institutions identified in the 65 prime customer list. Information sheets and letters have been sent. A salesman contacts these customers on a regular basis. Inventories have been made of stokers used, best briquet formulas determined for specific uses, and a special contact made to request inclusion on the list of bidders. Stott has two great advantages in this market over its competition. First, Stott will guarantee its price over the heating season; it's competition will not. Secondly, Stott will bid all institutions at $65 per ton. The competition bids large users less and gouges the smaller users, which most institutions are.

The residential market for Stott is currently 7,000 tons. These sales are off the street and old time customers of Stott. The residential market is projected to be 7,000 tons in 1983-84. All of the product sold in this market area is regular size briquets. An effort will be made through advertising, to acquaint customers with the stoker briquets for home use.

Residential heating takes two forms, primary and supplemental. Primary are those who heat a home with briquets. Supplemental is the use of small stoves or fireplaces to cut heating bills or heat cabins, ice houses, etc., temporarily. Product is bulk or packaged.

Sales in this market are made by Stott to stove manufacturers, distributors, dealers, and direct retail. Packaged product sales are made to all four types of customers, though, an effort was made in 1982-83 to expand the number and coverage of distributors. Distributors exist in North and South Dakota, Western Minnesota, Central Minnesota, Northeastern Minnesota, and the Upper Peninsula of Michigan. An effort was also made to expand the number of manufacturers and their dealers handling Stott packaged product. Currently, Fisher, Earth Stoves, and Woodchuck Stoves put Stott product in new stoves.

Stott would like to eliminate sales direct to dealers and retail customers. But, this will not occur until a viable distributor network is in place. Currently, Stott is evaluating its pricing system to distributors on packaged product. It appears a price reduction is necessary to provide a sufficient margin for distributors and dealers; and still get the product to the retail customer at a reasonable price.

Advertising has been and will be carried out on billboards, newspapers, and radio. Stott provides radio tapes, billboard paper, newspaper slicks, retail and dealer handouts, dealer signs, and special promotion signage. Advertising costs are shared 50/50 with distributors only.

Some effort will be made to expand the coverage of distributors both in our area and in other parts of the country. There will also be an effort to place product in chain stores and increase the number of manufacturers providing our product.

Anthracite packaged product presents the opportunity of selling product in Montana and New England. Montana has pollution control restrictions which can be met by anthracite briquets. Stott is working with its North Dakota distributor to market in Montana. New England is a ready market for anthracite. With development of distributors in New England, Stott anthracite briquets are cheaper than anthracite coal from the mines. Contact has been made with a potential distributor. This development process will continue in 1983-84.

Stott sales in this market are not projected to increase in 1983-84, though a slow increase is anticipated. Stott packaged product is by far the greatest margin product and has significant dollar impact. While packaged sales increase, some decline is anticipated in bulk sales due to a drop in briquet sales by C. Reiss, as Stott competes more directly with C. Reiss.

Research sales are those made under contract to test briquetted fuel for special uses or special formulas. Current sales are anticipated with Dow Corning, with whom Stott has signed a secrecy agreement covering development results. Sales in this area can't be anticipated. Stott will make an effort to contact major fuel suppliers, chemical companies and governmental agencies to indicate a willingness to do this type of work. In the past, the Department of Energy, Bureau of Mines, Conoco, General Electric, and the University of Minnesota have carried out research work with Stott. This work has been and will be done during the off season, and is done on a cost plus basis.

Department of Defense sales are made by bid for defense installations throughout the country and in Europe. The D.O.D. requires listing on the list of bidders and prior testing and approval of product before bidding. Stott is on the list of bidders and is in the process of getting product approval. Once this is accomplished, Stott will bid and lobby the Minnesota and Wisconsin Congressional delegations for assistance in purchases and specific inclusion of briquets in bid requests. This market in our area is 13,000 tons of anthracite for bases in Michigan and 325,000 tons is sent to Europe annually.

Again, nothing is anticipated in sales to the D.O.D. in 1983-84, but work will be done by management to secure some of this business.

The export sales business is a business that can't be anticipated. Current supply problems in the world have created a shortage of low sulfur petroleum coke. There is also a need for fuels which are smoke-free for use in England and Scandinavia. Stott is in contact with two brokers and one exporter for this market. This contact will continue. Efforts will continue to more easily produce a smoke-free briquet. Research will continue on the best methods of shipping, products, and contacts with additional parties to develop this market. Last year, a single order for export was 125,000 tons for England.

All of the market areas will be covered by three people selling with office backup for records, letters, and phone. Advertising tools are in place and promotional tape and slide program is being developed to assist in sales.

OFFICE/PLANT & EQUIPMENT

Stott Briquet consists of a plant located at 2826 Winter Street, in Superior, Wisconsin and offices located at 1500 Alworth Building, in Duluth, Minnesota. The plant has been in Superior for over fifty years. The office in Duluth has existed since 1981. Operating in both states has proved to be an advantage, particularly when doing business with governmental bodies.

The plant is situated on 16 acres of industrially zoned land. One block from the plant is the new Arrowhead Bridge, Wisconsin terminus. Immediately adjacent to the north is Amercian Brakeshoe and the Orba (Detroit Edison) Coal Dock. To the east is the Burlington Northern Superior railyard. To the west is a Standard Oil storage tank facility and to the south is vacant land. The property is bounded on the north by Winter Street and on the west by Maryland Street.

There are three rail lines running onto the property. Rail service is provided by the Soo, Chicago Northwestern, and the Burlington Northern. Truck service is provided by several local carriers throughout Minnesota and Wisconsin. Lakehead Trucking, Dean's Trucking, Kelly Fuel, and Spindler's Trucking are the prime carriers.

The plant consists of nine buildings as follows:

1. Press Building
2. Dryer Building
3. Boiler Room
4. Shop
5. Parts Storage Building
6. Garage/Storage Building
7. Packaged Storage Building
8. Office/Packaging/Locker Room Building
9. Scale House

The Parts Storage and Office/Packaging/Locker Room Buildings were built since 1981. The Packaged Storage Building was built in 1976. The remainder of the buildings were built with the plant and its modernization in 1929 and 1947-52.

The Press and Dryer buildings are the oldest buildings and most in need of siding and roof replacement. The remaining buildings are in good condition.

The raw material feed system to the plant is an overhead clam crane. The crane is in good condition. The elevated structure it operates on is in need of replacement. Raw material is loaded by the crane into a feed bin located behind the press building. The feed bin has two openings in the bottom to allow materials to flow into conveyors which carry raw material to the dryer building. The feed bin at one time was partitioned to allow the mixing of feed stocks. Over the years, this partition was removed. It should be replaced. The conveyors are in good condition and numerous parts are available for repairs.

The Dryer building houses three dryer furnaces, three rotary kiln dryers, and a hammer mill with a ferrous object separator. The dryer furnaces are masonry. Two furnaces are sufficient to provide enough material for the plant to run three presses. Dryer furnace #1 is in need of rebuilding and does not have a stoker. Dryer furnaces #2 and #3 are in good condition and have stokers. The three furnaces are fired by briquets and equipped with two cyclones for particulate collection.

The dryers are electrically driven and are 8 feet x 40 feet. Number one dryer is without a drive motor. Dryers two and three are in good shape. Two dryers are sufficient to dry material to operate three presses.

The hammer mill located at the rear of the dryers, is currently not used and inoperable. Raw material, as it is purchased today, is finer than was available in the past. In the future, the crane and hammermill should be replaced by a crusher and conveyor which would feed material into the feed bins.

From the dryer building, a conveyor carries the raw materials to the press building and a feed bin there. The feed bin passes material into three 10-foot long horizontal auger mixers, one for each press, where the raw materials are mixed with a binder. All of the mixers are in good condition.

The binder is heated for mixing in two storage tanks. One is 100,000 gallons and the other is 80,000 gallons. Heat is provided by steam produced in two boilers. Number one boiler is coal fired and currently not in operation. The stoker which feeds coal to it is currently inoperable. Boiler number two is oil fired. Oil for the boiler and plant equipment fuel is stored in a new 12,000 gallon tank. A single boiler can provide enough steam to operate the plant at maximum capacity. Number one boiler should be put back on line and number two used for back up only. The binder storage tanks should be replaced by five smaller tanks; 15,000 to 20,000 gallons each. This would allow greater variety in binders used and reduce heating costs. Binder is carried by underground lines to the press building. These should be replaced by elevated lines which would allow easier maintenance and breaks would be immediately visible. The three pumps which move the binder are all new since 1981, are variable speed, and 60-cycle powered.

After mixing in the horizontal mixers, the materials move down through a vertical mixer. Three of these exist, one for each press. None are in operation. They were found not to be necessary many years ago.

Passing unimpeded through the vertical mixers, the material falls into three 6-foot horizontal paddle mixers, one for each press. All are in good condition. Paddles were replaced in the past year. After the paddle mixers, material is carried by conveyor to storage bins on top of each press. All of the conveyors were reconditioned within the last year. The material is fed by rotary paddles through openings down into each press.

The three presses were built by Komarek-Greaves. They are larger and well built. Number one and Number three presses are rated at 35 tons per hour

continuous operation. They were installed new in 1947. Both are currently set to run larger briquets. There are three spare sets of rolls for these presses. Number two press is rated at 25 tons per hour. It was installed in 1929. Number two press has two spare sets of rolls, and is currently set to run stoker sized briquets. All three presses are hydraulic and provide 15,000 lbs. pressure to form the briquets. Number three press should be equipped with rolls to produce stoker sized briquets.

All three presses are served by a single conveyor beneath the runout tables to carry fines away for recycling. This equipment is in good condition.

Each press has its own cooling conveyor. These conveyors are 75 feet long and carry the briquets to the storage conveyor. They are all made of steel grids which allow fines to fall through. At the end of each conveyor are cooling blowers for summer operation. All of this equipment is in good condition.

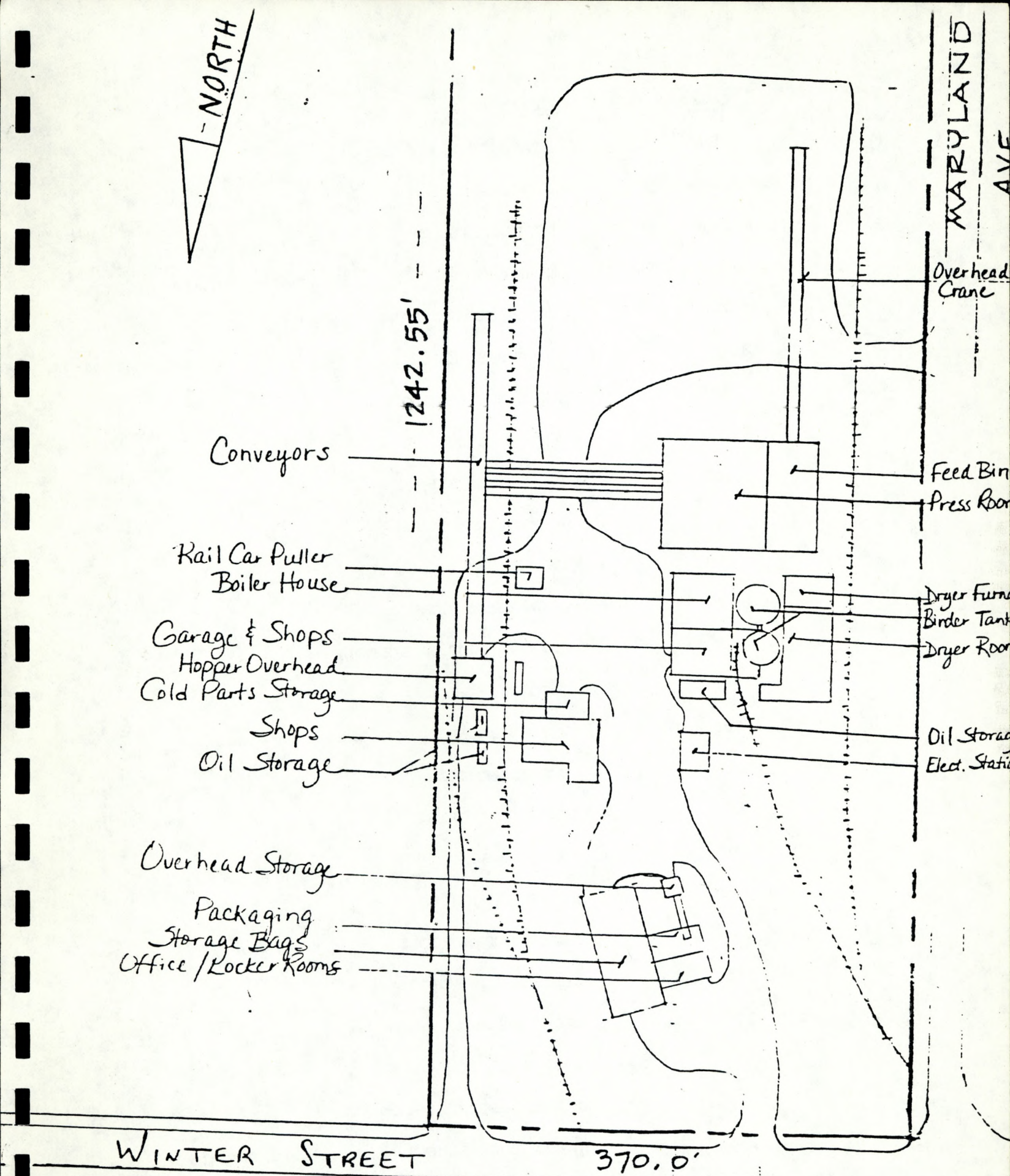
At the end of the press cooling conveyors, briquets drop onto another common cooling conveyor which carries the briquets to the south 60 feet where the briquets, if they are stoker sized, tumble down grates for ground storage; or, if they are regular sized, they fall onto another conveyor 150 feet long for transport to an overhead 300 ton storage bin. All of this equipment is in good condition. The common conveyor should be shortened to allow simultaneous production of regular briquets on Number one press while Numbers two and three are producing stoker briquets.

The storage bin has chutes allowing loading of rail cars off one side and trucks off the other. Two 3000 gallon spray oil tanks are located adjacent, and oil sprays are on the bin for oil treating trucks or rail cars. There are scales for both trucks and rail cars on either side of the scale house. All of this equipment is in good condition. When loading stoker briquets from the ground, a screening system is necessary to remove fines. We do not have one and have been renting one from Hallett Dock.

A smaller conveyor runs from the storage bin to a five ton bin for feeding into a small packaging machine. The packager is hand operated and is capable of packaging 800-40# bags per eight hour shift. The packager is in good condition but should be replaced with modern automatic heat seal system when sales warrant.

Raw material is moved to the crane by a 3-yard front end loader. Packaged material is handled by a Caterpillar fork lift, new in 1981. A 1978 Ford half-ton pick-up truck is used for plant errands. All of this equipment is leased from Chemical Equipment Leasing.

The Stott offices are comprised of four individual offices, a conference room, and a three-desk secretarial pool area. The offices are rented on a three-year lease beginning in 1982 and ending in 1984. Equipment includes two electric Remington typewriters, two tape calculators, and a xerox copier. All of the office equipment is owned or on lease purchase. All of it was purchased in 1981 or later. All of the office equipment is new in 1982 and is being purchased on a lease/purchase.



GENERAL BLD'G. LAYOUT
STOTT BRIQUET CO. SUPERIOR

TONS	BUYER
11,000	STATE OF WISCONSIN
2,500	DOUGLAS COUNTY
13,500	POPE & TALBOT
1,000	NORCO
10,000	CONSOLIDATED BADGER
1,000	DULUTH SCHOOLS
100	ASHLAND SCHOOL
300	ASKOV SCHOOL
100	BEARDSLEY SCHOOL
100	BROOTEN SCHOOL
240	CLARISSA SCHOOL
100	CLEARBROOK SCHOOL
325	CLIMAX-SHELLEY SCHOOL
160	CLOQUET SCHOOL
600	CROSBY IRONTON SCHOOLS
100	DANUBE SCHOOL
300	DENZLER FLORIST
100	ERSKINE SCHOOL
10,000	EDLEWEISS CHEESE
250	FLOODWOOD SCHOOLS
100	GREENBUSCH SCHOOL
100	BADGER SCHOOL
150	GOODRIDGE SCHOOL
150	GRAND RAPIDS SCHOOL
350	HERMANTOWN SCHOOL
100	HOFFMAN SCHOOL

TONS	BUYER
100	KELLIHER SCHOOL
150	LANCASTER SCHOOL
100	LAPORTE SCHOOL
150	LYND SCHOOL DIST. 45
150	MAHNOMEN SCHOOLS
200	MCINTOSH & WINGER SCHOOLS
100	MENTOR SCHOOL
480	PARK RAPIDS SCHOOL
150	PLUMMER SCHOOL
100	REACH ALL
150	RED LAKE FALLS COUNTY COURTHOUSE
250	RED LAKE FALLS SCHOOL DISTRICT
100	ST. JOSEPH'S SCHOOL
400	RED LAKE INDIAN RESERVATION SCHOOL
12,000	STATE OF MINNESOTA
175	STRANQUIST SCHOOL
350	SUPERIOR SCHOOLS
60	SUPERIOR WOODEN YACHTS
250	SWANVILLE SCHOOLS
600	SCHOOL DISTRICT #710
250	WALKER SCHOOL
300	WAUBUN SCHOOLS
75	STURGEON LAKE SCHOOL
69,365 total	

7000 TONS REGULAR

TONS	POTENTIAL BUYER
15,000	NORLIND BIOMASS FUELS
20,000	BLANDIN PAPER COMPANY
350	DAVY MCKEE
	DEFENSE ORDERS
2,000	DOW CORNING
10,000	DETROIT LAKES PUBLIC UTILITY
28,000	UNIROYAL
50,000	OWENS ILLINOIS FOREST PRODUCTS
100,000	RHINELANDER PAPER
30,000	OSCAR MEYER
65,000	CONSOLIDATED PAPER
65,000	MOSINEE PAPER
50,000	WARD PAPER
120,000	NEKOOSA PAPER
15,000	JIM FALLS DAIRY
60,000	FLAMBEAU PAPER
250	MACGREGOR SCHOOL
125,000	POTLATCH
10,000	ST. JOHNS
10,000	UMD
50,000	DULUTH STEAM
10,000	CONSECO
50,000	HANNA MINING/BUTLER TACONITE

CAPITAL IMPROVEMENTS 1983-84

1. New set of 1¼ inch rolls for big presses
2. Either crane cable or new pulverizer
3. Conveyor for pulverizer to wet bin. Cover for pulverizer.
4. Wet bin divider
5. Conveyor covers
6. #3 dryer new brick furnace or plastic
7. Enclosure chutes for cyclones. Exhaust into long drag
8. Check weld on stacks
9. #2 dryer repair blades, #2 new ~~motor~~ 25 cycle
10. Replace or repair pulverizer. Eliminate elevator, mag, shaker screen would need magnate on front end.
11. Covers on long drag
12. Wall sheeted on #1
13. #2 mixer paddles. Feed drag for #2 buckets replaced.
14. New drives on Pokey and Pet-coke
15. Covers on all conveyors
16. Chutes to roof from press hopper
17. #2 boiler on coal. #1 boiler new stack. Covers on stacks. 100,000
18. Pump for binder cars
19. Binder storage changes
20. Cover steam lines - welded joints
21. Divide table to run two sizes
22. Spray oil and heat coil. Trace line.
23. Screener and spray oil 25,00
24. Finish packaging
25. Finish locker room/office
26. Floor in storage building
27. Dryer and press room - brick tuck pointed and sheeted sides and roof
28. Drainage, clean-up and fill

Appendix F

Processed Wood Fuels Analysis
Summary of "Minnesota Processed Woodfuel Industry - A Study of International Opportunities" by Henri Heystek of Danoka International, Inc.

A. OVERVIEW OF WOOD FUEL PROBLEMS COMMON TO THE TARGET MARKETS AND OTHER DEVELOPING COUNTRIES

- Fuelwood and charcoal remain the single most important energy source representing from 50 to 95% of total energy consumed in all sectors and virtually 100% of household cooking requirements. Even in the Ivory Coast probably the most developed country in the region wood is still the source of 50% of the nation's total energy produced and provides 90% of household energy requirements.

- Woodfuel will remain the basic energy source for domestic/household use far into the next century as long as wood remains available from whatever sources. There is no alternative for the masses.

- Charcoal is the preferred cooking fuel and used primarily in urban areas. Prices are high and escalating. The average retail price is already or fast approaching U.S. $200. per metric ton. Prices exceed U.S. $300. per ton in some markets already.

- Low average incomes prohibit the use of alternative traditional "developed country" fuels and the most simple type of appliances with which to use them.

- Industrial use of energy is low compared to developed country standards, but growing at a faster rate as nations industrialize and urbanize, i.e. develop.

- Demand for total energy is projected to double in Africa by the year 2000.

- Limited capital is available for developing alternative fuel energy distribution systems to the masses.

- The bulk of wood removed at alarming rates from forests is for fuelwood purposes, not commercial forest products. Ecological implications not addressed in this report compound the situation further.

- All countries suffer from high deforesta- tion rates. Poor statistics make it difficult to determine the exact degree, but there is little doubt that demand is outpacing supply.

- Donor/developed countries, or voluntary groups, are contributing vast sums of moneys to attempt to rectify the imbalance between demand and supply but their good intentions are generally too little and too late. Most efforts would have to be increased 20 times in scope to be effective long term.

- The cost of imported oil, used primarily for the transportation sector and some industrial use, is strangling foreign exchange reserves. Many countries pay 50% or more of their export earnings for oil.

- Most countries have fluctuating export earnings from primarily agricultural product exports which are dependent upon crop conditions and world commodity prices.

- There is lack of government energy policies and technical staffing in the majority of countries.

- There is heavy dependence on developed countries for help in solving energy related problems.

B. THE TIMING IS RIGHT

Global realization of the pending woodfuel dilemma is fairly recent.

Although many of us have been aware of chronic food shortages in the world, few have been exposed to the woodfuel crises.

Although futurists may have been sending signals about a developing shortage, they must not have been heard or understood by influential world leaders.

Not until the United Nations Conference on Renewable Sources of Energy held in Nairobi, Kenya, during the summer of 1981 and attended by 1,000 delegates from 125 countries, plus 4,000 others including 700 journalists, did the world community really get the message and wake up to the reality which faces half of mankind.

Hastily executed programs have since been put into motion by well meaning groups in an attempt to prevent the inevitable, i.e. total depletion of woodfuel in the majority of developing nations around the world.

The vast majority of such programs, including our own U.S. Government's efforts, concentrate on:

- Attempting to grow trees in wood poor countries.

- Educating woodfuel consumers to conserve whatever forest resources remain by using more efficient woodburning appliances.

- Teaching charcoal producers more efficient ways to produce their product as it is one of the greatest single drains on remaining wood energy resources.

- Developing charcoal supplements or replacers.

- Promoting alternative renewable energy concepts such as solar, wind, and other biomass utilization -- few of which are applicable as a substitute for the wood fuel in cooking.

C. THE CONCEPT OF MOVING WOOD FROM WOOD RICH AREAS TO WOOD POOR AREAS.

None of the countless multi-million dollar programs that the writer was exposed to address the concept of moving woodfuel from "wood poor" areas. It would seem to the writer that such efforts could provide immediate benefits and, along with intensive tree planting programs, could certainly contribute towards stabilizing the deficit woodfuel situations in many problem countries and gain time for the implementation of additional reforestation efforts.

The concept has not been considered by many, if any, because of general unfamiliarity with our type of products and technology.

Traditionally moving bulky heavy firewood around in its natural state has been a tedious task performed by small entrepreneurs most on a very localized basis.

The Minnesota Product is uniform in size, easy to handle and transport, and most applicable to the above concept. Few know it exists.

D. ABOUT CHARCOAL

Fortunately several programs and groups have realized the evils of charcoal production. Attempts are being made to address this issue in several wood poor countries.

The problem is that this is the preferred household cooking fuel for those who can afford it for their open fire cooking methods. Substitutes which the writer did find, such as peat and compressed peanut shells, have not made a hit with the housewife. Probably because of the smoke, odor, and significantly lower caloric value of energy emitted.

There is a tremendous demand for suitable charcoal replacements in most wood poor developing countries. It is within this context that the Minnesota Processed Woodfuel Products and technology could find their greatest potential. The product comes closest to charcoal than other alternatives.

Charcoal consumption is enormous in most of the developing countries and a significant contribution to deforestation as it takes <u>six to eight</u> pounds of wood to make <u>one</u> poind of charcoal.

Some 70% or more of the potential wood energy in a tree goes up in smoke if it is converted into charcoal.

Actually the custom of charcoal making was started precisely for reasons of turning available bulky, heavy wood into a more convenient form for transport and handling purposes. Because of this, it has become the favorite wood-based fuel of urbanites, and as a developing country develops and urbanizes, the production and demand for charcoal escalates.

In order to make this perhaps somewhat difficult but crucial point clear:

Under the most optimum charcoal production methods, 100 lbs. of wood will yield 30 lbs. of charcoal which when used for cooking will emit (30 x 13,500 BTU's/lb.=) 405,500 BTU's.

The same 100 lbs. of wood can yield 90 lbs. of processed woodfuel pellets which when used for cooking will emit (90 x 8,500 BTU's/lb.=) 765,000 BTU's.

Most charcoal is, however, not made under optimum conditions; thus, one can safely say that in the final analysis our type of process doubles the potential "end use caloric value" of every tree felled for charcoal production purposes.
Replacement for the archaic and terribly inefficient charcoal production methods in wood poor countries with Minnesota and Wisconsin industry type of technology had not been considered anywhere.

It offers a real door opener with which to achieve the primary objective of exporting Minnesota Product.

E. INDUSTRIAL APPLICATIONS

The second most immediate potential for our product and technology ties in with developing countries' needs to trim their imported oil costs drastically by substituting oil with alternative solid fuels wherever possible.

In countries where solid biomass type fuels such as peat are being considered or already being used, our product offers significant potential as a supplement fuel. Since electric utilities are the largest industrial consumer of oil in many countries, they are deemed to be the best candidates.

Summary of Processed Wood Fuel Producers
Selected Characteristics

Plant	Production Levels ------ Max. Capacity	Current	Excess	On-Site Storage
Aspen Fiber	40,000 tons	18,000	22,000	4,500 tons
Aspenal	40,000	17,000	23,000	5,000
Cole	10,000	3,000	7,000	1,000
Durkee	4,800	3,900	900	1,000
Forest Fuels	36,000	19,200	16,800	3,400
TOTALS	130,000	61,100	69,700 (53%)	14,900

Product Description

Plant	Type	Size	BTUs/#	Ash %	Weight/C.F.	Moisture %
Aspen Fibers	Pellet	3/8" dia. x 1.5"	8,100	3	40#	¼10
Aspenal	Pellet	3/16-7/8" x 1-2/5"	8-8,500	¼5	40#	¼10
Cole	Briquette	80 mm x 3"	8000	-	50#	8-10
	Log	80 mm x 12"	8000	-	50#	8-10
Durkee	Briquette	3" dia. x 3-5"	8,937	.55	50#	7.5
Forest Fuels	Pellet	3/8" dia. x .5-.75"	8-8250	3.5	39#	4-6

SOURCE: Arrowhead Regional Development Commission