

HB

158

AB
157

IN THE LEGISLATURE OF THE STATE OF ALASKA

TENTH LEGISLATURE - FIRST SESSION

A BILL

For an Act entitled: "An Act making a special appropriation to the University of Alaska to determine the feasibility of using waste heat generated by the trans-Alaska pipeline for grain and forage drying; and providing for an effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA

* Section 1. The sum of \$100,000 is appropriated from the general fund to the University of Alaska for a study to establish the feasibility to use waste heat recovered from pump station No. 9 of the trans-Alaska pipeline to dry grains and forages for livestock feed.

* Section 2. The unexpended and unobligated portion of this appropriation lapses into the general fund June 30, 1979.

* Section 3. This Act takes effect immediately in accordance with AS. 01.10-070(c).

FISCAL NOTE

I. REQUEST

Bill/Resolution No. Senate Bill No. 87
 Title An Act Making A Special Appropriation to the University of Alaska to Determine Feasibility of Using Waste Heat for Grain Drying Date 9 February, 1977
 REQUESTED BY Senator Kerttula

II. FISCAL DETAIL

Agency Affected University of Alaska
 Program Category Affected Agricultural Experiment Station
 Budget Request Unit(s) Affected Organized Research

EXPENDITURES (Thousands of Dollars)

	FY 77	FY 78	FY 79	FY 80	FY 81	FY 82
100 PERSONAL SERVICES	3.4	24.6	37.9	-0-	-0-	-0-
200 TRAVEL	-0-	3.5	0.5	-0-	-0-	-0-
300 CONTRACTUAL	-0-	10.2	7.2	-0-	-0-	-0-
400 COMMODITIES	0.2	0.2	0.3	-0-	-0-	-0-
500 EQUIPMENT	2.5	9.5	-0-	-0-	-0-	-0-
600 LAND & STRUCTURES	-0-	-0-	-0-	-0-	-0-	-0-
700 GRANTS, CLAIMS, ETC.	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL				-0-	-0-	-0-

FUNDING (Thousands of Dollars)

GENERAL FUND	6.1	48.0	45.9	-0-	-0-	-0-
FEDERAL FUNDS	-0-	-0-	-0-	-0-	-0-	-0-
OTHER (Specify)	-0-	-0-	-0-	-0-	-0-	-0-

POSITIONS

FULL TIME	1	2	2	-0-	-0-	-0-
PART TIME	-0-	-0-	1	-0-	-0-	-0-
TEMPORARY	-0-	1	1	-0-	-0-	-0-

III. ANALYSIS (See Fiscal Note Preparation Instructions, Section III)

See Attachment

IV. DATE 9 February, 1977 PREPARED BY Dr. F.J. Wooding, Dr. C.E. Lewis
 AGENCY Agricultural Experiment Station
 PHONE 479-7188 University of Alaska
 Original: Legislative Finance
 cc. Budget and Management
 Prime Sponsor (First Legislator Named)

Senate Bill No. 87
Project Summary Totals

100	<u>Personal Services</u>		\$ 65,857.39
	FY 77	\$ 3,394.61	
	FY 78	\$24,604.62	
	FY 79	\$37,858.16	
200	<u>Travel</u>		\$ 4,000.00
	FY 77	\$ -0-	
	FY 78	\$ 3,500.00	
	FY 79	\$ 500.00	
300	<u>Contractural Services</u>		\$ 17,400.00
	FY 77	\$ -0-	
	FY 78	\$10,200.00	
	FY 79	\$ 7,200.00	
400	<u>Commodities</u>		\$ 700.00
	FY 77	\$ 200.00	
	FY 78	\$ 200.00	
	FY 79	\$ 300.00	
500	<u>Equipment</u>		\$ 12,000.00
	FY 77	\$ 2,500.00	
	FY 78	\$ 9,500.00	
	FY 79	\$ -0-	
		TOTAL	\$ 99,957.39

Senate Bill No. 87
Analysis of Fiscal Note

FY 77 Costs

100 Personal Services \$ 3,394.61

Assistant Professor of Resource Systems \$ 3,394.61

This position would be employed for one month prior to FY 78 to begin implementation of the research project. It is the responsibility of the position to act as project co-principal investigator and to conduct the cost analysis, assist in data analysis of grains, and interact with technological contractual services provided.

\$2,482.13	Salary (\$2,482.13 per month X 1 month)
<u>394.66</u>	Leave Allowance (15.9%)
\$2,876.79	Subtotal
<u>517.82</u>	Staff Benefits (18%)
\$3,394.61	Position Total

400 Commodities \$ 200.00

a) Bag tags and grain bags \$ 200.00

500 Equipment \$ 2,500.00

a) Laboratory grain dryer and associated equipment \$ 1,000.00

b) Grain storage bins \$ 1,500.00

TOTAL FY 77 COSTS \$ 6,094.61

Senate Bill No. 87

FY 78 Costs

100 Personal Services

\$24,604.62

Assistant Professor of Resource Systems \$11,392.14

This position would be employed for three months to develop and coordinate the project. It is the responsibility of the position to act as project co-principal investigator and to conduct the cost analysis, assist in data analysis of grains, and interact with technological contractual services provided.

\$ 8,191.02	Salary (\$2,730.34 per month X 3 months)
<u>1,302.36</u>	Leave Allowance (15.9%)
\$ 9,493.38	Subtotal
<u>1,898.76</u>	Staff Benefits (20%)
\$11,392.14	Position Total

Senior Research Assistant (21A) \$11,922.48

This position would be employed for four months to develop the project. The person employed would be an agronomic specialist, skilled in laboratory techniques and would aid in laboratory work, calculating data and other duties assigned by the project heads.

\$ 8,572.40	Salary (\$2,143.10 per month X 4 months)
<u>1,363.00</u>	Leave Allowance (15.9%)
\$ 9,935.40	Subtotal
<u>1,987.08</u>	Staff Benefits (20%)
\$11,922.48	Position Total

Agricultural Laborer (11A)
(Temporary Help)

\$ 1,290.00

This position would be responsible for field work associated with grain harvest and storage and would be employed for one month.

\$ 1,075.00	Salary (\$1,075.00 per month X 1 month)
<u>215.00</u>	Staff Benefits (20%)
\$ 1,290.00	Position Total

200	<u>Travel</u>	\$ 3,500.00
	Travel required to review waste heat agricultural projects in parts of United States, such as California, Washington, Oregon, etc. to analyze various drying techniques for application in Alaska.	\$ 1,000.00
	The Scandanavian countries and England currently employ waste heat in the processing of agricultural products, particularly high moisture grains. A review of the techniques would be done to determine applications in Alaska.	\$ 2,000.00
	Approximately 20 trips to and from Delta Junction (Pump Station #9 site and field plot site) would be necessary during equipment adaption and harvest.	\$ 500.00
300	<u>Contractural Services</u>	\$10,200.00
	Contractural services will be used to determine types and amount of fungal organisms and amounts or presence of micro toxins in stored grains; analysis of carbohydrate content (sugars & starches); and amino acid analysis of proteins.	\$ 1,700.00
	Technological consultants will be used for aid in analysis of technology for utilizing waste heat for grain drying and for aid in equipment design and installation.	\$ 8,000.00
	Computer run time will be necessary for cost analysis and grain analysis.	\$ 500.00
400	<u>Commodities</u>	\$ 200.00
	a) Bag tags and grain bags	\$ 200.00
500	<u>Equipment</u>	\$ 9,500.00
	200 bushel per hour grain dryer, conversion and heat transfer equipment.	\$ 9,500.00
TOTAL FY 78 COSTS		<u>\$48,004.62</u>

Senate Bill No. 87

FY 79 Costs

100 Personal Services \$37,858.16

Assistant Professor of Resource Systems \$12,740.13

This position would be employed for three months to coordinate and complete the project. The position would also collaborate in preparation of documentation for publication of the project results.

\$ 9,010.11	Salary (\$3,003.37 per month X 3 months)
<u>1,432.62</u>	Leave Allowance (15.9%)
\$10,442.73	Subtotal
<u>2,297.40</u>	Staff Benefits (22%)
\$12,740.13	Position Total

Senior Research Assistant (21A) \$16,666.65

This position would be employed for five months to maintain and complete the project. The position would also assist in preparation of documentation of project results as assigned by project heads.

\$11,787.05	Salary (\$2,357.41 per month X 5 months)
<u>1,874.15</u>	Leave Allowance (15.9%)
\$13,661.20	Subtotal
<u>3,005.45</u>	Staff Benefits (22%)
\$16,666.65	Position Total

Secretary (12A) \$ 4,123.43

Secretarial services would be necessary for two months to type project results and be responsible for any duties necessary for publication of documentation.

\$ 3,379.86	Salary (\$1,689.93 per month X 2 months)
<u>743.57</u>	Staff Benefits (22%)
\$ 4,123.43	Position Total

Agricultural Laborer (11A) \$ 4,327.95
(Temporary Help)

This position would be responsible for field work associated with grain planting, harvest, drying and storage and would be employed for three months.

\$ 3,547.50 Salary (\$1,182.50 per month
X 3 months)
780.45 Staff Benefits (22%)
\$ 4,327.95 Position Total

200 Travel \$ 500.00

Approximately 20 trips to and from Delta Junction (Pump Station #9 site and field plot site) would be necessary during planting, harvest and drying seasons. \$ 500.00

300 Contractural Services \$ 7,200.00

Contractural services will be used to determine types and amount of fungal organisms and amounts or presence of micro toxins in stored grains; analysis of carbohydrate content (sugars & starches); and amino acid analysis of proteins. \$ 1,700.00

Technological consultants will be used to aid in assessment of methods of utilizing waste heat for drying assessment of system performance and documentation of technological data. \$ 5,000.00

Computer run time will be necessary for cost analysis and grain analysis. \$ 500.00

400 Commodities \$ 300.00

Parts needed for equipment adjustment and/or field preparation. \$ 300.00

TOTAL FY 79 COSTS \$45,858.16

Title:

The Feasibility of Utilizing Waste Heat from the
Trans-Alaska Pipeline for Grain and Forage Drying

Principal Investigators:

Frank J. Wooding, Ph.D.
Associate Professor of
Agronomy

Carol E. Lewis, Ph.D.
Assistant Professor of
Resource Systems

Performing Organization and Address:

Agricultural Experiment Station
School of Agriculture and Land Resources Management
University of Alaska
Fairbanks, Alaska

Date:

February 1, 1977

THE FEASIBILITY OF UTILIZING WASTE HEAT FROM THE
TRANS-ALASKA PIPELINE FOR
GRAIN AND FORAGE DRYING

BACKGROUND

Much emphasis has been placed in recent years on energy utilization and its impact on economic growth. In the face of an increasing world population, heavy demands are being made on energy supply sources, particularly as related to food production. It has become exceedingly important to conserve and improve the efficiency of energy available from both fossil and non-fossil fuels. This is very evident in the agricultural industry, particularly in small grain and forage production. As an example, natural gas forms the energy base for over 80 percent of the energy used in irrigation pumps, grain drying and anhydrous ammonia fertilizer production in Kansas. Decreasing supplies of natural gas can be expected with continuously rising prices.(1) This will be true in all agricultural areas of the United States. It is important to utilize the maximum energy available from any fuel source.

Alaska, in particular, is placed in a unique position in the scenario of total energy use in food production. Over 17 million acres of tillable land and 10 million acres of rangeland have been identified.(2) One area, the Delta-Clearwater region, in the interior is considered most attractive for future agricultural development for the following three major reasons:

1. The area contains approximately 10,000 cleared acres and over 100,000 acres of uncleared land with high agricultural potential. Portions of this acreage are currently in use for the production of grain and forage crops.
2. Pump Station #9 of the trans-Alaska pipeline is located centrally within the area. During beginning phases of oil flow, an average of 800,000 BTU per minute of low pressure turbine exhaust will be released at temperatures of 475° F at an ambient temperature of 0° F. At maximum oil flow, this will increase to an average of 1,000,000 BTU per minute at temperatures of 535° F.(3) These temperatures are considered within the range necessary to operate grain and forage dryers, which have an energy requirement in the neighborhood of 1/10 that available from Pump Station #9, if the grain and forage is harvested at moisture levels as high as 40 to 60 percent.(4,5)

3. The beginnings of a production and marketing infrastructure are present in the Delta-Clearwater area. A major road system serves as a connector to Fairbanks and Anchorage. Farm equipment and supply outlets are located within a 100 mile radius. Small grains and hay produced within the area are marketed within the state through established channels. In addition, Delta Junction is the headquarters of the Alaska Farmers Cooperative, Inc..

The potential for growth in agricultural production, processing and marketing in the Delta-Clearwater area will not be realized until several specific questions are resolved. These are:

1. Can waste heat be used for grain and forage drying?
Although the heat generated by pump station turbine exhausts is extremely high, it is not in a form immediately usable in any agricultural application. Investigations show that systems can be designed within specifications of the turbines to use the heat generated. (6) The various methods of transferring the heat to the drying area must be investigated to determine that which is the most efficient. Use of waste heat for grain and forage drying may make production of these crops within Alaska economically attractive.
2. Will use of turbine exhaust gases for drying damage grains and forages? Indications are that there will be no damage and that there may be an advantage to using waste gases. Grains and forages should be analyzed both before and after a storage period to determine the effect of the exhaust gases, if any.
3. Will grains and forages produced meet international quality standards? Data from the Agricultural Experiment Station at Fairbanks indicate approximately 80 percent of barley produced in the Delta-Clearwater area can meet international standards. Again, analysis of grain and forage quality before and after a storage period will substantiate this data.

The conversion and use of gas turbine exhausts as an energy source for drying grains and forages is a key to large scale production of an animal feed product within Alaska.

PROJECT OBJECTIVES

The objective of this project is to show the feasibility for utilizing waste heat for drying grains and forages. This will accomplish:

1. The provision of a waste heat recovery system design for Pump Station #9 of the trans-Alaska pipeline or for similarly designed exhausting systems.
2. The provision of a method for more efficient use of fossil fuel in a multi-purpose system (pump station operation and crop drying).
3. A means to use high moisture grains and forages as a year-round feed base in Alaska and as a marketable product to areas outside the state.

All of the above will combine to provide the opportunity for growth of an agricultural industry which will include as major components production, processing and marketing of grains and forages. The industry will serve the immediate area and the state and provide consumer benefits including dollar savings per unit of energy expended.

PROJECT AREA

The Delta-Clearwater area is largely agricultural. It is serviced by a major highway system providing access to Fairbanks (90 miles west-northwest), Anchorage (300 miles southwest) and the Canadian border (200 miles southeast). The nearest railhead is in Fairbanks; the nearest port, Anchorage. Only charter airlines service the area with Fairbanks the nearest international airport. The area cannot be considered a bedroom community of Fairbanks, although Fairbanks is considered the primary trade center. It was, previous to the trans-Alaska pipeline influx, a trading center for area farmers, most of whom had begun as homesteaders. In fact, Fairbanks, ninety miles west of the Delta-Clearwater area, from the turn of the century to the 1930's, was considered the center of Alaska's agriculture. Cattle and hogs were raised. Market vegetable production, hay production and grain production were under way.

In 1968, legislative action made additional land available to persons actively engaged in farming. Several area farms have grown because of this action but have not expanded substantially. As examples, a 1,000 hog production facility was established in 1970, but did not remain in operation because of lack of a consistent feed supply and lack of an existing market infrastructure.(7) A dairy operation involving more than one hundred head with a complete processing, packing and distributing facility exists in the area. In addition, a beef cattle feeding operation involving one hundred head was recently established. There is an on-going egg production operation of over 10,000 laying hens, as well as a sheepherder with a one hundred head flock. Agriculture in the area is not limited by climactic or biological factors, but by factors of a developmental and economic nature.

The transportation access in the Delta-Clearwater area provides a means for import and export of products. The same system makes distribution to inter and intra-state destinations possible, and provides access to shipping ports making available possibilities for international trade. Japan, in particular, imports 90 percent of its vital grains. Alaska, with a high quality grain product, could be in a good position to compete in the international livestock feed market. As the market is expanded, the Delta-Clearwater area could conceivably provide up to 100,000 acres of high quality agricultural land for production of grains and forages.

An ad hoc committee on agriculture has prepared an assessment of large scale barley production in the Delta-Clearwater area. The assessment indicates that farms approximately 3,000 acres in size, using fallow management systems are viable and that sufficient quantities of grain can be produced on 50,000 acres to warrant a 1 million bushel cut-through elevator-dryer system.(9) Investigation of the potential of drying grains and forages with waste heat is, therefore, of high interest in terms of contribution to a renewable resource economic base for the state. The conclusion which may be reached is that waste heat utilization may well be the impetus needed for the revival and future development of agriculture in Alaska.

RELATED STUDIES AND PROJECTS

The following is a listing of projects, with references, of on-going and future research by the University of Alaska, Agricultural Experiment Station.

Grain and forage production:

For the past four years, a cereal grain research program has been conducted in the Clearwater-Big Delta region. Emphasis has been placed on evaluation of barley, oat and wheat varieties as feed grain crops. Oat varieties have also been evaluated as a forage and straw crop. Other areas of research include fertilizer response, comparison of production systems (continuous grain vs. summer fallow-grain), tillage practices, seeding rates, and weed control.

Burton, W. E., D. H. Dinkel, and F. J. Wooding, "So Many Questions-- So Few Answers", Agroborealis, Vol. 3, No. 1, pp. 21-24, 1971.

Wooding, F. J., G. M. Paulsen, and L. S. Murphy, "Sulfur Composition of Soybeans as Affected by Macronutrient Deficiencies", Soil Science and Plant Analysis, 3:151-159, 1972.

Wooding, F. J. and C. W. Knight, "High Protein Grain from Interior Alaska"; Agroborealis, Vol. 4, No. 1, pp. 12-13, 1972.

Martin, G. C., R. F. Barnes, A. B. Simons, and F. J. Wooding, "Alkaloids and Palatability of Phalaris arundinacea L. Grown in Diverse Environments", Agronomy Journal, 65:199-201, 1973.

Wooding, F. J. and A. C. Epps, "Grain Varieties for the Golden Valley", Cooperative Extension Service Publication No. 46, University of Alaska, 1973.

Wooding, F. J. and C. W. Knight, "Barley Yields on Summer Fallowed and Stubble Land", Agroborealis, Vol. 5, No. 1, p. 22, 1973.

Wooding, F. J., D. H. Hassinger, and G. Willis, "Grains in Seward's Icebox", Agroborealis, Vol. 6, No. 1, pp. 4-6, 1974.

Wooding, F. J., J. L. Brossia, S. D. Sparrow and D. H. Hassinger, "Small Grains on Agricultural Land in Remote Areas of Alaska", Agroborealis, Vol. 7, No. 1, pp. 28-30, 1975.

On-going research concerns grain production in the Tanana Valley of interior Alaska. The objectives are to increase production of barley, oats, and wheat through a broad, intergrated, research program of variety testing and cultural practices. Triticale is to be evaluated as a potential new grain crop. Grains produced in a subarctic environment are to be evaluated for quality and suitability. In addition, grain adaptation tests are being conducted for remote areas of Alaska.

Wooding, F. J., "Small Grain Production in the Tanana Valley of Interior Alaska", Hatch Project, March 1, 1974.

Wooding, F. J., "Grain Adaptation Tests for Remote Areas of Alaska", Special Appropriation of Hatch Funds, 1974.

Since May, 1970, research on peas, barley and oat mixtures has been conducted to determine in-combination and independent response to harvest date and crop mix. The parameters of interest are protein, digestibility and yield.

Brundage, A. L., R. L. Taylor and V. L. Burton, "Barley, Oats and Peas, Alone and in Combination, for Forage", presentation at the Annual Meeting of the American Dairy Science Association, June, 1976.

Markets:

Past work on markets for agricultural commodities produced in Alaska has been largely confined to only statewide markets. The topics covered have included pork, beef, vegetables, dairy, and feed production. Although only limited local markets were identified, production within the state is small enough to allow market expansion in most areas.

Burton, W. E., "Alaska's Agriculture", Institute of Social, Economic and Government Research, University of Alaska, 1971.

Flynn, E. and W. Thomas, "Assessment of Markets for Fresh Vegetables in Anchorage", G. E. - TEMPO, Research Publication, 1973.

Thomas, W., and P. Linn, "Economic Factors in Alaskan Milk Marketing", Agroborealis, 1972.

Stephens, C., W. Thomas and V. Burke, "Supplying Alaska's Red Meat and Poultry Products, Institute of Agricultural Sciences, University of Alaska, 1975.

Research just beginning at the University of Alaska will analyze the export market for feed barley, malt barley, and grain and/or feed pellets. Identification will be made of possible markets and problems and opportunities associated with these markets. Included will be an analysis of price conditions, trade arrangements, transportation system requirements and appropriate domestic and foreign government regulations.

Thomas, W., "Agriculture in Alaska; 1976 - 2000 A.D.", Alaska Review of Business and Economic Conditions, Institute of Social, Economic and Government Research, University of Alaska, June, 1976.

Thomas, W., "International Markets and Marketing for Alaska Produced Farm Products", Research Project, Agricultural Experiment Station, University of Alaska, 1976. Sections of this marketing research will be carried on as in-kind contributions to the waste energy project proposed here.

Agricultural potential:

There are three agricultural potential studies which are on-going within the Agricultural Experiment Station. The major concern is economic and social impact on the state and on available markets for products from the state.

Buton, W. E., "Creating a Northern Agriculture, I, II, III, IV, V", University of Alaska, Agricultural Experiment Station Bulletin No. 42 through 46, 1975, 1976.

Faris, J. E. and R. J. Hildreth, "Consideration for Development - Alaska's Agricultural Potential", for the Federal Land Use Planning Commission of the University of Alaska, Agricultural Experiment Station, April, 1976.

Thomas, W. C., C. E. Lewis and F. J. Wooding, "The Potential for Production of Barley in the Delta-Clearwater Area of Interior Alaska", Univ. of Ak., Ag. Exp. Station, February, 1977, draft.

Waste heat utilization:

The utilization of waste heat in agricultural systems has been addressed within the Agricultural Experiment Station.

Dinkel, D. H., "Potential for Production of Intensively Cultured Crops in Alaska Using Geothermal or Waste Heat Sources", presented at the Second Int. Symp. on Cold Regions Engineering, Univ. of Ak., Aug. 13, 1976.

Lewis, C. E., "The Utilization of Waste Heat in Agribusiness Development", presented at the Second Int. Symp. on Cold Regions Engineering, Univ. of Ak. Aug. 13, 1976.

PROJECT PROCEDURES

Method of Approach

A three part study will be conducted over a two year period to provide answers to those questions raised in the background discussion. The parts of this study are:

- Part 1. Provision of an efficient design for the conversion of low pressure turbine exhaust to usable form.
- Part 2. Determination of the effect of turbine exhaust gases on quality of grains and forages.
- Part 3. Determination of grain and forage quality after drying with exhaust gas and after a period of storage at varying moisture levels.

Discussion of Part 1.

The exhausted heat available is in the form of a low pressure, high BTU per minute flow at high temperatures. Requirements of low back pressure for efficient turbine operation limit the design specifications for recovery of the heat. Both a fin tube and a tube/ambient air system have been suggested. Alternate possibilities will be considered. The possibility of a water jacket surrounding the recovery tube will be investigated, assuming a future need for heated water. Cost of the system and operation and maintenance requirements will be a primary consideration.

In FY 78, a small dryer (200 bushel per hour) will be purchased and equipped with heat conversion and transport systems which will allow utilization of turbine exhausts. If it is not possible, due to conflict with pipeline start-up operations, to use the Pump Station #9 site, an alternative source will be used. Several are available in the Fairbanks area. The dryer system is scheduled to be operational in FY 79.

After completion of drying of the FY 79 crops, an analysis of operating efficiency, cost of operation and conversion and installation costs will be prepared. The waste heat system will be compared to conventional drying systems using this cost data.

Discussion of Part 2.

During FY 78, grain and forage samples harvested either in Fairbanks or in the Delta-Clearwater area will be dried to moisture levels varying from 30 to 12 percent. The drying will be done at the Agricultural Experiment Station at Fairbanks using conventional drying methods. The objective of the FY 78 sampling is to establish a data base for Alaskan grains and forages dried using conventional methods. This data base will be used as a comparison when turbine exhaust is used for drying.

Before storage, contractual services will be used to analyze grain and forage quality. Particular attention will be given to carbohydrate content (sugars and starches), protein content, and amino acid composition of proteins.

The grain and forage samples will be stored in outdoor bins. After a nine month storage period, an analysis will again be conducted of carbohydrate content and proteins. Additionally, a determination will be made of the type and amount of fungal organisms and amounts or presence of micro-toxins in the stored grains and forages.

Discussion of Part 3.

During FY 79, the grain and forage drying procedure of Part 2. will be repeated. However, the drying will be accomplished using a waste heat source and a drying system described in Part 1.. Contractual services will again be used to perform the analysis described in Part 2. on the dried samples and on samples taken from grains and forages which have been stored for nine months.

After sample analysis is completed, carbohydrate content, protein levels, amino acid composition of proteins, and fungal types and micro-toxins present will be compared to those in the grain and forage samples in the control group of Part 2..

Summary of Data to be Collected

After completion of the three part study (July 1, 1979), sufficient data will have been collected to complete a report addressing the questions:

1. Can waste heat be used to dry grains and forages?
2. Will use of gas turbine exhaust for drying effect grains and forages?
3. Will grains and forages produced in Alaska meet international quality standards both before and after storage?

The following data categories will be used in the report.

1. Technology of waste heat recovery systems for use in grain drying.
2. Efficiency of waste heat recovery systems considering all energy uses within a system. An example would be the use of fossil fuel for pump station operation and a use of the exhaust heat from the turbines for crop drying.
3. Investment cost of the waste heat recovery system.
4. Operating cost of the recovery system.
5. Efficiency, investment cost and operating cost of conventional drying systems.
6. Quality characteristics of grains and forages stored at varying moisture contents for one season after drying by either conventional or waste heat methods.
7. Quality characteristics of grains and forages immediately after drying either by conventional or waste heat methods.

FOLLOW-UP

This project has been proposed to aid those persons already producing grains and forages within Alaska and those who may be considering a beginning enterprise. At present, there is no data base which the farmer can use to determine to what moisture level grains and forages should be dried to maintain quality after storage under interior Alaska climactic conditions. Moreover, much interest has been generated concerning the use of waste heat for grain and forage drying. It is

reasonable to assume an operating cost savings would be effected by waste heat utilization. When the cost of wasted energy is compared to investment cost of recovery systems, the qualitative savings of valuable fuels is also large. Cost savings may be even larger if the use of turbine exhaust proves beneficial in storage of grains and forages at higher than normal moisture levels. However, if gas turbine exhausts damage the crop, there will be no need for further consideration of waste heat for grain and forage drying. The completion of the much needed data base for drying of grains and forages utilizing waste heat.

FOOTNOTES

1. R. J. Robel, "There May be Energy Tomorrow but at a Frightful Cost", address to the Kansas Cooperative Council, 1976.
2. Alaska Rural Development Council, "Alaska's Agricultural Potential", prepared by the Agricultural Potential Committee ARDC Pub. No. 1, Fairbanks, Alaska, March, 1974.
3. Communication: Alyeska Pipeline Service Company, Anchorage, Alaska, April 28, 1976.
4. Operating and Parts List, Behlen Model K Grain Dryer, Behlen Manufacturing Company, Columbus, Nebraska.
5. Correspondence: MEC Company, Neodesha, Kansas, 1976.
6. Communication: Ekodyne, Inc., Santa Barbara, California, April 16, 1976.
7. Communication: F. J. Wooding, May, 1976.
8. A. Tussing, et. al., "Alaska Pipeline Report", Institute of Social Economic and Government Research, Univ. of Ak., Sept., 1971.
9. Thomas, W. C., C. E. Lewis, and F. J. Wooding, "The Potential for Production of Barley in the Delta-Clearwater Area of Interior Alaska", Univ. of Ak., Ag. Exp. Station, February, 1977, draft.

DREW'S SUGGESTION TO COMPLY W/ SB 87 THIS BILL

Introduced: 2/2/77
Referred: Resources and Finance

1 IN THE HOUSE

BY COWPER

2 HOUSE BILL NO. 158

3 IN THE LEGISLATURE OF THE STATE OF ALASKA

4 TENTH LEGISLATURE - FIRST SESSION

5 A BILL

6 For an Act entitled: "An Act making a special appropriation to the Univer-
7 sity of Alaska for a study to develop the technology
8 for using waste heat generated by the ^{transalaska} pipeline for
9 ~~agricultural purposes~~ ^{grain + forage drying}; and providing for an effective
10 date."

11 BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

12 * Section 1. The sum of \$100,000 is appropriated from the general fund to
13 the University of Alaska for a study to develop the technology necessary for
14 utilizing waste heat in Alaska for the production of intensively cultivated
15 agricultural crops.

16 * Sec. 2. The unexpended and unobligated portion of this appropriation
17 lapses into the general fund June 30, 1979.

18 * Sec. 3. This Act takes effect immediately in accordance with AS 01.10.-
19 070(c).

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21 sub. SB 87 (1067 ON TAPE 8:05 PM)

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CSHB 158

IN THE LEGISLATURE OF THE STATE OF ALASKA

TENTH LEGISLATURE - FIRST SESSION

A BILL

For an Act entitled: "An Act making a special appropriation to the University of Alaska to determine the feasibility of using waste heat generated by the trans-Alaska pipeline for grain and forage drying; and providing for an effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA

* Section 1. The sum of \$100,000 is appropriated from the general fund to the University of Alaska for a study to establish the feasibility to use waste heat recovered from pump station No. 9 of the trans-Alaska pipeline to dry grains and forages for livestock feed.

* Section 2. The unexpended and unobligated portion of this appropriation lapses into the general fund June 30, 1979.

* Section 3. This Act takes effect immediately in accordance with AS. 01.10-070(c).