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DE85-0006427

DIRECT UTILIZATION OF GEOTHERMAL HEAT IN CASCADE APPLICATION TO AQUACULTURE AND GREENHOUSE SYSTEMS AT NAVARRO COLLEGE

Annual Report
for the Period
January 1984 - September 1984

Prepared by
Kenan Smith - Director
✓ Environmental Aquaculture Services

Work Performed Under Contract

DE-FC08-79ET27508
DE-FC08-79ET27058

NAVARRO COLLEGE
Corsicana, Texas

MASTER

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U.S. DEPARTMENT OF ENERGY
CONTRACT MANAGEMENT ANNUAL PROJECT REPORT
1984

TITLE: DIRECT UTILIZATION OF GEOTHERMAL HEAT IN CASCADE
APPLICATION TO AQUACULTURE AND GREENHOUSE SYSTEMS

AGREEMENT:

Number: DE-FC08-79ET27058
Start Date: March 1, 1979
Completion Date: September 30, 1984
Participant: Navarro College
Highway 31 West
P.O. Box 1170
Corsicana, Texas 75110

1984

JANUARY

Approval was received from DOE to install a recirculation system to use the collection reservoir as the freshwater source.

Research data accumulation continued and was used for inclusion in the final report.

The Public Awareness program continued with numerous news and media releases; several speaking engagements were presented on the project. Work also progressed on composing an Audio/Visual Slide Show of the project.

Testing and balancing of the system was completed this month and a report on results would be received within 60 days.

FEBRUARY

Research data accumulation continued and the recirculating freshwater system was installed this month.

Work continued on recommended revisions to the O & M Manual.

MARCH

Continued research data accumulation on the operational phase of the project.

The O & M Manual was revised and sent to DOE for review.

Treatment of the injection well with citric acid was required again this month and successfully decreased backpressure.

APRIL

Data collection continued on heat load requirements and economics of the system.

Milestone III of final report rough draft was submitted to DOE for review and recommendations.

Approval was given by DOE on completion of the O & M Manual.

A small storage building was completed at the project site to store project materials and food for aquaculture animals.

The project was switched to summer cooling mode on April 23, 1984.

MAY

Continued data collection and tentative harvest date for the shrimp was scheduled for June 22, 1984. The harvest would mark the successful growth and culture of shrimp in geothermally heated ponds. A harvest ceremony was scheduled which included media coverage and participation by DOE representatives.

A bid was requested from contractors for installation of security lighting at the project site.

Work progressed on preparing Milestone IV of the final report.

JUNE

Data collection continued on system performance and economics.

Milestone IV was completed and sent to DOE for revisions and recommendations.

A shrimp harvest ceremony was held on June 22, 1984 with numerous community and media personnel in attendance. Also attending were Gwen Redding, Jim Cotter and Bob Clarke as representatives of DOE. The ceremonies were also covered by a representative from the National Geographic Magazine.

JULY

Work progressed on the final report with revisions to Milestone I through IV being completed. Work on Milestone V (final section) would be completed by mid-August and sent to DOE for recommended revisions.

Safety lighting at the project site was under construction and bids were being received on the installation of gas heating units for the aquaculture building which would improve the efficiency of the geothermal system.

AUGUST

A complete rough draft of the final report was submitted to DOE for review and revisions. Also an automated slide show presentation of the project was sent to DOE.

Work continued on safety lighting and heater installations in the aquaculture building.

A shipment of prawns for restocking purposes was received on August 17, 1984 and transferred to the aquaculture ponds.

Task items completed (1) Production Well, (2) Environmental Report, (3) Fluid Disposal System, (4) Preliminary Design Report, (5) Final Design Report, (6) Facilities Installation, (7) O & M Manual, and (9) Resolving Problems.

Task items to become final as of September 30, 1984: (8) Public Awareness Program, (10) Information Dissemination, and (11) Report Submittals.

SEPTEMBER

Final Report submitted to DOE; all construction and agreement requirements fulfilled.

Correspondence had been received from DOE that the rough draft of the Final Report had been accepted by DOE. The Final Report was sent to the printer and delivered to DOE by the end of September. Ten copies and one reproducible print were sent to DOE.

Security lighting of the project was completed on the grounds and heater units have been installed in the aquaculture building. A normal greenhouse cooling system was ordered for the greenhouse to be installed by the end of September, 1984.

For more explicit details and information see monthly and special reports submitted to the United States Department of Energy, Nevada Operations.

Dr. Lary Reed, Director
Navarro College

Kenan C. Smith, Project Coordinator
Navarro College

Task 9.	Resolve Problems	Initiated
Task 10.	Information	Initiated
Task 11.	Submit Reports	Initiated

3.0 TECHNICAL APPROACH OR WORK PLAN CHANGES

None

4.0 VARIANCES/PROBLEMS

The geothermal injection well began to show backpressure of 4-6 lbs. This problem was discussed with Bob Clark who recommended as a consultant, Technadrill Fenix in Houston. Upon their recommendation, 100 lbs. of citric acid was placed in the injection well. The back-pressure problem was eliminated immediately and has not returned to date.

Extremely cold weather with record breaking temperatures taxed the project during the period of December 18, 1983 through December 31, 1983. Although pond temperatures declined to 68°F, they did not approach a critical temperature of 55°F. The animals have survived this period of extreme cold weather.

City water bills are much higher than anticipated; therefore, a plan has been submitted to the Department of Energy for concurrence on installation of a pump to recirculate the collection reservoir water. The savings incurred by the use of recirculated water would pay for the installation of the pump within the first year.

All checklist items have been completed by McKinney and Moore with the exception of Testing and Balancing which has been scheduled for January 10, 1984.

5.0 OPEN ITEMS

None

6.0 RECENT AND PLANNED ACHIEVEMENTS

Research is continuing at the site with constant accumulation of data.

Improvements at the site have included the installation of greenhouse lighting, automation of the backup boiler, vents and fans for the aquacultural aspect, and continued tours and project media coverage.

A proposal has been submitted to the Texas Education Agency requesting approval of programs for the development of Aquacultural and Horticultural curriculum.

The first draft of the Operation and Maintenance Manual was submitted to the Department of Energy per the Milestone Progress Schedule for review.

Dr. Lary Reed, Project Director
Navarro College

Task 9.	Resolve Problems	Initiated
Task 10.	Information	Initiated
Task 11.	Submit Reports	Initiated

3.0 TECHNICAL APPROACH OR WORK PLAN CHANGES

Approval was granted by the Department of Energy to install the water re-circulation line from the two-acre reservoir. This line and pump installation will reduce utility costs for city water by approximately \$800. per month and pay back the investment within the first year. Installation of this system is planned for early February by McKinney and Moore for an approximate cost of \$6,000.

4.0 VARIANCES/PROBLEMS

None

5.0 OPEN ITEMS

None

6.0 RECENT AND PLANNED ACHIEVEMENTS

Research data assimilation has continued. Potential problems with heating demand requirements have been discussed with Bob Clarke, USDOE Nevada.

An apparent under-estimate of peak heating flows determined by the project's A/E firm can be rectified by increasing the geothermal well flow to 60 gpm. Attempts are being made to locate a surplus pump that could produce this flow.

Several presentations have been made and news releases distributed this month including a Fish Farmer's Conference presentation at Texas A&M University on January 27, 1984.

All Testing and Balancing has been completed and we are awaiting findings and recommendations from the TAB firm.

Dr. Larry Reed, Project Director
Navarro College

Task 10.	Information	Initiated
Task 11.	Submit Reports	Initiated

4.0 VARIANCES/PROBLEMS

None

5.0 OPEN ITEMS

None

6.0 RECENT AND PLANNED ACHIEVEMENTS

Research data accumulation has continued while we have modified the system on February 8, 1984 to recirculate water from the lake in order to cut the high cost of using city water.

Road conditions to the project site have been improved with the distribution of new gravel placed on the road and spread on February 16, 1984.

Work has continued on the recommended modifications to the operations and maintenance manual which should be revised and sent to D.O.E. by the end of March.

Communication with the Testing and Balancing firm established that a copy of their report would be sent to the college by March 15, 1984.

Dr. Lary Reed, Project Director
Navarro College

Task 10. Information Initiated

Task 11. Submit Reports Initiated

4.0 VARIANCES/PROBLEMS

None

5.0 OPEN ITEMS

None

6.0 RECENT AND PLANNED ACHIEVEMENTS

Research data accumulation continues during the operational phase of the project.

As the weather continues to warm, we anticipate geothermal consumption will decrease to a point by April 15, 1984 where the pump will be shut down until October of 1984.

Numerous presentations and tours to potential developers and organizations were delivered during March. Also, a possible publication through National Geographic Magazine is being processed through the Nevada Operations of the U.S. Department of Energy. Several photographs of the project have been forwarded to Bob Clarke for possible use in this publication.

A storage building adjacent to the greenhouse structure should be completed by the end of April 1984.

The O & M Manual has been revised and the next Milestone (III) of the Final Report should be sent to the Department of Energy by April 16, 1984.

Normal treatment of the injection well with citric acid was performed on March 30, 1984.

Dr. Larry Reed, Project Director
Navarro College

Task 10. Information Initiated

Task 11. Submit Reports Initiated

4.0 VARIANCES/PROBLEMS

None

5.0 OPEN ITEMS

None

6.0 RECENT AND PLANNED ACHIEVEMENTS

Data collection continues to be recorded for inclusion in the final report. Milestone III has been completed and sent to the Department of Energy for their revision and recommendations.

Revisions on the O & M Manual were completed during April, reviewed and accepted with no further revisions recommended.

Installation of the storage facility at the site was completed on April 27, 1984 and work is progressing on getting estimates for installation of security lighting at the project site.

Numerous tours were presented this month and work continues on a video and slide show presentation which should be completed by August 1, 1984.

The project was switched to summer cooling mode on April 23, 1984 and reuse of the geothermal well is not anticipated until approximately October 15, 1984.

Dr. Lary Reed, Project Director
Navarro College

Task 9.	Resolve Problems	Initiated
Task 10.	Information	Initiated
Task 11.	Submit Reports	Initiated

4.0

VARIANCES/PROBLEMS

None

5.0

OPEN ITEMS

None

6.0

RECENT AND PLANNED ACHIEVEMENTS

Data collection continues to be recorded for inclusion in the final report, Milestone IV is near completion and will be sent to the Department of Energy for revision and recommendations by June 15, 1984. A bid package for security lighting around the lake is being prepared and bids should be received by mid June, 1984. A tentative harvest date for the *Macrobrachium Rosenbergii* (shrimp) is scheduled for June 22, 1984.

Dr. Larry Reed, Project Director
Navarro College

Task 10. Information Initiated

Task 11. Submit Reports Initiated

4.0 VARIANCES/PROBLEMS

None

5.0 OPEN ITEMS

None

6.0 RECENT AND PLANNED ACHIEVEMENTS

Milestone IV was completed and sent to the United States Department of Energy, Nevada, for revisions and recommendations. All the revised milestones were then hand delivered by Jim Cotter and Bob Clarke back to Navarro College on June 22, 1984, when a Harvest Ceremony was held at the college. Those in attendance at the ceremony included: Gwen Redding, U.S. DOE Washington; Jim Cotter and Bob Clarke, U.S. DOE Nevada; Members of the Corsicana Chamber of Commerce, Texas; Media Representatives from Dallas and Waco, Texas; and Navarro College Personnel. After the ceremony, participants were treated to a luncheon which included crop items from the geothermal project.

A bid for the lighting of the project area was released to McKinney and Moore on June 29, 1984.

Dr. Lary Reed, Project Director
Navarro College

Task 10. Information Continuous

Task 11. Submit Reports Initiated

4.0 VARIANCES/PROBLEMS

None

5.0 OPEN ITEMS

None

6.0 RECENT AND PLANNED ACHIEVEMENTS

Work has progressed on the final report with DOE's recommended revisions of Milestones I through IV. Milestone V was being typed on July 31 and a completed rough draft of the final report should be submitted to the United States Department of Energy, Nevada office, by mid August 1984.

Safety lighting around the lake area is being installed and a recirculation line has been installed which should increase the effectiveness and economics of the system. The college has also received bids for gas heaters and their installation in the aquaculture building. These items will also improve the efficiency of the system and should be installed by mid September 1984.

Dr. Lary Reed, Project Director
Navarro College

Task 10. Information Continuous

Task 11. Submit Reports Initiated

4.0 VARIANCES/PROBLEMS

None

5.0 OPEN ITEMS

None

6.0 RECENT AND PLANNED ACHIEVEMENTS

Work has progressed on the final report with DOE's recommended revisions of Milestones I through IV. Milestone V was being typed on July 31 and a completed rough draft of the final report should be submitted to the United States Department of Energy, Nevada office, by mid August 1984.

Safety lighting around the lake area is being installed and a recirculation line has been installed which should increase the effectiveness and economics of the system. The college has also received bids for gas heaters and their installation in the aquaculture building. These items will also improve the efficiency of the system and should be installed by mid September 1984.

Dr. Larry Reed, Project Director
Navarro College

A complete rough draft of the final report was sent to the United States Department of Energy, Nevada office on August 10, 1984 for review and recommended revisions. On the same date an automated slide show and cassette ^{presentation on the project} was sent to both the Nevada operations office and Ewen Redding in the Washington D.C. office. 2

Work has continued on the lake area safety lighting and installation of heater units for the aquaculture building. These items should be completed by September 15, 1984.