

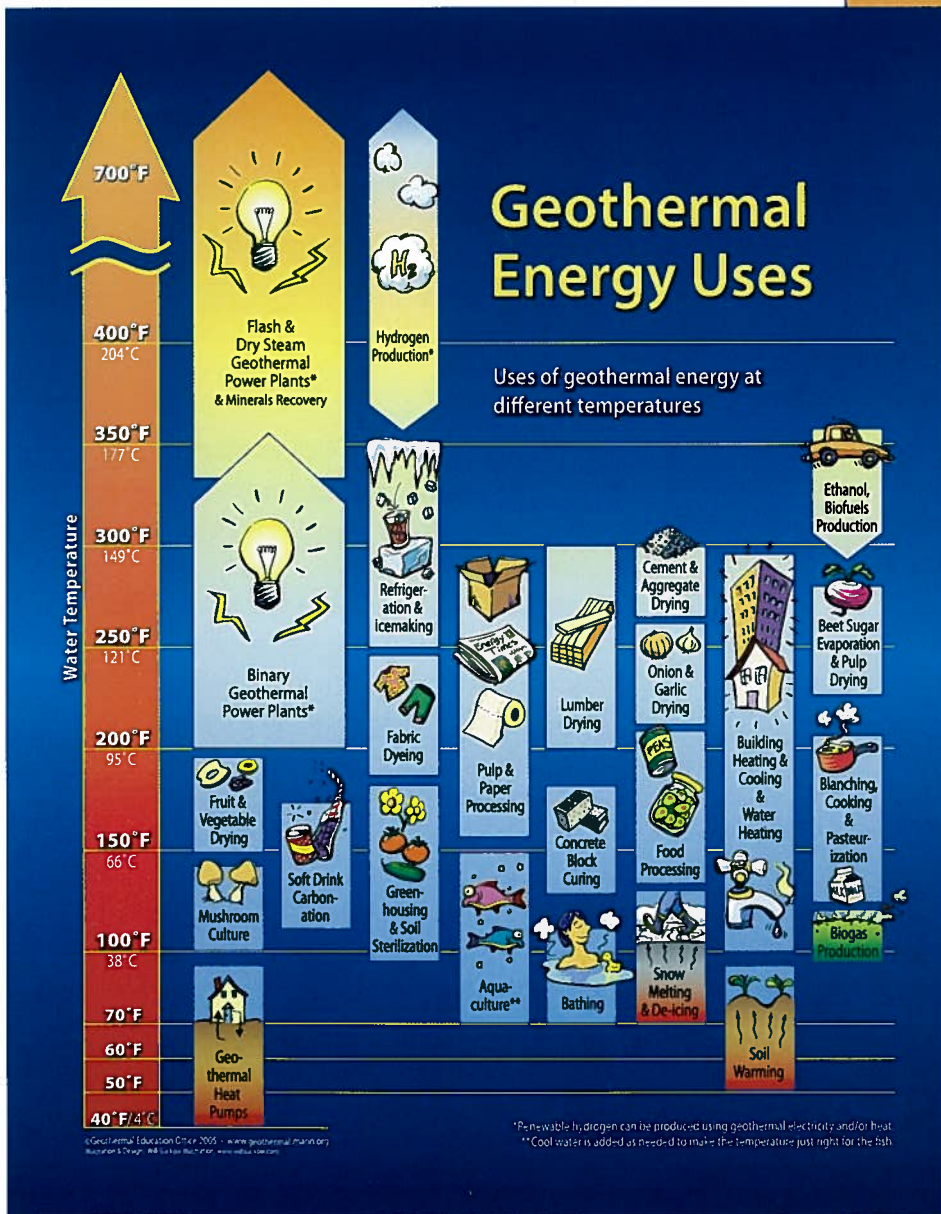


GEO-HEAT CENTER

Geothermal Services

Oregon Institute of Technology
Klamath Falls, Oregon

The Geo-Heat Center, established in 1974, is unique in its expertise and services.



The staff consists of innovative engineers in the field of geothermal direct-use, ground-source heat pumps, and small-scale power production.

Our engineering and economic analysis services have been provided to thousands of clients, from the homeowner interested in geothermal space heating and municipalities engaged in geothermal district heating projects, to industrial concerns adapting geothermal resources to meet the process energy needs.

Staff members are also actively involved with several geothermal professional organizations.

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In addition to offering a unique array of information and technical services unavailable elsewhere in the U.S., the Geo-Heat Center is located on the Oregon Institute of Technology campus, a showcase of geothermal energy use. The campus' geothermal direct-use system, operational since 1964, demonstrates the reliability and efficiency of a geothermal installation.



Well Drilling

The Center provides rapid response to requests for assistance with:

- Resource/application evaluation
- Technical support for private consulting firms, public agencies and individuals: design, materials selection, equipment selection
- Geothermal direct-use and heat pump system troubleshooting
- Engineering & economic feasibility studies - life-cycle cost analysis
- Technical training
- Impartial review and analysis of existing systems
- Information services - print and electronic



Direct-Use-Equipment

The Center's areas of experience include:

TECHNICAL ASSISTANCE

- Space heating & domestic hot water for schools, hospitals, colleges, motels/hotels, office buildings
- Space cooling for hotels, commercial buildings, district cooling
- Refrigeration - commercial refrigeration
- District heating - piping, customer connections, materials selection
- Heat pump applications
- Greenhouses - with low-temperature resources, radiant and forced-air systems
- Aquaculture heating requirements - Tilapia, catfish, prawns
- Industrial processes - crop drying, lumber drying, food processing
- Swimming pool/spa heating
- Waste heat utilization

RESEARCH

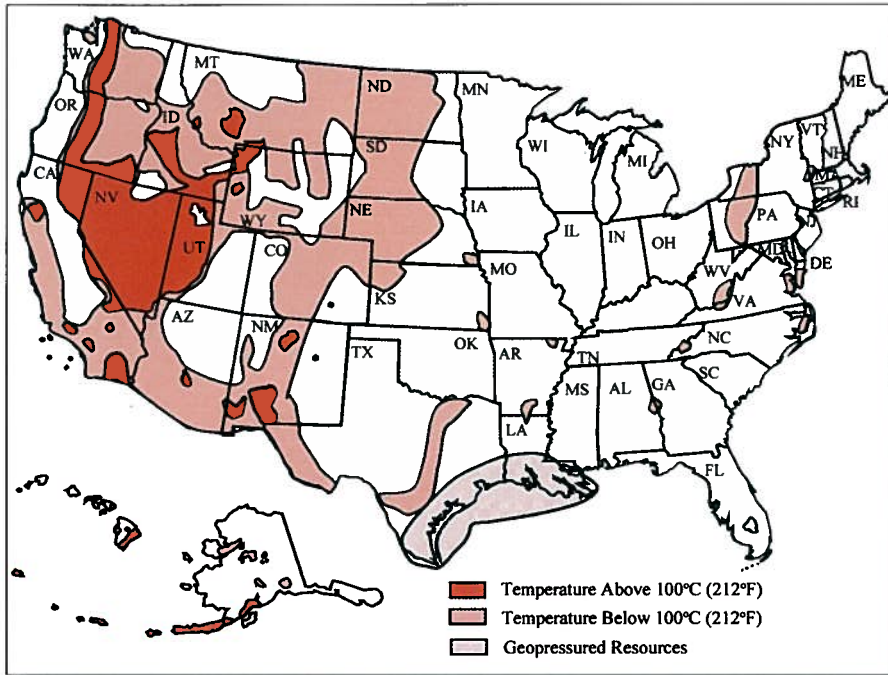
- Binary cycle analysis
- Performance of downhole heat exchangers
- Hydrology and geochemistry of the Klamath Basin
- Freshwater prawn culture
- Greenhouse heating systems
- Software development
- District heating economics
- Ground-source heat pump systems
- Appraisal of geothermal property
- Plate heat exchanger performance
- Well pump failure
- GHP system design
- GHP capital costs

PROFESSIONAL ACTIVITIES

- Geothermal Resources Council (GRC)
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- International Geothermal Association (IGA)
- International Ground Source Heat Pump Association (IGSHPA)

TECHNICAL ASSISTANCE - The Geo-Heat Center provides technical/economic analysis for those actively involved in geothermal development. This assistance can be in the area of feasibility at the outset of a project, equipment and materials selection during the design phase or follow-up troubleshooting for operational systems. Projects will be allocated a limited number of man-hours for analysis (based on merit).

Known and Potential Geothermal Resources



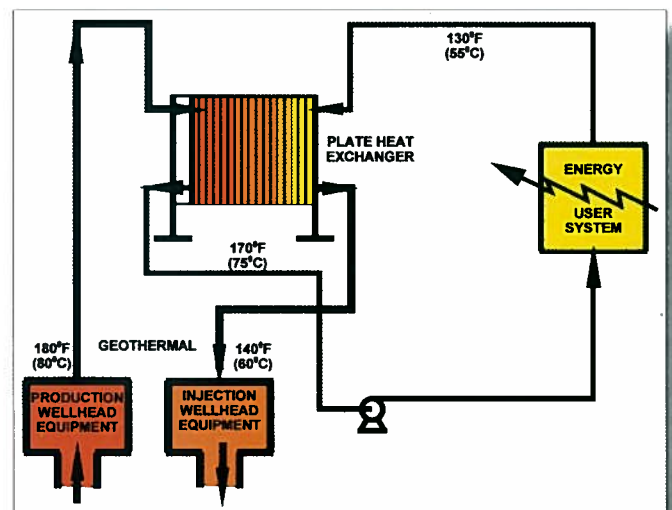
RESOURCE INFORMATION - Based on recently developed databases for the states of AK, AZ, CA, CO, ID, MT, NE, ND, NV, NM, OR, SD, TX, UT, WA and WY, data can be provided on over 12,000 thermal springs and wells. Data are available for a specific area of a city or county, and can include: location, temperature, flow rate, depth, water chemistry, current utilization and source references from which more detailed information can be obtained.

WEBSITE - <<http://geoheat.oit.edu/>>. The Geo-Heat Center’s website is the most comprehensive location on the internet for direct-use information, resource data, applications, vendors, links, events calendar and downloadable files on the following topics:

- Quarterly Bulletins
- Binary Power Plant Information
- Publications List
- Heat Pump Owner’s Guide
- General Direct Heat Utilization
- Links to other geothermal sites
- Greenhouse Developers Guide
- Aquaculture Developers Guide

ADVISING AND REFERRALS - The Geo-Heat Center acts as a clearinghouse providing technical information by meeting with groups and answering telephone inquires, emails, and letters from individuals, businesses, and government agencies on geothermal resources, space heating, district heating, greenhouses, aquaculture projects, equipment, heat pumps, small-scale electric generation systems, and other related items.

PRESENTATIONS - Center staff are available to make presentations on topics such as system design, economic considerations, and project examples to both lay and technical audiences.

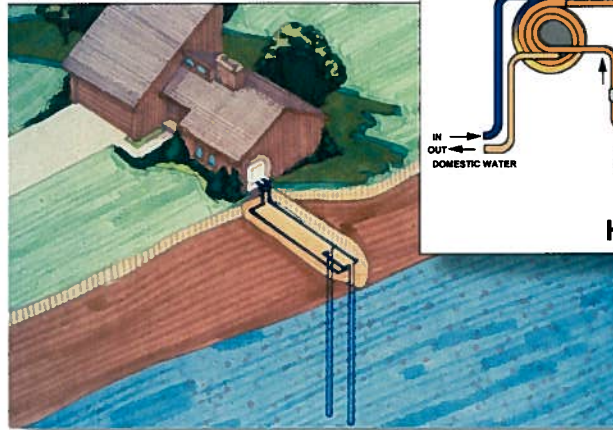


Geothermal Direct-Use System

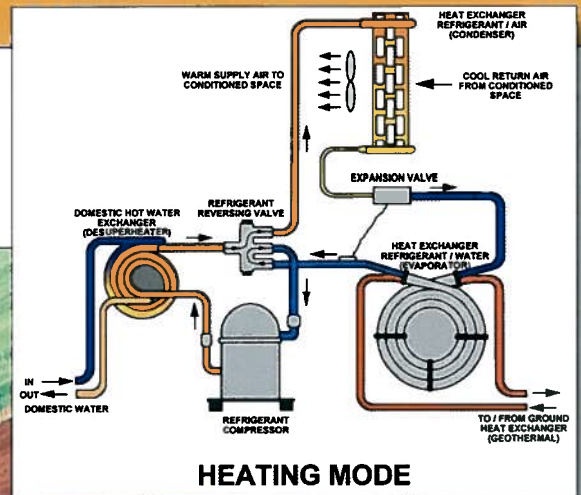
PUBLICATIONS - A Quarterly Bulletin featuring domestic and foreign research, development and utilization is available free of charge. Technical papers and reports on resources, direct-use equipment, design schemes, software, and feasibility studies may be obtained by writing for the GHC Publications Request Form or accessing our website: <<http://geoheat.oit.edu/>>.

TOURS - Schedule permitting, group tours are available of the Klamath Falls district heating system, OIT campus geothermal heating/cooling system, residential and local greenhouse and aquaculture applications.

LIBRARY - The Center maintains a geothermal library of over 5,000 volumes for lay and technical readers. Copies of selected articles and reports are available by contacting the GHC, and you may request a GHC library subject matter listing. Computer reference search is also available.



Geothermal Heat Pump Installation



HEATING MODE



GEO-HEAT CENTER

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FUNDING

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OREGON INSTITUTE OF TECHNOLOGY

At Oregon Institute of Technology since 1964, space and domestic water heating for twelve campus buildings has come from geothermal wells. In 1980, a lithium bromide chiller was installed to provide cooling to five buildings. Three hot water wells (192°F) which range in depth from 1,300 to



Geothermal Greenhouses

1,800 feet are pumped at varying rates to meet the energy demand. Merle West Medical Center, adjacent to OIT, utilizes a 191°F well to provide heat to the hospital and county nursing home.

Tours are available to inspect geothermal heating systems for these facilities. In addition, the Klamath Falls area includes over 600 residential, commercial and industrial geothermal applications including schools, churches, a downtown district heating system, greenhouse and aquaculture projects.



OIT Campus Fountain