

4.7 GEOTHERMAL ENERGY–DIRECT USE:

4.7.1 Direct Use of Low Grade Geothermal Energy:

1. Aquaculture and horticulture:

- ◆ Geothermal renewable energy is used in aquaculture and horticulture in order to raise plants and marine life that require a tropical environment.
- ◆ The steam and heat are all supplied by geothermal energy. Many farmers use geothermal power to heat their greenhouses. In Tuscany, Italy, farmers have used water heated by geothermal energy for hundreds of years to grow vegetables in the winter.
- ◆ Hungary is also a major user of geothermal power. Eighty percentage of the energy demand from vegetable growers is met by using geothermal energy. It is also used in fishing farms.
- ◆ The warm water spurs the growth of animals ranging from alligators, shellfish, tropical fish, and amphibians to catfish and trout. Fish growers from countries like Oregon, Idaho, China, Japan, and even Iceland use geothermal power.

2. Industry and agriculture:

- ◆ Industries are other consumers of geothermal energy. Their uses vary from drying fruits, vegetables, and wood, dying wool to extracting gold and silver from ore.
- ◆ It is also used to heat sidewalks and roads to prevent freezing in the winter. Thus, geothermal power generation is playing a major role in industry and agriculture.
- ◆ Timber is dried using heat acquired from geothermal energy, and paper mills use it for all stages of processing. There are many potential uses of geothermal energy in the industry.

3. Food processing:

- ◆ The earth naturally contains an endless supply of heat and steam, which can be utilized to sterilize equipment and rooms. This would put an end to the use of chemicals for this purpose.
- ◆ There are many potential uses of geothermal energy in food processing, but as yet, this renewable energy source has yet to be utilized to a large degree in this sector.

4. Providing heat for residential use:

- ◆ The most common use of geothermal energy is for heating residential districts and businesses. The first uses of geothermal fluid for heating a district in United States dates back to 1893.
- ◆ However, the French dominance, by almost 500 years as per the records, indicates that they were using geothermal energy in the 15th century. In the last few years, this renewable energy has caught the interest of an increasing number of house owners.
- ◆ Geothermal power generation provides more than just heat in summer; but a complete temperature control system that enables you to cool your home in winter as well. This significantly reduces heating and cooling bills, and keeps the home at a comfortable temperature year round.
- ◆ Direct geothermal heating systems contain pumps and compressors, which may consume energy from a polluting source. This parasitic load is normally a fraction of the heat output, so it is always less polluting than electric heating.
- ◆ However, if the electricity is produced by burning fossil fuels, then the net emissions of geothermal heating may be comparable to directly burning the fuel for heat. For example, a geothermal heat pump powered by electricity from a combined-cycle natural gas plant would produce about as much pollution as a natural gas condensing furnace of the same size
- ◆ Therefore, the environmental value of direct geothermal heating applications is highly dependent on the emissions intensity of the neighboring electric grid. Low temperature means temperatures of 149°C or less.
- ◆ Low-temperature geothermal resources are typically used in direct-use applications, such as district heating, greenhouses, fisheries, mineral recovery, and industrial process heating. Approximately 70 countries made direct use of 270 petajoules (PJ) of geothermal heating in the beginning of this century.
- ◆ More than half went for space heating, and another third for heated pools. The remainder supported industrial and agricultural applications. Global installed capacity was 28 GW, but capacity factors tend to be low (30% on average) since heat is mostly needed in winter.

- ◆ The abovementioned figures are dominated by 88 PJ of space heating extracted by an estimated 1.3 million geothermal heat pumps with a total capacity of 15 GW.
- ◆ Heat pumps for home heating are the fastest growing means of exploiting geothermal energy, with a global annual growth rate of 30% in energy production.
- ◆ Direct heating appliances of geothermal energy are more efficient than electricity generation, as the former requires low temperature heat resources.
- ◆ Heat may come from co-generation via a geothermal electrical plant or from smaller wells or heat exchangers buried in shallow ground.
- ◆ As a result, geothermal heating is economic at many more sites than geothermal electricity generation. Where natural hot springs are available, the heated water can be piped directly into radiators.
- ◆ If the ground is hot and dry, heat exchangers can collect the heat. However, even in areas where the ground is colder than room temperature, heat can still be extracted with a geothermal heat pump more cost-effectively and cleanly than by conventional furnaces.
- ◆ These devices draw on much shallower and colder resources than traditional geothermal techniques, and they frequently combine a variety of functions, including air conditioning, seasonal energy storage, solar energy collection, and electric heating.
- ◆ Geothermal heat pumps can be used for space heating essentially anywhere. Geothermal heat supports many applications. District heating applications use networks of piped hot water to heat many buildings across entire communities. In the USSR, the energy that is represented by geothermal hot water is used for heating of buildings, soil warming, green houses, and medical baths, and it is amounted to 15 million tons coal equivalent in 1970.
- ◆ In Hungarian basin, district heating, animal husbandry, and industrial processes benefit from geothermal heat. In Iceland, the principal uses are for space heating.
- ◆ In Reykjavík, Iceland, spent water from the district heating system is piped below the pavement and sidewalks to melt the snow.
- ◆ Geothermal desalination has been demonstrated. At Rotorua (New Zealand), lithium bromide absorption units enable air conditioning to be applied to a 100- room hotel.