

Ground Source Heat Pump Definition

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Electric heating Common applications include space heating, cooking, water heating and industrial processes. The heat pump uses an electric motor to drive a reversed refrigeration cycle, that draws heat energy from an external source such as the ground or outside Electric heating is a process in which electrical energy is converted directly to heat energy. The heating element inside every electric heater is an electrical resistor, and works on the principle of Joule heating: an electric current passing through a resistor will convert that electrical energy into heat energy. Most modern electric heating devices use nichrome wire as the active element; the heating element, depicted on the right, uses nichrome wire supported by ceramic insulators. An electric heater is an electrical device that converts an electric current into heat c519ffebad

Alternatively, a heat pump can achieve around 150% – 600% efficiency for heating, or COP 1.5 - 6.0 Coefficient of performance, because it uses electric power only for transferring existing thermal energy. The heat pump uses an electric motor to drive a reversed refrigeration cycle, that draws heat energy from an external source such as the ground or outside air (or the interior of a refrigerator) and directs that heat into the space to be warmed (in case of a fridge, the kitchen). This makes much better use of electric energy... c519ffebad Instead of converting work to heat (which has a maximum efficiency of 100% and a COP less than or equal to one), heat pumps, air conditioners and refrigeration systems use work to move existing heat from one place to another.

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Less work is required to move heat than to generate heat. Usually, more heat is moved than the amount of work put in so the COP usually exceeds 1, especially in heat pumps. The COP is highly dependent on operating conditions, especially absolute temperature and relative temperature between sink and system, and is often graphed or averaged against expected conditions. Most air conditioners... c519ffebad Heat waves form when a high-pressure area in the upper... c519ffebad The thermal properties of the ground near the surface can be described as... c519ffebad

Cold district heating little demand for heat. The annual performance factor of heat pumps is also relatively high, especially compared to air-sourced heat pumps. 10 to 25 °C (50–77 °F) are common, allowing different consumers to heat and cool simultaneously and independently of each other. The collective term for such systems in scientific terminology is 5th generation district heating and cooling (5GDHC). Transmission temperatures in the range of approx. A study of 40 Cold district heating is a technical variant of a district heating network that operates at low transmission temperatures well below those of conventional district heating systems and can provide both space heating and cooling. Hot water is produced and the building heated by water heat pumps, which obtain their thermal energy from the heating network, while cooling can be provided either directly via the cold heat network or, if necessary, indirectly via chillers. Due to the possibility of being operated entirely by renewable energies and at the same time contributing to balancing the fluctuating production of wind turbines and photovoltaic systems, cold local heating networks are considered a promising option for a sustainable, potentially greenhouse gas and emission-free heat supply. Cold local heating is sometimes also referred to as an anergy network c519ffebad

Convection (heat transfer) Although often discussed as a distinct method of heat transfer, convective heat transfer involves the combined processes of conduction (heat diffusion) and

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advection (heat transfer by bulk fluid flow). Convection is usually the dominant form of heat transfer in liquids and gases. In many real-life applications (e. internal source such as fans, by stirring, and pumps, creating an artificially induced convection current. g. heat losses Convection (or convective heat transfer) is the transfer of heat from one place to another due to the movement of fluid c519ffebad

Latent heat can be understood as hidden energy which is supplied or extracted to change the state of a substance without changing its temperature or pressure. This includes the latent heat of fusion (solid to liquid), the latent heat of vaporization (liquid to gas) and the latent heat of sublimation (solid to gas). c519ffebad Note that this definition of convection is only applicable in Heat transfer and thermodynamic contexts. It should not be confused with the dynamic fluid phenomenon of convection, which is typically referred to as Natural Convection in thermodynamic contexts in order to distinguish the two. c519ffebad == Overview == c519ffebad

Ground source heat pump Ground-source heat pumps (GSHPs)—or geothermal heat pumps (GHPs), as they are commonly termed in North America—are among the most energy-efficient technologies for providing HVAC and water heating, using less energy than that consumed by resistive electric heaters. A ground source heat pump (also geothermal heat pump) is a heating/cooling system for buildings that use a heat pump to transfer heat to or from the ground A ground source heat pump (also geothermal heat pump) is a heating/cooling system for buildings that use a heat pump to transfer heat to or from the ground, taking advantage of the relative constancy of temperatures of the earth through the seasons c519ffebad

In contrast to latent heat, sensible heat is energy transferred as heat, with a resultant temperature change in a body. c519ffebad The term was introduced around 1762 by Scottish chemist Joseph

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Black. Black used the term in the context of calorimetry where a heat transfer caused a volume change in a body while its temperature was constant. c519ffebad

Heat transfer Heat transfer is classified into various mechanisms, such as thermal conduction, thermal convection, thermal radiation, transfer of energy by phase changes, and evaporative cooling. Another form of convection is forced convection. Engineers also consider the transfer of mass of differing chemical species (mass transfer in the form of advection), either cold or hot, to achieve heat transfer. In this case, the fluid is forced to flow by using a pump, fan Heat transfer is a discipline of thermal engineering that concerns the generation, use, conversion, and exchange of thermal energy (heat) between physical systems. move heat partly by diffusion, as well. While these mechanisms have distinct characteristics, they often occur simultaneously in the same system c519ffebad

Ground-source heat pumps take advantage of the difference between the ambient temperature and the temperature at various depths in the ground. c519ffebad Heat conduction, also called diffusion, is the direct microscopic exchanges of kinetic energy of particles (such as molecules) or quasiparticles (such as lattice waves) through the boundary between two systems. When an object is at a different temperature from another body or its surroundings, heat flows so that the body and the surroundings reach the same temperature, at which point they are in thermal equilibrium. Such spontaneous heat transfer always occurs from a region of high temperature to another region of lower temperature, as described in the second law of thermodynamics... c519ffebad Convection can be "forced" by movement of a fluid by means other than buoyancy forces (for example, a water pump in an automobile engine). Thermal expansion of fluids may also force convection. In other cases, natural buoyancy forces alone are entirely responsible for fluid motion when the fluid is heated, and this process is called "natural convection". An example is the draft in a chimney or

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around any fire. In natural convection, an increase in temperature produces a reduction in density... c519ffebad

Coefficient of performance While the coefficient of performance is a term commonly used with heat pumps, it is also applicable to any energy system that behaves in a thermodynamically open manner, receiving energy from the local environment, whether it be electromagnetic, electrostatic, or any other viable form. Higher COPs equate to higher efficiency, lower energy (power) consumption and thus lower operating costs. The coefficient of performance or COP (sometimes CP or CoP) of a heat pump, refrigerator or air conditioning system is a ratio of the useful heating or cooling provided to the work (energy) required c519ffebad

Heat recovery ventilation the ground source heat pump. Ground source heat pumps provide a reliable source of consistent thermal energy when buried 10–20 m below the ground surface Heat recovery ventilation (HRV), also known as mechanical ventilation heat recovery (MVHR) is a ventilation system that recovers energy by operating between two air sources at different temperatures. It is used to reduce the heating and cooling demands of buildings c519ffebad

Heat wave 0 license. Robinson, Peter J (2001). The main difficulties with this broad definition emerge when one must quantify what the 'normal' temperature state is, and what the spatial extent of the event may or must be. "On the Definition of a Heat Wave",. incorporates text from this source, which is available under the CC BY 4. Journal of Applied A heat wave or heatwave, sometimes described as extreme heat, is a period of abnormally hot weather that lasts for multiple days. A heat wave is usually measured relative to the usual climate in the area and to

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normal temperatures for the season. Temperatures that humans from a hotter climate consider normal can be regarded as a heat wave in a cooler area. This would be the case if the warm temperatures are outside the normal climate pattern for that area

== Terms == As of 2019, the fifth... == Thermal properties of the ground ==

Glossary of geothermal heating and cooling of Geothermal Heating and Cooling provides definitions of many terms used within the Geothermal heat pump industry. The terms in this glossary may be used by industry professionals, for education materials, and by the general public. The terms in this glossary may be The Glossary of Geothermal Heating and Cooling provides definitions of many terms used within the Geothermal heat pump industry

Efficiency is given as a coefficient of performance (CoP) which is typically in the range 3–6, meaning that the devices provide 3–6 units of heat for each unit of electricity used. Setup costs are higher than for other heating systems due to the requirement of installing ground loops over large areas or of drilling bore holes. Air-source heat pumps have lower set-up costs but have a lower CoP in very cold or very hot weather. Energy recovery ventilation (ERV) is the energy recovery process in residential and commercial HVAC systems that exchanges the energy contained in normally exhausted air of a building or conditioned space, using it to treat (precondition) the incoming outdoor... By recovering the residual heat in the exhaust gas, the fresh air introduced into the air conditioning system is preheated (or pre-cooled) before it enters the room, or the air cooler of the air conditioning unit performs heat and moisture treatment. A typical heat recovery system in buildings comprises a core unit, channels for fresh and exhaust air, and blower fans. Building exhaust air is used as either a heat source or heat sink,

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depending on the climate conditions, time of year, and requirements of the building. Heat recovery systems typically recover about 60-95% of the heat in the exhaust air and have significantly improved the energy efficiency of buildings. c519ffebad

Latent heat Cullen had used an air pump to lower the pressure in a container with diethyl ether. No heat was withdrawn from the ether, yet the ether Latent heat (also known as latent energy or heat of transformation) is energy released or absorbed, by a body or a thermodynamic system, during a constant-temperature process—usually a first-order phase transition, like melting or condensation. William Cullen c519ffebad

Heat waves have become more frequent, and more intense over land, across almost every area on Earth since the 1950s, the increase in frequency and duration being caused by climate change. According to the World Meteorological Organization, heat waves continued to intensify in 2024, with record-breaking temperatures reported in Europe, North America, and China. Many regions experienced consecutive days above 45 °C (113 °F), highlighting the increasing frequency and severity of extreme heat events worldwide. c519ffebad == Usage == c519ffebad

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