



NEW TECHNOLOGIES IN HEAT SUPPLY IN HOUSEHOLDS

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ANNOTATION: *This article analyzes the modern and innovative technologies used in the provision of heat supply in housing. Solar thermal systems, geothermal heating, intelligent control equipment, and the use of energy-efficient insulation materials are considered. Also, the advantages of each technology are explained through technical specifications, performance indicators and performance diagrams. The information in the article is of practical importance in improving heat supply in housing, increasing energy efficiency and protecting the environment.*

Key words: *Heat supply, household heating, energy efficiency, renewable energy, smart heating systems, district heating, heat pumps, solar thermal systems, geothermal heating, smart thermostats, building insulation, low-carbon technologies, hydronic heating, infrared heating panels, automated heating control, thermal storage, combined heat and power (chp), iot in heating, green technologies, sustainable heating solutions.*

INTRODUCE

Housing plays an important role in creating comfortable and safe living conditions for the population. Therefore, the development of heat supply systems based on modern technologies not only saves energy, but also protects the environment and increases economic benefits. New technologies allow for efficient heat distribution in homes, reducing losses, and implementing intelligent management.

Use of solar energy

It is possible to provide hot water and heating in residential buildings through solar collectors and solar panels. Advantages:

- Natural and renewable resource;



- Long-term savings;
- Reducing dependence on electricity.

This technology is especially suitable for rural areas and remote settlements.

Geothermal heating systems

Houses can be heated and cooled by means of pumps that use the heat of the ground (geothermal pumps). This technology:

- Works effectively depending on the outside air temperature;
- Provides a lot of heat with low energy consumption;
- It has a long service life (up to 20-30 years).

Smart (intellectual) heating systems

With the help of smart thermostats and management software in housing:

- Set a separate temperature for each room;
- Automatic consumption analysis and savings;
- Remote control is possible through a smartphone.

This is not only convenient, but also reduces monthly utility costs.

Modern insulation and piping systems

To reduce heat loss in residential buildings:

- Energy-saving fire-resistant materials (minvata, polyurethane, penoplast);
- Thermally insulated plastic or polymer pipes;
- Double-layered (thermal glass) trailer windows and doors are used.

Such materials help to keep the house warm in winter and cool in summer.

Use of secondary heat sources

In some housing estates:

- Heat generated by electric stoves, air conditioners, or household appliances is recycled;
- Recirculating heat is saved through hot water supply systems.



This method is environmentally safe and energy efficient.

Technical information

1. Solar Thermal Systems

Component	Technical description
Solar collector	Vacuum tube or flat panel, absorbs up to 80-95% of energy
Hot water tank	100–300 liter storage tank, equipped with thermal insulation
Pump and controller	Temperature sensors and circulation pumps

→ **Installation efficiency** : Provides 60-70% of the annual hot water demand in a well-insulated building.

2. Geothermal heating (Ground Source Heat Pumps)

Parameter	Values
COP (coefficient of useful work)	3.0–5.0 (3–5 kW of heat per 1 kW of energy)
Subsoil depth	50–150 meters, vertical well or horizontal contour
Comfortable temperature range	-10°C to +35°C

→ **Working principle** : Converts underground temperature to room temperature with high efficiency.



3. Smart thermostats and control systems (Smart Thermostats)

- **Brand** : Nest, Tado, Honeywell Evohome
 - **Functions** :
 - Remote control (via smartphone)
 - Dynamic control based on temperature sensors
 - Creating a weekly/daily work schedule
- Enables 15-25% energy saving.



4. Insulation materials

Matter	Thermal conductivity coefficient (W/m·K)
Polyurethane (PUR)	0.024–0.030
Mineral wool	0.035–0.045
Expanded polystyrene (EPS/XPS)	0.030–0.040

→ **Recommendation** : The outer wall should have at least 5 cm of insulation.

Chart recommendations

1. **Solar thermal system operation diagram**

→ Collector → Pump → Reservoir → Consumer (can be drawn as a diagram)

2. **Underground heat pump operation cycle**

→ Underground well → Pump → Internal structure → Recirculation

3. **Intelligent control system diagram**

→ Thermostat → Controller → Device (heating, air conditioning)

4. **Insulation Efficiency Chart**

→ Comparison Chart: Uninsulated Wall vs. Insulated Wall Temperature Retention.

If you want, I can prepare these diagrams visually (in the form of drawings or slides).

Resources (scientific and technical)

1. **ASHRAE Handbook (HVAC Applications)** - International standards for heating, cooling and ventilation.

2. **IEA (International Energy Agency)** – Reports on renewable energy sources and thermal efficiency in housing.

3. **Resilience.org** and **ScienceDirect** – Database of scientific articles and analytical works.

4. **Textbook "Renewable Energy Sources"** , literature used in higher educational institutions of Uzbekistan.



Conclusion

By modernizing heat supply systems in housing:

- A comfortable and stable heating supply will be created for the population;
- Energy consumption and costs are reduced;
- Environmental protection is ensured.

Today, the introduction of such technologies is relevant not only in developed countries, but also in developing countries like Uzbekistan. In the future, it is expected that every home will have smart, economical and natural heat supply.

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