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Marking Technology of Energy Efficiency for Heating Ventilation and Air Conditioning

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Abstract. For a number of reasons, the guidance documents on energy efficiency of HVAC systems, developed by the European institutions, are focused on heating systems. Development standards for energy efficiency of air-conditioning and ventilation systems is delegated to national regulators. In addition, there is an ability to define standards for energy efficiency in hot climate. Given global warming and European comfort indicators of residential and public premises, becomes relevant for Ukraine energy efficiency levels rationing HVAC technologies on the national level. The problem of marking the energy efficiency of ventilation and air conditioning technologies is relevant for Ukraine because the implementation of European standards for the comfort of residential and public premises requires the use of ventilation and air conditioning systems in most buildings.

Keywords: energy efficiency HVAC, the level energy efficiency HVAC, reduction of greenhouse gas emissions systems HVAC.

Introduction. Improving the energy performance of buildings (reducing energy consumption) is impossible without understanding what technologies allow more effectively reduce power consumption. Marking technology admit focus on the most effective solutions to reduce energy consumption in buildings for planners and energy managers.

Relevance of research. The requirement to reduce the energy consumption of buildings is antagonistic with respect to the indices of the comfort of buildings. For the health of people, why using buildings, the priority is to maintain normalized comfortable conditions in the premises. Therefore, it is an actual problem to determine the most effective technologies for maintaining comfortable parameters.

Purposes of the article. The European Commission has done considerable work [1-4] on marking heating technologies, resulting in the creation of the EU directive (Fig. 1)

| | Best Available Technology (BAT) class for space heaters (including packages) |
|-------------|---|
| A+++ | Packages using renewables |
| A++ | Heat pumps (renewable) Best biomass boiler (renewable) |
| A+ | Gas cogeneration |
| A | Condensing gas boilers |
| B | |
| C | Non-condensing gas boilers |
| D | Electric resistance |

Fig. 1. Communication [1] from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. An EU Strategy on Heating and Cooling (SWD (2016) 24 final)

Main principles. It should be noted that this directive applies only to one segment of the HVAC

technology: forming of a comfortable microclimate by heating systems. For many countries, such as Ukraine, the other two systems – ventilation and air conditioning – consume energy not less than the relevant heating systems. It is proposed to mark also the degree of efficiency of ventilation and air-conditioning technology in addition to marking systems of heating.

The basis for labeling should lay leadership idea, used EU-degree greener technology, or minimize environmental damage, put the system in the process of maintaining comfort settings. Higher energy efficiency of HVAC systems corresponds to less damage of the environment, because increased energy efficiency of HVAC systems reduces emissions of greenhouse gases and other pollutants. Correct decision is also evaluating the effectiveness of technology rather than equipment: different HVAC equipment has individual characteristics, but the total energy is determined by positioning the perfection of technology, used in the equipment.

The following markings for air-conditioning technologies:

A+++ – packages installation for air-conditioning, heating and domestic hot water systems (DHW). Utilization of heat of air-conditioning for heating and DHW systems.

A++ – packages installation for simultaneous air conditioning and heating. Utilization of heat of air-conditioning for space heating.

A+ – direct exchange (DX) multi-zone installation of air-conditioning.

A – chillery installation multi-zoned air-conditioning.

B – DX local air-conditioning.

C – central air-conditioning.

D – removal of heat excess through ventilation.

The list displays both traditional and advanced air conditioning technologies designed for maintaining comfortable microclimate. In the list, position A+++ may be integrated solar technologies for heating DHW. Nevertheless, from an economic point of view this decision is too expensive.

For ventilation technology, the marking is offered as follows:

A+++ – enthalpy recovery ventilation (ERV). It means recovery of the heat and moisture from the exhaust air from the premises. It requires mechanical supply and exhaust ventilation. The recovery operates in winter and summer;

A++ – heat recovery ventilation (HRV). Heat recovery from exhaust air from the premises. It requires installation of supply and exhaust ventilation. The recovery operates mainly in winter.

A+ – forced ventilation with geothermal heat exchanger.

A – air-handling units with heating and cooling by heat pumps in winter and summer.

C – air-handling units that heat air by burning of fossil fuels in the winter mode;

D – natural ventilation.

The list reflects the technology really represented in manufactured equipment for ventilation of residential and public premises. Special attention deserves the ERV technology, which enables recovery of energy at heating and cooling operation.

Conclusions. All of the technologies proposed for ranking energy efficiency, are presented on the market and have been used in the construction. Technologies differ in size of capital investments and operating costs. Proposed classification allows quick assessing the attractiveness of their projects. The exact value of capital investments and operating costs is provided by a comparative calculation for a particular facility, which is usually performed during the feasibility study of the proposed solution.

References

1. An EU Strategy on Heating and Cooling {SWD(2016) 24 final}.
2. Directive 2009/28/EC European Parliament, Council of the European Union, COD 2008/0016.
3. Directive 2010/30/EU of the European Parliament and of the Council on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products.
4. Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for air conditioners and comfort fans.

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Маркування технологій опалення, вентиляції та кондиціонування повітря за ступенем енергоефективності

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Анотація. Через ряд причин, керівні документи щодо енергоефективності систем опалення, вентиляції та кондиціонування повітря, розроблені європейськими інституціями, зосереджені на системах опалення. Розробка нормативів з енергоефективності систем вентиляції та кондиціонування повітря делегована національним регуляторам. Також їм надана можливість визначити нормативи енергоефективності в умовах жаркого клімату. З огляду на процеси глобального потепління та переходу на європейські показники комфортності житлових і громадських приміщень, для України стає актуальним нормувати рівні енергоефективних технологій вентиляції та кондиціонування повітря на національному рівні. В статті пропонується визначення рівнів енергоефективності систем опалення, вентиляції та кондиціонування повітря. Таке маркування технологій енергоефективності систем вентиляції та кондиціонування повітря дозволить проектувальникам швидко прийняти рішення щодо використання потрібного типу систем для заданого рівня енергоефективності будівлі.

Ключові слова: енергоефективність ОВК, рівень енергоефективності систем ОВК, зниження викидів парникових газів системами ОВК.

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Маркировка технологий отопления, вентиляции и кондиционирования воздуха по степени энергоэффективности

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Аннотация. В силу ряда причин, руководящие документы по энергоэффективности систем отопления, вентиляции и кондиционирования воздуха, разработанные европейскими институтами, сосредоточены на системах отопления. Разработка нормативов по энергоэффективности систем вентиляции и кондиционирования воздуха делегирована национальным регуляторам. Также им предоставлена возможность определять нормативы энергоэффективности в условиях жаркого климата. Учитывая процессы глобального потепления и перехода на европейские показатели комфортности жилых и общественных помещений, для Украины становится актуальным нормировать уровни энергоэффективности технологий вентиляции и кондиционирования воздуха на национальном уровне. Такая маркировка технологий энергоэффективности систем вентиляции и кондиционирования воздуха позволит проектировщикам быстро принять решение об использовании нужного типа систем для заданного уровня энергоэффективности здания.

Ключевые слова: энергоэффективность ОВК, уровень энергоэффективности систем ОВК, снижение выбросов парниковых газов системами ОВК.

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