Evaluating New Energy Efficiency of HVAC Systems in Office Buildings

Energetic Efficiency Assessment: A Comparative Study

1. Introduction
Energetic efficiency is a measure of how effectively a system converts energy into useful work. In the context of HVAC systems in office buildings, it is crucial to assess the energy efficiency for several reasons:

2. Scientific significance
At the technical stage, the development of technological and construction measures, design solutions for the installation of protective screens for the base and surface of the landfill, collection, treatment and utilization of biogas, collection and treatment of leachate and surface wastewater is carried out.

3. Energetic efficiency assessment

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Thus, the technical stage of reclamation of the landfill for solid domestic waste includes the following measures: stabilization of the landfill body (delivery of soil for filling dips and cracks, its planning and creation of slopes with the required slope; construction of a degassing system for collecting landfill gas; creation of a collection and disposal system filtrate and surface runoff, creation of a multifunctional reclamation protective screen [2, 3]. The biological stage of reclamation provides for a complex of agro technical and phytomeliorative measures aimed at restoring disturbed lands. This stage is carried out after the engineering and technical stage of reclamation. This stage of reclamation of the landfill includes the following measures: soil preparation, selection of planting material, sowing of plants [4, 5].

Recultivated land after the completion of the entire complex of works should be an optimally organized and ecologically balanced sustainable landscape. When cultivating, it is necessary to take into account the various natural and man-made conditions for which certain types of grass mixtures are selected. The correct selection of types of grass for lawn coverage is a stage of special importance in biological reclamation of disturbed areas. The functional longevity of the lawn covering, its appearance and recultivation effect depend on it. The choice of plants for a specific region is carried out taking into account the climatic and soil conditions of the region, the type of reclamation, the functional purpose of the planting object [1, 5, 6].

The use of grass mixtures for lawn coverings is intended to average the difference in climatic conditions over the years. The presence of herbaceous plant species in the stand of different agro ecological needs makes it possible to increase the adaptability of the stand to changes in moisture conditions and thermal regime, which vary greatly from year to year. In the composition of the grass mixture, species are selected according to the type of growth and development, which have special requirements [7, 8]. The types of herbaceous plants that make up lawn coverings must be perennial and meet the following requirements: tolerate mowing if necessary, grow in accordance with the intended purpose, form a dense and dense turf, adapt to existing climatic conditions, be decorative.

3. Objects and methods of research

In the city of Krasnoyarsk and its suburbs, the peculiarities of weather conditions are traced, affecting the growth and development of lawn coverings. In the course of the study of the correspondence of the parameters of climatic environmental factors to the criteria for the growth of high-quality lawn coverings for the reclamation of landfills, it was established that the humidity regime is the limiting factor. For normal growth and development, cereal lawn grasses require 2 – 3 mm of moisture daily, which corresponds to 60 - 90 mm per month. The need for moisture varies with temperature and relative humidity [9]. The graphs show that according to the long-term average values of precipitation that fall per month, the moisture conditions in the city of Krasnoyarsk in the summer are quite favorable for the growth of lawn grasses. The amount of precipitation falling per month is in the range of 65 - 75 mm. Their number increases in the hottest month (July) to 195 mm. As the temperature rises, the evaporation of water from the soil surface and the water consumption of the plants themselves increase. Thus, the increase in the amount of precipitation in July compensates for the growing demand of plants for moisture.

But a more realistic picture of the moisture conditions in which lawn grasses have to develop in the city of Krasnoyarsk are shown by the graphs of monthly average values of precipitation in specific years. The average monthly values of precipitation in 2019 show that the moisture conditions during this period were extremely unfavorable for the existence of lawn grass stands. With the exception of August, the plants experienced an acute lack of moisture. It should be noted that 2019 is characterized as dry. Such conditions of humidification in our area are quite rare (one year out of five to ten years). The data for 2019 are presented in order to show that extremely unfavorable moisture conditions can develop in some years.
4. Results of research
Analysis of the humidification conditions that develop in the city of Krasnoyarsk and its suburban areas, in relation to the arrangement and maintenance of lawn coverings, shows:

1) In general, the area of the city of Krasnoyarsk is fully provided with precipitation for the normal growth and development of lawn grasses, with the exception of May and September;
2) Periodically, extremely arid conditions for the growth and development of lawn grasses develop;
3) Often lawn plants are exposed to excessive moisture as a result of a large amount of precipitation over short periods of time;
4) The amount of precipitation is unevenly distributed. Periods of high rainfall alternate with periods of relative drought.

On the basis of this, we have developed types of trash mixtures for reclamation of disturbed areas. So for the reclamation of landfills located in the middle lane, a grass mixture is proposed, consisting of such herbaceous plants as - rump 13%, red fescue 30%, meadow fescue 23%, wheatgrass 8%, wheatgrass 12%, red clover 10%, sweet clover 4% ... The herb mixture for the reclamation of landfills in the northern regions is presented - meadow fescue 20%, rump 5%, timothy grass 10%, bluegrass - 25%, wheatgrass 10%, sweet clover 5%, white clover 15%, wheatgrass 10%. Below are the characteristics of the main herbaceous plants that make up the mixtures of herbs for the reclamation of disturbed areas.

Red fescue (*Festuca rubra*) is a grassland. It grows quickly enough, while forming an even soft carpet and a highly branching root system, which is able to hold the soil together, so it is good to sow it not only on flat areas, but also on slopes. It responds well to frequent mowing, grows back quickly [6].

Meadow fescue (*Festuca pratensis*) is a perennial grass that forms bright green bushy shoots and strong dense turf. This is an unpretentious plant, it survives frosty winters, frost, drought and waterlogging well. Feels good with frequent mowing.

Boneless rump (*Bromus inermis Leyss*) - has a long creeping rhizome, which makes it possible to use the plant to fix the soil and protect the soil from washing away. It is unpretentious in cultivation. Seeds germinate well on any soil.

Red clover (meadow) (*Trifolium rubens*) is a cold-resistant, shade-tolerant plant, unpretentious to soils, grows on sod-podzolic, gray forest and chernozem soils.

Creeping white clover (*Trifolium repens*) is an unpretentious plant, resistant to moisture, drought, frost-hardy, resistant to trampling. Clover root system is fibrous, branched. The stem is long, spreads along the surface of the earth, rooting in the nodes, helps to strengthen the soil.

5. Conclusion
Thus, the biological properties presented in these herbal mixtures of herbs meet the requirements for reclamation of disturbed areas and care for them. They have high winter hardiness and drought resistance, resist pathogens, pests and weeds. At the same time, when arranging lawn coverings in the city of Krasnoyarsk and its suburban area, it is necessary to focus on the natural conditions of lawn moistening and adopt care technologies adequate to the prevailing conditions.

6. References
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