

- Developing state financial support programs (grants, subsidies) for RES projects;
- Modernizing legislative frameworks to expedite new technology implementation;
- Enhancing international collaboration and attracting investments through public-private partnerships.

Conclusions

Integrating RES into district heating systems is essential for Ukraine's sustainable development and energy security. Further research and implementation of advanced heat storage and energy optimization technologies are necessary, alongside with political measures that encourage investment and innovative solutions in district heating.

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IMPROVING THE OPERATIONAL PERFORMANCE OF STRUCTURES USING FIBERGLASS WRAPS

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The construction of main pipelines in various regions of Ukraine requires an increase in their reliability and durability, as this is a crucial national economic task. Solving this problem is associated not only with the need to minimize metal losses due to corrosion but also with ensuring the uninterrupted operation of pipelines. Structural materials used in pipe manufacturing inevitably contain defects, including microcracks; however, under proper operating conditions, they

can maintain their strength and functionality. The primary threat is not the presence of cracks as such but the operating conditions that can lead to structural failure. Consequently, an important task is to create conditions that prevent the material from reaching a critical failure state. [1-3].

Pipeline structures are often multi-component systems in which materials with different characteristics are combined to create strong and durable constructions with controlled properties. The use of materials such as fiberglass-reinforced plastic (FRP) helps reduce structural density, improve corrosion resistance, decrease thermal conductivity, and extend service life. The main cause of pipeline failure remains the insufficient load-bearing capacity of materials, leading to short-term or prolonged shutdowns. The duration of such shutdowns is determined by the time required to restore the pipeline to its operational state.

Researches conducted both in Ukraine and abroad confirm that the process of crack formation and pipeline failure can be controlled and, in some cases, even completely prevented. The ability to manage crack propagation and slow its growth opens up prospects for increasing pipeline durability. One effective method is the application of axial compressive stress at the ends of a sample, which stabilizes the failure process. It has also been proven that the introduction of soft linear inclusions perpendicular to the crack direction contributes to its deceleration or complete stoppage.

One of the promising solutions for pipeline protection is the use of fiberglass-reinforced plastic (FRP) shells, which provide high strength and resistance to corrosion. Their application not only protects metal from aggressive environments but also reduces material and energy costs. The use of prestressed FRP coatings enhances the structural resistance to temperature fluctuations and mechanical loads, as these coatings can adapt to pipeline size changes due to the elastic properties of fiberglass.

The multilayer winding of FRP reinforcement onto a metal core enables the creation of durable pipeline systems with enhanced characteristics. Studies have shown that the use of furan-epoxy binders in FRP shells increases their resistance to mechanical and climatic influences. During testing, impact strength, moisture resistance, salt resistance, and coating continuity parameters were analyzed, confirming the effectiveness of this protective method.

Conclusion. The durability of main pipelines depends on multiple factors, including design, operating conditions, and installation methods. The mechanical properties of materials play a key role in structural reliability. The primary cause of pipeline failure is the accumulation of dispersed damage leading to crack formation. The main risk factors include technological defects, aggressive environments, corrosion processes, and non-compliance with operational standards. The use of multilayer structures, protective coatings, and innovative materials such as FRP helps extend the service life of pipelines, minimize the risk of failure, and reduce metal consumption. Existing anti-corrosion coatings, including bitumen mastics, have certain drawbacks, necessitating the development of new materials with improved properties. One of the promising approaches is the

use of fiberglass-reinforced coatings, which provide high corrosion resistance and long-term durability of pipeline systems.

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PARK-MONUMENT OF GARDEN AND PARK ART OF LOCAL IMPORTANCE THEM A. I. YUSHCHENKO (M. VINNYTSIA)

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Parks are essential attributes of cities, both modern and ancient. They perform many functions among which the most significant for the townspeople - recreational and sanitary-hygienic. In Vinnytsia there are several parks, however, the most popular are only four: Central Park im. M. Leontovich, Vyshensky Park, Memorial Park im. M. I. Pirogov [1, 2]. However, there is also a park-monument of landscape gardening art of local importance at the OPND named after O. I. Yushchenko, who does not receive proper care [1]. Therefore, this park was chosen as the object of research.

The itinerary excursions conducted during 2024 on the territory of the park according to the generally accepted methodology made it possible to carry out its inventory. Plant names were determined using specialized resources [3]. The park is located on the street. Architects, 28 in the microdistrict of Podolia. It was founded in 1972 on the territory of the neuropsychiatric hospital. However, the territory has a significant proportion of trees that were planted in 1898.

The park has a central alley that intersects with the three side. These alleys were formed with the participation of *Populus nigra* 'Italica'. As a rule, this variation is represented exclusively by male specimens, but in the park there is the only female specimen in the Vinnitsa region. There is also an alley featuring *Larix decidua* Mill. Centuries-old plantations *Quercus robur* L., *Acer platanoides* L.,