Model	Task	Advantages	Limitations
Random Forest	Classification, Regression	Stability, noise resistance, interpretability	Can be overfitted with excessive depth
XGBoost	Classification, Regression	High accuracy, accounts for data imbalance	Complex hyperparameter tuning
SVM	Classification	Effective with small datasets	Poor scalability, sensitive to kernel choice
LSTM	Time Series Forecasting	Detection of long-term dependencies	High computational cost
CNN	Signal Analysis	Handles spectrograms and time patterns well	Requires transformation of signals into image format

Conclusions. The use of machine learning models in the field of predicting failures of hydroturbine components opens new horizons for the development of intelligent maintenance and the enhancement of energy system efficiency. Further research should focus on optimizing model parameters and exploring hybrid approaches that combine different machine learning techniques with domain-specific knowledge.

COMPOSITE COATINGS FOR CORROSION PROTECTION OF AISI 304 STAINLESS STEEL

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Abstract. Austenitic steels, especially AISI 304, are widely used because of their strength and corrosion resistance, but are subject to dangerous types of corrosion. Inhibitors and coatings are used for protection, but inhibitors are poorly understood under extreme conditions and coatings require refinement. A promising solution is composite coatings combining a matrix (polymers, metals, oxides) and a dispersed phase (carbides, nitrides, borides, oxides, carbon nanomaterials). They provide strength and chemical inertness. This paper gives a brief overview of the research relevance in the development and application of composite coatings for corrosion protection.
Keywords: stainless steel, corrosion protection, protective coatings.

Among all types of stainless steels, austenitic steels are the most widely used. They are characterised by durability, good weldability and also possess higher corrosion resistance than other types of steels. However, austenitic steel

AISI 304, which is widely used in different industries, is susceptible to stress corrosion cracking, pitting and intercrystalline corrosion [1]. These types of corrosion are particularly dangerous because they can be detected when the damage is already significant.

There are some ways to protect material from corrosion damage, such as inhibitors and protective coatings. As these steels are used under very different conditions and for different purposes, the question of inhibitor use under harsh conditions (high temperatures and pressures) remains unresolved [2]. Protective coatings have been successfully used much more frequently for these applications. However, there are also issues that need to be investigated, such as increasing the operating temperatures of the coatings, improvements in technology and the specifics of the technological application of these coatings in different industries.

There is also a wide variety of materials and techniques for creating coatings that effectively protect the base alloy from corrosive environments. In our research work, we investigate chromium oxide composite coating formation by electrolysis method [3].

The application of composite coatings for corrosion protection is a relevant topic. Such coatings are multi-component structures consisting of a matrix and inclusions, which together provide high protective properties. The matrix can be polymer, metal or metal compounds (oxides, nitrides, sulphides, carbides, etc.) as well as carbon materials. In addition, it is possible to create multilayer systems.

The dispersed phase plays a key role in the formation of unique properties of composite coatings, ensuring their functional efficiency. Solid particles of different chemical composition such as carbides (WC, TiC, SiC), nitrides (TiN, AlN, CrN), nitrides (TiN, AlN, CrN), borides (TiB_2), oxides (ZrO_2, Al_2O_3, TiO_2), carbon materials (graphene, nanotubes, diamond-like carbon) and even diamond nanoparticles are used as dispersed phase. These particles are typically nanometer or micrometer in size, which allows the creation of coatings with high density and minimal porosity. The dispersed phase is distributed in the matrix, improving mechanical properties as well as corrosion resistance by increasing chemical inertness and forming a barrier layer. In addition, the right choice of dispersed phase allows the coating to be tailored to specific operating conditions, such as high temperatures, aggressive environments or mechanical friction, making such coatings in demand in the aerospace, medical and energy industries [4].

Conclusions. Austenitic 304 steel is corrosion resistant, but is susceptible to dangerous types of failure. Inhibitors and coatings are used for protection but have limitations. Dispersed phase composite coatings improve mechanical and corrosion resistance properties. Nanomaterials within coatings allow them to be adapted to different conditions. Further research is needed to improve the reliability and durability of the materials.

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IMPROVING SURFACE QUALITY OF POLISHED PARTS WITH CLEANING AGENTS AND LUBRICATING AND COOLING FLUIDS

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Abstract. The article analyzes the alignment of a planned dissertation study with the new European research paradigm. It explores the possibilities and prospects of applying innovative methods for cleaning coolant-lubricating fluids (CLFs) to improve the quality of ground surfaces. The relevance of the research is emphasized in the context of sustainability, human-centeredness, and practical impact.
Keywords: grinding, coolant-lubricating fluid, CLF cleaning, impregnation, sustainability, human-centeredness, practical orientation.

Introduction

Topicality. Modern mechanical engineering imposes increased requirements on machining accuracy, surface quality, and environmental safety of production. Meeting these requirements is impossible without efficiency control of the condition of cutting fluids (coolants) during grinding processes [1]. It is well known that during grinding, coolants become heavily contaminated with fine abrasive and metal particles. These solid contaminants worsen cutting conditions: they reduce cooling efficiency, accelerate wear of