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**«POSSIBILITIES APPLICATION OF FUZZY LOGIC IN THE CONSTRUCTION OF
AUTOMATED SYSTEMS IN THE METALLURGICAL INDUSTRY»**

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Problem statement

Creation of high-quality plasma coatings requires constant control and management over a significant number of process parameters of the control system of the plasma spraying installation. The formation of such a controlled system will effectively connect technological equipment and information technologies into a single technological structure for plasma application of heat-protective coatings with feedback and the possibility of automatic process control at different stages of the process.

However, this approach complicates the operating conditions of the technological complex and leads to uncertainty in the complex dynamic system of production of an item by the plasma method.

Research Questions

The following questions were raised during the study:

- How to increase the efficiency of the plasma installation control in conditions of uncertainty of taking into account all input parameters affecting the plasma coating process?
- How to ensure the efficiency of big data management of a complex technological process: the plasma current, the vertical position of the plasma flow, the shape, density and temperature of the plasma to obtain materials with specified properties?

Purpose of the Study

The article discusses approaches to formalizing the assessment and management of the state of the control system of the plasma spraying installation, in which the main parameters are related to the operation of the plasmatron. Develop an algorithm for automated control of a plasmatron using fuzzy logic methods.

Research Methods

When considering approaches to formalize the assessment and control of the state of elements and devices of the technological process for applying heat-protective coatings by the plasma method, the use of classical mathematical apparatus is limited. And when it is impossible to obtain reliable data on processes when solving complex problems associated with blurriness and inaccuracy, it is advisable to use hybrid approaches, including the architecture of fuzzy logic (Fig. 1), proposed by the scientist Lofty Zadeh.

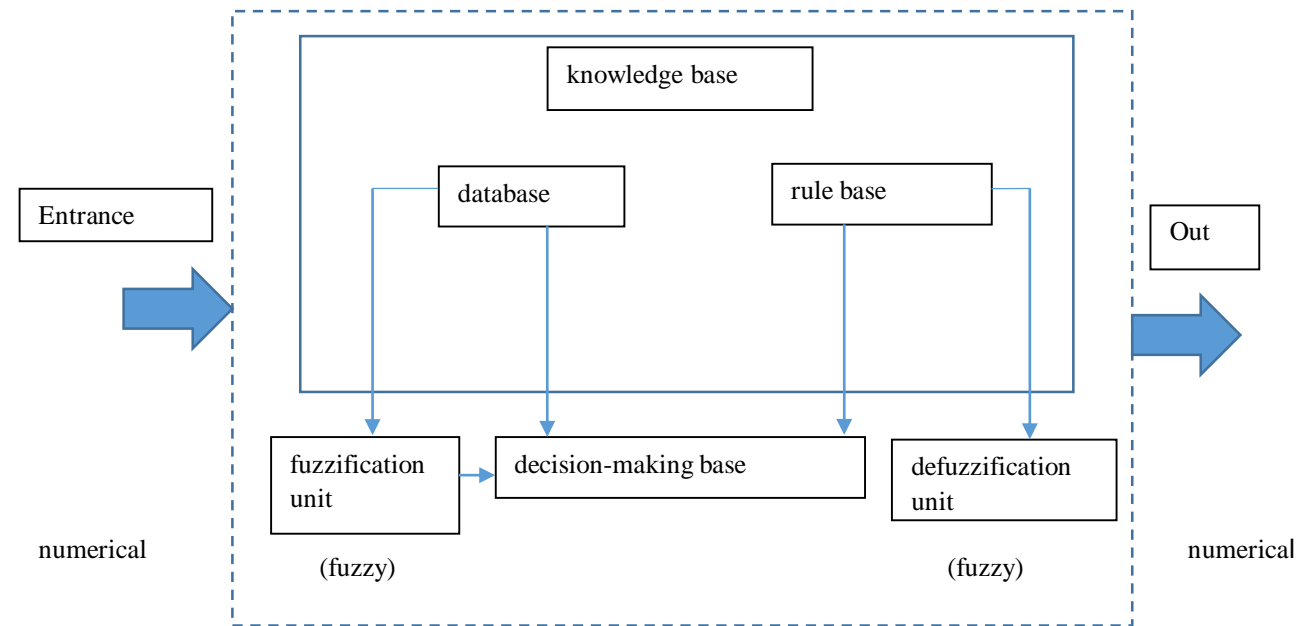


Figure 1. General scheme of the fuzzy system architecture

Findings

The proposed approach is distinguished by the use of an extended structure that combines a fuzzy algorithm, workflow data collection, evaluation of results, a database of set values and a database of rules, an algorithm for configuring system parameters, which ultimately allows for the efficiency of managing large data of a complex technological process and obtaining material with specified properties. The designed MSPSI should provide control of the plasma current, control of the position (equilibrium) of the plasma flow vertically, control of the plasma shape, control of plasma density, control of plasma temperature.

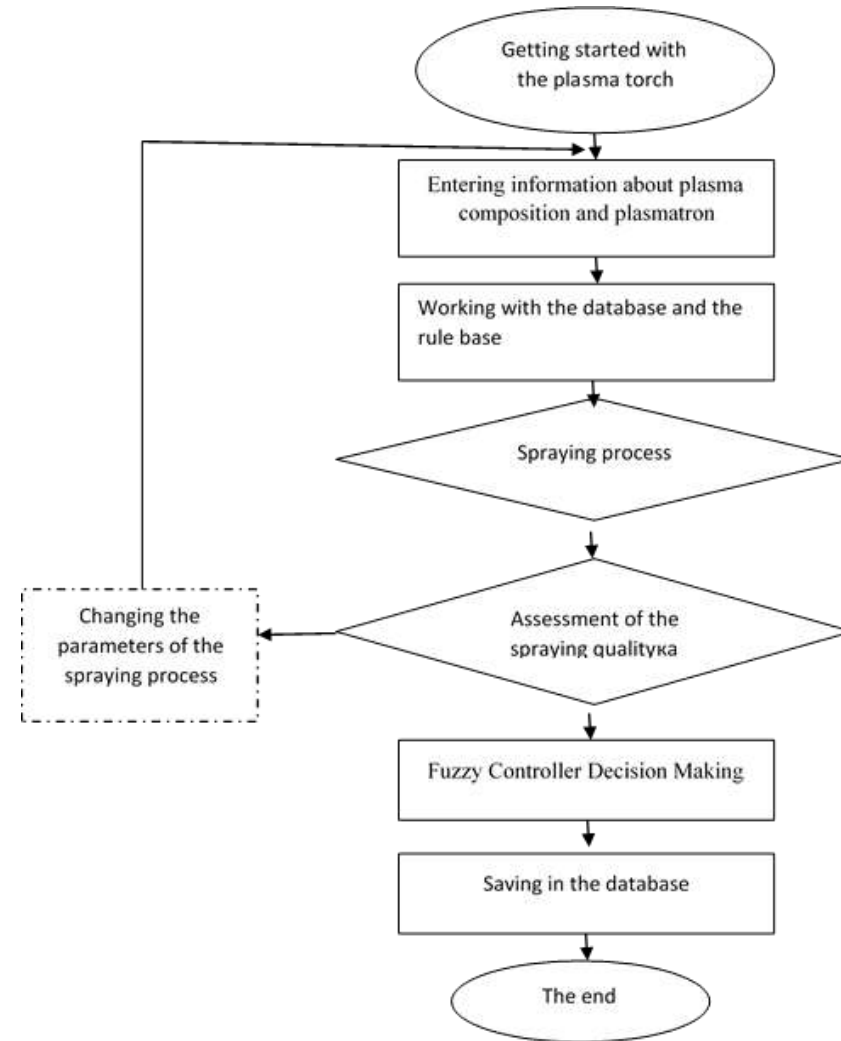


Figure 2. Shows an approximate algorithm for the operation of the plasma torch control system in a plasma spraying installation.

Findings



The fuzzy logic method can be used to model and optimize processes in controlling the state of elements and devices of the technological process of applying heat-protective coatings by the plasma method in the metallurgical industry.

Conclusions

Thus, automation of control processes based on fuzzy logic methods will allow changing and setting the speed, temperature, density of the plasma jet, position and shape of the plasma flow, as well as other parameters of this complex technological process. This approach increases the control efficiency of the plasma installation in conditions of uncertainty of taking into account all input parameters affecting the plasma coating process, expands the range of capabilities of the plasma torch and increases the possible range of sprayed materials (metals, ceramics, etc.). Working out such dependencies and modeling them using fuzzy logic in the MSPSI can contribute to the creation of materials with specified properties.

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