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Implementation and Optimization of Intelligent Control Systems to Ensure Reliable Operation of Boiler Units

Sobirov Muzaffarjon Mirzaolimovich [1]

Abstract: This in the article heat in energy pot of aggregates reliable work provide for smart management systems current reach and optimization discussion will be done . It is operational efficiency and security increase for artificial intellect and the car learning from algorithms use importance emphasizes . In the article information collection and analysis do , control to do algorithms improvement and risks evaluation through reliability evaluation process shown . From this besides , it is different in the circumstances prophetic technical service show and to work optimization for smart management to systems need that there is emphasizes . Findings energy manage according to b reliable solutions work to exit contribution to add directed .

Key words: smart management systems , boiler blocks , reliable performance , artificial intellect , machine study , information collection , management algorithms , risks assessment , prediction technical service to show , to work optimization .

Heat energy in objects pot aggregates reliable performance energy efficiency and of the system stability in providing important role plays Their optimal performance , problems in advance to determine and fast answer to give opportunities increases . Kazan aggregates technologies development with together , intellectual management systems energy efficiency more in raising important important have Theirs current to be done , certain in the circumstances fast and reasonable decisions acceptance to do enable creates Also intellectual systems energy consumption optimization and emissions reduce through ecological also eases the effect . This in the article pot of aggregates reliable work provide for intellectual management systems possibilities and optimization methods seeing will be released .

Intellectual Management Systems Main Concepts

- **Intellectual Management Systems**

Intellectual management systems artificial intelligence (SI) and car learning (MO) algorithms apply through energy systems efficiency to increase directed . This systems pot of aggregates work processes in real time mode observation and manage enable gives Management systems main processes automation , operational risks evaluation and clearly management strategies work to exit help gives

Management Model

Intellectual management system main purpose pot of aggregate movement is optimization . Of this for the following energy balance equation applies to :

$$E_{in} - E_{out} = \Delta E$$

Here :

- E_{in} is a boiler to aggregate being introduced energy (for example , fuel through);
- E_{out} - win from aggregate coming out energy (for example , heat water or in the form of steam);
- DE is energy change (if in the system losses if it is positive will be).

[1] Ferghana branch of the Tashkent University of Information Technologies named after Muhammad al-Khorezmi

Kazan Management Algorithms

Intellectual management systems through pot of aggregate temperature and pressure manage for PID (Proportional-Integral-Derivative) control from the algorithm is used . PID control algorithm the following equation with is represented by :

$$u(t) = K_p e(t) + K_i \int_0^t e(\tau)d\tau + K_d \frac{de(t)}{dt}$$

Here :

- $u(t)$ is control signal
- K_p , K_i , K_d — proportional , integral and differential coefficients ;
- $e(t)$ — error (expected value and real value between difference).

Car Learning Model

Car learning through pot of aggregate work indicators learning for regression from the models use can Simple linear regression the following in appearance is represented by :

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \epsilon$$

Here :

- ✓ Y is output variable (eg pot temperature);
- ✓ b_0 - intercept (constant);
- ✓ b_1 , b_2 , ..., b_n - regression coefficients ;
- ✓ X_1 , X_2 , ..., X_n - input variables (eg fuel consumption , water stream);
- ✓ e is the error term.

- **Management Models Development**

Kazan of aggregates reliable work provide for intellectual management systems different different models uses These are models basically :

- **Car study** : Kazan of aggregate work indicators learning and future problems in advance to determine for from the data uses
- **Neural networks** : Kazan work process in modeling is used and complicated relationships to determine help gives.

  Intellectual Management Systems Current reach

- **Data Get and Analysis**

  Intellectual management systems for initial stage as pot from aggregate information get and analysis to do necessary Sensors using win temperature , pressure , fuel spending and another parameters constant respectively observed . This data model is created through and analysis will be done .

- **Management Algorithms Improvement**

  Kazan aggregates for intellectual management systems efficiency increase in order to management algorithms constant respectively will be updated . This includes:

- **PID control** : Boiler temperature and pressure control in doing is used .
- **Adaptive management** : of the system work conditions looking automatic respectively it changes .

Decision acceptance to do Algorithms : Data based on optimal work regimes to choose help gives

Optimization Methods

- **Reliability Evaluation**

Kazan of aggregate reliability evaluation for intellectual management systems basically risk analysis and reliable work indicators through done is increased . This analysis in the process win work processes observed problems in advance is determined

- **Reasonable Management**

Kazan aggregates reliable work provide for reasonable manage methods apply necessary Reasonable management is optimal operation of the system modes work which provides is an approach . This includes:

- **Simulation based on optimization :** Simulations through different work conditions pot of aggregate efficiency to determine and improvement
- **Initial data based on management strategies work exit :** Previous work from modes received information analysis so new strategies work exit

- **Improved Planning**

Intellectual management systems using pot aggregates to use in the process future work regimes planning and risks prevention get can

Kazan of aggregates reliable work provide for intellectual management systems current reach and optimization modern energy in systems efficiency to increase important contribution adds . That's it systems using pot aggregates work processes automated , risks is evaluated and efficiency is increased . In the future intellectual management systems more development through energy in the field innovations and new approaches input can In parallel , intellectual management systems based on work developed strategies pot aggregates optimal and stable work provides that while economic is also useful will be Also like this approaches ecological the effect reduce and energy resources efficient use enable gives As a result , intellectual management systems energy systems the future for important to the factor rotation is expected . Energy in the field such innovations current not only economic efficiency increases , perhaps ecological also contribute to stability adds .

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