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Yzlozhenы Relevance of application hrybnыh polisaharidov in zaschyte plants boleznej from biotechnology development and production predposыlky mykobyopreparata IZ plodovыh phone mushrooms (Fomes fomentarius (L. Fr.), Gill.). Biotechnology vkljuchaet workpiece mushrooms, drying and storage s, yzmelchenye, эkstraktsyyu, otdelenie zhydkoy fraction, smeshyvanye components.

Hrybnыe polysaharydы, of Biotechnology, hrybnaya byomassa, mykobyopreparat, plodovoe Body, hrybnoy эkstrakt, Dimensions.

Set out the relevance of the use of mushroom polysaccharides in plant protection from diseases and conditions develop biotechnology mikobiopreparat production of fruiting bodies of fungi (Fomes fomentarius (L. Fr.), Gill.). Biotechnology includes a mushroom harvesting, drying and storage, crushing, extraction, separation of the liquid fraction, the mixing of the components.

Mushroom polysaccharides, biotechnology, fungal biomass, mikobiopreparat, fruiting body, mushroom extract size.

UDC 621,791,927

Mathematical model of optimization of energy consumption induction welding

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This article describes the method of induction welding of thin disc shaped ring using inductors by applying heat and electromagnetic screens. A mathematical model that describes the energy consumption during the induction welding of thin steel disks.

Induction welding, steel disc, electromagnetic screen, thermal field, energy, mathematical model.

Formulation of the problem. Widely used in agricultural machinery working bodies found, which is designed as a disc plows, hychkoriziv blades, discs for cutting sunflowers and more. To improve durability and samozahostryuvannya during operation of the working surface is reduced by various methods surfacing. Often, to restore parts designed as thin disks using induction welding powder hard alloys.

Analysis of recent research. In [1, 2] The essence of the method of induction welding of thin disc shaped ring inductors using special design. This surfacing is simultaneously strengthening the entire area using thermal and electromagnetic screens, but without rotation details regarding inductor. In this method of restoration work increases productivity by 4-5 times and almost no deformation of the working surfaces, that eliminates the need for additional straightening operations.

On the basis of the studies found that the known method of surfacing can be improved by specific power supply heat for the applicable law and thereby achieve reduction of electricity needed for the process of welding.

The purpose of research - Reducing energy costs for restoration of working surfaces by welding by developing a mathematical model and optimization of process parameters.

Results. In a thin disc shaped (Fig. 1) on the need to create a shaded area temperature TZD, which will provide high-quality surfacing with minimal energy consumption.

To prevent heat loss drive the entire region, in addition to thermally isolate welding zone, that heat set screen (Fig. 1).

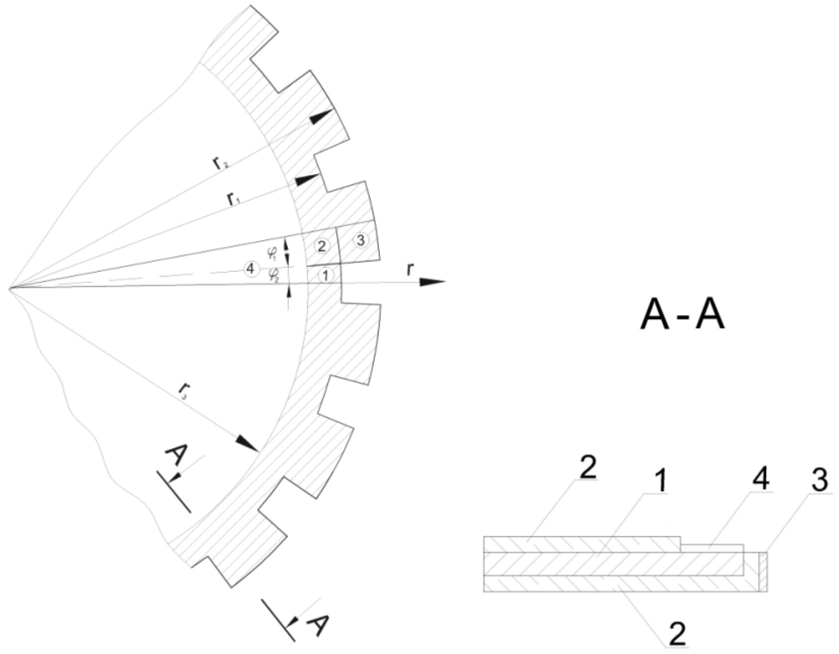

Fig. 1. Shaped drive 1 - Drive; 2 - thermal screen; 3 - electromagnetic screen; 4 - weld metal).

The heat equation for the drive element considering the average temperature and specific power for its thickness is of the form [3]:

$$\frac{1}{a}\frac{\partial T}{\partial t}=\frac{\partial^2 T}{\partial r^2}+\frac{1}{r}\frac{\partial T}{\partial r}+\frac{1}{r^2}\frac{\partial^2 T}{\partial \varphi^2}-mT+\frac{W(r,\varphi,t)}{\lambda_Д} \quad (1)$$

where: $T=T^{\bullet}-T_c$ - The temperature of the drive and the environment, $T^{\bullet}=const$, $T_c=const$; $m=B_i/2h^2$, $B_i=2hk$ - Bio criteria, $2h$ - the thickness of the disc; $k=\alpha/\lambda$, α - Heat transfer coefficient, λ - Thermal conductivity material disk; $W(r,\varphi,t)$ - Distribution function of specific power source; $\lambda_Д=ca\gamma$, c - Specific heat, a - Thermal conductivity, γ - Density.

In our case, a criterion B_i different from zero $r\geq r_3$, And the $r<r_3$ criterion $B_i=0$. Due to the fact that the temperature field is created using the ring inductors, it will simultaneously throughout the distribution area of welding in which a drive lines $\varphi=0$ and $\varphi=\varphi_1+\varphi_2$ (Fig. 1) no heat flow in a circular direction, ie with $\partial T/\partial\varphi=0$ All other lines that share the field 1,2,3,4 level of temperature and heat flow, and the free ends is a condition of convective heat transfer. There is no heat flux $\lambda(\partial T/\partial r)$ in the middle of the disc.

We write these boundary conditions and conjugation conditions:

$\partial T_4/\partial r=0$ at $r=0$; (2)

$T_2=T_3; \partial T_2/\partial r=\partial T_3/\partial r; \partial T_1/\partial r+kT_1=0$ at $r=r_1$; (3)

$\partial T_3 / \partial r + kT_3 = 0$ at $r = r_3$; (4)

$T_1 = T_4$; $\partial T_1 / \partial r = \partial T_4 / \partial r$; $T_2 = T_4$; $\partial T_2 / \partial r = \partial T_4 / \partial r$ at $r = r_3$; (5)

$\partial T_2 / \partial \varphi = 0$; $\partial T_3 / \partial \varphi = 0$; $\partial T_4 / \partial \varphi = 0$ at $\varphi = \varphi_1 + \varphi_2$; (6)

$T_1 = T_2$; $\partial T_1 / \partial r = \partial T_2 / \partial r$; $\partial T_3 / r\partial \varphi - kT_3 = 0$ at $\varphi = \varphi_1$; (7)

$\partial T_1 / \partial \varphi = 0$; $\partial T_4 / \partial \varphi = 0$ at $\varphi = 0$. (8)

Here and in the future value of the indices 1, 2, 3, 4 correspond to regions of the disk 1, 2, 3, 4 (Fig. 1).

Initial conditions are as follows:

$T_1 = 0$; $T_2 = 0$; $T_3 = 0$; $T_4 = 0$ at $t = 0$. (9)

At the end of surfacing after cessation of energy from the heat source, the temperature in the welding area should be equal to a given TZD, ie:

$T_1 = T_{зд}$; $T_2 = T_{зд}$; $T_3 = T_{зд}$ at $t = \tau$, $r \geq r_3$. (10)

If the power of heat sources given, then by solving equation (1) with the boundary conditions (2) - (8) and temporary conditions (9) we obtain the temperature distribution in the disc.

In this case, the power of heat sources are not given. Therefore, the variation of heat sources is found from the condition of minimum energy necessary for surfacing, ie:

$$J = \frac{1}{2}\int_o^{\tau}\left(\int_{r_2}^{r_1} W_1^2 r dr d\varphi + \int_{r_2}^{r_1}\int_{\varphi_1}^{\varphi_2} W_2^2 dr d\varphi + \int_{r_1}^{r_2}\int_{\varphi_1}^{\varphi_1+\varphi_2} W_3^2 dr d\varphi + \int_0^{r_2}\int_0^{\varphi_1+\varphi_2} W_4^2 dr d\varphi\right) dt \to min. \quad (11)$$

Using the method of Lagrange multipliers [4] to determine the specific capacity blending modes, we obtain the formula:

$W_i = \overline{T}_i / \lambda_Д$, $i =$ *1, 2, 3, 4*, (12)

where: $\overline{T}_i$ satisfy the differential equation:

$$\frac{\partial^2 \overline{T}_i}{\partial r^2} + \frac{1}{r}\frac{\partial \overline{T}_i}{\partial r} + \frac{1}{r^2}\frac{\partial^2 \overline{T}_i}{\partial \varphi^2} + \frac{1}{a}\frac{\partial \overline{T}_i}{\partial t} - m\overline{T}_i = 0, \quad (13)$$

boundary conditions and conjugation conditions similar to (2) - (8) and a temporary condition:

$\overline{T}_4 = 0$ at $t = \tau$. (14)

Applying the equations (1) and (13) Laplace formula $\tilde{f} = \int_0^{\infty} f e^{-st} dt$ and taking into account the initial conditions, we get:

$$\frac{\partial^2 \tilde{T}_i}{\partial r^2} + \frac{1}{r}\frac{\partial \tilde{T}_i}{\partial r} + \frac{1}{r^2}\frac{\partial^2 \tilde{T}_i}{\partial \varphi^2} - \left(m + \frac{s}{a}\right)\tilde{T}_i + \frac{\tilde{W}_i}{\lambda_Д} = 0; \quad (15)$$

$$\frac{\partial^2 \overline{\overline{T}}_i}{\partial r^2} + \frac{1}{r}\frac{\partial \overline{\overline{T}}_i}{\partial r} + \frac{1}{r^2}\frac{\partial^2 \overline{\overline{T}}_i}{\partial \varphi^2} - \left(m - \frac{s}{a}\right)\overline{\overline{T}}_i - \frac{\overline{T}_i^0}{a} = 0, i = \textit{1, 2, 3, 4} \quad (16)$$

where: $\overline{T}_i^0$ - The value of the Lagrange multipliers at $t = 0$.

It should also be noted that the functions $\tilde{T}_i, \overline{T}_i$ must satisfy the boundary conditions and conjugation conditions (2) - (8) in which the above functions necessary to put a sign $\sim$.

Since the regions 1, 2, 3 (Fig. 1) at the end surfacing $t = \tau$ must have a set temperature TZD, size $\overline{T}_1^0, \overline{T}_2^0, \overline{T}_3^0$ necessary to determine the conditions of (10). In the 4 enough $\overline{T}_4^0$ find out the conditions (14). After finding functions $\tilde{T}_i, \overline{T}_i$ ($i =$ *1, 2, 3, 4*), Originals determined by Theorem clotting and required specific capacity external heat sources $\tilde{W}_i$ by formulas (12).

Solution equations (15), (16) on the specified boundary conditions and conjugation conditions are quite difficult and cumbersome. Therefore, in welding introduce the averaged values of $\tilde{T}_i$ Adopting independent of coordinates. Then according to (12) and (15) take $\tilde{W}_1 = \tilde{W}_2 = \tilde{W}_3, \overline{\overline{T}}_1 = \overline{\overline{T}}_2 = \overline{\overline{T}}_3$, which does not depend on the coordinates.

From (15) and (16) with (12) we find:

$$\overline{\overline{T}} = 2\frac{\overline{T}^0}{s - am}; \tilde{T} = 2\frac{\overline{T}^0 a}{\lambda_Д^2 \left(s^2 - a^2 m^2\right)}. \quad (17)$$

The original values of the past, taking into account conditions $T(t = \tau) = T_{зд}$ Ie the desired features will be:

$$\overline{T} = 2\overline{T}^0 e^{atm}; T = 2\frac{\overline{T}^0}{\lambda_Д^2} sh(atm) \quad (18)$$

where: $\overline{T}^0 = T_{зд} \lambda_Д^2 m / 2sh(am\tau)$ And specific capacity, which found using (12), are as follows:

$$W = W_1 = W_2 = W_3 = \frac{\lambda_Д m}{sh(am\tau)} T_{зд} e^{amt}. \quad (19)$$

Based on the analysis (18) (19) found that to obtain the desired temperature in the zone during welding τ with minimum energy consumption, power density heat sources necessary to change the law (19). As the region $0 \le r \le r_3$ thermally insulated and non-surfacing, the use of heat sources in this area unnecessary, that there $W_4 = 0$.

The temperature field in $0 \le r \le r_3$ is given by equation (15), which should take $W_4 = 0$ And on the edge of the field $r = r_3$ temperature changes by renowned law $T_4 = T$ where T asked by (18).

Given the symmetry temperature field are:

$$\tilde{T}_4 = AI_0(x) + Bk_0(x) \quad (20)$$

where: $x = ar$, $a = \sqrt{s/a}$; $I_0(x), k_0(x)$ - Modified Bessel functions and Hankel zero order.

The temperature in the center of the disc should be limited, so take $B = 0$. Satisfying requirements $\tilde{T}_4 = \tilde{T}$ at $r = r_3$ for $\tilde{T}_4$ obtain the following expression:

$$\tilde{T}_4 = \frac{I_0\sqrt{rs/a}}{sh(am\tau)(s^2 - a^2m^2)I_0\left(\sqrt{r_2 s/a}\right)} amT_{зд}. \quad (21)$$

Applying the theorem of convolution (21) determine the temperature T_4:

$$T_4 = \left(\frac{I_0\sqrt{mr}}{2amI_0\left(\sqrt{mr_2}\right)} e^{amt} - \frac{J_0\left(\sqrt{mr}\right)e^{-am\tau}}{2amJ_0\left(\sqrt{mr_2}\right)} + \sum_{k=1}^{\infty} \frac{J_0\left(a_k \frac{r}{r_2} e^{-a\left(\frac{a_k^2}{r_2^2}\right)\tau}\right)}{a\left[\left(\frac{a_k^2}{r_2^2}\right)^2 - m^2\right]\frac{r_2^2 J_1(a_k)}{2a_k}} r_2 \right) \frac{am}{sh(am)} T_{зд}, \quad (22)$$

where: $J_0(x)$, $J_1(x)$ - Bessel functions of the first kind and first order; a_k - The roots of the equation; $J_0(a_k) = 0$.

To assess the energy savings, which is achieved by changing the power density, the optimum (energy saving) law we find constant power density, determined by formula (19) required for heating during the drive t TZD to the desired temperature in the area of deposition:

$$T = \frac{W}{\lambda_Д m}\left(1 - e^{-amt}\right) \text{or } W = \frac{T_{зд}\lambda_Д m}{1 - e^{-am\tau}}. \quad (23)$$

Because the power density change in law (19), while energy density is determined by:

$$N_1 = \int_0^{\tau} \frac{T_{зд}\lambda_Д m}{sh(am\tau)} e^{amt} dt = \frac{T_{зд}\lambda_Д}{sh(am\tau)a}\left(e^{am\tau} - 1\right). \quad (24)$$

In the case of constant power density, which is defined by the formula (25), we get:

$$N_2 = \frac{T\,\lambda}{1 - e^{-am\tau}} m\tau. \quad (25)$$

While energy savings find the formula:

$$\Delta \frac{N_1 - N_2}{N_2} 100\% = \left\{1 - \frac{2[sh(am\tau) - 1]}{am\tau sh(am\tau)}\right\} 100\%. \quad (26)$$

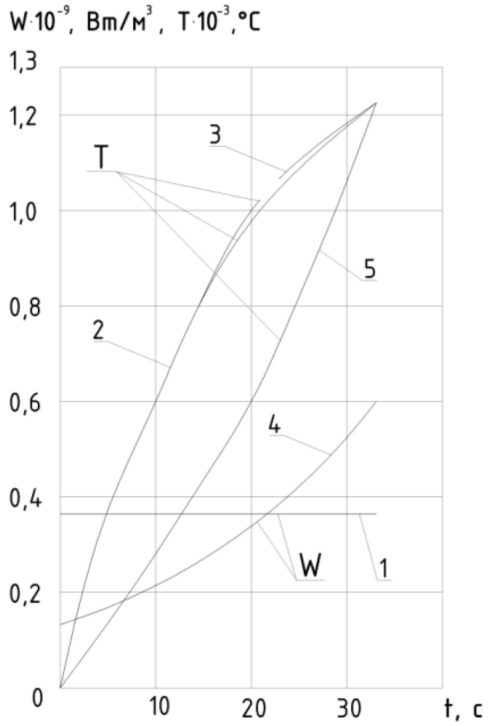

Fig. 2. Change of power density and temperature in the welding zone depending on time of 1, 2 - theoretical power density and temperature; 3 - experimentally determined temperature; 4, 5 - optimum power density and temperature.

Based on the results of theoretical research and experimental data obtained depending volumetric power density heat sources and temperature in the welding zone from its time in the case of powdered hard alloy welding PG-C1 to disk steel ST3 (Fig. 2).

Calculations show that the optimum (energy saving) mode heating saves 15% energy ... 25 (depending on surfacing materials). For example, when surfacing material PG-AN9 (NH8S2R3P) savings is 23%, while surfacing material PG-S1-15%.

A characteristic feature of temperature field distribution along the radius of the disk (Fig. 3) is that the distance from the zone of deposition to the center of the disk temperature quickly decreases so that starting from mid-range disk is almost equal to the ambient temperature is within this area of disc barely heated.

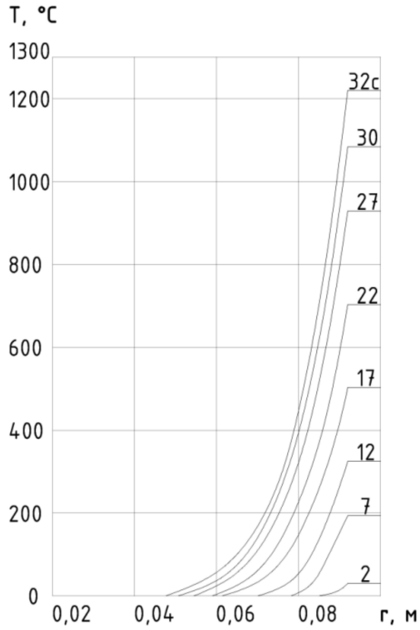

Fig. 3. Temperature distribution depending on the radius of the disk for different periods of time surfacing.

Conclusion. The change in time of power density heat sources in the area of welding of thin shaped discs for energy-saving mode ensures energy savings of 15 ... 25% depending on the used surfacing materials.

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In Article ynduktsyonnoy described method of deposition of thin disk with fasonnыh Using koltsevыh ynduktorov putem of application of thermal and electromagnetic эkranov. Is designed matematycheskuyu model kotoraja harakteryzuet zatratы energy t Time ynduktsyonnoy deposition of thin steel disk.

Ynduktsyonnoe surfacing, Steel disc Electromagnetic screen, thermal field, Energy, matematycheskaya model.

The paper describes the induction welding method of thin shaped disks with using of ring inductors by application of heat and electromagnetic screens. Developed a mathematical model that describes the energy consumption during the induction welding of thin steel disks.

Induction welding, steel disc, electromagnetic screen, thermal field, energy, mathematical model.

UDC 621.43.068.4

FEATURES OF HARMFUL COMPONENTS Combustion gases forest technology ENGINES And farm tractor

Beshun OA, OA Maroussia, Ph.D.

The basic harmful components of exhaust gases of modern engines silsko- and forestry tractors, analyzes the mechanisms, causes and conditions of their formation and ways to minimize harmful emissions.

Ecology, engine, diesel, toxicity, opacity, exhaust gases emissions rule *Standard, Stage, Euro, Tier.*

Formulation of the problem. The problem of protecting the environment from harmful emissions of heat engines is no less urgent than saving energy. All industrialized countries are intensive search for ways to reduce toxicity and smoke SH (exhaust gas) heat engines, especially transport. Now the world has a system of international, intergovernmental, governmental and industry standards that apply to gasoline engines of cars and trucks as well as buses and cars, tractors and combines diesel.

Analysis of recent research. Obviously, the urgency of finding solutions to the problem of reducing the burden on the environment will only be strengthened over time [1, 2]. No exception in this respect is the field of forest technology and agricultural production, which involves a large number of cars equipped typically diesel engines. The latter is known to be one of the biggest polluters of the environment and, in practice, not exhausted its potential improvement. The introduction of the legislation rigid standards toxicity and smoke SH railroads and intense competition - two factors that stimulate lately dvyhunobudivni leading