

INNOVATION SCIENCE AND TECHNOLOGY



Scopus || Electronic journal specializing in Scopus

ISSUE 11



Acceptance of papers **November, 2025**



Acceptance of papers

Published monthly



Topics

economics, technology, social sciences





EDITOR-IN-CHIEF:

Mirzaliyev Sanjar Makhmatjon ugli

DEPUTY EDITOR-IN-CHIEF:

Makhmudov Nosir Makhmudovich
DSc., Prof., Academician

DEPUTY EDITOR-IN-CHIEF:

Ochilov Bobur Bakhtiyor ugli – Senior lecturer at TSUI

THE SCIENTIFIC-POPULAR ELECTRONIC JOURNAL **"INNOVATION SCIENCE AND TECHNOLOGY"** HAS BEEN REGISTERED UNDER THE NUMBER **C-5669633** BY THE AGENCY FOR INFORMATION AND MASS COMMUNICATIONS (AOKA) OF THE REPUBLIC OF UZBEKISTAN, EFFECTIVE FROM OCTOBER 9, 2024.

CONTACTS

Phone: **+998 50 737 87 88**

Website: <https://ist-journal.uz>

Email: innovationist2025@gmail.com

The scientific electronic journal "Innovation Science and Technology" has been included in the list of scientific publications recommended for the publication of main scientific results of dissertations for the award of PhD and DSc degrees in economics and technical sciences, in accordance with the Resolution No. 370 of the Presidium of the Higher Attestation Commission of the Republic of Uzbekistan, dated May 8, 2025.

Electronic publication, Issue 11. 378 pages.
Approved for publication on November, 2025.

Editorial board:



Sharipov Kongiratbay Avezimbetovich,
Doctor of Technical Sciences (DSc), Professor



Abdurakhmanova Gulnora Kalandarovna,
Doctor of Economic Sciences (DSc), Professor



Cham Tat Huei,
Doctor of Philosophy (PhD), Professor (Malaysia)



Muhammad Imran Sadiq
Doctor of Philosophy in Economics (PhD),
Professor, Malaysia



Ahmed Aziz Ismail
Doctor of Technical Sciences (DSc),
Professor (Egypt)



Lee Chin
Doctor of Philosophy in Economics (PhD),
(Malaysia)



Asongu Simplicé
Doctor of Philosophy in Economics (PhD),
Cameroon



Rui Dang
Doctor of Chemistry (DSc), Professor, China



Zahoor Ahmed
Doctor of Philosophy in Economics (PhD), Turkey



Shujaat Abbas
Doctor of Philosophy in Economics (PhD), Russia



Tina A Coffelt
Doctor of Philosophy in Educational Sciences
(PhD), USA

CONTENTS

POVERTY AND DEVELOPMENT	14
Kholmirezayev Abdulhamid Khapizovich	
WAYS TO ACHIEVE ECONOMIC STABILITY THROUGH THE IMPLEMENTATION OF INNOVATIVE TECHNOLOGIES IN INDUSTRIAL ENTERPRISES	23
Sadriddinov Bakhtiyor	
STRUCTURE-PROPERTY RELATIONSHIP OF ORGANOSILICON MATERIALS: EVALUATION BASED ON THERMOGRAVIMETRIC ANALYSIS	36
Tosheva Dilfuza Farxodovna, Siddikov Ikrom Iminjonovich, Rakhimov Firuz Fazlidinovich	
"CREATING AN ALGORITHM AND SOFTWARE TOOL FOR PERSONAL IDENTIFICATION USING FACIAL SCANNING TO PROTECT THE OPERATING SYSTEM"	43
Usmonov Maxsud Tulqin o'g'li	
ENSURING INTERDISCIPLINARY INTEGRATION BASED ON MOBILE LEARNING TECHNOLOGIES.....	51
Zaripov Olimjan Kuvandiq son	
MONITORING OF THE AYDAR-ARNASAY LAKE SYSTEM AND ASSESSMENT OF THE CHEMICAL COMPOSITION OF COLLECTOR WATER INFLOWS INTO THE LAKE ECOSYSTEM.....	55
Erkabayev Furkat Ilyasovich, Madrimov Rajabboy Masharipovich, Aminov Khamza Khusanovich	
APPROBATION OF THE RESISTANCE OF BRICKS MADE FROM "ANGREN" SECONDARY KAOLIN TO THE EFFECT OF LIQUID METAL.....	62
Umurov Ulug'bek Meylievich	
THEORETICAL AND PRACTICAL FOUNDATIONS OF PERFORMANCE-BASED BUDGETING.....	68
Allakuliev Akmal Baltayevich	
IMPROVING ECONOMIC MECHANISMS THROUGH EFFECTIVE USE OF ORGANIZATIONAL AND LEGAL FRAMEWORKS IN TOURISM DEVELOPMENT.....	71
Abdusalomov Djamshid Abdusalomovich	
TEMPERATURE-RADIATION REGIME OF THE TERRITORY OF UZBEKISTAN FOR THE DESIGN OF SOLAR GREENHOUSES	76
Ilkhom Ismatovich Rakhmatov, Shakhzod Niyoz ogli Izomov	
THEORETICAL ASPECTS OF GREEN FINANCING IN FORMING A GREEN ECONOMY	81
Khalikov S. X.	
MUVAFFAQIYATLI STARTAP FAOLIYATIDA ROL O'YNOVCHI MUHIM OMILLAR VA O'ZBEKISTON SHAROITIDA STARTAP EKOTIZMINING RIVOJLANISHI.....	87
Qosimova Dilorom Sobirovna	
EFFECTIVENESS OF INNOVATION MANAGEMENT SYSTEMS.....	92
Umarova Nilufar Abdulkakhorkizi	
INFLUENCE OF INTERNATIONAL RANKING ORGANIZATIONS ON HIGHER EDUCATION INSTITUTIONS AND EXISTING PLATFORMS	96
Urozboev Khayrulla Murodboy ugli	
BASE STATION MONITORING TECHNOLOGIES IN MOBILE NETWORKS	103
Ibrokhimkhuja Rikhsikhujayev, Mohit Bhandwal	
FORMATION AND MANAGEMENT OF INVESTMENT PROJECTS OF ENTERPRISES	108
Abdunazarov Saidakhmat Abdumalikovich	
THE IMPORTANCE OF QUALITY MANAGEMENT IN ENTERPRISE ACTIVITY MANAGEMENT.....	113
Rasulov Shavkat Sharof son	
PARTICIPATORY BUDGETING OF THE STATE BUDGET	117
Khamidov Khabibullo Khikmatulla ogli	
TRANSFORMING THE HIGHER EDUCATION SECTOR THROUGH PUBLIC-PRIVATE PARTNERSHIP UNDER CONDITIONS OF DIGITALIZATION	123
Abdullayev Javohir Abdumalik og'li	
WAYS TO IMPROVE THE EFFICIENCY OF THE FINANCIAL MANAGEMENT SYSTEM IN ENTERPRISES.....	131
Begalov Sherzod Maxsutaliyevich	

DIRECTIONS FOR IMPROVING THE RESERVOIR SAFETY ASSESSMENT AND MANAGEMENT SYSTEM USING THE EXAMPLE OF THE TALIMARJON RESERVOIR.....	136
Xodjaqulova Nodira Xosiyatqul qizi	
ECONOMIC EFFICIENCY AND INNOVATIVE TRANSFORMATION PROCESSES OF DIGITAL TECHNOLOGY IMPLEMENTATION IN UZBEKISTAN'S OIL AND GAS INDUSTRY	141
Tarakhtiyeva Gulmira Kulbayevna	
INNOVATIVE APPROACHES TO RISK MANAGEMENT AND ASSESSMENT OF INVESTMENT PROJECTS IN THE DIGITAL ECONOMY.....	145
Muxitdinova Kamola Alisherovna	
INNOVATIVE COOPERATION AND MARKETING STRATEGIES FOR STRENGTHENING THE REGIONAL ECONOMY: THE CASE OF NAMANGAN REGION	149
Sattarov R. A.	
MARKETING PROBLEMS IN THE INTERNATIONAL TEXTILE MARKET AND FOREIGN EXPERIENCES IN SOLVING THEM.....	159
Musayeva Shoirazimovna	
THE PROBLEMS OF LINGUISTIC ANALYSIS OF ELLIPTICAL SENTENCES IN MODERN ENGLISH.....	165
Jurayeva Hilola Kamol qizi, Eshonkulov Ravshan Tokhirovich	
THE EFFECTIVENESS AND PROSPECTS OF INTEGRATING ARTIFICIAL INTELLIGENCE INTO URBAN SECURITY DEVELOPMENT	171
Iminov Akbarjon Odiljonovich	
21ST CENTURY CHANGES AND THE GROWING IMPORTANCE OF PROFESSIONAL ENGLISH PROFICIENCY	175
Rakhimova Shirin Utkurovna	
A COMPARATIVE STUDY OF UZBEKISTAN'S INNOVATION EFFICIENCY: EVALUATING GII OUTPUT-INPUT RATIOS RELATIVE TO LEADING AND EMERGING INNOVATIVE ECONOMIES	179
Umidjon Khoshimov	
ANALYSIS OF MODERN FINANCING MODELS FOR OUTSOURCING SERVICES IN PRESCHOOL EDUCATIONAL INSTITUTIONS AND THEIR EFFICIENCY	189
Khamidov Anis Choriyevich	
СРАВНИТЕЛЬНЫЙ АНАЛИЗ АРХИТЕКТУР ДИАЛОГОВЫХ СИСТЕМ ДЛЯ МЕДИЦИНСКОЙ ПРЕДМЕТНОЙ ОБЛАСТИ	195
Гофуржонов Мухаммадали Расулжон угли, Бурханова Айгуль Ильясовна	
EFFICIENT USE OF FINANCIAL RESOURCES IN UZBEKISTAN'S FORESTRY SECTOR	201
Mamatqulova Muxlisaxon Mamirjanovna	
ESG RISKS AND CORPORATE ACCOUNTABILITY: GLOBAL LESSONS AND IMPLICATIONS FOR UZBEKISTAN	206
Zakhidov Azizbek Rustamovich	
PRACTICE OF FOREIGN COUNTRIES IN PROVIDING FINANCING FOR ENTREPRENEURS' INNOVATIVE INITIATIVE.....	211
Jubanova Bayramgul	
SAMARQAND VILOYATIDA IJTIMOYIY XIZMATLAR SOHASINING RIVOJLANISH DARAJASI VA SAMARADORLIK KO'RSATKICHLARI.....	216
Berdiyeva Nafisa Qahramonovna	
TOURISM SERVICES MANAGEMENT AND IMPROVEMENT IN UZBEKISTAN	221
Otaxonova Iroda Xamdami qizi	
TO'G'RIDAN-TO'G'RI XORIJIY INVESTITSİYALARNING O'ZBEKISTONDA IQTISODIY BARQARORLIKNI TA'MINLASHDAGI AHAMIYATI VA UNING DINAMIK TAHLILI	228
Abdurasul A.Sobirov	
O'ZBEKISTON RESPUBLIKASIDA TADBIRKORLIKNI TASHKIL ETISHDA MOLIVAVIY TAVAKKALCHILIKNI BAHOLASH	233
Bayxonov Baxodirjon Tursunbayevich	
ANALYZING N-SHAPED ENERGY VERSUS ENVIRONMENT MODEL: EVIDENCE FROM UZBEKISTAN.....	240
Xalimjonov Nurbek Ulug'bek o'g'li, Toxirov Shodiyor Zafar o'g'li, Jumamuratov Sultanbek Iyasovich	

PROSPECTS FOR DEVELOPING SUSTAINABLE TOURISM IN UZBEKISTAN.....	248
Alieva Makhbuba Toychievna	
EXPANDING THE FINANCIAL CAPABILITIES OF LOW-INCOME FAMILIES THROUGH DIGITAL FINANCIAL SERVICES.....	252
Bauyetdinov M.J., Djumamuratova Xurliman	
ANALYSIS OF FACTORS AFFECTING THE EFFICIENCY OF PUBLIC PROCUREMENT.....	258
Abdurakhmonova Mahliyo Nurmamatovna	
THE IMPACT OF SMALL AND MEDIUM ENTERPRISE FINANCING ON ECONOMIC GROWTH: EMPIRICAL EVIDENCE FROM UZBEKISTAN.....	262
Aziza Farmonovna Ergasheva, Rustam Olimjonovich Oltinov	
ANALYSIS OF FACTORS INFLUENCING THE ACTIVITIES OF THE COMPANY'S SALES NETWORK.....	277
Usmanov Ilkhom Achilovich	
NODAVLAT OLIY TA'LIM MUASSASALARINING TIZIMLI RIVOJLANISHIDA MARKETING FAOLIYATINING SAMARADORLIGINI OSHIRISH.....	282
Yuldashov Isomiddin Sidiqovich	
LEVERAGING OPEN INNOVATION AND DIGITAL PLATFORMS TO ACCELERATE SUSTAINABLE STARTUP ECOSYSTEM DEVELOPMENT IN EMERGING ECONOMIES.....	288
Azamov Sardor Telman ugli	
PROSPECTS FOR ENSURING BALANCE BETWEEN INDUSTRIAL SECTORS IN THE TERRITORIES OF THE ZARAFSHAN REGION.....	297
Murtazayev Isabek Bazarbayevich	
THE IMPACT OF ECONOMIC GROWTH ON UNEMPLOYMENT IN CENTRAL ASIA.....	306
Kungratov Ilmurod Kuzibay ugli, Jumayev Samariddin Sayfiddin ugli	
EKOTURIZMNING BARQAROR RIVOJLANISHDAGI AHAMIYATI: TABIIY RESURSLARNI MUHOFAZA QILISH VA MAHALLIY HAMJAMIYATLARNI QO'LLAB-QUVVATLASH MASALALARI.....	313
Hamzayeva Dilfuza Samarovna	
THE ESSENCE, IMPORTANCE, AND NECESSITY OF INNOVATION ACTIVITY IN SMALL ENTERPRISES.....	320
Yuldashev Kodirjon Mamadjanovich	
EFFECTIVE MANAGEMENT OF THE FINANCIAL STABILITY OF THE ENTERPRISE.....	326
Baymuratova M.M.	
ENHANCING FINANCING MECHANISMS FOR EARLY CHILDHOOD AND SCHOOL EDUCATION FACILITIES: INTERNATIONAL LESSONS FOR UZBEKISTAN.....	331
Murodbek Boltaboev	
THE IMPACT OF DIGITAL PAYMENT SYSTEMS DEVELOPMENT ON THE BANKING SECTOR: A COMPARATIVE ANALYSIS OF CENTRAL ASIAN COUNTRIES.....	337
Aziza Farmonovna Ergasheva, Rustam Olimjonovich Oltinov	
STRENGTHENING GRADUATE ENTREPRENEURSHIP THROUGH INSTITUTIONAL AND FINANCIAL SUPPORT MECHANISMS.....	350
Valiyev Umid Gulamovich	
MATHEMATICAL MODEL FOR PREDICTING THE DYNAMIC EVOLUTION OF CRACKS IN URBAN CONSTRUCTION STRUCTURES.....	355
Sh. A. Anarova, M. N. Samidov	
TURIZM TARMOG'INI RAQAMLI TRANSFORMATSIYA QILISHDA BIG DATA TEXNOLOGIYALARIDAN SAMARALI FOYDALANISH.....	364
Maxmudova Aziza Pirmamatovna	
THE DEVELOPMENT OF ENTREPRENEURSHIP DURING THE REIGN OF MIRZO ULUG'BEK.....	368
Aripov Oybek Abdullayevich	
ON THE ISSUE OF CALCULATING THE PARAMETERS OF THE EDGES DURING HIGH-FREQUENCY WELDING OF A PIPE BILLET FROM A FERROMAGNETIC MATERIAL.....	372
Zairkulov Elyor Yoqubjon o'g'li	



ON THE ISSUE OF CALCULATING THE PARAMETERS OF THE EDGES DURING HIGH-FREQUENCY WELDING OF A PIPE BILLET FROM A FERROMAGNETIC MATERIAL

Zairkulov Elyor Yoqubjon o'g'li

Associate Professor, Doctor of Philosophy in Technical Sciences (PhD)

Department of Technological Machines and Equipment

Tashkent State Technical University named after Islam Karimov

Email: zairkuloveybor@gmail.com

Abstract: The article presents a method for calculating the parameters of weldable edges during high-frequency welding of pipe billets made from ferromagnetic material (low-carbon and low-alloy steels). It examines the features of current distribution under the influence of the skin effect, proximity effect, and magnetic circuits. An approach is proposed to account for the loss of magnetic properties in the heated zone, along with a correction coefficient for power and resistance of ferromagnetic edges compared to non-magnetic ones. Calculation dependencies and graphs are provided to optimize inductor parameters and welding regimes.

Key words: roll calibration, continuous pipe welding mills, high-frequency welding, pipe blank forming, single-radius calibration, double-radius calibration, oval calibration, edge pre-forming, corrugation, welded seam, electric-welded pipes.

Annotatsiya: Maqola ferromagnit materialdan (kam uglerodli va past qotishmali po'latlardan) quvur tayyorlamasini yuqori chastotali payvandlashda payvandlanadigan chetlar parametrlarini hisoblash usulini taqdim etadi. Sirt effekti, yaqinlik effekti va magnit sxemalar ta'sirida tok taqsimlanishining xususiyatlari ko'rib chiqiladi. Isitish zonasida materialning magnit xususiyatlarini yo'qotishini hisobga olish usuli, shuningdek, nomagnit chetlar bilan solishtirganda ferromagnit chetlarning quvvati va qarshiligini tuzatish koeffitsiyenti taklif etiladi. Induktor parametrlari va payvandlash rejimlarini optimallashtirish uchun hisoblash bog'lanishlari va grafiklari keltirilgan.

Kalit so'zlar: valklarni kalibrlash, uzluksiz quvur payvandlash agregatlari, yuqori chastotali payvandlash, quvur tayyorlovini shakllantirish, bir radiusli kalibrlash, ikki radiusli kalibrlash, oval kalibrlash, chekka qismlarni shakllantirish, gofirovka hosil bo'lishi, payvand chok, elektropayvandlangan quvurlar.

Аннотация: Статья посвящена разработке метода расчёта параметров свариваемых кромок при высокочастотной сварке трубной заготовки из ферромагнитного материала (низкоуглеродистые и низколегированные стали). Рассматриваются особенности распределения тока под влиянием поверхностного эффекта, эффекта близости и магнитных контуров. Предложен подход к учёту потери магнитных свойств материала в зоне нагрева, а также коэффициент коррекции мощности и сопротивления для ферромагнитных кромок по сравнению с немагнитными. Приведены расчётные зависимости и графики, позволяющие оптимизировать параметры индуктора и режимы сварки.

Ключевые слова: калибровка валков, непрерывные трубосварочные агрегаты, высокочастотная сварка, формовка трубной заготовки, однорядная калибровка, двухрядная калибровка, овальная калибровка, проформовка кромок, гофрообразование, сварной шов, электросварные трубы.

INTRODUCTION

High-frequency welding is one of the most advanced and widely applied technologies in modern metalworking, particularly in the production of longitudinally welded steel pipes. This process is fundamentally based on the laws of electromagnetic induction and current flow, as well as a complex combination of physical phenomena, including the surface effect, proximity effect, ring and coil effects, and the influence of magnetic circuits and copper shields on current distribution. In addition, the welding process is significantly affected by temperature-dependent changes in the electrical and magnetic properties of metals, as well as by electromagnetic forces arising in high-frequency fields. The controlled interaction of these phenomena enables localized and efficient heating of the welded edges, ensuring high productivity, structural integrity of the joint, and stable geometric characteristics of the finished product.

Despite the extensive industrial application of high-frequency welding, the accurate analysis and optimization of electromagnetic and thermal processes in the welding zone remain a challenging scientific and engineering problem. The distribution of current density, the role of magnetic permeability variations, and the influence of auxiliary elements such as magnetic cores introduce significant complexity into both theoretical modeling and practical implementation. In particular, the behavior of ferromagnetic materials during heating, including the loss of magnetic properties near the welding temperature, necessitates refined analytical approaches and reliable calculation methods. Therefore, a detailed study of current distribution, power consumption, and heating efficiency in high-frequency welding is essential for improving process controllability, reducing energy losses, and enhancing the overall quality and reliability of welded pipe joints under modern industrial conditions.

REVIEW OF LITERATURE ON THE SUBJECT

The law of electromagnetic induction manifests itself in the fact that if the magnetic flux Φ passing through a surface bounded by a certain contour changes in time, an emf is induced (induced) in this contour, the instantaneous value of which e is determined by the formula:

$$e = \oint E_{ind} dl = -d\Phi / dt \quad (1)$$

where E_{ind} is the vector of the electric field strength (induced); dl is a vector equal to the length of the contour section dl and directed tangentially to the contour in the direction of the bypass; $d\Phi$ - change in the magnetic flux through the surface bounded by the contour during the time dt [1].

Direction e , etc. with. is determined by the rule of the right-hand screw, while if the screw is tightened so that its tip moves in the direction of the magnetic forces with increasing flux, then the positive direction for the induced emf. coincides with the direction of rotation of the head of this screw. In fact, the induced emf at this moment has a negative direction, therefore, a minus sign is put in formula (1) [2].

The surface effect is manifested in the uneven distribution of alternating current over the cross section of the conductor. The highest current density is observed at the outer surface of the conductor. With increasing distance from the outer surface, the current density gradually decreases. The higher the frequency, the faster the current density decreases. At a very high frequency, the current flows only through the thin surface layer of the conductor. The surface effect significantly increases the resistance of the conductors, which greatly complicates the transmission of alternating current. However, the surface effect makes it possible to concentrate the release of energy in the surface layers of the heated product, which is important when carrying out the processes of hardening, high-frequency welding, etc. [3]

The proximity effect is manifested when an alternating current flows in the conductor system. Moreover, each of them is located not only in its own alternating magnetic field, but also in the field of other conductors. The effect of proximity is manifested the stronger, the smaller the distance between the conductors and the higher the frequency of the current. With induction heating, the currents in the inductor and the heated part are almost exactly in antiphase. Therefore, using the proximity effect, it is possible by selecting the appropriate shape of the inductor to concentrate the current on the parts of the product that need to be heated [4].

The effect of magnetic circuits on the current distribution in a conductor is that if a conductor through which a high-frequency current is passed is surrounded on three sides by a ferromagnetic material having a high electrical resistivity (ferrite or stratified iron), then the current distribution in the conductor will change dramatically ... It can be assumed with sufficient accuracy for practice that almost all the current will be pulled to the open edge [5].

RESEARCH METHODOLOGY

The research methodology of this study is based on analytical and computational approaches to investigate high-frequency welding processes of ferromagnetic and non-magnetic pipe billets. The initial data were obtained from established electromagnetic induction laws, theoretical models of surface and proximity effects, and experimentally measured material properties of steels used in pipe production. Model parameters, including current density distribution, magnetic permeability, and geometric characteristics of the welded edges, were determined using experimental measurements and reference data from prior studies. The analysis was carried out through mathematical modeling and the coupled contour method, allowing calculated values of current distribution, specific power, and welding power to be evaluated and compared under different welding conditions and configurations of magnetic circuits.

ANALYSIS AND RESULTS

When welding pipes, the material of the surfaces to be welded by the end of heating loses its magnetic properties to a depth of up to $(2 \div 3) \Delta$ in the middle of the edges and up to $(3 \div 5) \Delta$ at the corners. Approximately 80–85% of the length of the edges in the heating section have the surfaces to be welded, heated to the temperature of loss of magnetic properties to a depth equal to or greater than Δ . Therefore, the real edges can be reduced to the one shown in Fig. 1 system (Figure 1).

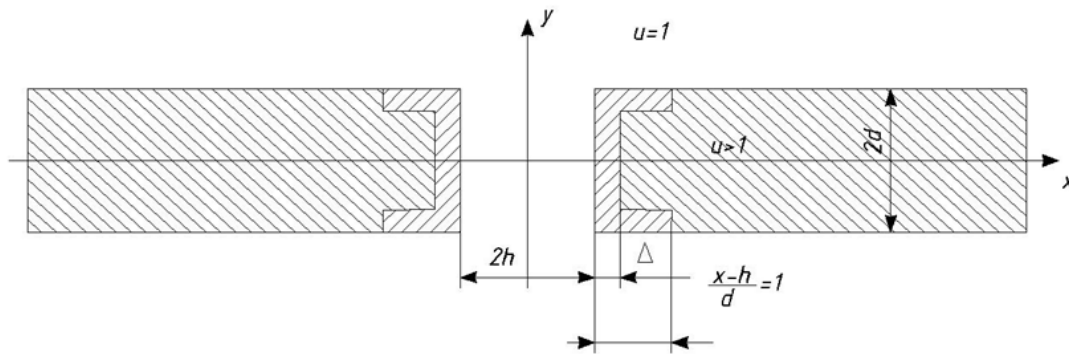


Figure 1. The flat system to which the weldable edges made of ferromagnetic material

Measurements have shown that the distribution of the surface current density on models made of ferromagnetic material, in which the surfaces to be welded to a depth of $(1 \div 2) \Delta$ are non-magnetic, the same as on models made of non-magnetic material (maximum discrepancy 12%).

Consequently, with the same distribution of the surface current density on the non-magnetic and ferromagnetic edges, the useful power is approximately the same. The total power on the ferromagnetic edges is somewhat higher, since on the lateral surfaces the magnetic permeability $\mu > 1$ and the specific power is higher than at $\mu = 1$.

The power required for welding and the resistance of ferromagnetic edges increase in comparison with the power and resistance of non-magnetic edges in proportion to the coefficient:

$$k_{\mu} = \frac{\int_{S_2} |\delta_s|^2 |dz| + 0,55 \int_{S_3} \sqrt{\mu_e} |\delta_s|^2 |dz|}{\int_S |\delta_s|^2 |dz|}, \tag{2}$$

where S_2 , and S_3 are the contours of integration in the sections with $\mu_e = 1$ and $\mu_e > 1$ (μ_e is the relative magnetic permeability on the surface of the edges).

Using formula (2), the values of k_{μ} for parallel edges were calculated, from which the average coefficients k_{μ} of for edges located at an angle were then obtained. The values of these coefficients for edges with different arrangement of magnetic circuits are shown in Fig. 2, from which it can be seen that k_{μ} av depends on the welding current and the gaps between the edges, as well as the gaps between the magnetic cores and the edges (Figure 2).

$$1 - I_{kp} / 2d = 15 \cdot 10^4 \text{ A/m}; 2 - I_{kp} / 2d = 45 \cdot 10^4 \text{ A/m}; 3 - I_{kp} / 2d = 90 \cdot 10^4 \text{ A/m}$$

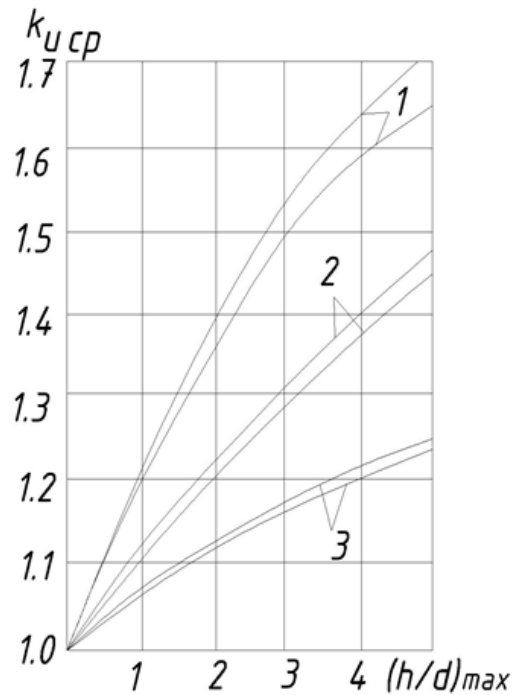


Figure 2. Values of the coefficients k_{Ucp} for ferromagnetic edges located at an angle with and one magnetic core ($b/d = 10$ - solid lines, $b/d = 6$ - dashed lines)

The coupled contour method can be used to calculate the parameters of an inductor used to weld pipes made of ferromagnetic material without using magnetic cores. The system under study (inductor - pipe billet) is divided into elements isolated from one another. The cross-section of the conductors of each element is taken so small that the current density within the cross-section can be considered constant. Breaking the outer and inner surfaces of the pipe billet into elements, we obtain two circuits I and II (Fig. 3) with elementary currents: one is formed by currents flowing along the outer $I_{нар}$ and inner $I_{ин}$ surfaces of the pipe, and the second is formed by the current flowing along the inner surface of the pipe $I_{ин}$, and the current passing along the welded edges $I_{кр}$. In this case, the real spreading of the current over the surfaces of the pipe billet is replaced by the idealized one. The inductor also breaks down into elements (Figure 3).

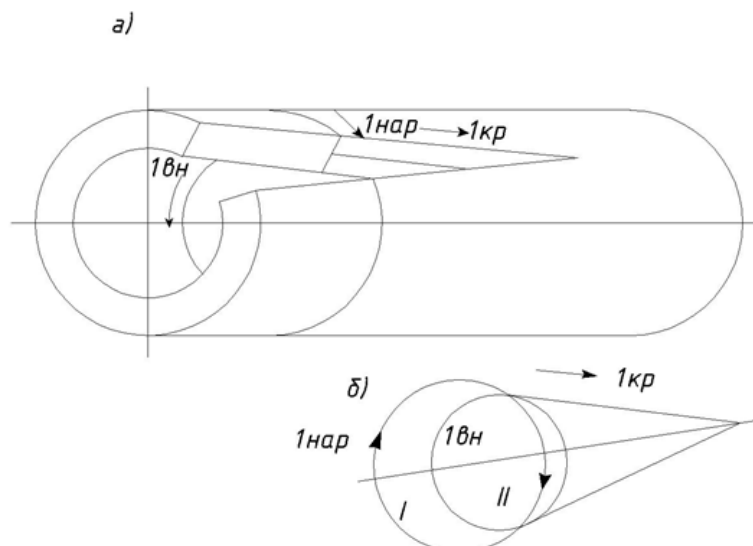


Figure 3. Idealized surface spreading pattern pipe billet and an element consisting of contours current with inductive current supply

The solution of the system of equations for the contours of the pipe billet and the inductor makes it possible to obtain the distribution of the current density and specific power on the surfaces of the pipe billet and the

inductor; equivalent active, inductive and impedance of the inductor and the welding power required to heat the edges to the welding temperature; choose the optimal dimensions of the inductor and its location.

CONCLUSIONS AND SUGGESTIONS

Research work on determining the influence of thermal deformation parameters during high-frequency welding on the quality of welded joints of longitudinal welded pipes of low-carbon and low alloy steels revealed that:

- with the same distribution of the surface current density on the non-magnetic and ferromagnetic edges, the useful power is approximately the same;
- the power required for welding and the active resistance of edges made of ferromagnetic material are increased compared to the power and active resistance of edges made of non-magnetic material.

List of used literature:

1. Zairkulov E.E., Dunyashin N.S. To the question of determining the power absorbed by a conductive medium during high-frequency welding of longitudinal pipes // Actual issues in the field of technical and socio-economic sciences. Republican interuniversity collection. - Tashkent: TCTI, 2019 - S.255-257.
2. Zairkulov E.E., Dunyashin N.S. To the question of studying the influence of high-frequency welding mode parameters on the quality of welded joints // Materials of the Republican Scientific and Technical Conference "Resource- and Energy-Saving, Environmentally Friendly" - T.: SUE "Fan VA Tarrakiyot", 2019 - P. 162-164.
3. Alzhanov MK, Tursynbekova A. U. Issues of improving the design of pipe welding equipment based on ferrite heaters // Young scientist. - 2016. - No. 2. - S. 117-121.
4. Danchenko V.N., Kolikov A.P., Romantsev B.A., Samusev S.V. - Technology of pipe production: Textbook for universities / - M.: Internet Engineering, 2002.
5. Osadchy V.Ya., Vavilin A.S. - Technology and equipment for pipe production. Internet Engineering, 2001.

Proofreader: Zokir ALIBEKOV

Layout and Designer: Oloviddin Sobir ugli

2025. № 11

© When materials are reproduced, the INNOVATION SCIENCE AND TECHNOLOGY journal must be cited as the source. Authors are responsible for the accuracy of the information in materials and advertisements published in the journal. Editorial opinions may not always align with those of the authors. Submitted materials will not be returned to the editorial office.

To publish articles in this journal, you may submit articles, advertisements, stories, and other creative materials through the following links. Materials and advertisements are published on a paid basis.

You may subscribe to the journal at any time using the following details. Once subscribed, please send a screenshot or photo of your payment confirmation to our Telegram page @iqtisodiyot_77. Based on this, we will send the latest issue of the journal to your address each month.

“The journal “INNOVATION SCIENCE AND TECHNOLOGY” has been registered by the Agency for Information and Mass Communications under the Administration of the President of the Republic of Uzbekistan from 09.10.2024 under the registration number №390637. License number: C-5669633. PNFL: 30407832680027

Our address: Tashkent city, Yunusobod district, 19th block,
House 17.



Acceptance of articles
Published every
monthly



Directions
Social, economic, political,
technological, scientific

 **Scopus || Scientific electronic journal specializing in Scopus**

CERTIFICATE NUMBER: №390637

**ORDER NUMBER ACCORDING TO
THE LICENSE REGISTER: C-5669633**

CONTACT:

-  Contact us
+998 50 737 87 88
-  Telegram channel
t.me/scopus_IST2100

 Journal official website
<https://ist-journal.uz/index.php/IST>