

- small-sized betatron for 2.5 MeV energy for field operation (GOU VPO Tomsk Polytechnic University, RI of Introscopy);

- ACOUSTIC EYE system for NDT of internal condition of tubes of heat exchangers, steam generators and other industrial facilities, having tubes in their structures («Spektr» Ltd.);

- automated facility for eddy current control of bearing rings VISTKON (UNITEST GROUP);

- magnetostriction generators of higher power waveguide waves (Souhtwest Research Institute);

- automated unit «Shilo» for testing girth welds in tube-tubesheet system (TSNK Laboratory);

- AVGUR-T system for external and internal AUST of welded joints and base metal of pipelines and welded T-joints with coverplates (SPC «Ekho+» Ltd.).

In a specially equipped hall leading world manufacturers made 16 presentations of the most advanced equipment. Presentation by Harry Passi (Sonotron NDT Company) on «Ultrasonic testing with phased array application. Result visualization in keeping with

the actual geometrical dimensions and shape of the object of control», as well as US flaw detector on phased arrays ISONIC 2009 generated participants' interest.

As part of Exhibition activities, a competition of exponent companies for the «Best Booth of ECNDT 2010» was held. By the results of an anonymous poll of more than 300 specialists a commission headed by D. Gilbert, Editor-in-Chief of Insight Journal, determined the winners. These were booths of the following companies: OLYMPUS, Spektr, General Electric, South African Institute for NDT (in the nomination «Best Booth of the National NDT Society»).

In the official meeting devoted to closing of the 10th Jubilee Conference its results were summed up and countries-organizers of the next international conferences were presented, namely of 18th International Conference in SAR, and 11th European Conference in Czechia in 2014.

*Dr. S.V. Klyuev, RF*

## INTERNATIONAL CONFERENCE ON WELDING CONSUMABLES

The 5th International Conference «Welding consumables. Technologies. Production. Quality. Competitiveness», devoted to the 20th anniversary of Association «Elektrod», took place in Artyomovsk, Donetsk region, in the period of June 7–11, 2010. The organizers of the Conference were Association «Elektrod» of enterprises of CIS countries and CJSC «Artemmashzavod «VISTEK». 44 specialists from 29 enterprises and organizations of Ukraine, Russia and Kazakhstan participated in the work of the Conference. I.M. Livshits, the president of the Association, general director of CJSC «SVAMA», opened the work of the Conference. N.I. Yatchenko, general director of VISTEK, delivered a welcome speech to the participants of the Conference. Prof. V.N. Shlepakov, leading staff scientist of the E.O. Paton Electric Welding Institute, presented the greeting speech of Prof. B.E. Paton to the participants of the Conference.

The program of the Conference included 25 papers and presentations, many of which were included into the Collection prepared by the International Association «Svarka». One part of the papers was devoted to covered electrodes and technology of their manufacture, and another part described the problems of development, production and application of solid wires, flux-cored wire and fluxes for mechanized arc welding. During two plenary sessions the lecturers presented their papers, commented upon their content before the participants of the Conference and answered the questions of the audience.

In the paper «Methods of modernization and development of electrodes for manual arc welding and surfacing» Dr. I.N. Vornovitsky (OJSC SPA «TSNIIT-MASH») explained new criteria of quality and algorithm of processes of development of electrodes to solve the problems of providing high quality of their manufacturing and stability of welding-technological characteristics. On the example of operation of preparation of coating mass the advantages of intensive mixers over roller ones in improvement of key characteristics of electrodes, such as productivity (increases), losses of metal for waste and spattering (decrease), manoeuvrability of electrode (improves) are shown. O.V. Dzyuba (SPC «Svarochnye materialy», Krasnodar) reported about new technology of increase of modulus of liquid glasses designed for manufacturing welding consumables. For this purpose the methods of electrolysis were suggested to be used, applied for desalination of sea water. In the paper some properties of obtained soluble-glass materials are analyzed.

I.M. Livshits («Izhorskies varochnye materialy», Ltd., RF) reported in his speech that the results of optimization of the technology of manufacturing of flux of the grade 48 KRF-16, intended for welding of structures of nuclear power plants, allowed considerable decrease of sulphur and phosphorus content in deposited metal.

I.N. Zvereva, engineer (OJSC «MKM-METIZ», Magnitogorsk, RF) told about advantages of lubrica-



tion of the grade PANLUBE S622T of the company PAN CHEMICALS (Italy), revealed at manufacturing electrode cores of the wire produced in large-lot line of wire rod drawing after mechanical removal of scale from its surface. High adaptability of the process including stability of drawing, high efficiency of lubrication holdup, absence of dusting and «burning» of lubrication material is observed. Lubrication is easily removed from the surface of the wire in the process of washing out, which is confirmed by results of evaluation of amount of lubrication on the surface of rods after operation of cutting. Two papers of I.M. Livshits are dedicated to actual problems of production and application of electrodes of general purpose. In the first one the attempts to change electrodes UONI-13/55 are analyzed, which were 70 in the last year with the new developments to improve their manufacturability in the process of production, to increase the welding-technological characteristics, and also physical-mechanical characteristics of welds performed by them. The paper concerns the results of the previous works (TsU-6, TsU-7 of TsNIITMASH, ANOD of the E.O. Paton Electric Welding Institute, UONI-13/45AA and UONI-13/55AA of TsNII KM «Prometey»), and also the challenged developments carried out in the frames of state program «Magistral». The second paper concerns speculations, made by some manufacturers of electrodes, on far-fetched problem of influence of the coating colour on welding-technological and operational properties of electrodes.

Dr. V.G. Lozovoj (SPC «Svarochnye materialy») comprehensively reported in his work about experience of large group of authors, accumulated during tests and application of Russian electrodes LB-52 TRU instead of foreign ones in welding of blast furnace of Novolipetsk Metallurgical Works. The paper is saturated with practical data and is recommended to those involved in development and application of low-hydrogen electrodes designed for welding and repair of objects of metallurgical complex.

Dr. A.E. Marchenko (the E.O. Paton Electric Welding Institute) devoted his paper to the analysis of physical-chemical nature and results of investigation of strength of electrode coatings. It was shown that strength of electrode coatings, manufactured using binder in the form of a liquid glass, is provided by hydrant shapes of alkali silicates occurred during dehydration of liquid glass at heating of electrodes not more than to 200 °C. The structure of silicate binder is considerably deteriorated in the course of high-temperature heat treatment (400 °C), to which low-hydrogen electrodes are subjected. As a result, the hydrate forms of silicates possessing binding (adhesion) properties completely disappear in it. Moreover, high-temperature heating and cooling of electrodes provoke the inner stresses in the coating, caused by inadmissible shrinkage of silicate matrix and also difference of coefficients of thermal expansion of ma-

trix and filler in the coating on one hand and coating and rod on the other hand.

The paper of Dr. Marchenko, prepared together with engineer N.A. Protsenko (the E.O. Paton Electric Welding Institute), describes the new edition of international standards ISO 9000 and ISO 9001 and their national versions in Ukraine and also prospect of issuing of a new standard ISO 9004.

In the review, prepared by Drs A.E. Marchenko and N.V. Skorina (the E.O. Paton Electric Welding Institute) and also engineer V.P. Kostyuchenko (OJSC «Mezhgosmetiz-Mtsensk») the detailed technical characteristics and advantages of low-hydrogen electrodes with two-layer coating, which are available at international market of welding consumables, are given and prospects of their development and production in CIS countries are shown.

Dr. Marchenko presented the paper «Grounding and experimental investigation of the system of deoxidization and microalloying of metal, deposited by low-hydrogen special-purpose electrodes», prepared by a group of authors headed by Prof. I.K. Pokhodnya. As far as in welding using coated electrodes the welding zone is not very reliably protected from surrounded air, as during use of other welding consumables, titanium in deoxidation system Mn-Si-Ti acts not only as a deoxidizer, but also as a nitride-forming element. Such «doubling» does not allow its use as microalloying element for effective control of impact toughness of weld metal. To increase protective capacity of coating, it is necessary to increase relation  $\text{CaCO}_3:\text{CaF}_2$  in coating and its thickness. Under the given conditions combining titanium as microalloying element with boron it is possible to increase impact toughness of weld metal not only at room but also at negative temperature down to -60 °C.

Engineers P.A. Kosenko and N.A. Solovej devoted their paper to the problems of production of welding consumables at SE «Pilot Plant of Welding Consumables of the E.O. Paton Electric Welding Institute of the NAS of Ukraine» (OZSM). It is outlined in this paper that under the present economic conditions at the market of welding consumables the quality of output products and rendered services have the primary significance for successful functioning of enterprise. The acting system of quality management by the standard ISO 9001:2000 was certified in 2007. Now the preparation for its recertification in accordance with statements of new version of standard set into force in 2009 is carried out. Nowadays OZSM fully prepared his test laboratories for accreditation according to ISO/IEC 17025:2006. In its market activity it was reoriented to the work with small organizations and outlet sale of electrodes. In a tiny package the most challenging grades of electrodes began to be packed. The packing line of productivity of about 470 boxes of 1 kg mass per hour was designed and manufactured. A new package, manufactured of strong mi-

crocorrugated cardboard and made in brand style and white-blue colors, traditional for OZSM, will provide proper storage of electrodes and satisfy the demands of consumers.

The paper of the specialists of the E.O. Paton Electric Welding Institute, presented by Prof. V.N. Shlepakov, was devoted to the question of application of flux-cored wires for welding structures of units of metallurgical and mining production. In the paper the analysis of structural defects revealed in the units of mentioned productions after their continuous operation was given. The characteristics of developed flux-cored wires and technologies of their application for mechanized and automatic welding of these structures were described. The results of tests of offered technology showed increase in productivity of welding operations by 1.5–2 times. The welding consumables are saved, the level of residual stresses in welded joints is decreased and their operation reliability increased. The basic principles of use of offered technology on the different objects of metallurgic complex were defined.

V.N. Shlepakov also presented the paper «Bases of formation of compositions of flux-cored wires at high welding efficiency». He outlined that the solution of problems of mechanized welding of steels of increased and high strength is defined by technological and metallurgical requirements which are specified to welded joints, and high productivity of process of wire electrode melting must be combined with low specific heat input into a near-weld zone. This is achieved using tubular gas-shielded flux-cored wires with a metallic type of core, in content of which the volume of filler does not exceed 1.5 %. The correlation of fractions of metallic and gas slag-forming parts of a core is determined in accordance with the required level of alloying of deposited metal. To protect molten metal

from air the gas mixtures based on argon should be applied. This provides stable arc burning, decrease of number of short circuits, and character of transfer of electrode metal transforms from drop into spray one.

In conclusion part of his paper the author made review of aspects of production and application of seamless flux-cored wire, where he generalized the multi-year foreign and domestic experience in this question. It was included into Collection as a separate paper. The principle of modernization of three grades of electrodes — ANO-21, ANO-4 (rutile coating, design of PWI) and UONI-13/55 (low-hydrogen coating, design of TsNIIM, Russia), carried out by the E.O. Paton Electric Welding Institute, was reported by engineer O.I. Folbort (the E.O. Paton Electric Welding Institute). The modernization of electrodes AHO-21 was made to widen their assortment and expecting a maximum possible use of raw materials of the Ukrainian manufacturers. The modernization of the electrodes ANO-4 and UONI-13/55 was caused by necessity of fulfillment of requirements, which are specified by Russian National Agency for Control and Welding (NAKS) to the products delivered both to Russia and also to Federation by foreign producers. S.Yu. Ryabov, chief engineer of «Silikat Ltd.» (St. Petersburg), reported about production of silicate lumps, designed for manufacturing welding electrodes, their characteristics and terms of delivery. A number of planned speeches failed in connection with the fact that reporters did not arrive to the Conference by different reasons and did not participate in its work. Their papers are available for review, as far as they are included into published Collection.

*Dr. A.E. Marchenko,  
Eng. P.V. Ignatchenko, PWI*