

## 4th INTERNATIONAL SEMINAR «NEW DIRECTIONS OF RESEARCH IN THE FIELD OF HIGH-FREQUENCY ELECTRIC WELDING OF SOFT LIVE TISSUES»

On November 23, 2009 the 4th International Seminar on «New Directions of Research in the Field of High-Frequency Electric Welding of Soft Live Tissues» was held in Kiev at the E.O. Paton Electric Welding Institute of NASU. More than 60 persons (doctors of surgical profile, veterinary surgeons, and specialists on medical equipment) from Ukraine, Russia, Belarus and the USA participated in it. The Seminar organizers were PWI and International Association «Welding» (IAW).

Opening the Seminar, Prof. B.E. Paton noted that its objective is exchange of general information on the achieved results in the field of high-frequency welding of soft live tissues and jointly overcoming the bottlenecks in application of this technology. The near-term goals are development of higher quality certified equipment and tools, organizing surgeon training, continuation of research and application of the technology in new areas of surgery.

During almost nine years of application of the technology of high-frequency electric welding of soft live tissues in practical surgery in Ukraine more than 50,000 operations have been performed in 80 clinics, and about 100 new surgical procedures have been developed.

Technology of high-frequency electric welding of soft live tissues is protected by patents of Ukraine, Russia, USA, Australia, European Union, Canada, China and Japan. Permissions were obtained for clinical application in Ukraine, Russia, USA and countries of the European Union. Our dream and near-term goal is fitting every surgical ward in Ukraine with equipment for welding live soft tissues; considering that there are 9,000 surgeons and about 27,000 beds in the surgical wards in Ukraine, it is necessary to annually manufacture up to 1000 EK-300M1 units with differ-

ent sets of bipolar welding tools. This means that a transition from small-batch to large-batch manufacturing of equipment and tools is required.

Let us note some of the speeches. In his presentation Prof. G.S. Marinsky (PWI) gave a retrospective analysis of the equipment and bipolar welding tools for welding soft live tissues, manufactured by PWI and IAW. Presentation of Dr. O.N. Ivanova (IAW) and D.D. Kunkin (PWI) was devoted to development of devices for recording the electric parameters in welding live tissues in order to analyze their influence on welded joint quality and selection of control algorithm of this process. In the presentation of Prof. S.E. Podpryatov (PWI/KCCH #1, Kiev) it was noted, in particular, that strength of the joint in electric welding is achieved due to welding of muscle tissues to each other and creation of new joints of collagen fibres. Performance of electric welding of various soft live tissues requires a certain combination of the value (and shape) of electric current, degree of tissue heating and pressure on the tissues. Presentation of M.P. Zakharchash, Corresp. Member of AMSU (O.O. Bogomolets National Medical University, Kiev) dealt with the issues of application of electric welding technology in surgeries on patients with mechanical jaundice. Presentation of E.Yu. Aktan (Taras Shevchenko National University, Kiev) highlighted the issues of application of biophysical effects in electric welding of soft live tissues and prospects for their application in surgical practices and provided a classification of structural changes in biological tissues depending on temperature (40–45 °C — cell loss, 60–80 °C — protein denaturation, except for collagens, 80–100 °C — collagen denaturation, above 100 °C — dehydration and coagulation of the tissue). It is shown that investigation of structural changes in the collagen component during welding enables assessment of the effectiveness of the electric welding method compared to laser welding. A.F. Vozianov, academician of AMS (Institute of Urology of AMS of Ukraine, Kiev) spoke about the prospects for application of electric welding technology in urology. G.V. Bondar, academician of AMS (Donetsk Regional Antitumour Center) noted that it is very difficult to change technology in medicine, but the technology of electric welding of soft live tissues provides a significant shortening of surgery duration, reduction of blood loss, absence of either sutures or post-operation complications, high degree of tissue regeneration, etc., which, in its turn, stimulates the surgeon to quickly master the technology.



Seminar session in progress

Donetsk Regional Antitumour Center has 25 operating rooms and EK-300M1 units are installed in 12 of them, and the technology is used in almost all the operations, except for lung surgery. Among the disadvantages of the technology, G.V. Bondar noted an absence of a wide range of bipolar welding tools, both as to their purpose and typesize. Yu.A. Zozulya, academician of AMS (Institute of Neurosurgery of AMS of Ukraine, Kiev) spoke about the prospects for application of electric welding technology in neurosurgery: for stopping parenchymatous bleeding from brain tissue, for sealing brain system after tumour removal, for sealing the meninges.

Two presentations by V.A. Naumenko (V.P. Filatov Institute of Eye Diseases and Tissue Therapy of AMS, Odessa) were devoted to application of high-frequency electric welding technology in treatment of eye diseases, in particular, in retinopexy (retinal detachment) and eye enucleation. It is proven that application of high-frequency electric welding in eye enucleation allows preventing blood loss when crossing muscles and neurovascular bundle and achieving the necessary fastening of the muscles to Tenon's capsule and reliable joining of the conjunctiva edges to each other without suture application. In eight cases of retinopexy the chorioretinal commissure made by electric welding method, prevented development of retinal detachment beyond the experimental area. In one case separation of the retina on the boundary of chorioretinal site was noted (chorioretinal commissure



Discussion during the Seminar: *standing from left to right* Profs. M.E. Nechitajlo (A.A. Shalimov National Institute of Surgery and Transplantology) and G.V. Bondar (Donetsk Regional Antitumour Center)

made by laser coagulation, turned out to be untenable on all the eyes).

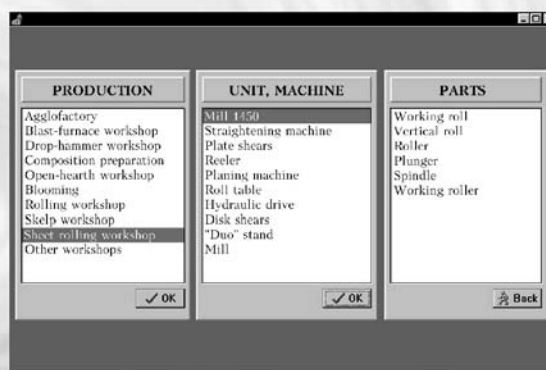
In conclusion Prof. B.E. Paton noted that many problems of the technology of electric welding of live tissues have already been solved, and this technology is already quite well-established in surgery, but there are still many tasks ahead of us. These are setting up large-scale production, manufacturing of competitive power sources and tools, certification of European level production, provision of guarantee and after-sale service, organizing surgeon training, etc.

*Dr. A.T. Zelnichenko, PWI*

## COMPUTER SYSTEM TO DESIGN TECHNOLOGIES FOR REPAIR AND HARDENING OF METALLURGICAL EQUIPMENT PARTS

**Purpose.** The system is intended to design technologies for repair and hardening of metallurgical equipment parts by the electric arc surfacing methods. The computer system is based on the experience accumulated by 16 metallurgical plants in the field of surfacing. It allows design of a surfacing technology for 350 different parts (selection of surfacing consumables, methods, conditions, equipment, etc.) at a level of a highly skilled specialist. The system operation result has the form of a process sheet.

**Application.** The system can be used at metallurgical enterprises. It is intended for welding technologists working at a plant engineering department.



Selection of a part to be surfaced

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