IN MEMORY OF S.I. KUCHUK-YATSENKO

Serhiy Ivanovych Kuchuk-Yatsenko, the first Deputy Director of the E.O. Paton Electric Welding Institute of the NAS of Ukraine, Academician of the National Academy of Sciences of Ukraine passed away **on March 22, 2021**.

After graduating from the Kyiv Polytechnic Institute, Serhiy Ivanovych was assigned to work at the E.O. Paton Electric Welding Institute, where he passed a glorious working path from a young expert engineer to professor, doctor of technical sciences, chief of one of the leading departments, first Deputy Director of the Institute on research work, Academician of the National Academy of Sciences of Ukraine. In 1960, S.I. Kuchuk-Yatsenko defended a candidate and in 1972 a doctoral thesis. In 1978 he was elected a corresponding member and in 1987 a full member of the National Academy of Sciences of Ukraine.

The research activity of S.I. Kuchuk-Yatsenko is associated with studies of physical and metallurgical processes in welding of different materials in a solid phase. In particular, he obtained new data on the peculiarities of producing joints with the formation of a thin layer of melt on the contact surfaces of parts to be welded, its behaviour under the action of electrodynamic forces and features of its interaction with the gaseous medium in the contact zone. It was for the first time shown that the state of the melt during deformation of parts to be welded has a dominant effect on the formation of metal bonds between the contact surfaces and the formation of chemical heterogeneity in the joint area. The influence of oxide structures in the melt on the quality of joints was studied in detail and the ways of minimizing oxidation processes in the specified welding period were determined. Along with the mentioned studies, S.I. Kuchuk-Yatsenko for many years had been carrying out specifically-targeted studies of transient processes of heating and damage of single contacts at high energy concentrations. A number of new regularities, characterizing the energy indices of the process of contact fusion of metals, determined the ways of automatic control of the basic parameters of the process in order to obtain the most favourable conditions for heating and deformation of parts to be welded.

As a result of the mentioned fundamental studies, S.I. Kuchuk-Yatsenko developed new methods of flash butt welding by continuous, pulsed, pulsating melting, patented in the leading countries of the world. Based on them, S.I. Kuchuk-Yatsenko together with the staff colleagues developed the technologies of welding for different products, control systems and new models of welding equipment that have no analogues in the world practice. The equipment is featured by a high efficiency, the minimum consumed power and weight, provides a stable and high quality of joints. These advantages are the most significant during welding of parts of a complex configuration with large cross-sections. Research and engineering activity of S.I. Kuchuk-Yatsenko was characterized by a comprehensive approach to solving the set problems. His basic investigations were accompanied by the development of original welding technologies, automatic and recently computerized control of the welding process and the creation of modern welding equipment.

With his direct participation, industrial production of new welding equipment and its mass implementation into production was organized. Here are some of the most significant stages of activity of S.I. Kuchuk-Yatsenko.

For more than fifty years, S.I. Kuchuk-Yatsenko dealt with works on welding rails. Due to the technologies and equipment for rail welding, developed with his active participation and supervision, for the first time in the world practice it was possible to use a highly efficient flash butt welding in field conditions, which greatly contributed to the transition of railways to seamless tracks. With an active participation of S.I. Kuchuk-Yatsenko, on the terms of the PWI documentation, the serial production of such equipment was organized at the Kakhovka Plant of Electric Welding Equipment, which in the 1970s became a world exporter of such equipment. Over the past years, more than ten generations of rail welding machines were created and are still used in many countries around the world. S.I. Kuchuk-Yatsenko took an active part in the improvement of this equipment and welding technology, which allows maintaining its high competitiveness. In recent years, new generations of welding machines were created that allow welding rails of infinite length during the repair of seamless tracks with the simultaneous stabilization of their stress state. In 1966, for the development and implementation of a machine for flash butt welding of rails in the repair and construction of seamless railway tracks, as a member of the author's team S.I. Kuchuk-Yatsenko

was awarded the Lenin Prize. He was awarded the title of «Honorary Railwayman of the USSR».

The developments of S.I. Kuchuk-Yatsenko and his colleagues were also successfully used in machine-building plants in the manufacture of circumferential billets, shafts and billets from dissimilar materials. The use of multiposition flash butt welding was especially effective, which allowed welding large-sized parts simultaneously in several places (engine bodies, radiators of powerful transformers). The introduction of one installation in the production line of crankcases of powerful diesel units at one of the locomotive plants allowed increasing the labour efficiency by 70 times and releasing 380 welders. A significant effect was also obtained as a result of multiposition welding at the Zaporizhzhya Transformer Plant in the manufacture of transformer radiators. In 1976, as a member of the author's team S.I. Kuchuk-Yatsenko was awarded the State Prize of the Ukr.SSR for creation and industrial implementation of the new technology and highly-efficient assembly and welding complexes for mass production of large-sized structures from unified elements. For the first time in the world practice, S.I. Kuchuk-Yatsenko with a group of staff colleagues developed an original technology of flash butt welding of products of a complex shape and a large cross-section of high-strength alloys based on aluminium, which provided producing joints with the strength almost equal to the strength of the base metal. Based on it, the production of unique equipment was developed and mastered, which is used in the manufacturing of space technique at Ukrainian plants. In 1986, as a member of the author's team S.I. Kuchuk-Yatsenko was awarded the USSR State Prize for the creation of the technology and equipment for flash butt welding of structures made of high-strength aluminium alloys. S.I. Kuchuk-Yatsenko made a significant contribution to the technology and equipment for flash butt welding of pipelines of different purpose. With his active participation, the technologies, control systems and equipment for flash butt welding of pipes with a diameter from 60 to 1400 mm were developed and its large-scale implementation at the construction of pipelines on the territory of the former USSR was performed. With the use of FBW, more than 70000 km of different pipelines were welded, including 4000 km of the most powerful pipelines in the Far North. The use of FBW allowed increasing labour efficiency and providing the reliability of pipelines. This work was also awarded the Lenin Prize in 1989.

Under the supervision of S.I. Kuchuk-Yatsenko and with his direct participation, the works on the creation of pressure welding technologies for stationary joints of pipes for different purposes continued. For the first time in the world practice, the technologies and equipment for press welding with the use of magnetically impelled arc heating were developed to join pipes with a diameter of up to 300 mm and a wall thickness of 5–15 mm, which were characterized by a high efficiency with a minimal energy consumption of the process.

S.I. Kuchuk-Yatsenko took an active part in all stages of implementation of the mentioned works. In 1998 he was awarded the title of «Honoured Worker of Science and Technology of Ukraine» and in 2000 he received the E.O. Paton Prize for the research work «Welding in solid phase». S.I. Kuchuk-Yatsenko is the author of more than 700 scientific publications, including 10 monographs, 350 author's certificates, as well as more than 300 Ukrainian and foreign patents, many of which were purchased by foreign companies under license agreements.

Academician S.I. Kuchuk-Yatsenko dealt with current problems in the field of welding, creation of advanced technologies for joining hard-to-weld materials. He headed one of the leading scientific departments of the E.O. Paton Electric Welding Institute. For a long time S.I. Kuchuk-Yatsenko fruitfully cooperated with the Kakhovka Plant of Electric Welding Equipment, one of the leading manufacturers of welding equipment in Ukraine. He took an active part in the organization of serial production of machines for flash butt welding of railway rails and pipes.

S.I. Kuchuk-Yatsenko was the Deputy Chairman of the Academic Council of the PWI, a member of the Editorial Board and the editor-in-chief of the «Paton Welding Journal». He trained more than ten candidates and doctors of technical sciences. He was elected the first President of the Society of Welders of Ukraine, was a member of its Board, a member of the Society of Welders of the USA and Great Britain.

For his merits the scientist was awarded two Orders of the Red Banner of Labour, the Order of the Badge of Honour, the Order of Prince Yaroslav the Wise and different medals.

The talent of the scientist and the chief, warm-heartedness and kindness gained S.I. Kuchuk-Yatsenko the authority and respect of the welding community. Friends, colleagues and students are deeply saddened by this loss, and the memory of Serhiy Ivanovych will remain forever in their hearts.

Team of the E.O. Paton Electric Welding Institute,
Editorial Board and editorial staff of «The Paton Welding Journal»