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INTERNATIONAL CONFERENCE «CONSUMABLES FOR WELDING, SURFACING, COATING DEPOSITION AND 3D TECHNOLOGIES»

International Scientific and Technical Conference «Consumables for welding, surfacing, coating deposition and 3D technologies» was held in Kyiv at E.O. Paton Electric Welding Institute on June 4–5, 2019. It was organized by E.O. Paton Electric Welding Institute, International Associations «Welding» and «Electrode» and Society of Welders of Ukraine. Proceedings of the Conference were published to the beginning of Conference work in form of special issue of Paton Welding Journal, No.6, 2019.

Scientists, lecturers and engineer-technical specialists of SRI, higher education institutions, industrial and commercial enterprises, representatives of associations from a series of cities of Ukraine as well as foreign participants from Poland, Germany, France participated in the Conference, in total more than 60 people.

A list of organizations and companies, specialists of which participated in the Conference, included: E.O. Paton Electric Welding Institute, Paton PWE, TM.Weltek LLC, Sumy-Electrode LLC, Vitapolis LLC, NTUU «Igor Sikorsky Kyiv Polytechnic Institute», Dnipro University of Technology, Z. I. Nekrasov Iron and Steel Institute of the NAS of Ukraine, SE Ivchenko-Progress, PLAN-T LLC, Additive Laser Technologies of Ukraine LLC, Tekhnologii Vysokikh Energij LLC, Zirast-Dnepr LLC, Dniprovsk State Technical University, VANT LLC, Institute of Welding in Gliwice (Poland), Dr. Rosert RCT Company (Germany), Welding Alloys Group (France) and others.

Deputy Director of PWI Prof. I.V. Krivtsun made a welcoming speech at the Conference opening. He conveyed greetings to the Conference participants on behalf of Prof. B.E. Paton, in short words described the main tendencies on the world's market of welding consumables and wished successful and fruitful work to the Conference. In particular, the importance of meetings and

Discussion during presentation of A.A. Mazur

During the visit to Paton PWE

discussions between the specialists in the field of welding consumables, which assist to rise the efficiency of welding engineering, was underlined.

16 presentations on a series of relevant for welding engineering topics were made at the Conference during plenary session. Without giving detailed attention to each of them (as it was mentioned, the presentations were included in the issue of Paton Welding Journal, No.6, 2019), we would like to note only those, which sparked the largest interest and provoked lively discussions. Thus, presentation of A.A. Mazur (PWI) «State and perspectives of world's market of welding consumables» it was noted that welding in foreseeable perspective is the basic technology in many branches of industry and construction. Industrialized countries are characterized with sufficiently stable dynamics of development of welding engineering and welding market, which is determined by stable growth of consumption of structural materials and expansion of their mix as well as appearance on welding market of new advanced materials, technologies and equipment for welding and related processes.

R. Rosert (Germany) in presentation «Welding and submerged-arc surfacing of high-alloy steels with flux-cored wires» in details outlined on several examples of realized projects on manufacture of unique welding equipment. Outlined technologies of welding and surfacing today are effectively used for welding of all classes of high-alloy steels and alloys, for surfacing of cobalt-based alloys.

Y. Nagaj (Poland) in presentation «Issues of certification of welding consumables in Poland and EU countries» outlined on the algorithm of action of any company having a goal to enter the European market. He in details highlighted the steps of Poland on a way of economic development, which allowed it to become EU equal partner.

Large interest was provoked by presentation of A.A. Kononenko (Dnipro University of Technology) «Investigation of conditions of deep penetration in manufacture of samples of high-temperature alloy Inconel 718 by method of selective laser melting». This method (Selective Laser Melting) allows manufacturing complex-profile products on a computer model virtually of any metallic powders.

The exhibition of manufacturers of welding consumables, with participation of PWI, Paton PWE, Sumy-Electrode LLC, VITAPOLIS LLC, VELMA LLC, PLAN-T LLC was held during the Conference.

A series of bilateral negotiations directed on cooperation and further collaboration, and performance of joint projects took place during the Conference and Exhibition work.

In the second day of the Conference its participants visited Paton Pilot Plant of Welding Equipment.

Drs A.T. Zelnichenko, V.N. Lipodaev, PWI

Calendar of July

JULY 1, 1957 Date of birth of Yu.S. Korobov, professor, honoured inventor of the Russian Federation. At his participation, new designs of holders for welding semiautomatic devices, technologies of submerged-arc welding of shells, surfacing of axes of balancers of special equipment were developed and implemented. Under his supervision, the technology of spraying by electrometallization of steel coating on the aluminum base of worn-out surface of the roller of a creeper tractor was developed. The conception of improving the quality of coatings during arc metallization based on the analysis of the results of modelling physicochemical processes and studying the properties of coatings was developed and scientifically grounded.

JULY 2, 1929 American inventor and businessman Edward Budd (1870–1946) received a patent on the technology of welding in the automotive industry. Edward Budd was a pioneer in the mass production of all-metal car bodies and founded his own company «Edward Budd Manufacturing Company». Preferring the frame metal structures, Edward Budd proceeded not only from the fact that they are stronger than wood ones and also more manufacturable. Edward Budd was the first who applied spot welding in the automotive industry.

JULY 3, 1960 At the beginning of July 1960, T.M. Slutskaya (1907–1987), a representative of the Paton School, developed for the first time the self-shielding activated electrode materials for arc welding. She developed the basis of alloying wires with rare earth and rare metals, due to which nitrogen was bound into refractory nitrides.

JULY 4, 1981 The largest Soviet nuclear-powered submarine in the world, a heavy strategic-purpose missile cruiser submarine of the Project 941 «Akula» with a length of more than 170 m was put into tests. Its pressure hulls were welded from sections (shells) of cylindrical, conical and elliptical shape with a wall thickness of 75 mm. A similar submarine at the same time was created in the United States and, later on was named «Ohio».

JULY 5, 1931 Date of death of Oscar Chelberg (1870–1931), a Swedish inventor and industrialist, founder of the company ESAB in 1904. Oscar Chelberg invented the electrode coating used for manual arc welding by immersion of a bare steel wire into the mixture of carbonates and silicates. The purpose of the coating is to protect the molten metal from the effect of oxygen and nitrogen, present in the atmosphere. His pioneering developments laid the foundation for beginning the investigations on the development of reliable welding electrodes. Today, ESAB produces welding materials, equipment for welding and cutting of metal for practically all the branches of industry.

JULY 6, 1935 The construction of the German heavy cruiser «Admiral Hipper» was started. After signing the Treaty of Versailles, Germany was restricted in the construction of large-capacity ships. In order to officially comply with the restrictions to weight, several radical innovations were included in the design of this type of a ship. Designers were the first to use welding in large military ships instead of riveting. Because of their heavy armament of eight 203 mm guns and small sizes, the British began referring to such vessels as «pocket battleships». The hull of the ship was built of transverse steel frames; more than 90 % of the structure was joined using welding, which reduced the total mass of the hull by 15 %.

JULY 7, 1962 The absolute speed record of 2681 km/h was set in the experimental all-weather interceptor E-166 of the Design Bureau «MiG». This flight was performed by the test pilot G.K. Mosolov. Unlike the Americans, who chose a titanium alloy as the basic material of their reconnaissance aircraft, the «Experimental Design Bureau named after A.I. Mikoyan» chose different grades of steels. Its application allowed refusing from riveted structures in favour of welded ones. This, in turn, required the creation of new technological cycles, taking into account the use of different welding methods during a large-panel assembly. The experimental operation of the E-166 aircraft allowed gaining an important flight experience at high supersonic speeds.

JULY 8, 1761 Date of birth of V.V. Petrov (1761–1834), a Russian physicist- experimenter, self-taught electrical engineer, academician of the St. Petersburg Academy of Sciences. One of the outstanding achievements of the scientist was the discovery of the phenomenon of an electric arc in 1802 and evidence of the possibility of its practical application for the purpose of melting, welding metals and their reduction from ores and for lighting. In 1802, he designed a large galvanic battery consisting of 2100 copper-zinc cells with an electromotive force of about 1700 V.

*The material was prepared by the Steel Work Company (Krivoy Rog, Ukraine) with the participation of the editorial board of the Journal. The Calendar is published every month, starting from the issue of «The Paton Welding Journal» No.1, 2019.

JULY 9, 2014 The first launch of the rocket-carrier of «Angara» family from the «Plesetsk» Cosmodrome was performed. The rocket is capable of delivering 35 tons of cargo into orbit. The requirements of strength and tightness of welds of the fuel tanks were the most fully satisfied by argon-arc welding. During the construction of the «Angara» rocket -carrier, it is supposed to gradually introduce friction stir welding for application. The «Angara» rocket-carrier replaces the outdated model «Proton-M».

JULY 10, 1905 During dispersal of the workers meeting, L.I. Borchaninov (1837–1905) was killed. He was a worker at the Motovilikh plants, one of the first welders in Russia. He was working under the supervision of N.G. Slavyanov, an inventor of arc welding of metals. Together with the worker P. Aspidov, he accompanied Slavyanov to the Fourth Electrical Exhibition in St. Petersburg, where they equipped a temporary workshop and demonstrated the process of restoring metallic parts using electric welding. He participated in the building of the largest in Russia and Europe tugboat «Kasogs Prince Rededya», where welding was used instead of riveting for the first time in the history of shipbuilding.

JULY 11, 1979 «Skylab», the first and only American space station, leaved the orbit, completing its work. During the flight, experiments were carried out on evaluation of the effect of zero gravity on the quality of welded joints produced by electron beam welding. The «Skylab» station was equipped with a complex which included multi-purpose electric furnaces and an electron beam installation. The experiments were conducted on the investigation of molten metal, photographing the behaviour of calcined materials in zero gravity, studying the crystal growth, treatment of immiscible alloys and brazing of stainless steel.

JULY 12, 1929 The first in the history of aviation the flight of the German giant flying boat «Dornier Do-X» took place. The aircraft was designed for service at the long-distance passenger airlines. On October 20, 1929, during a 40-minute demonstration flight, this plane took off from the Lake Constance with 169 passengers on board. This record remained unsurpassed in the first half of the XX century. Due to the low flight characteristics, the aircraft did not come to the series production but only made several demonstration flights to Africa, North and South America in 1930–1932. In order to reduce weight, welding was applied for joining aluminum parts.

JULY 13, 1936 The destroyer of the project 7 «Gnevny» was launched. It was the main ship of the so-called Stalinist series, built for the Soviet Navy in the second half of the 1930s, one of the most popular types of destroyers in the history of the Soviet fleet. The thickness of the hull lining was 5–9 mm, the deck flooring was 3–10 mm, and the watertight bulkheads were only 3–4 mm. The structures were mainly riveted, but the electric welding was used for the assembly of bulkheads, platforms under the lower deck and a number of other elements.

JULY 14, 1969 An inhabited underwater apparatus designed to study the middle depths of the Gulf Stream (up to 1000 m), the Ben Franklin mesoscaphe, was submerged into the water. It was designed by Jacques Picard. A special attention was paid to welds. Numerous tests and examinations were carried out before it was allowed to use the apparatus. For welding, electrodes, alloyed with manganese and molybdenum, were used.

JULY 15, 2010 In the summer of 2010, the book «Paton School» was prepared for publication. It presents information about the world-famous Paton's scientific and engineering school in the field of welding and related technologies, which was organized by academician E.O. Paton, an outstanding scientist, and further developed by academician B.E. Paton, a worthy successor of his activities. In the book the formation and development of this school is highlighted and information about its famous representatives is given.

JULY 16, 1961 By decree of the Presidium of the Supreme Soviet of the USSR for great successes in the development of the rocket industry, science and technology, successful performance of the first flight of a Soviet man in space in the «Vostok» spacecraft-satellite, M.K. Yangel was re-awarded the title Hero of Socialist Labour.

JULY 17, 1964 By resolution of the Council of Ministers of the Ukr.SSR of 12.06.1964 No. 59.5 and resolution of the Presidium of the Academy of Sciences of the Ukr.SSR of July 17, 1964 No. 188 the E.O. Paton Prize of the National Academy of Sciences of Ukraine was established for outstanding scientific works in the field of developing the new metallic materials and methods for their treatment. This is one of the few examples where the award is named after a welder-scientist.

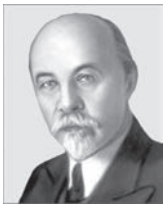
JULY 18, 1955 At Disneyland an amusement facility: a model of a space rocket called Moonliner, was opened. Since 1955 to 1962 Moonliner was located in the first futuristic exhibition. It was also an example of a new approach to modern advertising media. In order to build a 27-meter aluminum rocket the welding in inert gases was used. It is interesting that with the development of rocket construction, the same welding methods were used in the production of real space rockets. The construction of such a facility caused a wide resonance with the public already before the launch of the first satellite of Earth.

JULY 19, 1900 The opening of the Paris Metro took place. The opening was dated for the beginning of the 1900 World's Fair. The Paris Metro is one of the oldest metros in Europe (the fourth after the London, Budapest and Metro in Glasgow). The unsurpassed capabilities of thermit welding at that time were demonstrated visually during laying the tracks of the Paris Metro.

JULY 20, 1966 The crew commander Neil Armstrong and the pilot Edwin Aldrin of the American spacecraft «Apollo-11» landed a lunar module on the Moon. The accomplishment of this project could not be achieved without the use of modern welding technologies.

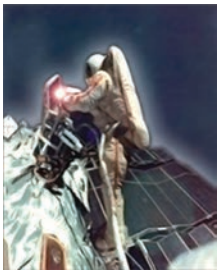
JULY 21, 2007 The skyscraper «Burj Khalifa» of 829.8 m height was officially recognized as the tallest building in the world during construction. The solemn opening ceremony took place on January 4, 2010 in Dubai, the largest city of the United Arab Emirates. During its construction the welding technologies were especially in demand. They were applied starting from the foundation and ending at the highest point, where everything was fastened either with bolts or electric arc welding. It is one of the records and demonstrates how large structures can be created by welding. The spire of «Burj Khalifa» is a complex steel structure with many columns and welded beams.

JULY 22, 1872 Date of birth of V.F. Mitkevich (1872–1951), an outstanding Russian and Soviet electrical engineer, academician of the Academy of Sciences of the USSR. In 1901, he proposed circuits of a single-phase full-wave rectifier (full-wave with two windings) for converting an alternating current into a direct current and a three-phase one-half-wave rectifier (half-wave with zero output). V.F. Mitkevich was the first in the world to propose a three-phase arc for welding metals.



JULY 23, 1995 Date of death of N.A. Langer (1910–1995), a chemical scientist-analyst, representative of the Paton school. He made a significant contribution to the development of methods for protection of welded joints against corrosion. He proposed original electrochemical methods for studying the corrosion resistance of welded joints. They allow predicting the stability of joints during operation in the environments with a high corrosion activity. Langer investigated the conditions for the occurrence of particularly threatening corrosion of welded joints, the so-called crevice corrosion, and also identified methods for its elimination. The results of a number of works have found application in industry.

JULY 24, 1967 In St. Louis the Arch was opened, also known as a Gateway to the West. It is a memorial, which is the hallmark of St. Louis. Its height is 192 m at the highest point and the width of its base is also 192 m. The arch is the highest monument at the territory of the United States. Builders, together with the company «Lincoln Electric», successfully manufactured and joined 142 parts of one of the most complex building structures in the US history. During its construction the manual arc welding, semi-automatic gas-shielded welding and submerged-arc welding were used.



JULY 25, 1984 In open space outside the board of the orbital station «Salyut-7», experiments in electron beam welding were carried out using a welding device URI (a versatile hand tool) designed at the E.O. Paton Electric Welding Institute. This device allowed welding, cutting, brazing metal and depositing coatings. The cosmonauts V. Dzhanibekov and S. Savitskaya went into outer space to perform welding technological works. For three and a half hours, the cosmonauts conducted the entire complex of planned experiments.

JULY 26, 1845 The ship «United Kingdom» with an all-metal hull started its first voyage across the Atlantic. The vessel was distinguished by its enormous sizes: its length was almost 100 m. In the «United Kingdom» for the first time, a screw propeller was used instead of paddle-wheels. That was a real event in shipbuilding. When creating a huge crankshaft for the ship, a new modernized «welding hammer» was used, invented by Joseph Stenster.

JULY 27, 1942 The American interceptor «Mustang NA-73X» took the first air battle. The need in accelerated production of military machinery forced the use of welding even wider. It was estimated that during the transition to welding in an aircraft weighing 4 tons, where it was usually necessary to apply up to 100,000 rivets of 112.5 mg each, a weight reduction of about 10 % is achieved. At the same time, aerodynamics, tightness and corrosion resistance are improved, and the time for manufacturing the whole structure is shortened by 60 %.

JULY 28, 1883 Date of birth of V.P. Vologdin (1883–1950), a Soviet scientist and engineer, a pioneer in the use of electric welding in ship building. He designed and built the first all-welded ship in the USSR. A tugboat of the series «ZhS» (iron welded) was built. It turned out that a hull of the ship became lighter, the labour intensiveness of the ship building was reduced by a third.

JULY 29, 1993 A certificate on registration of the Society of Welders of Ukraine was issued. It was founded in November 1992 by the initiative of the E.O. Paton Electric Welding Institute (Kiev). The organization unites all scientists, teachers, specialists, craftsmen and workers in the field of welding and related processes in Ukraine. The main task of the Society is informational, consulting, legal support of all workers employed in the welding industry of Ukraine.

JULY 30, 1904 The longest battle of the Russian-Japanese War, the defence of Port Arthur (July 30–December 23, 1904) began. The sailors of the Russian fleet and the workers of the Baltic Ship Repair Plant, located in the besieged city, successfully used arc welding by a coal electrode to repair the ship hulls.

JULY 31, 1962 Date of death of Nils Miller (1899–1962). He left after him a large company «Miller Electric». In the 1920s almost all electric arc welding was carried out using a bulky and expensive three-phase generator. In 1929, Nils Miller realized the need in designing a small and inexpensive welding machine, operating from the power mains. In 1935, the company «Miller Electric» was founded. Next year, El Mulder, the chief engineer of the «Miller Electric», invented the first in the world high-frequency industrial welding device at alternating current. This invention significantly improved the quality of welding and allowed using welding at alternating current.