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PWI Pilot Plant of Welding Equipment is 60



Cosmonauts V.N. Kubasov and G.V. Shonin with «Vulkan» unit before Soyuz-6 flight

Welding technologies, similar to many others, do not stay in one place, but have a steady tendency to develop, new materials are created, welding technologies are improved, as well as welding equipment, which becomes more cost-effective, compact and efficient from year to year.

A bright example of successful welding technology development is PWI PPWE, which celebrated its 60th anniversary on January 1, 2019.

From the moment of the start of its operation (1959), the main objective of the Plant was optimizing the technology of manufacturing new welding equipment, developed by PWI scientists. And over the 60 years of its history, the Plant has manufactured hundreds of thousands of equipment units for almost all continents of the world. Welding equipment manufactured by the Pilot Plant, was used for performance of welding operations in a broad range of conditions: from water depths to open space.

Among the known historical events, which were realized with application of PPWE equipment, the following should be noted:

• construction of «Bukhara-Urals» and «Druzhba» gas pipelines (A850 and A943 machines for welding large-diameter pipes);

• first welding operations with the electron beam, plasma and consumable electrode in space, performed by the crew of «Soyuz-6» spaceship (unique «Vulkan» apparatus);

• Soviet-French experiment in near-earth space (special hardware «Araks»);

• world's first cutting, welding, brazing and spraying of metal plates in open space at «Salyut-7» station (portable electron beam unit URI).

In the period from 1992 to 1998, during the unstable economic situation in Ukraine, when many production enterprises were closing, the Pilot Plant of Welding Equipment managed to preserve its production facilities and most valuable personnel resource. During this period the main activity of the Plant was manufacturing transformer equipment.



Laying the main pipeline

In 2004, in parallel with manufacture of classic transformers and rectifiers, a new department is formed, the main purpose of which was development of welding inverters. This department was formed from high class specialists — graduates of NTUU «KPI», who were immediately sent for training to Italy, to one of Europe's leading plants on manufacture of inverter welding machines. This yielded its results — Pilot Plant of welding equipment was the first in Ukraine to master manufacture of inverter-type welding machines, and today the Plant's products take up a considerable share of Ukrainian market of welding equipment. PPWE also is the only plant in Ukraine, capable of manufacturing welding equipment for welding



PPWE central building

currents from 150 A for household consumers up to 10000 A for Ukrainian industry giants.

After the Plant has occupied a serious share of Ukrainian market, a decision was taken to actively develop exports. In 2012 the first export delivery of inverter-type welding machines to Equatorial Guinea was carried out. Since 2013 welding machines began to be exported to Georgia, Moldova and Azerbaijan. In 2014 the Pilot Plant received the European Certification CE for inverters, and in 2017 confirmed it for the entire line of inverter-type PATONTM machines. As of 2019 PATONTM products have been supplied to more than 20 countries all over the world — from Latin America to South Korea.

«During the entire period of its activity the Pilot Plant of Welding Equipment implemented the developments of the Electric Welding Institute. On the one hand, it was a great responsibility, but on the other, it always kept the team's creativity in good shape and allowed working with the newest developments in the field of welding that largely predetermined today's success of the Plant», — Victor Koritsky, PWI staff member, shares his impressions.

The Plant carries on close cooperation with PWI and PWI Experimental-Design and Technological Bureau, remaining the production site for manufacturing pilot equipment. Over the last several years, a number of National and International projects have been realized using the Plant production facilities, including:

• development of welding technology and equipment for manufacturing welded combined rotors by automated submerged-arc welding by an order of OJSC «Turboatom» (2013);

• project of State Oil Company of Azerbaijan (SOCAR) on severing two pontoons from a block by directed explosion method at construction of an off-shore stationary platform No.7 in the Caspian Sea (2014);

• project of State Company «Ukrspetsexport» on development and manufacture of a batch of welding equipment for tropical climate, which was supplied to one of shipbuilding plants in South-East Asia (2015);

• development of welding equipment for electroslag welding of metal up to 200– 450 mm thick for mechanical engineering plant in Eastern Europe (2016);

• joint development by the Plant and PWI EDTB of multioperator welding rectifiers VDU-



Anat. V. Stepakhno, Chairman of PPWE Board, is demonstrating new samples of welding power sources to academician B.E. Paton

Acad. I.V. Krivtsun, PWI Deputy Director



Pilot Plant of Welding Equipment of the E.O. Paton Electric Welding Institute is one of the main partners of PWI in the field of development and batch production of modern competitive equipment for welding and related technologies. Institute scientists, with the participation of PPWE, perform studies of different welding processes and technologies, determining technical requirements to equipment, which is necessary for their practical realization. The thus obtained results are the base for manufacture of modern power sources and other specialized equipment at PPWE. An example of such fruitful cooperation can be the joint work performed last year on determination of welding-technological properties of inverter power sources for arc welding with expanded functional capabilities, the results of which are already being used by the Plant in manufacture of the line of multifunctional digital inverters. A promising direction of further cooperation of PWI and PPWE can be joint work on organizing mass production of specialized equipment and tools for high-frequency welding and treatment of live biological tissues, developed by the Institute's scientists in cooperation with specialists of different medical institutions of Ukraine.

1202P, which were used to re-equip the carriage works of SCB Foundry in the Czech Republic (2016);

• project for State Company «Ukroboronservis» on development of an automatic mortar coordinating system (2016). The Project was presented with success at XIII International Specialized Exhibition «Arms and Security–2016».

The Plant also continues successfully realizing the Institute's developments in its products, manufacturing classical-type welding equipment. Literally at the end of 2018 the Pilot Plant realized a project on delivery of four multioperator welding rectifiers PATONTM VMG-5000 for welding currents up to 5000 A for top Ukrainian enterprises — leaders of the mining industry and metallurgy. Modern pace of development of science and technology necessitates regular upgrading of production enterprises on the strategic and technological levels. It is impossible to correspond to the status of the national steel manufacturer without continuous investments into development of the industry, which is given special attention by the Plant management.

In order to expand the range of manufactured products and strengthen its market positions, PPWE management took a decision on setting up its own company for production of welding electrodes. As a result, at the beginning of 2016, a new company OJSC «PATON-Elektrod» was established, which began manufacturing welding electrodes of the most popular grades of the classic formulations: ANO-21, ANO-36, ANO-4, UONI 13/45, UONI 13/55, MR-3, special electrodes for surfacing of T-590 grade, for cast iron welding of TsCh-4 grade, for welding high-alloyed steels OZL-8 and TSL-11, as well as electrodes of Elite series by improved PWI formulation. And in 2017 the technology park for electrode manufacture was complemented by a modern

line of the capacity of 12 tons per shift, as part of realization of the strategy of development of this sector.

In 2017 the Plant commissioned a section on production of cases for welding machines, which accommodated high-technology equipment of the known TRUMPF brand: coordinate-perforating press for treating large metal sheets, hydraulic bending press to give the required shape to metal parts and line of powder painting of finished products. And in 2018 the section of mechanical production was up-

graded: HAAS turning center, HAAS vertical machining center and specialized rotary table were put into operation. This entire equipment complex is fully automated and allows performing a wide range of operations on manufacture and machining of parts in the shape of bodies of revolution. Conducted refitting and upgrading of production led to improvement of product quality, reduction of labour consumption of complex operations



Fruitful reliable cooperation of PPWE and EDTB for 60 years is still going on now. A large number of joint projects have been realized over these years. And now, when solving new tasks, EDTB can always rely on the enterprise, which is capable of embodying the most daring ideas. Continuous mutually beneficial cooperation of our organizations allows finding new customers, opening and expanding the markets.





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Blank production shop



Assembly line of welding power sources

and shortening of certain production cycles, that allowed somewhat slowing down the increase of prices for finished products.

«The steps taken for upgrading the production facilities of the Pilot Plant and step-by-step realization of development strategy allow us looking to the future with confidence. Today the Plant is focused on development of new samples of welding equipment and extension of the product range. Active development of high-power inverter-type machines with up to 1200 A welding currents is conducted now. We hope that they will complement the line of PATONTM welding inverters in the near future», — Anatolii Stepakhno, Chairman of Plant Board is talking about plans.

Another important vector of Plant development is active expansion of export of its products. Today, the priority objectives of the en-

Vitalii Sokolyuk, Director of <u>MasterWeld Sp</u>.z.o.o Company



Our Company has been the official distributor of PATONTM welding equipment and electrodes in the Polish Republic beginning from 2016. During this time, the Plant products have proven their worth. This is high quality equipment and materials for welders of any qualification. This is exactly why PATONTM products are always in high demand, and we increase deliveries every month, accordingly, and see great prospects for PATONTM brand in EC market.

Daria Selina, Export Director of the Plant



The Plant has certain achievements — in January 2019 we shipped a trial batch of PATONTM products to Costa-Rica, which, as we think, will be the start of subsequent effective operation in this region.

terprise export department include expansion of PATONTM product presence in the markets of the European countries, as well as entering the Central American market. Thus, over the 60 years of its activity the Pilot Plant of Welding Equipment has really gone a long way, with its ups and downs, trying to preserve and multiply its production and personnel potential to a maximum and improve the effectiveness of its operation. In the long run, this allowed it to become a leading Ukrainian manufacturer of welding equipment and materials, and PATONTM products to be in high demand both among Ukrainian welders and welding professionals all over the world.

Editorial Board of «The Paton Welding Journal»

CALENDAR OF FEBRUARY

Production of Sherman tank began in the USA. Compared to riv-**FEBRUARY 1, 1941** eted tank M-3. it had a larger caliber gun (75 mm), cast or welded turret. Pullman-Standard Company participated in fulfillment of the program on all-welded tank production. It developed the technology of welding the hull and turret. A conveyor line for hull assembly and welding was organized. Multilayer manual arc welding was performed in the downhand position, and after that the structure was installed into positioners. Automatic submerged-arc welding in equipment developed already in 1940, was used only for producing the heaviest part — tank wheels from low-carbon steel.

FEBRUARY 2, 1933 All-Ukrainian Academy of Sciences (AUAS) adopted a resolution on setting up the Electric Welding Institute on the base of the Electric Welding Committee and Electric Welding Laboratory of AUAS. Evgeny Oscarovich Paton (1870-1953) was appointed Director of the Institute.

FEBRUARY 3, 1938 Birthday of V.G. Fartushny (1938–2018), President of the Welding Society of Ukraine, specialist in the field of welding high-alloyed corrosion-resistant steels, mechanization and automation of welding production, equipment for thermal coating and robotic complexes. He took an active part in development and testing of Vulkan unit, in which welding in space was performed in 1969. During 1980-2004 he was Director of All-Union Design Institute of Welding Production. V.G. Fartushny is author of about 100 scientific publications and inventions.

FEBRUARY 4. 1952 At the start of 1952 B.E. Paton and B.I. Medovar developed the process of electroslag remelting (ESR) at the Electric Welding Institute for the first time, in order to produce high-quality metals. At ESR metal refining is achieved by changing the slag composition and process temperature mode.

FEBRUARY 5, 2005

Sea fighter (FSF-1), experimental ship of the US navy, was tested. Its hull has a smaller waterplane area, ensuring high stability even on rough seas. The ship was one of the first, in manufacture of which friction stir welding began to be applied at assembly of metal panels.

FEBRUARY 6, 1989 An experiment was performed in Yantar unit on deposition of thinfilm coatings by the method of thermal electron beam evaporation and condensation, in order to study the features and dynamics of the process in space environment.

FEBRUARY 7, 1950 R. Sarazin, French inventor, proposed a method and machine for continuous coating of electrodes. In keeping with his invention, the wire was unwound from the bundle at wheel rotation. It was then straightened in rollers and entered in extrusion press, which was followed by its cutting into separate electrodes, and feeding by a conveyor for drying.













^{*}The material was prepared by the company Steel Work (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.

In the beginning of 1951 E.O. Paton Electric Welding Institute together with Novokramatorsk Machine-Building Plant developed a process and technology of vertical electroslag welding of metal of up to 2000 mm thickness. For the first time in the world the new method was used in welding of stator of hydraulic turbine for Mingachevir Hydro Power Station.

Birthday of S.M. Gurevich, a well-known scientist in the field of metallurgy and welding of titanium and refractory metals. For the first time in the world S.M. Gurevich developed a technology of submerged-arc welding of titanium. He participated in the development of the methods of electroslag welding and electroslag remelting of titanium, argon-arc welding over flux layer with flux-cored wire. S.M. Gurevich is the author of almost 600 scientific papers, including more than 100 patents for invention.

FEBRUARY 15, 1938 The second transatlantic liner Leviathan, initially constructed as German liner Vaterland, was recycled. On April 6, 1917 the USA entered the World War I and Vaterland was impressed by American authorities. Three months after it was renamed in «Leviathan». After repair using welding it was subjected to sea trials. They were successful, the vessel built up impressive speed of 27.48 knots. Leviathan carried military cargos in North Atlantic, transported troops in Europe. The vessel has transported in total more than 100 thou of soldiers for 19 voyages.

CALENDAR OF FEBRUARY

FEBRUARY 8. 1988 ABB Concern (Asea Brown Boveri Ltd.) was founded. It is a Swedish-Swiss Company, specialized in the field of electrical and power engineering and information technologies. ABB Company is actively pursuing manufacture of industrial robots, including those for welding operations. The Concern has its representative offices in more than 100 countries of the world. Production facilities are located in the territory of Germany, Switzerland, Sweden, Italy, France, Czechia, India, China, USA, Portugal, Brazil, Finland, Estonia and other countries.

and features of joint formation on such materials as high-carbon and high-alloyed steels, copper, and aluminium allovs of different alloving systems.

of nonferrous metals and alloys. In his works he set forth the main principles of resistance butt welding

FEBRUARY 9, 1915 Birthday of G.P. Sakhatsky (1915–1992), known scientist and specialist in the field of cold welding

Birthday of V.P. Larionov (1938-2004), known Russian scientist in the field of **FEBRUARY 10, 1938** strength and reliability of structures, operating under extreme climatic conditions of the North, academician of RAS. He obtained fundamental results in the field of materials physics, metallurgy and kinetics of welding processes.

FEBRUARY 11, 1965

FEBRUARY 12, 1981 President of the AS of USSR acad. B.E. Paton was awarded with the

tures as well as afloat ships.

Lomonosov Gold Medal — the highest award of AS of USSR — for outstanding achievements in the field of metallurgy and metal technologies.

FEBRUARY 13, 1951

FEBRUARY 14, 1917









FEBRUARY 22, 1937 Date of birth of V.M. Sagalevich (1937-1995), Professor of the Bauman Moscow State Technical University, a scientist in the field of welding, welding strains and stresses. The works of Professor V.M. Sagalevich are devoted to the problems of strength, theory of welding strains and stresses, including deformations of thin-sheet and thin-walled structures during welding.

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welding equipment. He developed a series of original welding apparatuses, units, machines and devices such as roll-welding mills for mine cars, first models of apparatuses for electroslag welding, first in the USSR through-pass mill for automatic welding of large-diameter pipes, heads for resistance welding of main pipelines and another unique welding equipment.

patented. Staff member of Westinghouse Electric Corp. L.V. Chubb experimenting with electric capacitors found that the wire is welded to aluminum plate in passing through them of accumulated electric discharge. This observation allowed making some conclusions, namely discharge ruined strong oxide film complicating soldering and, that provided the possibility to get sound joint of aluminum wires. The capacitor-discharge welding at once started to be used in electric engineering (welding of silver, tungsten and other contacts).

Capacitor-discharge welding and device for its realization was

FEBRUARY 18, 1914 Birthday of V.V. Podgaetsky (1914–1991), a well-known scientist, Honored Master of Science and Engineering of Ukraine. He made a fundamental contribution in welding metallurgy, in particular, investigation of interaction of metal, slag and gases, causes of formation of pores. cracks and other defects in weld metal. Published 215 scientific papers, including 23 monographs.

FEBRUARY 19, 1948

V.P. Nikitin, a well-known scientist in the field of electrical engineering, welding and electromechanics was awarded with an honorary title «Honored Master of Science of RSFSR» for outstanding achievements in the field of science. The main works of V.P. Nikitin are dedicated to investigation of physical processes in electric arc and development of electric machines and apparatuses for arc welding. He designed a structure of one-body transformer-regulator for arc welding, which found application in industry. In 1926–1929, V.P. Nikitin being a professor of Ekaterinoslavsk Mining Institute was simultaneously a consultant at many Ukrainian and Russian enterprises.

R.I. Lashkevich died. He was a talented designer and researcher in the field of development of

FEBRUARY 20, 1986 On February 20, 1986 the Soviet Union launched the scientific orbital station «Mir», replacing the orbital stations «Salyut» and became for about 15 years a single in the world manned space laboratory for long-term scientific-technical experiments and investigation of human body in space. Further on the solar-cell batteries designed at the E.O. Paton Electric Welding Institute were deployed at the station.

FEBRUARY 21, 1920

On February 21, 1920, the State Commission on Electrification of Russia (GOELRO plan) was established. Later, in the GOELRO plan, the name of the future construction: the Dnieper Hydroelectric Station appeared. On March 15, 1927 on the rock «Love» a red flag with the inscription «Dneprostroy began» was set. During its construction, autogenous cutting and welding, electric welding, devices for butt joining of reinforcement bars and other mechanisms became widespread.









FEBRUARY 17, 1982

FEBRUARY 16, 1912

FEBRUARY 23, 1934 The French inventors R. Sarrazin and O. Moneiron received a patent for the electrode coating of their development, which included the compounds of alkali and alkaline earth metals (feldspar, marble, chalk and soda). Due to the low ionization potential of such elements as sodium, potassium, calcium, the arc was easily excited and maintained in burning.

FEBRUARY 24, 1988 Date of death of James Rosati (1911–1988), an American sculptor who created his sculptures by welding of stainless steel. His most famous works were created since the 1960s, where a special role was occupied by a stainless steel sculpture «Ideogram» of 23 feet height. About forty monumental sculptures of James Rosati are located in the United States of America and other countries.

1936 Date of birth of O.K. Nazarenko (1936–2014), a famous scientist in the field of electron beam welding, a corresponding member of the NAS of Ukraine. He provided physical and technical grounds for the ability of avoiding defects in welded joints during breakdowns in electron gun by short-time removing of accelerating voltage. On this basis, he created perfect power sources, developed principles of automatic electron beam guiding along a welded joint, and created corresponding systems which use secondary electron emission from the welding zone as a source of information. With his participation the technology and equipment for electron beam welding of rocket and gas turbine engines was introduced into the industry of Ukraine.

FEBRUARY 26, 1934 The first plant for the production of the «people's» car Volkswagen was opened. The first produced car was the famous VW Beetle. This is the most popular car in history, produced without additional consideration of the basic design. In total, 21,529,464 cars were manufactured. In its development Ferdinand Porsche (later founder of the second variant of the Tiger tank) was involved, who was keeping contact with Ford and other pioneers and actively introduced new technologies at the plant. Welding provided reliability and quick assembly of the car in the conveyor.

FEBRUARY 27, 1917 J.H. Lincoln published one of his patents in the field of welding. He is the founder of Lincoln Electric Company, which became an American multinational company, producing equipment for arc welding, robotic welding, plasma and gas cutting. In 1909, for the first time in history, the company manufactured a welding apparatus. In 1911, Lincoln Electric produced the world's first portable welding apparatus with a controlled voltage.

FEBRUARY 28, 1962 At the end of February, at the general meeting of the Academy of Sciences of the Ukr.SSR, a new membership of the Presidium was selected. Boris Evgenievich Paton, Academician of the Academy of Sciences of the Ukr.SSR, became the President. Today, the NAS of Ukraine includes 174 institutes. The number of its associates is over 30,000 members.









