

## PRODUCTION OF WELDING CONSUMABLES BY ENTERPRISES OF CORPORATION «PLAZMATEK»

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Information about PJSC «PlazmaTek», the leading manufacturer of welding consumables in Ukraine and CIS, history and plans of development, products being manufactured, as well as some peculiarities of the technology of their manufacture is described.

**Keywords:** arc welding, welding consumables, coated electrodes, production of welding consumables

In 2016 the Public Joint Stock Company «PlazmaTek» celebrated the 15<sup>th</sup> Anniversary. The activity of the PJSC «PlazmaTek» began on the base of «Agromash» enterprise of agricultural machine building in village Rudnitsa of Vinnitsa region, which manufactured a small amount of welding electrodes ANO-4 for repair purposes in its industry branch. Over the next 15 years the great investments were contributed for the enterprise development, a radical technical modernization and reorganization of the production was made, the volumes of products were increased (Figure 1, *a, b*).

At present, the PJSC «PlazmaTek» represents a modern multi-profile company with annual turnover

of 50 million of euro and staff of 1340 persons (Figure 2). As to selling the welding consumables the corporation occupies the leading positions in CIS. Additionally to the electrode production a unique complex was constructed for manufacture of copper-plated welding wire of 10 million euro cost. It was completed with the Swedish technological equipment, having a vacuum plasma dressing of a rolled wire and designed for manufacture of 10 thousand tons of wire per year (Figure 3). On the base of treatment plant in Rovno region the enterprise on production of raw materials for manufacture of welding electrodes, such as mica-muscovite, fluorspar, kaolin and quartz sand, was

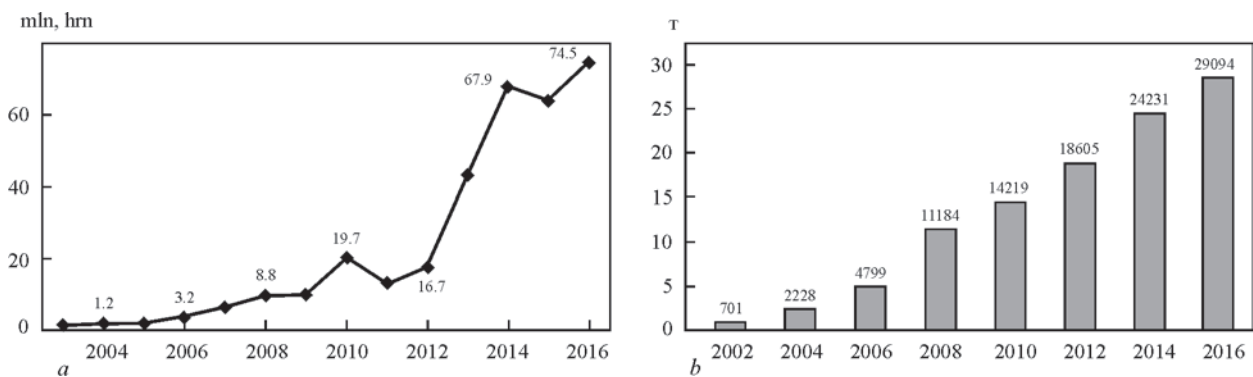


Figure 1. Investments into the corporation development (*a*) and volumes of production of electrodes (*b*) in 2003–2016



Figure 2. Panorama of industrial buildings of corporation

established and is functioning now. The enterprise has the unique technological equipment and necessary monitoring-analytical devices. Being designed at the beginning for satisfying the needs inside the company only, it was further reoriented also for the sale.

At present, the production capacities, functioning in Ukraine and Belarus, are designed for electrode manufacture in the volume of 46 thousand tons per year. They are delivered to dealers by own transport from the trade-logistic centers, providing services to customers at the territory of countries occupying the area of 21 million km<sup>2</sup>. Now the PJSC «PlazmaTek» exports the welding electrodes to more than 20 countries at different continents. The share of company «PlazmaTek» at the main markets is, %: 46 in Ukraine, 32 in Belarus, 46 in Romania, 41 in Moldova, 10 in Russia, etc.

The PJSC «PlazmaTek», having its representations in Europe, in the nearest future has an intention to open them in UAE, USA and Brazil, and also to construct plants for the electrode production in Kazakhstan and Azerbaijan, transforming gradually into the international corporation.

In the electrode production of the PJSC «PlazmaTek» the system of the quality management is functioning during 10 years, which was worked out and certified in accordance with provisions of DSTU ISO 9001. The general structure of the quality management system is given in Figure 4.

Since 2006 the PJSC «PlazmaTek» is successfully manufacturing the rutile-cellulose electrodes ANO-36 (E46 RS type by GOST 9467–75), developed at the E.O. Paton Electric Welding Institute of the NASU and realizing them under the trademark MONOLITH. Since 2007 their promotion as a competitor to electrodes OK 46.00 began at the market of Europe. For admission to the European market the electrodes ANO-36 passed the certification in the Institute of Welding in Gliwice (Poland) for conformity to the requirements of the International standard ISO 2560. In 2008 the volume of production of electrodes ANO-36 surpassed the level of 10 thousand tons (90 % of total production of electrodes by the enterprise at that moment). Nowadays, alongside with them approximately 8 % of electrodes with a basic coating, about 2 % of special electrodes for welding of stainless steels with a rutile-basic coating, as well as electrodes for welding of cast iron and for surfacing are produced. All the electrodes as to the properties and quality level are in compliance with the requirements of the European and International standards.

In 2009 the right was obtained to mark the electrodes ANO-36, manufactured by the PJSC «PlazmaTek», as CE grade, confirming their conformity



Figure 3. New technological line for manufacture of copper-plated welding wire

to standards of quality and safety of the European Union. At the same year the system of the quality management of the PJSC «PlazmaTek» was certified in accordance with ISO 9001 by the TUF Rayland European Body on certification.

Technological scheme of production of electrodes includes, together with conventional components, the additional components, required under market conditions, such as management of resources, including processes of buying raw and other materials and interaction with customers, analysis of market and providing services to customers of products (Figure 5).

Now, the production of electrodes is equipped with required technological, analytical, test equipment and devices, mainly of the domestic manufacture. Their technical characteristics provide the production of a wide assortment of grades, types and sizes of electrodes, which are in demand at the market. There is equipment, which is not traditional at the domestic

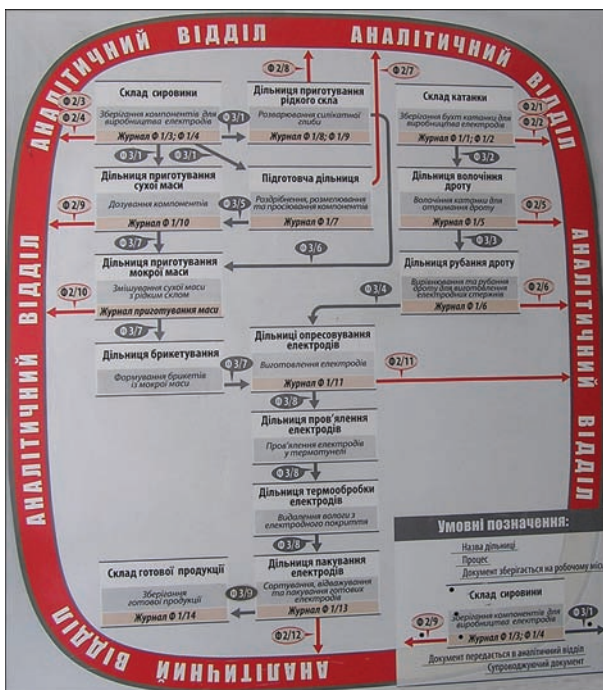


Figure 4. Structure of the quality management system according to DSTU ISO 9001



**Figure 5.** Cargo transport of company for delivery and fast communication with the customer of products

conditions. For example, to provide the quality of electrodes by coating thickness variation the 4-, 5-, 6- and 8-fold drawing mills, operating from a rolled wire, and modern and cutting machine tools AR-04 of «Velma» Company are included into the technological chain of manufacture of rods, and for sieving the powder materials the vibration sieves Sv-0.8 and Sv-1.2 are used.

For dry mixing the charge and preparation of a coating mass the intensive counter-flow mixers of SGI 060, SI 10-1A and SI 20 models of «Velma» Company are used.

The electrodes are manufactured in six technological lines:

- the first line is equipped with an electrode coating unit AOE-4, modernized by «Velma» company to update hydraulic systems and a press head, its rod feeding machine tool, briquetting press and dressing machine;

- the second and third lines are equipped with presses PEO 2000 of «Velma» Company with regular auxiliary equipment (briquetting press, rod feeding machine tool, dressing machine);

- the fourth line is equipped with press PEO 1000 of «Velma» Company and regular completing parts; general view of line is given in Figure 6;

- the fifth line is equipped with electrode coating press of OB 2775 model, manufactured by the Pilot



**Figure 6.** Line of manufacture of electrodes in press PEO 1000

Plant of Welding Equipment of the E.O. Paton Electric Welding Institute;

- the sixth line is equipped with a vertical press of «Bruno Berner» Company and designed for manufacture of special-purpose electrodes.

In all the lines for electrode manufacture the devices for individual marking and deposition of a special coating on electrode edges for arc exciting are mounted, and also there are electromagnetic and mechanical devices for selective monitoring of coating thickness variation.

Heat treatment of electrodes is performed in a conveyor three-pass furnace, three thermal tunnels, as well as in 7 electric chamber-type furnaces with a working space volume of 5 m<sup>3</sup>, manufactured by Sarnensk plant of bridge structures.

Packing of electrodes is still performed manually into cardboard boxes of 0.5; 1.0; 2.5 and 5.0 kg mass and into thermo-shrinkable film.

The electrodes, designed for realization through a retail trade, are supplied in a special packing.

At present, two lines on packing of electrodes into tubes of own manufacture of 1.0 and 2.5 kg mass are mounted and started operation, their automation is planned. The works are carried out for implementation of vacuum packing of electrodes into a foiled film.

Technological and testing laboratories perform control of characteristics of liquid glass and grain composition of powders of electrode coatings, chemical composition of wire and deposited metal, mechanical properties and hardness of weld metal, etc. For this purpose, there is a set of devices and test machines. In particular, areometers, viscometers, diffraction scattering machine, X-ray spectrometer «Spectromax» (Germany) (Figure 7), rupture machine R5M, pendulum hammer 2010 KM-30 (Figure 8), etc.

There is a workshop on manufacture of specimens for testing the weld metal properties. Measuring industrial laboratory of the PJSC «PlazmaTek» was ac-



**Figure 7.** X-ray spectrometer «Spectromax»

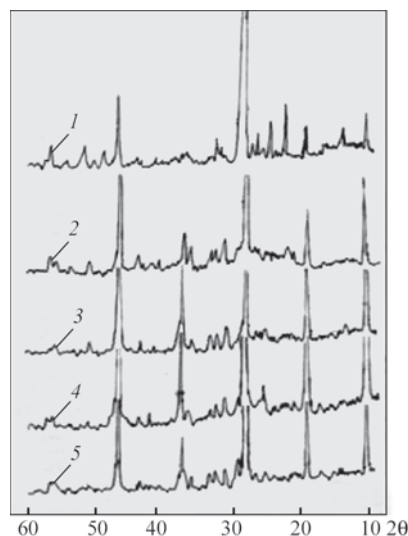


**Figure 8.** Rupture machine R5M and pendulum hammer 2010 KM-30

credited for carrying out measurements in the sphere of competence of State metrological inspection.

Over many years the PJSC «PlazmaTek» is closely cooperated with the E.O. Paton Electric Welding Institute in optimizing and updating of the technology of manufacture of ANO-36 electrodes, in training of personnel, creation of the quality management system, corresponding to the provisions of standard DSTU ISO 9001, in testing of new raw materials, including those, the production of which is mastered in the treatment plant, included into the PJSC «PlazmaTek» structure. Figure 9 gives optical characteristics (in relative units) of domestic and foreign mica-muscovite. Comparison of structure confirms the possibility of use of the national raw material in technological purposes.

The PJSC «PlazmaTek» is a member of the International Association «Electrode» and the Society of Welders of Ukraine (SWU). Results of joint works are published in welding journals, at the E.O. Paton



**Figure 9.** Comparison of structure of specimens of mica-muscovite: 1–3 — test samples; 4, 5 — samples of Indian and Russian mica of grade SME-315

Electric Welding Institute, and also in publications of Association «Electrode» and SWU [1–4].

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