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## Current Situation and Developmental Trends in Production and Welding Techniques in Russia

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**Abstract:** The article presents the primary indicators illustrating the current situation and developmental trends in the production of welding equipment and materials in Russia in 2010-2013. The study also contains the analysis of tendencies taking place on the welding technique market (import-export) in the Russian Federation.

**Keywords:** Russian welding market, development tendencies, welding equipment production

**DOI:** [10.17729/ebis.2015.5/5](https://doi.org/10.17729/ebis.2015.5/5)

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When analysing the present state and developmental trends of the national economy, Russian experts state that in the past 20 years, all Russia's processing industry sectors, including welding equipment production, have seen steady decreases in spite of the positive results in the years 2000-2008 and 2010-2012. In 2013, the industrial production index dropped from 102.6% to 99.9%. Experts estimate that in 2015 the industrial production of Russia will decrease by 3% [1].

The current level of Russian industry and industrial potential constitute a mere half of the highest level reached in the late 1980s. Today, the level of the country's share in global industrial potential has fallen below the level present before WW2 (1937: 7%; 2013: 3.6% of the global gross product). In the past 20 years, the industrial share of the Russian GDP has fallen from 37% to 26%. The share of the machine-building industry and of the metal-processing industry (including the armaments industry) in the industrial production structure has decreased by

twice and today does not exceed 20%. At the same time, in developed countries, such as the USA, Germany and Japan, the machine-building industry constitutes 30-35% of the GDP, and its share in industrial production amounts to approximately 50% [2].

It is estimated that the technological resources of the Russian economy are exhausted by 45% (in the power sector even 60%) and are nearing a critical level. At the end of 2012, the level of the general wear of primary resources amounted to 48.6%, and in processing related manufacturing companies – 46.8%. Entirely worn resources make up approximately 10-15% [3-5].

A similar situation is observed in welding manufacturing – 85% of devices are obsolete and fail to satisfy global standards in safety, environmental protection and efficiency. In the building engineering almost 80% of all welding operations are performed manually; in the automotive industry and in machine tool manufacturing, this index stands at approximately 30% [1, 2].

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For many years, Russian industry has called for a dramatic renewal of welding devices, yet at the same time, the production of welding equipment has decreased considerably [6,7]. The lower production of welding technique is attributed to a significant decrease in metal processing, lack of funds for investments and low competitiveness of the national welding production, both on the domestic market and overseas. Over the past 20 years, Russia has seen a significantly diminishing welding sector potential both in terms of production and research. Many scientific establishments and industrial companies dealing with the development and production of welding equipment have closed [8]. For instance, the only Russian inter-sectoral research institute dealing with welding technologies – Russia Welding Institute (created in 1992 on the basis of the world-famous All-Union Research Welding Equipment Institute and the oldest St. Petersburg company “Electric” (established as early as in 1892)) has ceased to exist.

Presently, the most specialised companies manufacturing welding equipment include the following enterprises:

- ZAO URALTERMOSVAR – employing 400 workers and manufacturing arc welding equipment for rectifiers for automated welding and inverter rectifiers;
- Electric Welding Equipment Company ISKRA – manufacturing motor-driven welding sets, transformers, automatic welding machines, resistance welding machines (for spot, flash and linear welding);
- OOO NPP TECHNOTRON – manufacturing devices for various arc welding methods;
- OOO WELDER, established in 2003 – manufacturing inverter welding machines for DC MMA welding – one-phase up to 200 A and three-phase up to 350 A;
- PSKOWELECTROSVAR – manufacturing machines for all resistance welding methods and heavy machinery for flash welding. In the recent years, a series of MSR 6301A stationary

machines for welding rails has been manufactured on an order placed by Russian Railways. In addition to these relatively large companies, in today’s terms (each employing a few hundred workers), Russia has many small firms manufacturing and servicing welding equipment, primarily intended for manual and semiautomatic welding, employing between several and several dozen workers.

In 1992 the number of welding machines manufactured in the Russian Federation amounted to 98.4 thousand. In 1998 the first significant decrease in production, i.e. by 73%, was observed. The years 2000-2008 saw a production growth of 3.5 times, i.e. from 29.9 thousand to 104.6 thousand units. However, the economic crisis of 2008-2009 led to a repeated decrease in production in all companies. In 2010 the total production of equipment for fusion and pressure welding constituted 63.7% at the highest level of 2008; this trend of decrease has not stopped until today [9, 10]. Also, the past 20 years saw a significant change in the structure of manufactured welding equipment. In 1995 the share of welding power sources in the structure of manufactured welding equipment amounted to 70%, whereas in 2010, this indicator did not exceed 15%. As a result, over 50% of machines for arc welding and surfacing are not equipped with power sources, whilst in 1995, this indicator did not exceed 9%. In addition, the production of welding equipment for special methods has fallen by twice [10].

The lack of investments in the welding sector created a situation where, even on the domestic market, Russian companies manufacturing welding equipment cannot compete with overseas businesses, which, in addition, enjoy considerable preferences in Russia. On 1 January 2010, customs duties on imported welding equipment were fully abolished, yet a 10% import duty tax on components for Russia-made welding machines was maintained. The Russian market of welding equipment is growing, yet its dependence on equipment manufactured

abroad is rising as well. The share of import on the total sales of welding equipment in the Russian Federation amounted to 60%: in 2006, 70%; 2007, 75%; 2008, 85%; and 90% in 2012 [8].

The share of the countries united in the Commonwealth of the Independent States, including Russia, in the structure of the global market of welding equipment does not exceed 5%. According to information provided by the Japanese publication entitled *The Japan Welding News for the World*, in 2012 the market of welding machines (for arc welding and resistance welding) in the CIS countries (including Russia) amounted to 65 thousand units. Tables 1 and 2 present data concerning the size and structure of welding equipment sales in Russia and the CIS countries in 2011 and 2012 [11, 12].

Russia; the primary suppliers of these devices are companies from Europe, the USA and China.

Chinese machines for semiautomatic welding make up approximately 20% of imports. The primary users include “small businesses”, private companies and individual users. The share of Chinese semiautomatic welding machines is gradually decreasing and presently amounts to approximately 5-7%. The leading Chinese suppliers in the Russian market in 2012-2013 were SHENZHEN JASIC TECHNOLOGY and SHENZHEN HUAYILONG ELECTRIC.

In 2013 the share of American companies providing the Russian Federation with welding devices made up 25%. Unlike Chinese welding machines, devices imported from the USA are entirely directed to industry. The primary

American suppliers delivering to Russia are Lincoln Electric and Miller; the end users of American-made welding equipment are primarily petrochemical companies.

In 2013 the primary suppliers of semiautomatic welding machines to Russia were the EU countries whose market share amounted to more than 50%. Private users purchase 15-20% of such devices (usually up to 200 A). Particularly popular are inexpensive, simple and reliable machines coming from Italy (Telwin) and France (Gys). The primary suppliers of industrial semiautomatic welding machines to Russia are Fronius,

CLOOS, Lincoln Electric, Kemppi, EWM, ESAB, Lorch and Migatron. The import structure reveals a growing number of devices designed in the inverter technique in the primary circuit [13, 14].

Russian analytical companies estimated that in 2013 the trend of increasing sales in the welding equipment market would continue, yet in

Table 1. Sales of welding equipment in terms of numbers in Russia and the CIS countries and their share in the global structure in 2012

| Welding equipment            | World           |            | Russia and CIS |            |
|------------------------------|-----------------|------------|----------------|------------|
|                              | 1 000 units     | %          | 1 000 units    | %          |
| Arc welding equipment        | 1 301,7         | 100        | 63,3           | 4.8        |
| Resistance welding equipment | 53,85           | 100        | 1,7            | 4.0        |
| <b>In total</b>              | <b>1 355,55</b> | <b>100</b> | <b>65,0</b>    | <b>4.8</b> |

Table 2. Sales of welding equipment in terms of numbers in Russia and the CIS countries and their structure in 2011-2012

| Welding equipment            | 2010        |              | 2012        |              |
|------------------------------|-------------|--------------|-------------|--------------|
|                              | 1 000 units | %            | 1 000 units | %            |
| Arc welding equipment        | 55,0        | 97.5         | 63,3        | 97.4         |
| Resistance welding equipment | 1,4         | 2.5          | 1,7         | 2.6          |
| <b>In total</b>              | <b>56,4</b> | <b>100.0</b> | <b>65,0</b> | <b>100.0</b> |

The greatest share (over a half) in the welding equipment market of the Russian Federation in 2011-2013 was made up by devices intended for MMA welding. The most popular methods applied in Russian industry are based on semiautomatic MIG and MAG welding. Devices for such welding methods, as mentioned above, constitute ¼ of welding machines imported by

2014 the growth stopped and was followed by a decrease [15]. A similar situation can be observed as regards the production and consumption of welding consumables – production is decreasing, whilst the import-driven value of the market is growing.

Russian federal statistical services and analytical companies estimate that in the past 15 years the domestic production of welding materials has diminished by almost 3 times. According to information provided by the Welding Association “Electrod”, in 2001 the production of welding materials in Russia amounted to 245 thousand tons, whereas in 2006 it amounted to 306 thousand tons. In the same period, the consumption of steel (as the equivalent to ready steel production) amounted to 27 million tons and 35 million tons respectively. In 2013 the consumption of steel stood at 43 million tons, whereas the production of welding materials amounted to 97 thousand tons, i.e. decreased by nearly three times. Another noticeable phenomenon is the lower quality of covered electrodes, i.e. the primary group of welding consumables produced in Russia. Experts state that the major reason for this situation is the lack of raw materials of required quality [16]. In Russia, covered electrodes make up approximately 80% of the total production of welding consumables (in Japan – 10%, in Germany – 9%, in Ukraine – 52% and in China – 58%).

Table 3. Production of covered electrodes in Russia in 2007-2013 [tons]

| Type of welding consumable | 2007    | 2010    | 2011    | 2012    | 2013   |
|----------------------------|---------|---------|---------|---------|--------|
| Covered electrodes         | 183 600 | 101 543 | 107 005 | 105 914 | 97 331 |

Among general purpose covered electrodes, Russian companies produce mostly rutile-covered electrodes (grades MR-3, ANO-21 and OZS-12) and ilmenite-covered electrodes (grade ANO-6). The share of these electrodes in the total production amounts to approximately 60%. These electrodes are in greatest demand as they can be used both in AC and DC welding, practically

in all positions, and do not require high welding skills. Low-hydrogen electrodes (grades UONI-13/45 and UONI-13/55) make up 36% of total production. These electrodes are used in welding structures of critical importance and require high welding skills.

Presently, depending on information sources, in Russia there are approximately 200 manufacturers and suppliers of covered electrodes. It is difficult to provide the exact number, as many of these businesses work half-legally and irregularly, supplying mainly local markets. At the same time, many well-known producers have closed their production and disappeared from the market, e.g. the large company “Kranex” in Ivanov, the Tscherepov Steel Rolling Mill being part of the “Severstal” group, the “Atommach” facility in Volgograd, “Specmontagizdelie” in Schelkovo near Moscow, the steelworks “Krasny Sulin” in the district of Rostov administration, the company “Kirovsky zavod” in Saint Petersburg and West Siberian Steelworks in Novokuznetsk. The production of covered electrodes has practically been finished at “Artemovskiy mekhanitschekiy” in the district of Sverdlovsk administration, the company “Shadrinsky elektrodny zavod” in the district of Kurgansk administration and at “Ingriyan zavod” in Saint Petersburg.

Presently, the production of covered electrodes has even increased in Moscow-based companies such as “Specelectrod”, whose production capacity has grown to 80 thousand tons and product range has reached 190 grades of electrodes (the greatest in Russia). Covered electrodes are also produced by “Moscovskiy elektrodny zavod” and “Losinostrovskiy elektrodny zavod”. The Russian market of welding materials is witnessing an expansion of overseas companies. The Swedish-based globally present concern ESAB has taken over the company “SVEL” in Saint Petersburg, producing covered electrodes. The same company has bought “Sytshevskiy elektrodny zavod” from Gazprom. Lincoln Electric,

a US-based multinational concern, has acquired the company “Meschgosmetiz” located in Mtsensk and manufacturing covered electrodes and copper plated electrode wires. Currently, the production in these facilities has been stopped.

In the recent years, the Russian market of welding consumables has been characterised by increasing import. In 2001 the import of welding materials was low and did not exceed more than 3% of domestic production, whereas, in 2013, this indicator reached almost 32%. In 2001 the import of welding materials amounted to 7.3 thousand tons, with welding production amounting to 245 thousand tons. In 2013 this import reached 38.6 thousand tons, with the production of approximately 120 thousand tons.

Since 2011 the value of imported welding materials has grown significantly. In 2007-2010 this value was approximately 51-53 million USD. In 2012, if compared with the previous period, this indicator grew by 37% to reach 70.1 million USD. In 2013 the annual growth was 15%, and the value of import amounted to 80.6 million USD. The structure of imported welding materials is dominated by covered electrodes, making up 86% of the total import of welding materials. More than 30% of welding consumables are imported from China. The export of welding materials is insignificant – in 2012 it amounted to 13 thousand tons, and in 2013 to 15.4 thousand tons, i.e. approximately 30% of the import size. In the years mentioned above, the greatest export was directed to the common market countries, i.e. Kazakhstan and Belarus. The export was dominated by covered electrodes (90%) [17]. The share of

Russia and the CIS countries in the structure of the global market of welding materials does not exceed 3.5%. According to data provided by the Japan Welding News for the World, in 2012 the size of the welding materials market of the CIS including Russia amounted to 220 thousand tons. Tables 4 and 5 present data concerning

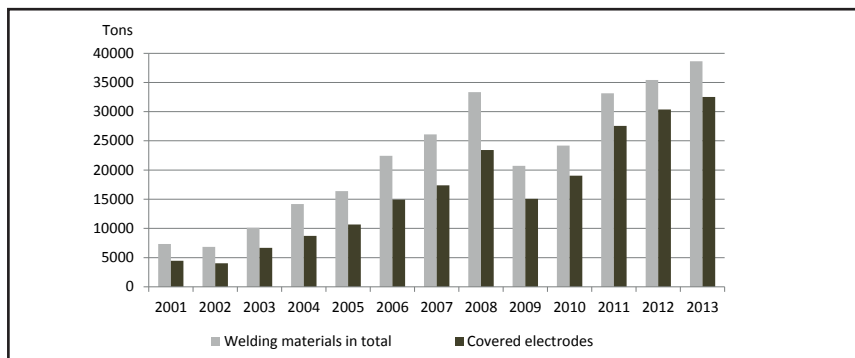


Fig. 1. Dynamics of the import of all types of welding materials and covered electrodes in the Russian Federation in 2001-2013 (according to BD UN COMTRADE)

Table 4. Consumption of welding materials worldwide and in Russia (along with CIS) in 2013

| Welding materials               | World          |            | Russia and CIS |            |
|---------------------------------|----------------|------------|----------------|------------|
|                                 | 1 000 units    | %          | 1 000 units    | %          |
| Covered electrodes              | 2 389,3        | 100        | 105,6          | 4.4        |
| Flux-cored wires                | 863,7          | 100        | 17,6           | 2.0        |
| Wires for submerged arc welding | 706,2          | 100        | 30,8           | 4.4        |
| Solid wires                     | 2 324,4        | 100        | 66,0           | 2.8        |
| <b>In total</b>                 | <b>6 283,6</b> | <b>100</b> | <b>220,0*</b>  | <b>3.5</b> |

\* Consumption of welding materials in Ukraine (without flux) in 2013 amounted to 56 thousand tons [19].

Table 5. Consumption of welding materials worldwide and in Russia (along with CIS) in 2011-2013

| Welding materials               | 2011         |            | 2012         |            | 2013         |            |
|---------------------------------|--------------|------------|--------------|------------|--------------|------------|
|                                 | 1 000 tons   | %          | 1 000 tons   | %          | 1 000 tons   | %          |
| Covered electrodes              | 112,2        | 51         | 112,7        | 49         | 105,6        | 48         |
| Flux-cored wires                | 13,2         | 6          | 18,4         | 8          | 17,6         | 8          |
| Wires for submerged arc welding | 30,8         | 14         | 32,2         | 14         | 30,8         | 14         |
| Solid wires                     | 63,8         | 29         | 66,7         | 29         | 66,0         | 30         |
| <b>In total</b>                 | <b>220,0</b> | <b>100</b> | <b>230,0</b> | <b>100</b> | <b>220,0</b> | <b>100</b> |

the size and structure of the consumption of welding materials in Russia and the CIS in 2011 and 2012 [18-21].

The production, import and export as well as, ultimately, the consumption of welding consumables in Russia is dominated by covered electrodes, which corresponds to the sectoral structure of rolled steel consumption in the Russian Federation. The building industry, i.e. the primary user of covered electrodes, uses 53% of rolled sheets and 76% of rolled shapes [22].

Experts believe that the short and mid-term development of the Russian market of welding materials will be connected with the further growth of the market of covered electrodes. However, the share of covered electrodes in the total production and consumption of welding materials will decrease. Growing consumption will be related to solid and flux-cored wires, yet the market will continue to be dominated by covered electrodes.

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