



MARKET OF WELDING CONSUMABLES IN UKRAINE

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The systemized economic and statistic information about the state and development of Ukrainian market of welding consumables is presented. The quantitative and cost values of volumes of production, consumption and export–import of welding consumables are given. 5 Tables, 13 Figures.

Keywords: *welding, welding production, equipment, welding consumables, economy, statistics, market*

Welding as a method for producing permanent joints of metals and non-metals is a key technology in production of more than a half of GDP in the industrialized countries. It specifies the serious tasks before welding production of any country, which are to be solved considering high nowadays requirements.

Welding production in Ukraine (Table 1) includes a highly-developed research component, production of modern welding equipment and consumables as well as structures and other welding products and the system of training of engineering and working staff. All this allows demonstrating Ukraine as a country with a high level of development of welding production.

The regional structure of welding production of Ukraine is presented in Table 2. The greatest

number of enterprises is focused in the Donetsk-Pridneprovsky region, producing 57 % of welding structures manufactured in Ukraine. About 45 % of engineers and technicians and 44 % of workers are engaged in their production. There are also 23.5 % of higher establishments of the III–IV and 53 % of the I–II levels of accreditation functioning in the region, which educate engineering-technical staff for welding production.

The domestic school of welding technologies as to its merits occupies one of the leading places in the world. Such achievements of Ukrainian welders as automatic welding of armor bodies of the legendary tank T-34, unique welded structures of the civil period, such as main oil-and-gas pipelines, the E.O. Paton all-welded bridge in Kiev, electroslag welding of metal of almost unlimited thickness, welding in aerospace engineering, in space and under water are widely known.

The events of the recent years had a negative influence on the economy of Ukraine and its production potential, but a high research level still allows the Ukrainian school of welders to keep the position of one of the world leaders. The evidence of this is the Ukrainian technologies and equipment for flash-butt welding of rails of unlimited length, that is particularly important in construction of modern high-speed railroads, and the recent developments in welding of live tissues widely used in all the continents. As to the opinion of academician S. Glaziev, the author of theory of technological structures, these both projects meet the requirements of the VI technological structure, i.e. they are the technologies of the future.

It is clear that study of state and dynamics of development of the world and national welding production including economic and statistical analysis of the market of welding consumables has already been for more than 50 years as one of the scientific priorities of the Institute. Rich information banks were accumulated, necessary

Table 1. Welding production in Ukraine

Characteristics	Number
Enterprises–producers of welded structures (having 5 and more welders), un.	~2,000*
Enterprises–manufacturers of welding equipment, un.	39
Enterprises–manufacturers of welding consumables, un.:	
in total	64
certified (UkrSEPRO)	33
System of staff training, un.:	
higher educational establishments	17
secondary schools	17
colleges	487
Staff, pers.:	
workers of welding specialties	~80,000*
engineers and technicians	>5,000*
* Evaluative data.	



Table 2. Regional structure of welding production in Ukraine, %

Region	Enterprises	Welded structures	Engineers and technicians	Workers	Higher educational establishments of the III–IV a.l.	Higher educational establishments of the I–II a.l.
Central ¹	22.4	14.1	11.4	16.8	23.5	17.6
Donetsk-Pridneprovsky ²	34.4	57.0	44.9	43.5	23.5	64.7
Eastern ³	12.5	9.7	24.0	14.7	5.9	11.8
Southern ⁴	10.6	8.0	8.3	9.5	17.7	5.9
Western ⁵	20.1	11.2	11.4	15.5	29.4	0

Notes. 1 – Kiev, Regions of Kiev, Chernigov, Cherkassy, Kirovograd, Zhitomir; 2 – Regions of Donetsk, Dnepropetrovsk, Lugansk, Zaporozhie; 3 – Regions of Kharkov, Sumy, Poltava; 4 – Regions of Nikolaev, Odessa, Kherson, Crimea Republic; 5 – Regions of Vinnytsa, Volyn, Trans Carpathian, Ivano-Frankovsk, Lvov, Rovny, Ternopol, Khmelnytsk, Chernovtsy.

staff was trained, methods of investigations were mastered, on the basis of which three principles are laid:

- the first one: the investigation of phenomena both in statics as well as in dynamics during a quite long period;
- the second one: to provide the objectivity the evaluation should be given in combination with the corresponding values of world and leading countries;
- the third one: during investigation of state of the investigated phenomenon the preference should be first of all given to real values, as far as the cost values can distort the real situation. Except of all the rest the use of real values provides a possibility to avoid the influence of varying exchange rates during international comparison of the values.

As an example of the higher objectiveness of real values as compared to the cost ones, the dynamics of GDP of Ukraine in the cost figures and that of welding production in real values (Figure 1) can be given. According to the data of the State Statistics Committee in general al-

most all the values of welding production, determined in natural values, turned to be much lower than the values of GDP, calculated in the cost figures. It was caused by the fact that the volumes of machine building and metal treatment, in the first turn, the production of metal-consuming types of products, dropped sharply (Table 3).

The main structural material, which is widely applied in production of welded structures, is steel. Annually in Ukraine about 30 mln t of steel rolled metal is produced, the considerable part of which is exported to many countries of the world, and the visible consumption inside the country in the last years amounts to almost 6 mln t, of which 2/3 part falls to manufacture of welded structures (Figure 2). The analysis of the given data shows that the welded structures in Ukraine amount from 2/3 to 3/4 part of rolled metal consumption, that corresponds to the similar world values.

The values in Figure 3 evidence that the welded structures are the leading type of metal

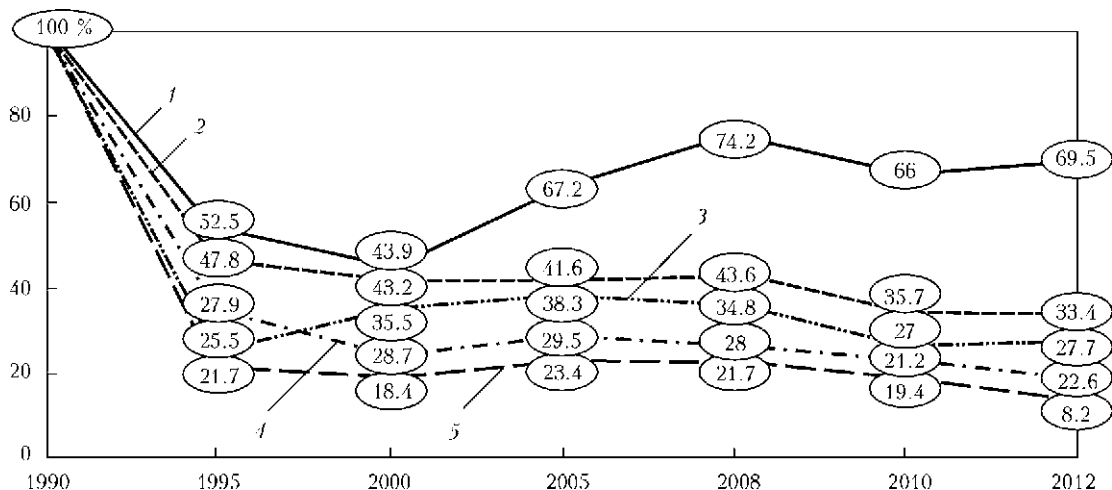


Figure 1. Main indices of Ukrainian economy and welding production, %: 1 – GDP; 2 – products of machine building; 3 – consumption of rolled metal; 4 – production of welded structures; 5 – consumption of welding consumables

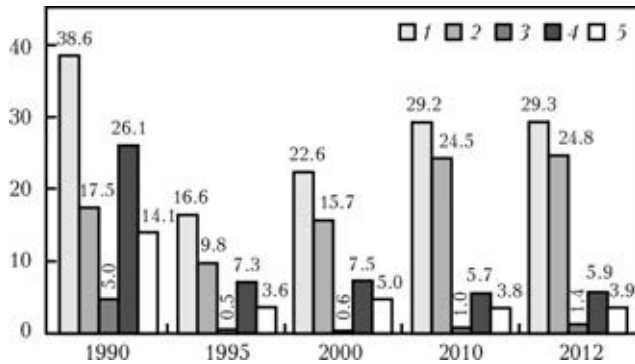


Figure 2. Production of welded structures in Ukraine, mln t: 1 – production of rolled metal; 2 – import of rolled metal; 3 – production of welded structures; 4 – export of rolled metal; 5 – visible consumption of rolled metal

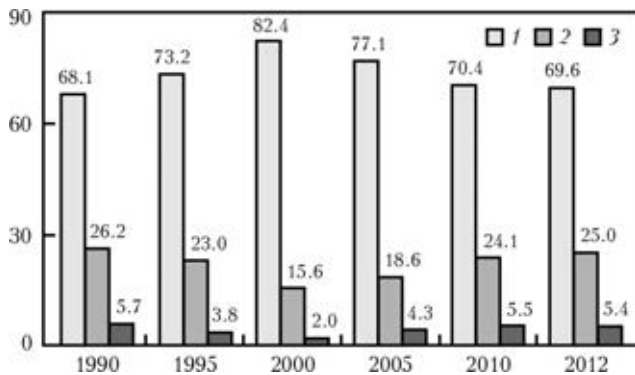


Figure 3. Structure of production of metal billets in Ukraine, %: 1 – welded structures; 2 – castings; 3 – forging and stamping pieces

billets produced in the country, leaving castings, forgings and stamping pieces far behind.

One of the main components of welding production is welding consumables. Figure 4 presents the dynamics of production of welding consumables in Ukraine, their export and import, allowing establishing the annual volumes of domestic consumption, i.e. volumes of domestic market.

Figure 5 shows seven main Ukrainian manufacturers of welding consumables, the share of which was 96.1 % of annual output in 2012, whereas the share of smaller manufacturers was

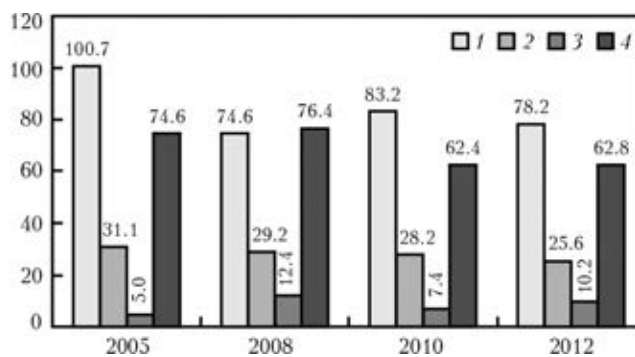


Figure 4. Ukrainian market of welding consumables, thou t: 1 – volume of production; 2 – export; 3 – import; 4 – visible consumption

Table 3. Output of metal-consuming types of industrial products in Ukraine

Products	1990	2012	Decrease in volume of production, times
Ferrous rolled metals, mln t:			
output	38.6	18.4	2.1
consumption	26.1	5.9	4.4
Pipes, mln t	6.5	2.2	3
Bridge cranes, pcs	1389	117	12
Tractors, thou pcs	106	5.28	20
Combine-harvesters, pcs	1500	50	30
Metal cutting machine-tools, thou pcs	37	0.11	342
Forging-press equipment, thou pcs	10.9	0.05	214
Excavators, thou pcs	11.2	0.08	143
Passenger cars, thou pcs	156	69.7	2.2
Buses and lorries, thou pcs	40.3	6.5	6.2
Freight cars, thou pcs	80	47.6	1.7

3.9 %. Yet very recently their volume at the market amounted to more than 9 %, which evidences about the continuing process of concentration of welding consumables production.

The capacities of Ukrainian enterprises on production of welding consumables satisfied the needs of many machine building plants of the former USSR, but after its collapse the volumes of production decreased considerably. 1/4–1/3 of the production volume falls to export. The visible use of welding consumables inside the country at the recent years amounts to 63,000 t.

In the structure of production of welding consumables (Figure 6) almost a half belongs to the production of electrodes (as compared to 1990 their volume increased nearly by 20 %), about 30 % falls to welding fluxes. As compared to

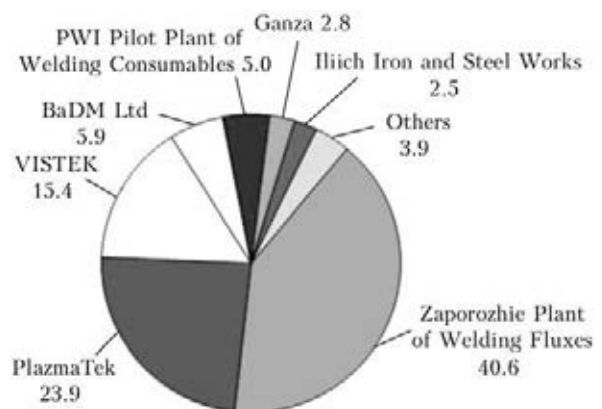


Figure 5. Share in output of welding consumables by the main Ukrainian producers, %

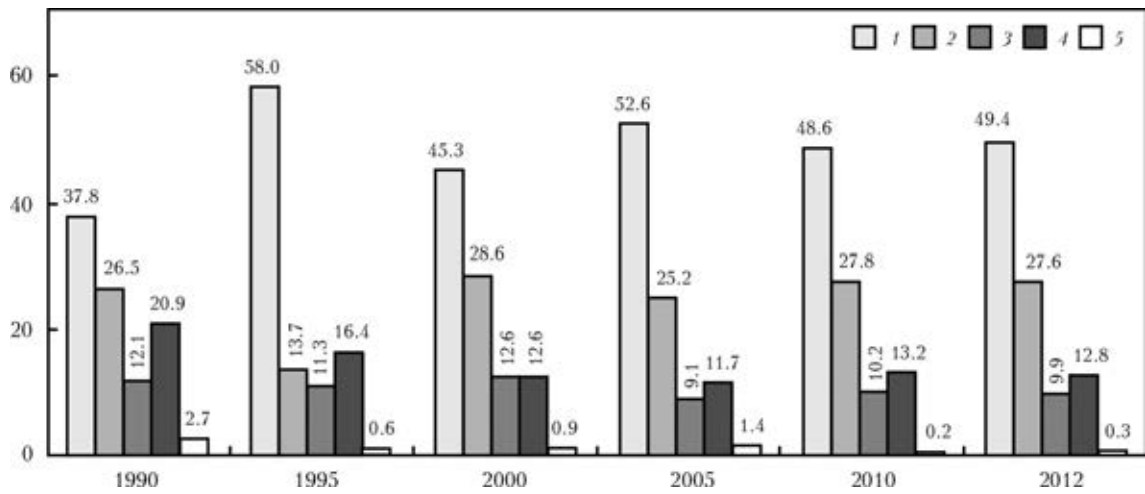


Figure 6. Structure of output of welding consumables, %: 1 – electrodes; 2 – standard wire; 3 – flux-cored wire; 4 – flux; 5 – alloyed wire

1990 the production of alloyed and flux-cored wire was decreased.

The presence of data on the structure and volume of consumption of welding consumables allows determining the volume of application of each of the main methods of arc welding (as to the deposited metal) during the last 47 years (Figure 7).

In Ukraine in the 1960–1980 the level of mechanization of arc welding was comparable with that of the leading countries. Thus, in 1965 the volume of manual welding in Ukraine amounted to 63 % and was constantly decreasing to 44.9 % till 1985 (Table 4). However stagnation of the USSR economy in the second half of the 1980s, different shocks and reforms negatively influenced the whole economy of Ukraine and, in particular, its welding production (see

Figure 7). In the 1990–1995 the volume of manual welding sharply jumped to the level of 30 years old values (to 65.1 %) and further was slowly decreasing to 48.9 % (in 2012), being inferior to the similar value of leading countries. At the same time in the period of the 1965–1990 the volume of welding in CO₂ grew from 9.5 to 37.2 %, and then again sharp decrease to 23 % (in 2000) and slow rise to 33 % (in 2012) are observed. Automatic submerged arc welding was all the time at a sufficiently high level – 20 ± 3 % in the 1970–1980 due to its application in ship building and production of building structures and pipes. Then in the 1990–1995 the recession to 7.5 % is observed, and in the next years the stabilization at the level of 15.5 ± 1 % took place due to production of pipes of large diameter for main pipelines. Quite unsatisfactory situation

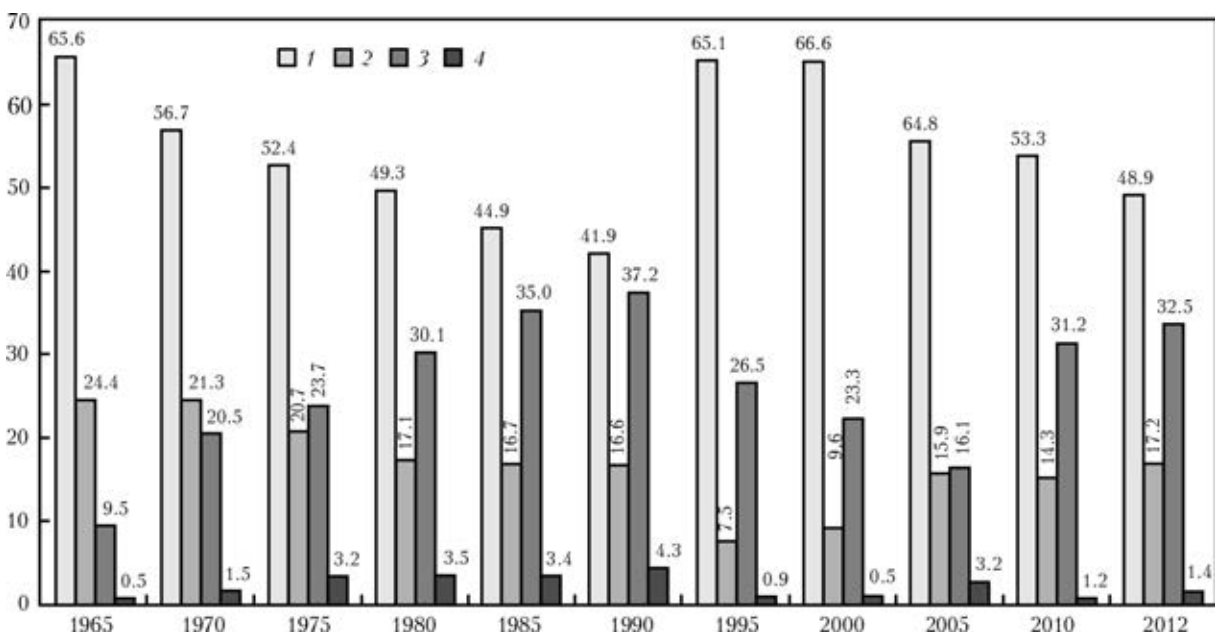


Figure 7. Technological structure of arc welding methods in Ukraine, % (as to deposited metal): 1 – manual welding; 2 – submerged arc welding; 3 – welding in shielding gas; 4 – welding using flux-cored wire



Table 4. Structure of arc welding methods, % (as to deposited metal)

Country	Welding method	1965	1975	1985	1995	2000	2005	2012
West Europe	MAW	74	58	34	18	15	12	8.9
	CO ₂		31	56	70	71	75	63.9
	FCW		2	3	6	6.5	6.5	19.1
	ASAW		9	7	6	7.5	6.5	8.1
USA	MAW	71	53	42	25	19.5	15	10.3
	CO ₂		25	38	54	54	58.5	61.4
	FCW		13	13	19	19	19.5	22.1
	ASAW		9	7	7	7.5	7	6.2
Japan	MAW	85	67	44	22	14	12	7.3
	CO ₂		20	39	52	54	54.5	49.5
	FCW		1	11	25	25	27	35.9
	ASAW		9	10	7	7	6.5	7.3
Ukraine	MAW	63	52.4	44.9	65.1	66.6	64.8	48.9
	CO ₂	9.5	23.7	35	26.5	23.3	16.1	32.5
	FCW	0.5	3.2	3.4	0.9	0.5	3.2	1.4
	ASAW	27	20.7	16.7	7.5	9.6	15.9	17.2

Note. MAW – manual arc welding; FCW – flux-cored wire welding; ASAW – automatic submerged arc welding.

can be observed with the flux-cored wire, i.e. increase in values almost from 0 to 4.3 % in 1990 and the next drop to the level of 1.2–1.4 %.

The reduction in consumption of welding consumables decreased the anthropogenic impact of welding on the environment. The cooperation of the E.O. Paton Electric Welding Institute with the Kiev Institute of Labor Medicine and Odessa Centre of Protection of Breathing Organs of Welders allows creating the necessary research base for economic evaluation of problems of hygiene and ecology in welding production. The results of these investigations, carried out for evaluation of anthropogenic impact of welding production on environment, presented in Table 5, from which it follows that emission of harmful substances to the atmosphere during welding amounts to hundred fractions of a percent from the amount of general emissions, and has no danger for the environment. Nevertheless, the specifics of welding processes, especially manual and semi-automatic ones, where welder

stands directly in the zone of arcing, requires taking of necessary measures not only to protect their breathing organs, but also to make the environment in the welding shops healthier.

The production of welding consumables in Ukraine is oriented to the consumption not only in different branches of domestic industry, but also to delivery to the foreign markets. The volume of export at the Ukrainian market amounts almost to 30 % of the volume of their production (see Figure 4), whereas import does not exceed 12,400 t. Such correlation of export–import provides in general the positive foreign trade balance on welding consumables (Figure 8).

However, in the recent years the Ukrainian producers of welding consumables feel severe competition in struggle for a user on the side of importers, which became especially acute after

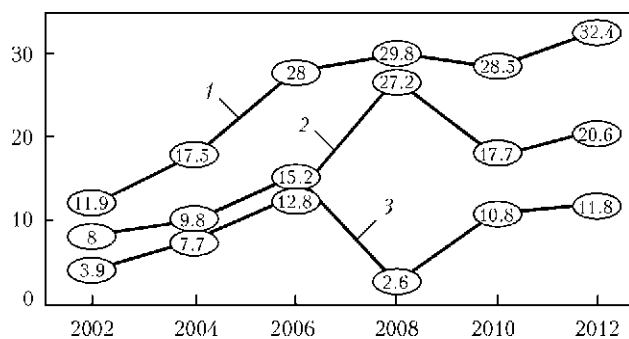


Figure 8. Foreign trade balance of Ukraine on welding consumables, mln USD: 1 – export; 2 – import; 3 – balance

Table 5. Anthropogenic impact of welding production on the environment

Year	Emissions of harmful substances to the atmosphere, thou t				
	Total	Including			Welding production
		Automobile transport	Stationary sources	In total	
1990	15500	6100	9400	6.90	0.044
1995	7500	1800	5700	1.92	0.026
2000	5900	1900	4000	1.17	0.021
2005	6600	2200	4400	1.84	0.028
2010	6678	2547	4131	1.27	0.019
2012	6821	2486	4335	1.28	0.019



entering of Ukraine to the WTO and opening of the domestic market. The dynamics of growth of import of welding consumables in Ukraine from 2002 to 2012 (from 3.9 to 27 mln USD) exceeds the dynamics of export growth of that period (from 11.9 to 29.8 mln USD). It resulted in decrease of the positive foreign trade balance down to 2.6 mln USD. The financial crisis of 2008 weakened the positions of importers (due to the growth of dollar exchange rate), that resulted in decrease of volumes of import of welding consumables. However, by 2010 in connection with overcoming crisis phenomena in the economy the tendency to growth of import in foreign trade balance of Ukraine on welding consumables was renewed.

The structure of export and import of welding consumables is presented in Figure 9. The domestic producers export mainly alloyed wire, electrodes and fluxes, and in the structure of import the main volume falls to welding fluxes and electrodes for manual arc welding.

In accordance with data of the governmental statistics the main trade partners of Ukraine in 2013 were countries of Europe, Asia, and Russia

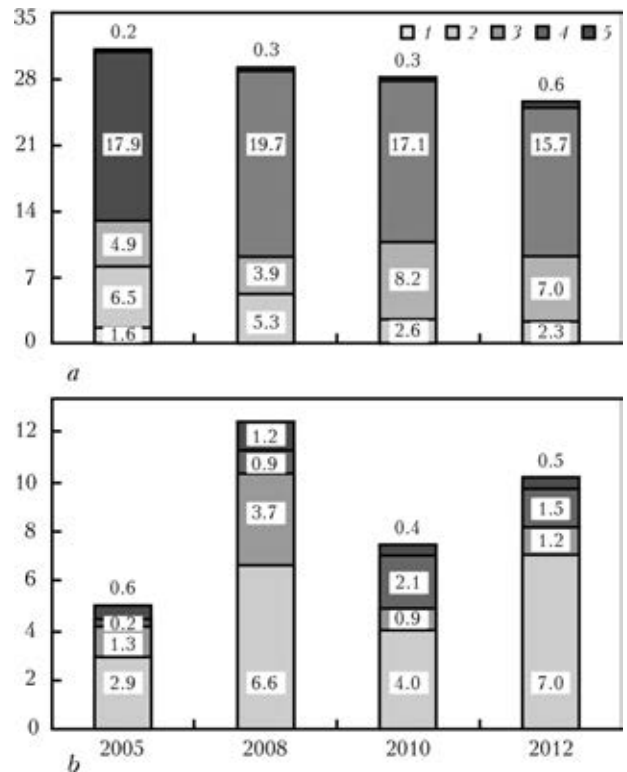


Figure 9. Structure of export (a) and import (b) of welding consumables, %: 1 – standard wire; 2 – flux; 3 – alloyed wire; 4 – flux-cored wire; 5 – electrodes

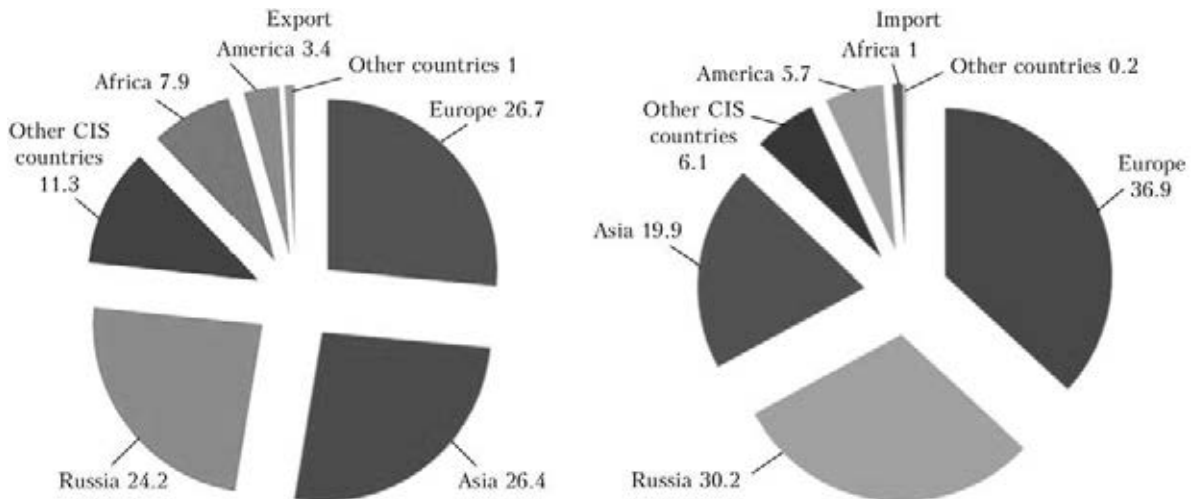


Figure 10. Foreign trade activity in Ukraine, %

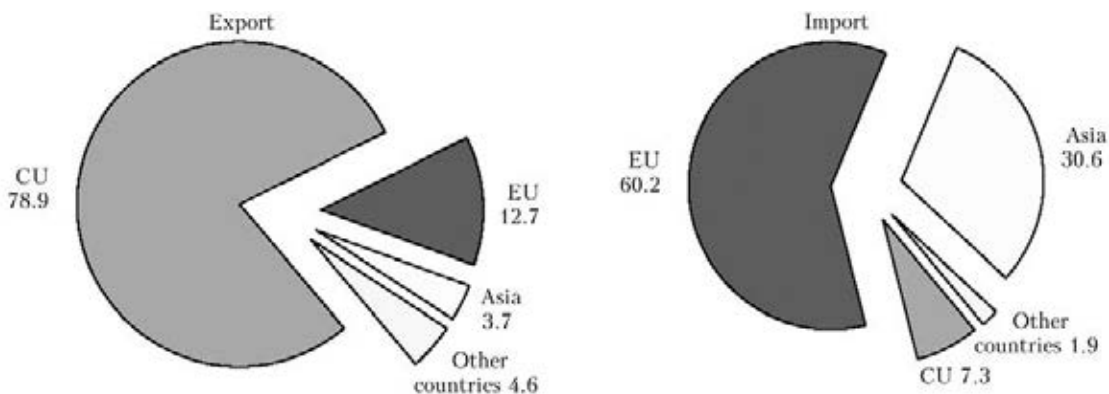


Figure 11. Geography of export–import of welding consumables in 2012, %

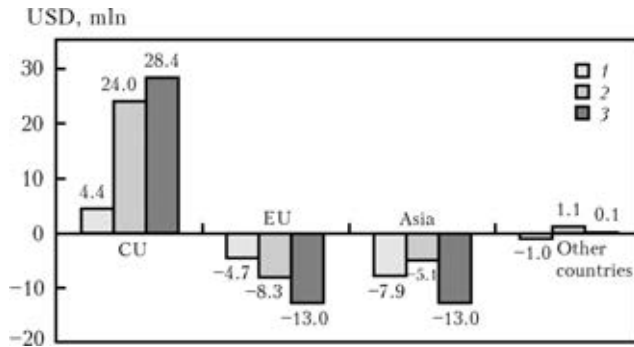


Figure 12. Foreign trade balance of Ukraine on groups of goods and regions in 2012: 1 – welding equipment; 2 – welding consumables; 3 – in total

(Figure 10). Almost 35.5 % of export of Ukrainian products and 36.3 % of import falls to Russia and other CIS countries. Export and import to Europe and Asia amount, respectively, to 26.7 and 26.4, and to 36.9 and 19.9 %.

The foreign trade activity at the market of welding consumables differs greatly from the foreign economic activity of Ukraine in general (Figure 11). Thus, according to the results of 2012, 75 % of volume of export of welding consumables falls to the countries of the Customs Union (CU) (mainly Russia, Belarus and Kazakhstan) and only 12.7 % to the countries of the European Union. In import of welding consumables the different situation is observed: 60.2 % of volume belongs to deliveries from the EU countries and 7.3 % – CU countries. Also in the structure of import the volume of deliveries from the Asian countries is high, i.e. 30 % (mainly from China), which during the last years had a tendency to annual growth. The foreign trade balance on the groups of goods of welding technologies is given in Figure 12. The dynamics of average cost of welding consumables in export–import is shown in Figure 13.

Conclusions

Welding remains the leading technological process in Ukrainian industry, and the national market of welding consumables is developing dynamically. The development and modernization of welding production requires the presence of corresponding economic, statistic and marketing

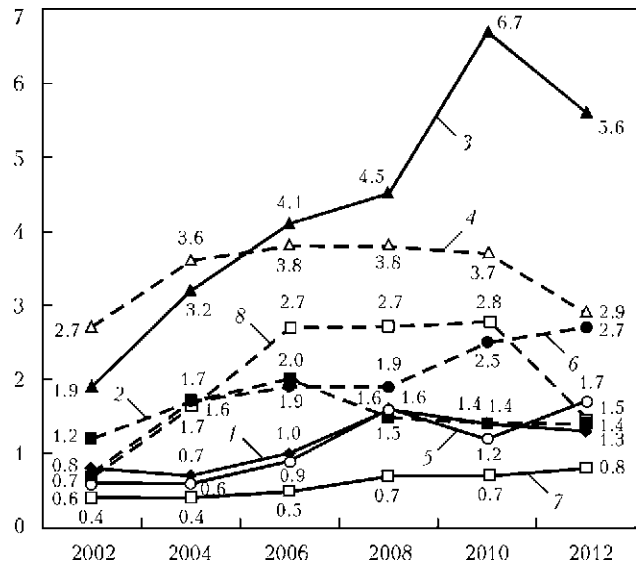


Figure 13. Average cost of welding consumables, thou USD/t: 1, 2 – export and import of alloyed wire; 3, 4 – export and import of flux-cored wire; 5, 6 – export and import of covered electrodes; 7, 8 – export and import of flux

information allowing taking the grounded decisions at determination of directions of research works and developments, and also working out the strategy at the macro- and microlevel. The distinct dependence between consumption of steel metal products and demand on the specific types of welding technologies allow using the forecasts of development of markets of metal consumption as the base for prediction of welding production.

The article is written according to the results of analysis of the market of welding technologies in Ukraine, performed by the Department of Economic Investigations of the PWI, according to the statistic data of the State Statistics Committee and the Custom Service of Ukraine, economic-statistic review «SVESTA-2010», materials, published in the journal «Avtomaticheskaya Svarka», «The Japan Welding News for the World», by the corporations ESAB, Lincoln Electric, etc.

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