



STATE-OF-THE-ART AND TENDENCIES OF DEVELOPMENT OF EUROPEAN MARKET OF JOINING TECHNOLOGIES (Review of materials of economical-statistical data collection on welding production SVESTA-2014)

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Paper gives the research data on volume of production and structure of joining technologies and services in EU countries, received by German Welding Society and European Welding Federation in 2007 and 2010 as well as volume of consumption of welding equipment in EU for 2012 and 2013 and volume of production of welding equipment in Germany in 2012 and 2013. 10 Ref., 13 Tables.

Keywords: European market, welding technologies, welding equipment, joining technologies, volume of welding equipment production

European Union (EU) market of joining technologies (JT) and services, including welding equipment market, makes around 30 % of world market, and the largest EU national market, namely German market, is around 30 % of EU market. Wide-range investigations on evaluation of input of JT in EU economy, carried out in 2007 and 2010 by German Welding Society (DVS) and European Welding Federation (EWF) allowed receiving the most complete evaluation of volume and structure of production

as well as EU market of JT and services. Added values and employment level, obtained as a result of JT application [1, 2], were also determined.

Investigation of cost volume of JT market in EU countries included evaluation:

- equipment and systems for welding, surfacing, brazing and cutting (including spare parts and accessories), adhesion and mechanical joints, thermal spraying, robots and robotized systems, laser technologies;

- accompanying goods and JT services: materials for welding, surfacing, brazing, coating deposition, adhesives, rivets, gases for welding and cutting, means for environment and individ-

Table 1. Volume of production of equipment and JT systems in the EU in 2007 and 2010

Joining technologies	Production volume, mln Euro		Portion, %	
	2007	2010	2007	2010
Welding and surfacing	3916*	3732	52	47
Brazing	629*		8	
Cutting	582*		8	
Spare parts and accessories	–	2202	–	28
Adhesion bonding	338	548	5	7
Mechanical joining	324	279	4	3
Thermal spraying	54	59	1	1
Robots/robotic systems	323	829	4	10
Laser technologies	1334	301**	18	4
Total	7500	7951	100	100

*Including spare parts and accessories.

**Data were provided only by Germany.

**Table 2.** Volume of production of accompanying goods and JT services in the EU in 2007 and 2010

Accompanying goods and JT services	Production volume, mln Euro		Portion, %	
	2007	2010	2007	2010
Welding and surfacing consumables	1717	2027	15	27
Materials for brazing	127		1	
Materials for thermal spraying	256		2	
Other materials (including adhesives)	6 040	1860	48	25
Welding gases	2232	1728	18	23
Rivets	500	552	4	7
Means for environment and individual protection	277	267	2	4
Vent equipment	50	–	1	–
Control means	723	688	5	9
Education	561	417	4	5
Total	12,483	7539	100	100

ual protection, control means, equipment for vent systems, education.

Data, obtained as a result of investigations in a period of 2007–2010 and statistical data on volume of welding equipment production in Germany in 2012 and 2013, published by DVS, allow evaluating conditions and tendencies of development of JT market and production in EU for 2012 and 2013 [3].

According to research data carried by DVS and EWF the volume of production in EU countries during post-crisis 2010 made 15.5 bln Euro, that is 22.6 % lower than the level of 2007. Tables 1 and 2 provide for data on volume of production of equipment and systems for separate JT in EU as well as accompanying goods and JT services.

After crisis of 2008, as can be seen from Tables 1 and 2, the growth of equipment production and JT systems was outlined in EU in 2009 as well as significant (40 %) reduction of volume of production of accompanying goods and JT services took place. Production of JT automation means is growing in EU. Volume of production of robots and robotics complexes rised 2.5 times for three years and exceeded 800 mln Euro in 2010. The International Robotics Federation predicts that volume of sales of industrial robots will increase in Europe by 4 % annually in 2014–2016. At that, it should be noted that portion of welding robots in annual sales had risen from 33 % in 2011 to 50 % in 2013. Volume of production of equipment for adhesion technologies also increases. Prediction of German experts relatively to rise of this technology application for materials joining was completely proved [4]. Reduction of production volume for accompanying goods took place mainly due to production re-

duction in «Other materials» category. Volume of production of materials for welding, surfacing, brazing and thermal spraying in 2010 virtually achieved sales level of 2007. DVS statistical data show 19.4 % increase of production of materials of this category in Germany in 2011, that allows predicting appearance of positive trend in whole for EU during this year [3]. It should also be noted that cost volume of welding consumables in Germany in 2012 and 2013 was reduced for 5 and 6.7 %, respectively, and made 550.7 mln Euro in 2013.

Tables 3 and 4 represent data on volume and structure of production of accompanying goods and JT services in 2007 and 2010.

Data given show significant change of structure except for substantial reduction of production volume of accompanying goods and JT services in a period of 2008–2010. Main portion (~50 %) in structure of production of accompanying goods and services in EU countries in 2007 falls to adhesives production; 18 % – for welding gas; 17 % – materials for welding, surfacing, cutting and thermal spraying. This structure was somewhat different in Germany, i.e. first place on volume of production was taken by welding gas – 28 %, the second is the materials for welding, cutting and thermal spraying (27 %), third is covered by adhesives production (13 %). Services on personnel education made significant portion in EU countries market and, especially, Germany, namely 4.5 and 11 %, respectively.

More than 3 times reduction of volume of adhesives production was noted in 2008–2010 in EU, at that its portion in general production volume of accompanying goods and services reduced to 25 %. This resulted in change of portion structure of production of accompanying goods

Table 3. Production of accompanying goods and services in JT field in Germany and the EU in 2007

Accompanying goods, services	Production volume, mln Euro		Portion, %	
	Germany	EU	Germany	EU
Materials in total, including for:	576	2100	27.3	16.9
welding and surfacing	415	1717	19.7	13.8
thermal spraying	78	256	3.7	2.1
brazing	83	127	3.9	1.0
Gas for welding and cutting	598	2232	28.4	17.9
Adhesives	271	6040	12.9	48.4
Rivets	134	500	6.4	4.0
Control equipment	229	723	10.9	5.7
Occupational safety	49	277	2.3	2.2
Vent equipment	9	50	0.4	0.4
Education	241	561	11.4	4.5
Total	2106	12,483	100	100

Table 4. Production of accompanying goods and services in JT field in Germany and the EU in 2010

Accompanying goods, services	Production volume, mln Euro		Portion, %	
	Germany	EU	Germany	EU
Materials for welding, surfacing, brazing, thermal spraying	549	2027	25.7	26.9
Gas for welding and cutting	544	1728	25.5	22.9
Adhesives	339	1860	15.9	24.7
Rivets	182	552	8.5	7.3
Control equipment	267	688	12.5	9.1
Occupational safety	56	230	2.6	3.1
Vent equipment	18	37	0.8	0.5
Education	179	417	8.5	5.5
Total	2135	7539	100	100

and services at absence of significant growth of production.

Quantitative volume of welding consumables consumption in EU by estimation of «The Japan Welding News for the World» made 530 thou t or 8.5 % of world consumption of welding consumables in 2013. Consumption of welding consumables reduced by 7 % in EU in 2012 and 2013 based on data of this publication. DVS notes 3 % decrease of production of welding consumables in Germany from 199.7 to 193.6 thou t [3, 5–7] in this period.

Structure of welding consumables consumption in EU included 56 % of solid and 20 % of flux-cored wires. Portion of these materials consumption continues growing, however, this process has become slower. Tables 5 and 6 provide data on volume and structure of consumption of main types of welding consumables in EU and in the world.

Main portion of production volume (more than 70 %) in the structure of production of equipment and JT systems in EU, based on DVS data, makes equipment and systems for welding, surfacing, cutting and brazing, including spare parts. Table 7 shows the data on production volume of equipment and JT system in EU and Ger-

Table 5. Volume of welding consumables consumption in the world and EU in 2013

Welding consumables	In the world		In the EU	
	thou t	%	thou t	%
Electrodes	2389.3	100	58.3	2.4
Flux-cored wire	863.7	100	106.0	12.3
Wire for SAW	706.2	100	68.9	9.8
Solid wire	2324.4	100	296.8	12.8
Total	6283.6	100	530.0	8.5

**Table 6.** Volume and structure of welding consumables consumption in the EU in 2011–2013

Welding consumables	2011		2012		2013	
	thou t	%	thou t	%	thou t	%
Electrodes	68	12	60	11	58	11
Flux-cored wire	108	19	105	19	106	20
Wire for SAW	75	13	77	14	69	13
Solid wire	319	56	308	56	297	56
Total	570	100	550	100	530	100

many in 2010 for main types of technologies accounting on the basis of costs.

In 2013 cost volume of production of equipment for welding and related technologies (brazing, surfacing, spraying, cutting) in Germany made 1663.8 mln Euro (considering production of spare parts 2430.4 mln Euro), and accounting on the basis of quantities it is 812,088 units. The largest portion, namely, 28 % in the cost structure of production of equipment for welding and related technologies is covered by expensive machines and apparatuses for resistance welding and 27 % in total go for equipment for plastics welding, cutting, laser and ultrasonic welding. At that, their portion is not great accounting on the basis of quantities and makes 1.8 and 5.8 %, respectively.

The largest portion in production of equipment for welding and related technologies in Germany accounting on the basis of quantities falls to arc welding – 56.8 % (461,536 units), from which equipment for automatic arc and plasma welding makes only 0.5 % (2369 units). At that portion of equipment for automatic arc and plasma welding accounting on the basis of costs makes 8 % and portion of other apparatuses for arc welding, including equipment for

MIG/MAG welding, is 12 %. Starting from 2010, the volume of production of automatic machines for arc welding increased from 336.5 to 464.7 mln Euro in 2013 or by 38 %.

Production volume of equipment for welding and related technologies in EU in 2013 can be evaluated on the level of 5 bln Euro and for JT is 10–11 bln Euro based on given above German statistical data and data of Table 7.

Equipment for arc and resistance welding dominate in all world markets, including EU market. Portion of EU in world consumption of welding equipment for arc and resistance welding accounting on the basis of quantities covers ~12 % of equipment for arc welding and ~22 % of equipment for resistance welding according to evaluation of «The Japan Welding News for the World». Portion of equipment for arc welding makes 93 % in the structure of consumption of these types of welding equipment in EU. Tables 8 and 9 provide data on consumption of equipment for arc and resistance welding in the world and EU for 2011 and 2012 accounting on the basis of quantities [8, 9].

The main manufacturers of equipment and accompanying goods and JT services in EU are Germany (as was mentioned above) and Italy,

Table 7. Volume of production of equipment and JT systems in Germany and EU in 2010

Joining technologies	Production volume, mln Euro		Portion, %	
	Germany*	EU**	Germany	EU
Welding, surfacing, brazing, cutting	1259	3732	47.3	47.0
Spare parts	535	2202	18.6	27.6
Adhesion bonding	309	548	10.7	7.0
Thermal spraying	17	59	0.6	0.7
Mechanical joining	89	279	3.1	3.5
Laser technologies	301***	301*	7.9	3.7
Robots/robotic systems	444	829	15.4	10.5
Total	2881	7951	100	100

* Data for 2011.
** Data for 2010.
*** Data were provided only by Germany.



Table 8. Portion of consumption of equipment for arc and resistance welding in the world and EU in 2012

Welding equipment	In the world		In the EU	
	thou un.	%	thou un.	%
Arc machines	1301.70	100	152.5	11.7
Resistance machines	53.85	100	11.7	21.7
Total	1355.55	100	164.2	12.1

Table 9. Portion of consumption of equipment for arc and resistance welding in the EU in 2011 and 2012

Welding equipment	2011		2012	
	thou un.	%	thou un.	%
Arc machines	150	93.2	152.5	92.9
Resistance machines	11	6.8	11.7	7.1
Total	161	100	164.2	100

Table 10. Volume of production of equipment and systems as well as accompanying goods and JT services in the EU in 2007 and 2010 (mln Euro)

Country	2007			2010		
	Equipment and systems	Accompanying goods and services	Total	Equipment and systems	Accompanying goods and services	Total
Germany	2500	2110	4660	2881	2135	5016
Italy	1170	1800	2970	876	880	1758
France	320	1510	1830	518	940	1458
Great Britain	160	1190	1350	213	541	754
Poland	97	169	266	–	–	–
Check Republic	–	–	–	76	51	127
Netherlands	29	382	411	27	228	255
Other EU countries	3224	5319	8543	3360	2765	6125
Total for EU	7500	12,480	19,980	7951	7539	15,490

which covers half of production volume and consumption of equipment and accompanying goods and JT services in Europe.

Germany is an indisputable leader of the European market. Only Germany succeeded in recovery of production volume of goods and JT market and intensifying their production during post-crisis period. Data, given in Table 10, allow evaluating regional structure of JT market in EU following from contribution of national economies of EU countries.

Germany and Italy are also the main EU manufacturers of equipment for welding, cutting and brazing. In sum these two countries produce 70 % of all welding equipment in EU (only Germany

produces around 43 %). Table 11 provides data on cost volume of production of equipment and systems for welding, cutting and brazing in series of EU countries in 2010.

Investigations, carried by DVS and EWF, showed the relevance of JT for EU economy. In 2010 a total added value, received as a result of JT application, made 65.1 bln Euro in EU for ~1.2 mln of work places. For comparison the total added value, received from JT in 2007 in Europe, was 86 bln Euro at more than 2 mln of work places [1].

Table 12 provides data on quantity of personnel working in the field of production of equipment and systems as well as accompanying goods

Table 11. Volume of production of equipment and systems for welding, brazing and cutting in the EU countries in 2010 (mln Euro)

Country	Equipment	Spare parts	Total
Germany	1259	535	1794
Italy	319	255	574
France	137	243	380
Great Britain	58	99	157
Check Republic	21	43	64
Other EU countries	1938	1028	2966
Total for EU	3732	2202	5934

Table 12. JT: Quantity of personnel involved in production for the EU and Germany in 2007 and 2010

Index	2007		2010	
	EU	Germany	EU	Germany
Quantity of personnel working in production of equipment and JT systems	55,000	15,000	45,000	18,332
Quantity of personnel working in production of accompanying goods and JT services	68,000	15,350	36,267	16,419
Total	12,3000	30,350	81,267	34,751

**Table 13.** JT application: Quantity of profession-engaged personnel in 2010

Country	Welders	Other professions*	Operators of welding robots	Involved in welding production, total	Other JT professions**	Involved in JT, total
Germany	156,146	19,611	82,570	258,327	74,157	332,484
France	51,068	11,357	26,052	88,477	14,751	103,228
Italy	112,829	19,667	23,806	156,302	54,785	211,087
Total for the EU	646,914	110,487	200,746	958,147	166,085	1,124,232

* Inspectors, NDT-inspectors, designers, researchers, instructors, planning engineers.
** Specialists on surfacing, brazing, cutting, thermal spraying etc.

and JT services in EU and Germany for 2007 and 2010.

Number of people working in the branches of industrial production, related with JT application, made 1.1. mln in EU. Table 13 includes data showing quantity of people engaged in welding production fields by their profession for Germany, Italy and France.

Economic crisis 2008 and 2009 had significant effect on European industry including for JT area, and revealed the necessity of its prompt updating. European Committee developed and adopted the plan of post-crisis recovery «Strategy 2020», which is based on new developed program of EU researches and innovations «Horizon 2020» for 2014–2020 with total financing volume 80 bln Euro. The aim of this framework research program is to increase the compatibility of Europe in global meaning, its economic rise and creation of new work places.

Development of progressive joining technologies was also referred to priority directions in scope of EU research and innovation program «Horizon 2020». Realizing the projects in given research direction provides for:

- 20 % reduction of consumption of expensive and critical materials;
- 30 % improvement of technical characteristics of products without increase of its final price;
- increase of automation level and reduction of production time in comparison with currently applied technologies [10].

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