Škoda electric engines for agriculture

Jiri CHMELENSKY

Dept. of Management, Masaryk Institute of Advanced Studies of Czech Technical University in Prague, Kolejni 2637/2a, 160 00 Prague 6, Czech Republic

j.chmelensky@gmail.com

Abstract. *This paper deals about electric mobile – article of electrification of agriculture. In 1924-1928 Škoda Electric factory Doudlevce produced electric motors of different sizes and outputs, which was based on pre-war trend of electrification with alternating current. Electric energy won in heavy competition of steam power, Diesel power and gas power. Electro mobiles were used for trashing machines, flour mills, brewing machines, and in classical agriculture too. Classical agriculture was based on horse power. Škoda Electrotechnic factory developed and produced six types of farmsteads sets – electro mobiles for agriculture. One stretcher (VN), two pushcarts (VK and VD) and three four wheels cart – light (VL), medium (VS) and heavy (VT). This poster is based on electro historical and electro actual expertise literature and Škoda archive materials, which are located at SOA Plzeň – Klášter and author´s practical terrain and museums research.*

Keywords

Skoda, electric, agriculture, engine.

1. Sources of research and methods

This poster article uses scientific methods of history of technics. First phase is forming research question and studying historical and up-to-date electro technic literature. After literature research phase and work with this literature, we can start researching archive materials. And finally, we can search for electro mobiles in museums and private collections.

The scientists question is: How did ETD participate in electrification process of traditional agricultural in Czechoslovakia? The poster is only an introduction of this problematics. To answer the question we have to study specialized literature. The most complex and the most important book comes from LIST. V.: *Elektrisace rolnictví*. [1] The oldest book about electrification of agriculture is by KŘIŽÍK. F.: *Elektřina ve službách rolnictví*.[2]

Actual work about agricultural electrification and comparation with other world is *Mýtus a realita hospodářské vyspělosti Československa by* Kol. A.[3] The necessary work for complicated process of electrification is the book by EFMERTOVÁ, M.: *Elektrotechnika v českých zemích a v Československu do poloviny 20. století*.[4] Archive materials can be found at SOA Plzeň – Klášter, at third department for factory archive materials. In the department, in former archive of original Škoda factory we can research fund of General direction (GŘ) and photography fund. At GŘ fund we can look for pricelists, catalogues and manuals for maintenance of electro mobiles and electric engines. The photography fund has about twenty photos of electric mobiles.

The agricultural electro mobile is a set of electric engine, the trigger and the switcher situated on a carriage. Electro mobile can be divided into stretchers, handcarts and four wheels carriages according to weight and construction. Electro mobile could have a cable reel and an electrometer of consumed electric energy. The electrical engines can be divided according the output in electric engines with short armature, armature rings and armature rings with diverter.

Fig. 1. The line with Škoda electric engines. From left to right: small engine with short armature, engine with armature rings and two engines with armature rings and diverters. Source: SOA Plzeň, SOA Plzeň – Klášter. Photography fund, photo n. 65-0950.

2. Electrification of Czechoslovak agriculture

The main idea was based on changes of traditional agricultural process with support of electrical energy. The power plants could distribute cheap electrical energy to traditional agricultural areas of Czechoslovakia. Electrical energy was changed in mechanical work by electrical engines on carriages. The electrical engines were used for

threshing machines, cutting machines, scrapping machines, grindstones machines, mills machines, straw blowing machines, and transport. Energy was transmitted by transmission belt.

The new kinds of mechanization changed traditional system of agriculture. The farmer did not have to use expensive work of animals and much more expensive work of people. He could use the new means of agricultural mechanization. He could experiment with steam engines, gas engines, or with Diesel engines. All the machines were expensive for a typical farmer and they needed very expensive infrastructure, or large stocks of fuel. But the alternating current opened a new way for practical use of electric engines in agriculture. The price of electric engine was lower, than that of Diesel engine, or much lower than steam engine. The electric engine did not need expensive service of machinist. The farmer could handle the electric engine himself. Electric mobiles had a lot of advantages: low price, relatively low weight, high mobility of all engines, easy handling, fire safety and universality.

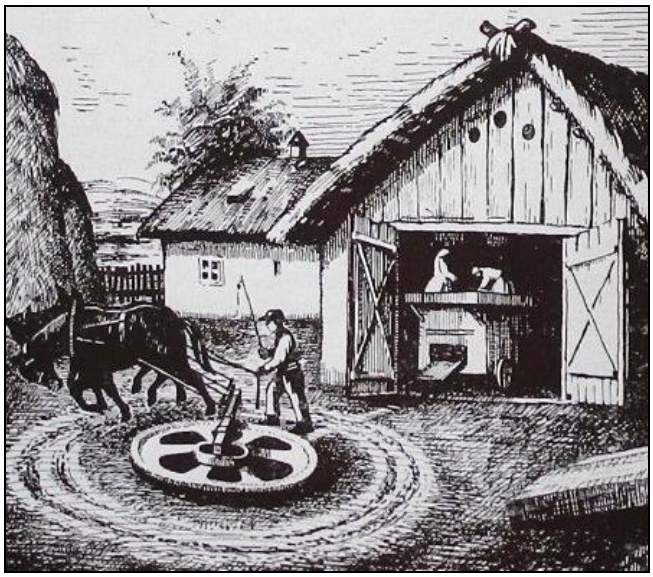

Fig. 2. Horse gin of trashing machine. Source: SOA Plzeň, SOA Plzeň – Klášter. Fund GŘ 520, box 2460. Hospodářské soupravy s elektromotory. GŘ SŽ, 1928, p. 12.

Necessary output of electric engine							
Land summary (ha)	5	8	12	25	50	125	250
Fields (ha)	3	4	6	15	30	80	175
Output in kW	**1,5**	**2,2**	**3,7**	**6**	**7,5**	**10**	**15**
Period of trashing process (hrs.)	80	80	80	100	100	130	180

Tab. 1. Necessary output of electric engine by Škoda factory. Source: SOA Plzeň, SOA Plzeň – Klášter. Fund GŘ 303, box 2354, p. 4.[4]

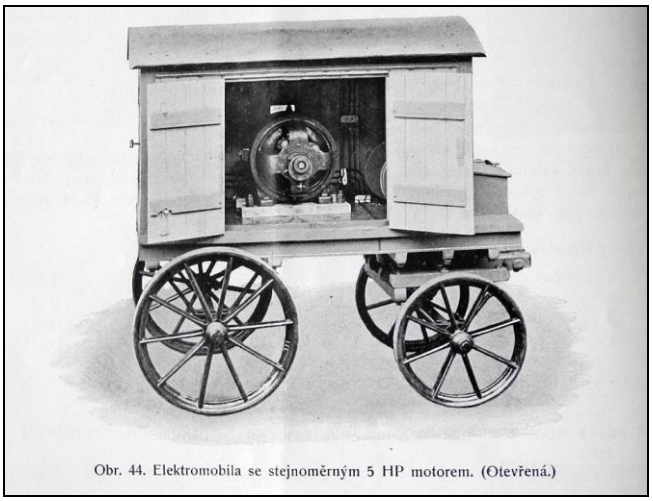

Fig. 3. Electric four wheeled carriage constructed by František Křižík with direct current engine with electric performance 5 HP (3.73 kW). Source: KŘIŽÍK, F.: *Elektřina ve službách rolnictví*. KŘIŽÍK, 1908, p. 26.

3. Skoda electric engines

Škoda ETD constructed and produced six types of electrical engines sets for agriculture – electric mobiles. A stretcher (VN), two types handcarts (VK and VD) and three types of four wheels carriages – light (VL), medium (VS) and heavy (VT). All carriages and pushcart type VD had wooden cases. The case protected electric engine against dust, typical for agricultural process. The set could have normal on/off switch, or switcher reverse, switcher with bridging of fuses for engines with short armature, or switching case with regulator star/triangle. The base trigger was type OTA (oil trigger), or a better roller type KT 1 Z. Special (extra paid) equipment were: electric cable winch, hand for electric counter, or other electric connection. Later, when factory Bartelmus–Donát was bought in 1927, the production of electric engines was transferred to Brno. After the ETD factory reorganization the new areas for specialized production of electric devices were opened.

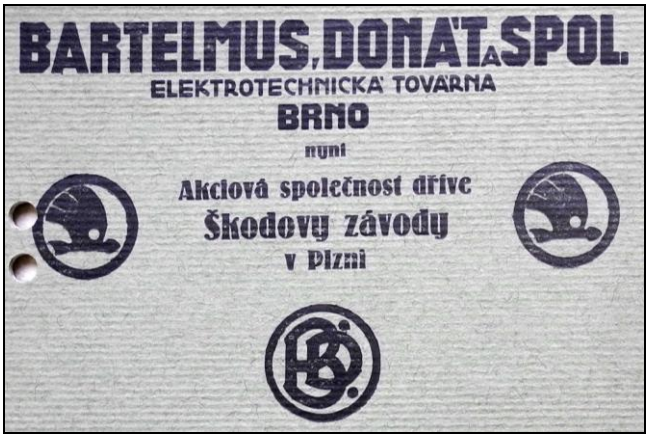

Fig. 4. Advertisement of Bartelmus–Donát factory. Source: SOA Plzeň, SOA Plzeň – Klášter. Fund GŘ 303, box 2354.

Electro mobiles ŠKODA						
Specification	Stretcher VN	Handcart VK	Two wheel chart VD	Light four wheel chart VL	Medium four wheel cart VS	Heavy four wheel cart VT
Output kW	1,5	2,2	4	7,5	11	22
Type of engine	SS 33 5K/4-0	SS 43 S/4-0	SS 63 S/4-0	SS 123 Z/4-0	SS 153 Z/4-0	SS 253 Z/4-0
Armature	Short armature	Ring armature	Ring armature	Ring armature with diverter	Ring armature with diverter	Ring armature with diverter
Price in Kčs	2985	4020	5030	8270	11655	18560 21880*

Tab. 2. Summary of electric mobiles ŠKODA. *Version with controler. Source: SOA Plzeň, SOA Plzeň – Klášter. Fund GŘ 520, box 2460. Hospodářské soupravy s elektromotory. GŘ SŽ, 1928, p. 13.

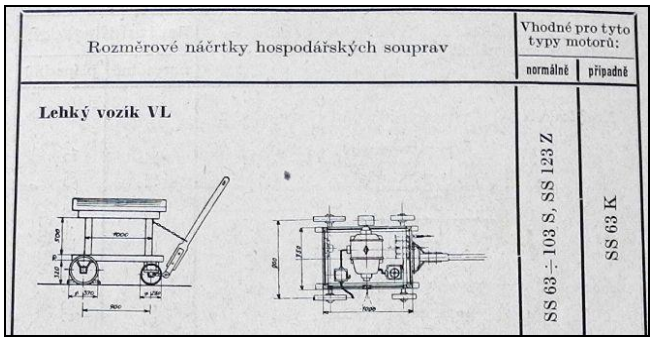

Fig. 5 Basic dimensions of Škoda small four wheeled cart type VL. Source: SOA Plzeň, SOA Plzeň – Klášter. Fund GŘ 520, box 2460, p. 16.

Fig. 6. Skoda four wheeled cart type VT during cutting of slaw. Source: SOA Plzeň, SOA Plzeň – Klášter. Photography fund, photo n. 65-0390.

4. Evaluation of electric engines and electric engines today

Skoda electric motors were usually used in Czechoslovakian agricultural industry till the end of 50th. Later there were developed and produced modern electrical engines of lower weight and higher electric effectivity. We can find such electric engines for agriculture in two institutes of museums character, in *The City small water power plant Museum* in Písek (district Písek) and in private *Museum of Old machines in Žamberk* (district Ústí nad Orlicí).

In Písek we can find two wooden handcarts type VK. First wooden handcart with complete wooden box can be found on electric engine type SS 6 S/4 with power performance 3 kW. Second wooden handcart type VK without wooden box can be found with the engine type SS 81 S/4 with electric performance 4 kW. In Žamberk there were preserved in excellent condition one Škoda wooden cart with electric engine type M6a S/4, with electric performance 3.0 kW. Second Skoda cart is original Bartelmus-Donát steel chart with electric engine Skoda type AN 6 S/6-0 with electric performance 3.3 kW. In a location in central Bohemia there is stored one Skoda wooden four wheel cart of light type VL with electric engine type SS 10 S/6 with electric performance 3.2 kW. In Žamberk there were preserved two handcarts ČMKD and two four wheeled carts Wikow. In authors' collection there is one handmade four wheel electric chart with electric engine Siemens with electric performance type DMR53N/4 with electric output 5.5 kW. That agricultural cart was homemade in 50th years past century. Originally it was equipped with Slavia Diesel Engine. This Siemens-Schuckert electric engine propelled trashing machine till the end of 70th of past century. Today this engine is used for circular saw and for a crab.

Review of found electric engines				
Localization	Produced by	Type of chart	Type of engine	Electric perf. of engine
Žamberk	Škoda	L	M6a S/4	3 kW
Žamberk	Bartelmus–Donát/Škoda	V II	AN 6 S/6-0	3,3 kW
Secret	Škoda	VL	SS 10 S/6	3,2 kW
Písek	Škoda	VK	SS 6 S/4	3 kW
Písek	Škoda	VK	SS 81 S/4	4 kW
Author´s collection	Siemens–Schuckert	Slavia Diesel	DMR53N/4	5,5 kW

Tab. 1. Summary information's about charts and electric engines. Source. Own research.

Fig. 7. Škoda handcart type VK with electric engine type SS 6 S/4 with electric performance 3.0 kW. Písek (distr. Písek). Foto J. Chmelensky, 2015.

Figure 8. Bartelmus–Donát four wheel cart type VII with electric engine Škoda type AN 6 S/6-0 with electric preformation 3.3 kW. Žamberk (distr. Ústí nad Orlicí). Foto J. Chmelensky, 2015.

Fig. 9. Škoda four wheel chart type VL with electric engine of type SS 10 S/6, with electric preformation 3.2 kW. Central Bohemia. Foto J. Chmelensky, 2015.

Fig. 10. Siemens–Schuckert electric engine of type DMR53N/4 wit electric preformation 5.5 kW. Own private collection. Foto J. Chmelensky, 2015.

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[3] Kol. A.: Mýtus a realita hospodářské vyspělosti Československa. Karolinum, 2000, p. 63-69.

[4] EFMERTOVA, C., M., Elektrotechnika v českých zemích a v Československu do poloviny 20. století. Libri, 1999.

[5] SOA Plzeň, SOA Plzeň – Klášter. Fund GŘ 520, box 2460.

[7] SOA Plzeň, SOA Plzeň – Klášter. Fund GŘ 303, box 2354.

About Author

Now he is employed as internal doctor student on Dept. of Management of The Masaryk Institute of Advanced Studies of Czech Technical University in Prague, he had studied History at Philosophical Faculty of Charles University in Prague and Building Preservation at Philosophical Faculty of Jan Evangelista Purkyne University in Usti nad Labem. He specializes at History of Science and Technics, Economics, Military History, World and Czech History 19th and 20th century, focussing on Škoda Factory in Plzeň.