

THE MOST IMPORTANT MACEDONIAN FOUNDRY COMPANIES

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Abstract: In this paper short review about the most important Macedonian foundry companies is given. During preparation of this work authors visited production units of the foundry companies and discussed with their management about the most important things concerning their current work and the plans for the future. It was found that six of the companies are the most important for Macedonian industry. All of them are private companies. They are founded before transition period, and their production is mainly intended for the foreign market. It is important to say that they have very ambitious plans for improvement of technological processes and increase of production.

REVIEW OF MACEDONIAN FOUNDRY COMPANIES



MZT LEARNICA AD :: Skopje

MZT Learnica A.D. Skopje is Stakeholder Company in private ownership. During its existence MZT Learnica A.D. Skopje has experienced several significant investments and transformations. In 1945 - MZT Learnica is founded as department in composite of MZT Tito. In 1970 - Significant reconstruction with new furnaces and Gisak semiautomatic moulding lines is performed in the foundry. From 1976 - MZT Learnica grows in independent legal subject. In 2006 new melting aggregates are installed, and was agreed and is in phase of realization new automatic moulding line as encircled technological manifold with new sand plant and shot blasting machine. Company manufacture castings from gray, ductile iron (90%) and nonferrous metals with fully encircled technological line; starting from manufacturing pattern equipment, core making, moulding, pouring, shot blasting, machining, coating, packing, and warehousing in own store for selling.

MZT Learnica A.D. Skopje has qualified labour force which is in system of continuous education for performing of following tasks:
Manufacturing of pattern foundry equipment from wood, plastics and metal;

Manufacturing of cores with CO₂ procedure and shell procedure;

Moulding on lines:

- 800x800x300 - automatic line SAVELI
- 1000x800x300x500; 1200x1000x300x500;
- 1600x1200x300x500; line KINKEL WAGNER.

Own plant for epoxy coating.

Own plant for classic painting.

Own plant for machining, lapping, milling, and shave.

Company poses 2 medium frequency induction furnaces with capacity of 5t/hour.

Own laboratory for mechanical testing, metallographic testing, testing of sand quality as well and chemical analyses of metal.

Chemical analyses of metal.

The most important products in MZT Learnica are: parts for machine industry, fittings (with flanges and pipes, with tyton junction, for plastic pipes, with flanges mobile and pipes for plastic pipes with flange mobile), decorative products, air valves and hydrants, sewage armour and parts by agreement. Some of their products are given in figure 1.

MZT Learnica A.D. pays special attention to the quality of the products fully respecting request of the customers, taking in mind satisfaction with product and business cooperation. In company say that development is their imperative, through which they secure competitiveness on market and company profitability, with inclusion of employees in the development of the same according their knowledge, experience.

Company in its working is fully oriented at continuous respect of customer requests and their satisfaction, continuous development which secures competitive product and company profitability including employees in company development according their competence, knowledge, training and experience. Choosing respective suppliers is additional guarantee for product quality.

Company offer various types of cooperation as follows: manufacturing of tools for pouring and castings, castings with your tool, machining, coating, transportation, etc.

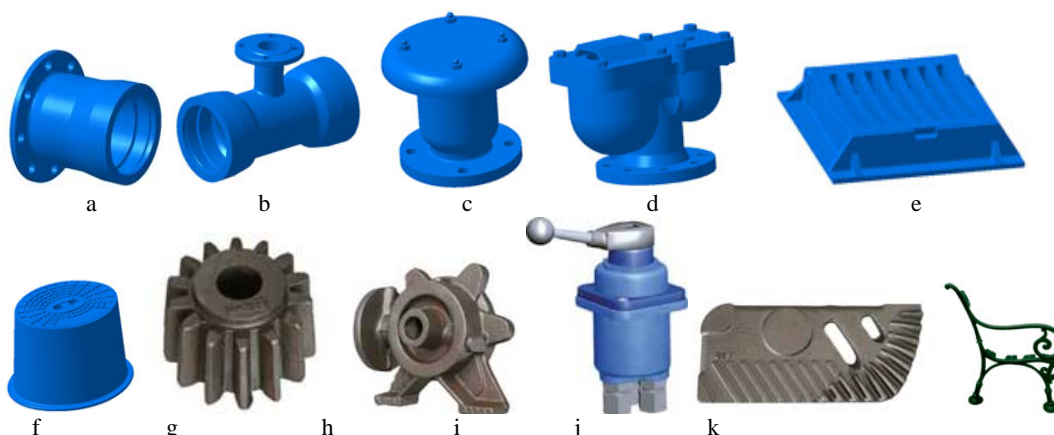


Figure 1 a. EU flanged and tyton socket pieces, b. MMA flange on tyton tee, c. VV air valve - single body, d. DVV automatic air valve with two balls, e. sewage greed and frame, f. pit hydrant cover - with elliptic opening, g. sprocket h. bearing case, i. direct brake, j. segment for steam boiler, k. bench side



ALUMINUM AND ZINC FOUNDRY

The aluminum and Zinc Foundry LLC – Resen produces high quality aluminum and zinc effluences by using a technology of high pressure casting. The company follows the production program of the factory producing heating items – Algreta, and also introduced new types of radiators that suit the worldwide quality standards and which can be used in the world’s largest heating systems, as is the example in Moscow and throughout Russia and Macedonia.

The factory is equipped with Italian machinery used for pressure foundry, heating chamber machines ranging from 20 to 180 t used for zinc casting effluences and cold chamber machines ranging from 180 to 1100 t also used for casting aluminium effluences. The metal melting is central but mostly the work is according to the wishes of the clients, with more types of aluminium alloys. Estimated number of employees is 74.

There is a special part in our Foundry equipped with a machinery park used for producing and processing of radiator parts where all of the radiator parts are cut, welded, examined and assembled.

The manufacturing process goes on without releasing the waste waters and other materials into the environment. The water is remanufactured inside the factory compound where it’s used again as clean technological water.

In the factory there is a paint shop section where the radiators are being painted with an electrostatic white paint RAL 9016.

Main products of the company besides three types of radiators are: hydraulics and pneumatics parts, automobile industry parts, electro industry parts, and miscellaneous parts (figure 2).

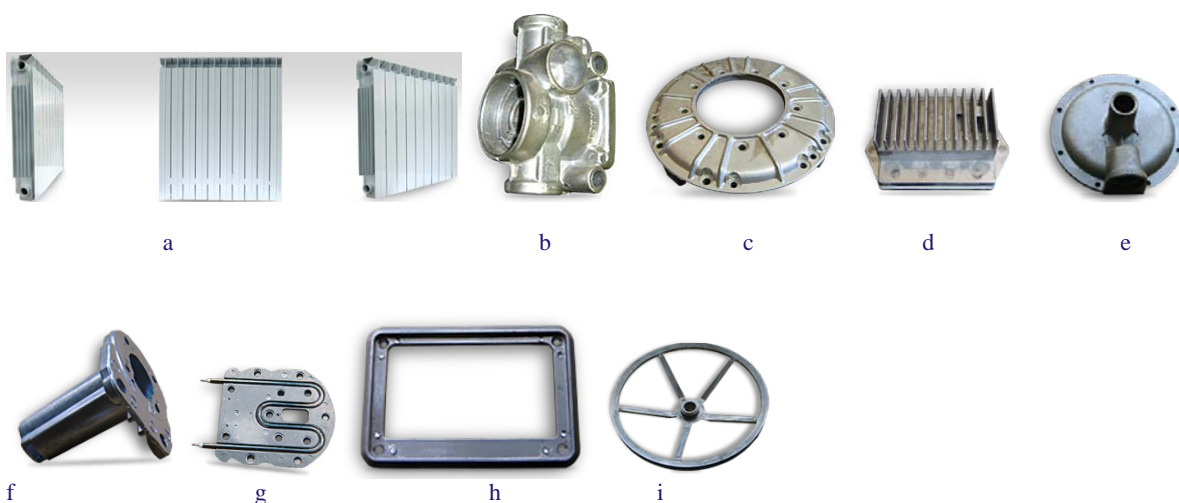


Figure 2 Different casting in Aluminum and Zinc Foundry LLC a. radiator, b and c. hydraulics and pneumatics parts, d and e. automobile industry parts, f and g. e; electro industry parts, h and i. miscellaneous parts.



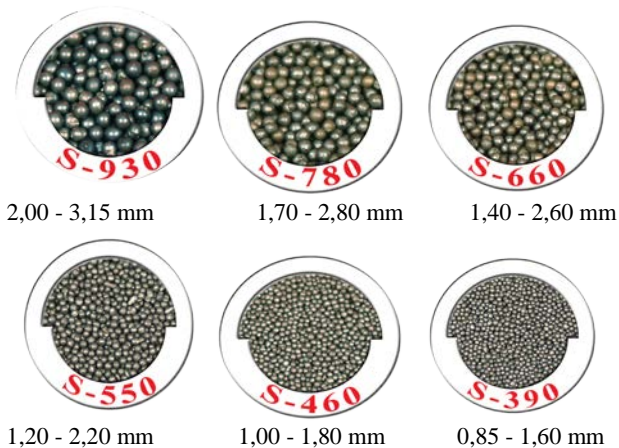
ZELEZNIK AD - MACEDONIA

Zeleznik AD is a private share holders company company for production and trade founded in 1970. Since its first products sold in the neighboring countries, today in more than 90% of Zeleznik production is export oriented. Company supply its long term business partners located in the countries of the European Union and also in the overseas countries.

Zeleznik AD is a company from the field of ferrous metallurgy which deals with production 1. Low carbon steel shots;

2. Various kinds of steel castins.

As can be seen from the figure 3 steel shots have different granulation, from 0,18 mm until 3,15 mm. Packing of steel shots is in 25 kg polypropilen bags on pallet of one tone.



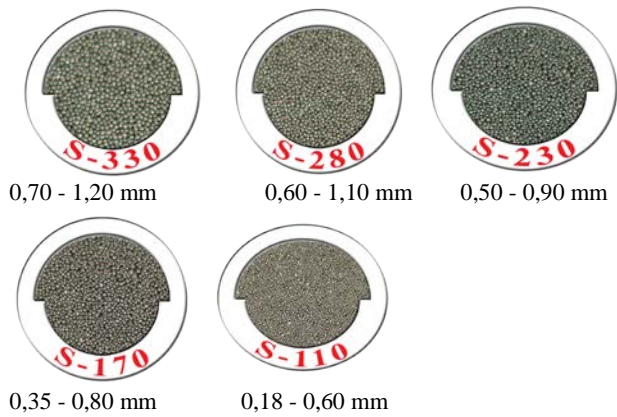


Figure 3 Different granulation of steel shots produced in Zeleznik AD

Some technical dates about steel shots are given below:

Chemical composition: C = approx. 0,10% - 0,15%, Si = approx. 0,10% - 0,15%, Mn = approx. 0,50% - 1,00%, P = max. 0,035%, S = max. 0,035%;

Period of durability: ERVIN TEST K50 = 2000 - 2500 cycles;

Hardness: HRc = 41 - 45; HV = 420 - 480;

Specific weight: 7,5kg/dm³;

Filling weight: 4,4kg/dm³;

Microstructure: Bainite / Martensite.

The most usual application of steel shot is given in the table 1.

Table 1. Application of steel shots in different sectors.

GENERAL APPLICATIONS		
PRODUCTION	PRODUCTS	PURPOSES
FOUNDRY	Iron and Steel Casting Product Non-Ferrous Casting Products	Desanding Deburring
STEEL WORKS & ROLLING MILL	Blooms and Billets Hot and Cold Rolled Products Drawn and Extruded Products Steel Tubes	Descaling
METALWORKING	Metal Construction & Shipbuilding Forging, Stamping, die-work Spring, gears, sundiers	Descaling Surface Preparation (Before painting coating, enamelling, galvanizing) Shot Peening
MISCELLANEOUS	Drums, Wagons, Site Equipment Graphite Electrodes Heavy Concrete Stone Dressing	Reconditioning

As can be seen from the figure 4 (a-c) different castings are produced in AD Zeleznik. These parts are mainly produced from manganese steel and are mainly used in three industry areas: quarries, steam power plants and building and construction.



Figure 4. Castings from Zeleznik AD for different industry sectors: a. quarry b. building and construction c. steam power plants.

For production of steel shots and castings, company posses three electro inductive furnmnces (2 tones each). Two of them are low frequency (500Hz) and one is medium frequency furnace (50 HZ). Maximal annual production is 2000 t castings and 8000 tone steel shots.



RZ Institute was formed and built in parallel with the foundation of RZ "Skopje". Its concept followed the needs of the former steelworks factory and wider. The institute started with its work in 1967. On December 05, 1997 the Institut undergone the process of transformation into the privately-owned establishment. Since February 2001, RZ Institute is fully private-owned facility. After privatisation of RZ Institut AD Skopje, the need of the economic efficiency arise, which led to the necessary improvements of the market competitive abilities. These were the reasons for the rehabilitation, modernisation, and re-assignment of the existent

technological lines and production processes. RZ Institut AD Skopje employs 56 permanent employees.

Nowadays RZ Institut is a shareholding company with the dominant activity of production of alloys from coloured metals (aluminium and copper) and non-metals. RZ Institute offers production of coloured metallurgy, metallurgy in production of the fire proof materials, as well as the production of industrial lime.

RZ Institute produce different types of Al alloys according EN standards (table 2) and desoxidation module, used in steel industry (table 3). Other alloys can be produced on the customers' demands.

Table 2 Aluminium alloys according EN standa produced in RZ Institut

aluminium alloys	Si	Fe	Cu	Mn	Mg	Zn	Cr	Ni	Pb	Sn	Ti	each	total
DIN225 EN AC-45000	5.0-7.0	1.0	3.0-5.0	0.2-0.65	0.55	2.0	0.15	0.35	0.3	0.15	0.2	0.05	0.35
DIN226 EN AC-46000	8.0-11.0	0.6-1.2	2.0-4.0	0.55	0.55	1.2	0.15	0.55	0.35	0.25	0.2	0.05	0.25
DIN230 EN AC-44300	10.5-13.5	0.45-1.0	0.1	0.55	0.55	0.1	/	/	/	/	0.2	0.05	0.25
DIN231 EN AC-47100	10.5-13.5	0.6-1.2	0.7-1.2	0.55	0.35	0.55	0.1	0.3	0.2	0.1	0.2	0.05	0.25
DIN233 EN AC-43200	9.0-11.0	0.65	0.35	0.55	0.2-0.45	0.35	/	0.15	0.1	/	0.2	0.05	0.15
DIN239 EN AC-43400	9.0-11.0	0.45-1.0	0.1	0.55	0.2-0.5	0.15	0.05	0.15	0.15	0.05	0.2	0.05	0.15

Table 3 Desoxidation module, used in steel industry

Element	Si	Fe	Cu	Zn	Pb	C	S	P
%	1-4	1-3	0.6-2	0.2	0.2	>0.1	>0.1	0.01

Mould and sand castings of aluminium is implemented in RZ Institut too. Mould casting is used for obtaining of ingots with dimensions 640x75x65, weight between 5.5 and 6.5 kg, packed on cast palletes from the same material, with dimensions 640x640x700, and weight between 600 and 650kg. Different forms on the customers demand (unique pieces or small series) are produced too. Casting in sand moulds is implemented for different single forms or small series (elements for sewerage and water systems, industrial systems: underground hydrants, ventile heads, fire hydrants, pipes and so on.

Production of copper alloys according to EN standards is performed too. The following copper alloys are mostly produced (according to EN standards): Rg-bronzes, tin-lead bronzes, tin bronzes and aluminum bronzes.

Casting of copper alloys implies mould casting of ingots with dimensions 640x75x65, weight between 13 and 15kg. Different

forms on the customers' demand (unique pieces or small series are produced too. Sand Moulds is performed for casting of cylinders from D=20 mm to D=200 mm and pipes from D=20 mm to D=200 mm. Different prophiles on customers' demands are produced too.

Casting of art sculptures out of bronze, brass and aluminium is implemented in current time. RZ Institut has an adequate equipment and trained personnel for creating art sculptures starting from vax model and finishing with casting in bronze, brass or aluminium.

Two aggregates are used for melting of aluminium (1,2 and 0,5 t) and two for melting of copper alloys (both of 0,5 t). All of them are heated by natural gas. Agregates for aluminium can be seen in the figure 5. One small inductive furnace (11 kg) is used for decorative casting.



Figure 5 Agregates for melting aluminium alloys ina RZ Institut



J.S.A. TEAL - Tetovo

J.S.A. TEAL - Tetovo was established in 1978 as a part of ALUMINA from Skopje. About ten years later in accordance with the Enterprise Law, in 1989, TEAL was registered as an independent company which became a Holding Company in 1991. In 1999, the German company RAKU from Obernburg - Germany became the dominant owner of TEAL possessing 53% of it. - Since 1978, TEAL is a company which satisfied the buyers needs for quality aluminium profiles. The mission of the Company is to overcome the expecting the clients and to become "Supplier of high quality aluminium profiles of hard and soft aluminium alloys". TEAL is export - oriented company. Over 90 % of the products are for the foreign markets like Serbia, Germany, Austria and Slovenia. The annual manufacturing capacity is about 2000 tons of final product, in three shifts.



Figure 6 Aluminium logs

The main activity of the holding company J.S.A. TEAL from Tetovo is the production of aluminium alloys and profiles. More concretely:

- Production of aluminium logs, blocks for deoxydation and alloys
- Production of pressed aluminium profiles, pipes, bars and construction profiles;

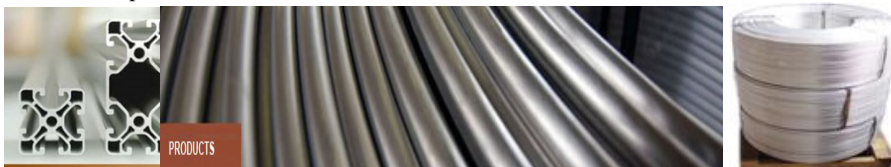


Figure 7 Final products in J.S.A. TEAL

The improvements in the foundry, where the melting and the foundering of the aluminium is done, are planned with the inclusion of the SNIF system (Spinning Nozzle Inert Flotation System). This is a refinement system which allows a better quality of the metal, reduced time of processing, reduced emissions and lower operation costs.

The inclusion of surface protection is an extra given value to the final product, and the same will be done through the use of the process of anodization, and later on through the initiation of a process for surface protection with dust painting.

Key production groups are:

The manufacturing process, implemented in TEAL, is actually an integrated manufacturing system, which starts with aluminium and some other elements like copper, silicon and magnesium. Aluminium as raw material in the manufacturing process is with the pureness of 99.7 % - 99,8%. The process ends with a final product - aluminium profile in different circle dimensions and shapes. Melting of row material is in two electro inductive furnaces (5,5 t each).

It means that the manufacturing process is divided into two main phases:

- Process of manufacturing aluminium alloys in shapes of logs and ingots, figure 6;
- Extrusion of logs into profiles with different circle dimension (figure 7), followed by heat treatment where necessary.

- Production of aluminium gallantry, aluminium brackets for electrical distribution network and similar products;
- Key production groups are: aluminium alloys in a shape of logs and ingots and aluminium profiles in different circle dimension. These products are later on used in the automobile industry, construction, airplane industry, machine industry and etc.

- Aluminium alloys in a shape of logs and ingots.
- Aluminium profiles in different circle dimension.

These products are later on used in the automobile industry, construction, airplane industry, machine industry and etc. The company also manufactures all kind of products made of aluminium profiles, like doors and windows and also products for industrial purposes, including aluminium brackets for electrical distribution network.

The most important categories in J.S.A. TEAL - Tetovo are: aluminium logs, blocs for deoxydation, aluminium alloys, aluminium profiles, pipes and bars and aluminium gallantry.



LTH Castings* LTH Learnica-Ohrid

LTH Learnica in Macedonia was founded in 1961 and joined the LTH Castings Group as the last member in 2005. Starting in the 60s as a supplier for the ex Yugoslav car industry, covering various part and material categories the company evolved to a structured and cost-efficient die-casting producer, based on the technical knowledge with favourable labour cost.

LTH Learnica is specialized for complex, high-quality high-pressure die-aluminium components and systems. Supplier of both high-tech and less complex parts manufactured by a network that is

spread across Central and South Europe (Slovenia, Croatia and Macedonia).

Highest-quality, innovative solutions and dedicated customer service sunder continuous improvement.

Core competences of the company are: die-casting of aluminium parts, tool design and manufacturing, processing of aluminium alloys:

- EN AC 46000 (AlSi9Cu3, Al226)
- EN AC 44300 (AlSi12, Al230)

- EN AC 47100 (AlSi12Cu, Al231)

Additional Service is heat treatment of aluminium parts.

The recently introduced in-house tool and mould production supports the LTH Castings Group tool demand and enables on the other hand the site to focus on manufacturing aluminium anti-vibration components, spools as well as some non-automotive electronic housing components. The site focuses on raw part production, labour intensive products and products with intensive and sensitive mould maintenance demand.

Core competences of the company are:

- Aluminium die-cast automotive components;
- In-house manufacturing of tools and devices;
- Development of products, tools and processes;

- One stop shop - from initial development to serial production;

- Simultaneous and resident engineering.

Strategic focus of the company is: quality first approach, Volume production with fully exploiting the labour cost advantages, focusing rough part with grinding, tapping and drilling possibilities, increasing share of parts demanding intensive tool maintenance, further development of tool shop, SE Europe proximity advantages (Romania, Turkey etc.), specialisation to selected product groups.

Key products of the LTH Learnica is: tool-making: die-cast tools, deburring tools sleeves.

Series production includes: anti vibration components safety systems castings (spools).

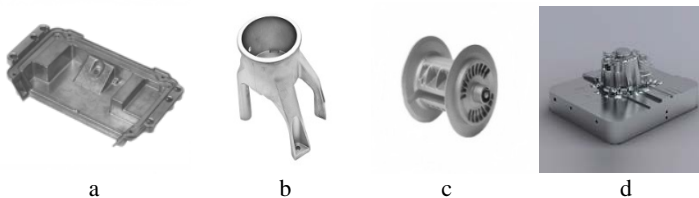


Figure 8 LTH Learnica products a. automobile part, b. anti vibration component, c. spool, d. tool making

There is four aggregates (furnaces) heated by natural for melting of aluminium alloys, figure 9. Fifteen casting machines are used for die casting of aluminium alloys in LTH Learnica.



Figure 9 Pouring of molten metal from the melting furnace, LTH Learnica

CONCLUSION

In this paper an overview of Macedonian foundry companies is given. In current time six companies play key role in Macedonian economy. All of them were separately presented. These companies were founded in the period of socialist society. They past very hard period of transition. Nowadays they are private companies with domestic or foreign owners. They have similar planes for the future to improve technological process, to employ high-quality personel (production and control), to increase production, to acquire new markets and to protect environment.

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