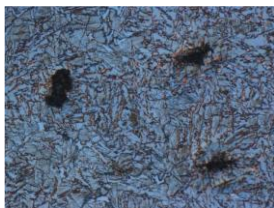
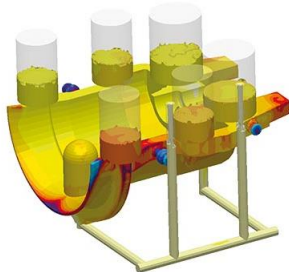
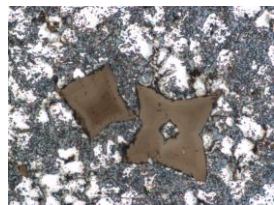




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<p>name of the Unit:</p> <p>DEPARTMENT OF MATERIALS ENGINEERING AND PRODUCTION SYSTEMS</p> <p>Faculty of Mechanical Engineering, Lodz University of Technology</p>		<p>symbol:</p> <p>K-14</p> <p>https://k14.p.lodz.pl/</p>
<p>head of the Unit:</p> <p>Prof. Tadeusz Pacyniak, PhD, DSc</p>	<p>potential promoters:</p> <p>Grzegorz Gumienny, PhD, DSc, Prof. of TUL Bogusław Pisarek, PhD, DSc, Prof. of TUL Tomasz Szymczak, PhD, DSc</p>	<p>contact person:</p> <p>Grzegorz Gumienny, PhD, DSc, Prof. of TUL phone: 42-631-22-04 grzegorz.gumienny@p.lodz.pl</p>
<p>scope of activities:</p> <p>The main areas of interest and research directions are the following issues falling within the general concept of Mechanical Engineering:</p> <ul style="list-style-type: none"> designing new materials based on Fe, Al, Cu, Mg and other metals, selection of materials for machine parts, development and improvement of technology (Lost Foam, Inmold, permanent mould casting, high pressure die casting (HPDC), lost wax process, etc.). 		
<p>present activities:</p> <p>We deal with the development of modern casting alloys based on iron, aluminium, copper, magnesium and others. We use the thermal and derivative analysis (TDA) method to study the crystallization process of alloys and to assess their quality. We develop environmentally friendly technologies of materials with high strength parameters. We build and implement quality control systems for casting alloys based on the analysis of the crystallization process, enabling the assessment of the alloy's quality before pouring the mould.</p> <p>We carry out numerical tests using the MAGMASOFT software, which allows us to improve the quality of castings, optimize process conditions, and reduce production costs. Using virtual experiment design and autonomous optimization methodology, proper process parameters and optimized gating systems can be established for all casting materials and processes, including heat treatment and melting metallurgy.</p> <p>We conduct reverse engineering research using a 3D scanner.</p> <p>We are ISO 9001 TÜV certified for laboratory tests using the TDA method.</p>		 
<p>future activities:</p> <p>Development of current and new, environmentally friendly foundry technologies as well as high-strength alloys with high resistance to abrasive and adhesive wear.</p>		



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[publications/patents, awards, projects:](#)

- Gumienny, G., Kurowska, B., Klimek, L. (2020). Aluminium in Compacted Graphite Iron, China Foundry. 17(2), 137–143.
- Szymczak, T., Gumienny, G., Klimek, L., Goły, M., Szymshal, J. & Pacyniak, T. (2020). Characteristics of Al-Si Alloys with High Melting Point Elements for High Pressure Die Casting. Materials, 13(21), 4861.
- Jankowski, J., Kołakowski, D., & Pisarek, B. (2020). Selection of the Technological Ceramic Layer Thickness in an HPDC Machine Plunger in the Aspect of its Strength. Advances in Science and Technology. Research Journal, 14(4).
- T. Szymczak, G. Gumienny, C. Rapijko, T. Pacyniak. Silumin for pressure die casting with additive of tungsten and vanadium Patent EP 3184659 A1.
- G. Gumienny, B. Kacprzyk. Compacted graphite iron with a matrix of ausferrite and carbides. Patent 232412.

We conduct the following research projects:

- “An innovative production line for the production of high pressure castings with significantly reduced porosity” - project financed by the European Regional Development Fund, Intelligent Development Operational Program, 01.2019-12.2021;

[keywords:](#)

casting alloys, crystallization, simulation of the solidification process, foundry technologies, reverse engineering

[list of internship proposal in this research team:](#)

- The possibility of internships in the production of machine and device parts.