The 109th European Study Group with Industry

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The 109th European Study Group with Industry (ESGI) took place from May 11th to May 15th, 2015, at the *Department of Production and Systems* of the *School of Engineering*, *University of Minho*. Among others, the event counted with the scientific support from the ALGORITMI (www.algoritmi.uminho.pt) and CMAT (www.cmat.uminho.pt) research centers. These ESGI meetings were created with the objective of renovating and reinforcing the links between Mathematics and Industry. More information on the study groups and related aspects is available at the International Study Groups website [2] and the European Consortium for Mathematics in Industry [1].

This particular meeting is part of the series of European Study Groups, where industries are requested to pose mathematical challenges to a set of experienced mathematical researchers. These researchers dedicate a full working week in providing a solution, or avenues to get a solution, to the posed challenges. We counted with the participation of several national experts, with a large experience in this type of events, to address six mathematical challenges submitted by local companies, but with a national and international impact, operating in the portuguese market and overseas.

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The posed challenges were: *Modelling and optimization of production scheduling*, where a textile company posed the challenge to model the full production operations; *Physical model of MDF boards*, where the challenge to provide a physical model of MDF boards was proposed; *Setting the Reserve Fleet*, where a public transportation company challenged the group to provide an optimal vehicles reserve fleet; *Surgical cases packages*, where an optimal set of surgical cases packages for use in surgical wards was to be obtained; *Prediction model to textile parameters*, where the combination of yarns and yarns types where to be obtained in order to get a textile with given properties; and *Optimization of a shoes injection moulding machine*, where the scheduling of an injection moulding machine was addressed.

To deal with such a wide set of challenges, mathematical subjects such as probability and statistics, operational research, optimization, differential equations, and finite element numerical methods were used.

A detailed report with the group achievements was delivered to the corresponding companies, where a solution for the challenge and/or avenues for future collaborations were proposed.

References

[1] ECMI European Consortium for Mathematics in Industry. Information service. http://www.ecmi-indmath.org.

[2] Mathematics in Industry. Information service. http://www.maths-in-industry.org.