

DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

The allocation of resources is one of the basic economic problems, which specifically concerns companies. Resources in the enterprise are a factor of a production which is the subject of rational management. Efficient utilization of such resources, which is affected by planning and scheduling, translates directly into profits. In order to manage the resources, it is necessary to analyze various plans and configurations and then to choose the best possible solution. However, due to the complexity of such process and significant number of potential options, intuitive methods are usually ineffective.

Advanced metaheuristic optimization methods do not have these drawbacks. Such methods involve intelligent search through the multidimensional space of possible solutions, whilst optimizing a defined criteria (such as minimize delay penalties, maximize utilization of machinery and vehicles) and ensuring that the operational constraints (such as precedence constraints or availability of resources at different times) are met. This represents significant benefits for the considered type of enterprises where number of criteria need to be optimized at the same time. However, metaheuristic optimization methods require mathematical models of the processes being optimized. Often the accuracy of existing models is insufficient when these models do not take into account such aspects as availability of resources, reduction in performance over time, periodic maintenance, changeover times or precedence constraints. This results from simplifications used in these models; some aspects of reality are either completely ignored in the models, or these aspects do not exist in the models at the same time.

Therefore, the main aim of this research project is development of new models that better reflect practical aspects of resource management and scheduling, taking into account actual requirements of real industrial enterprises. Using these models and operational research theories, practical and effective optimization algorithms for resource management in manufacturing and transport processes will be developed.

The scientific area covered by this project refers of a wide spectrum of models and methods for resource management optimization. The scientific part of the project includes a significant contribution to the development of management science and decision theory through the construction of the new models and advanced methods. Furthermore, the constructed new generic models and related methods will constitute a solid background for the future research on the development of optimization modules, which can be used in Enterprise Resource Planning systems to support decision-making in manufacturing and logistics-transportation companies, which translates to society benefits.