Hybridization of exact methods and metaheuristics for solving full truck load problems for ready-mixed concrete

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A medium-sized company in the concrete industry located in Upper Austria is facing the following problem when scheduling their daily operations: The company has several plants producing concrete and a heterogeneous fleet of vehicles for delivering the concrete to their customers' construction sites. The objective is to deliver the concrete to the customers' sites in a timely, but cost-effective manner.

Usually the ordered quantity of concrete exceeds the capacity of a single vehicle. Therefore several deliveries need to be scheduled in order to satisfy an order. These deliveries need to be scheduled such that they are non-overlapping and such that the gaps between consecutive deliveries are kept as small as possible. Certain vehicles are responsible for delivery of concrete only. Other vehicles might also be utilized for special unloading operations if required at the construction site. These vehicles need to remain at the construction site until all vehicles delivering concrete have finished unloading.

This talk will focus on a solution approach for the problem at hand which combines the advantages of exact methods, based on a network flow formulation with side constraints (see [1] and [2]), with those of metaheuristics (see [3]). The approach is capable of producing high quality solutions in a reasonable amount of time. The network flow formulation with side constraints can be solved comparatively easily as it involves a limited number of scheduling options for the unloading operations at a site, which have been generated by the embedded metaheuristic. Our preliminary results improved comparing solutions generated by variable neighbourhood search and simulated annealing approaches.

References

[1] Hoffman, K. and Durbin, M., The Dance of the Thirty Ton Trucks, to appear in: *Operations Research*

[2] Glover, F., et al. (1992), *Network Models in Optimization and their Applications in Practice*, John Wiley & Sons, Inc., New York

[3] Glover, F. and Kochenberger, G. A. (2003), *Handbook of Metaheuristics*, Kluwer Academic Publishers, Norwell