RAS – 2010 Problem Solving Competition

Related Literature and Further Reading

General Railway Planning and Operations Problems

In the general area of railroad planning and operations, Cordeau et al. (1998) presented a survey of optimization models for railroad operations particularly in the context of train routing and scheduling. Ahuja et al. (2005) formulated a locomotive scheduling problem (or locomotive assignment problem) to assign a set of locomotives to trains in a pre-planned train schedule so as to ensure sufficient power supply. Vaidyanathan et al. (2008) studied a locomotive routing problem that minimizes the cost for locomotive ownership and assignment over a railroad network. The fuel availability and service constraints are considered in an "aggregation-disaggregation" framework.

Problems Related to Fuel Cost Optimization (Airlines and Railway)

Stroup and Wollmer (1991) developed a linear programming model to minimize the total fuel cost for an airline flight schedule, subject to airplane capacity and supplier constraints. Zouein and Abillama (2002) proposed a multi-period capacitated inventory model that determines fueling schedule of each airplane along its predetermined route to minimize the overall fuel costs. Khullet at el (2007) studied a series of fueling schedule problems to find the optimal travel route that minimize fuel costs needed to travel from an origin to a destination, or to visit a set of predetermined points. Regarding fuel station selection, Kuby and Lim (2005) and Kuby (2005) presented a greedy algorithm and a mixed integer program to find the optimal location of refueling facilities that maximize the flow volume covered by the stations without running out of fuel. Later, Kuby and Lim (2007) extended their model by adding candidate facilities along network arcs, and Upchurch et al. (2009) extended this model for capacitated fuel stations. Lim and Kuby (2009) presented a heuristic algorithm that solve for the optimal refueling station locations to maximize the flow that can be refueled with a given number of facilities. Berman et al. (1992) developed a discretionary service facility model which determines the optimal location of facilities to maximize possible potential customer flow. Wang and Lin (2009) proposed a flow-based set covering model to locate vehicle refueling stations that minimizes the total facility cost while ensuring the passing vehicle always meet a fuel station before running out of fuel. In a forthcoming article, Nourbakhsh and Ouyang (2010) present a linear mixed-integer mathematical model that integrates not only fuel station location decisions but also locomotive fueling schedule decisions. The proposed model helps railroads decide which fuel stations to contract, and how each locomotive should purchase fuel along its predetermined shipment path, such that no locomotive runs out of fuel while the summation of fuel purchasing costs, shipment delay costs (due to fueling), and contracting charges is minimized.

Further Reading

Daskin (1995) provides an introduction to basic methodologies that may be useful for the facility selection aspects of the posed problem. Zipkin (2000) presents a complete treatment of the inventory control and production management aspects.

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