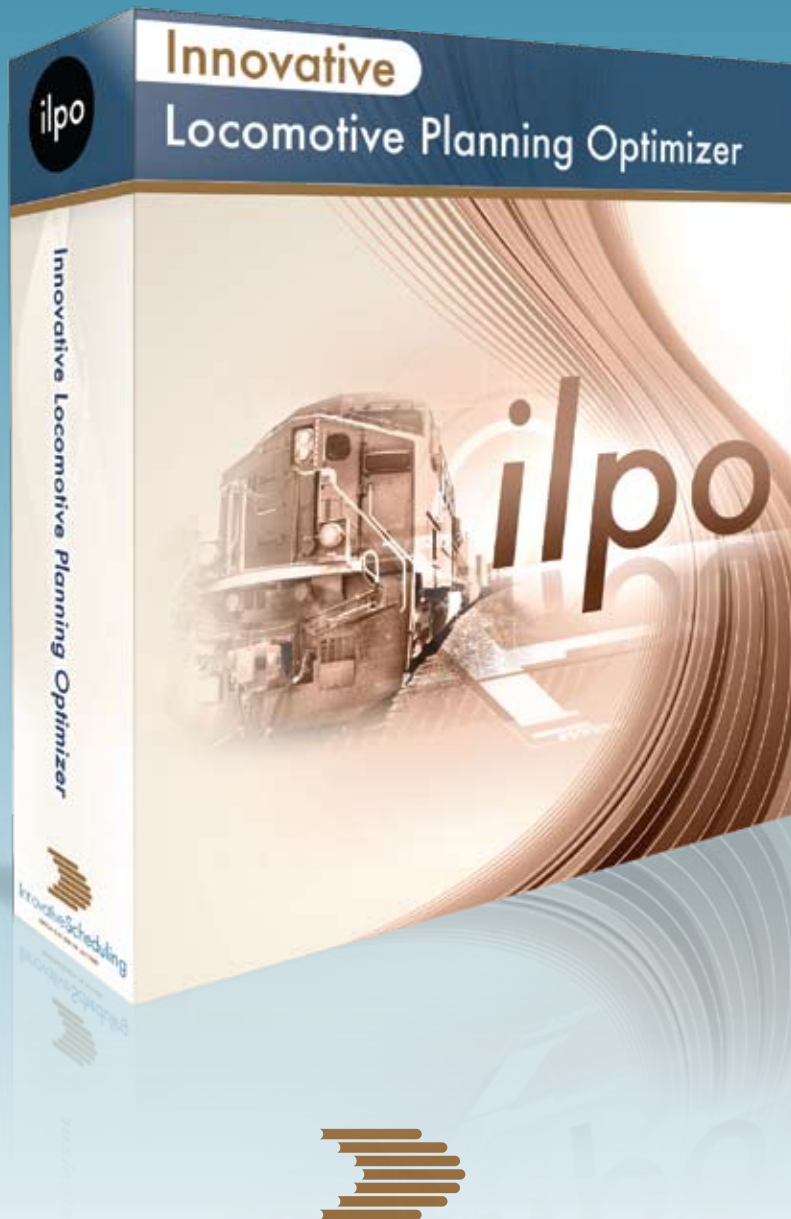


DETERMINE OPTIMAL LOCOMOTIVE ROUTING



Innovative Locomotive Planning Optimizer (ILPO) is an interactive, web-based decision support system that determines a locomotive operating plan for a given train schedule.

- ➔ Aid locomotive managers in developing/modifying locomotive operating plan
- ➔ Determine total fleet requirements to support a given train schedule
- ➔ Set policies regarding deadhead moves, light engine moves, and consist rules
- ➔ Set benchmarks for locomotive utilization and productivity statistics and aid in fleet sizing



Innovative Scheduling

OPTIMIZATION IN ACTION

INNOVATIVE LOCOMOTIVE PLANNING OPTIMIZER



INNOVATIVE LOCOMOTIVE PLANNING OPTIMIZER DETERMINES THE FOLLOWING:

- ➔ Consists of locomotives that actively pull each train
- ➔ Consists of locomotives that deadhead on each train
- ➔ Consists of locomotives that light travel over the network
- ➔ Train-to-train connections that ensure locomotive assignments are network optimal

A locomotive operating plan specifies which locomotive consists (sets) will pull each train and which consists will deadhead or light travel to obtain overall network-wide balance and cost efficiency. The locomotive plan serves as a blueprint to guide the day-to-day tactical assignment of locomotives to trains.

A locomotive plan must honor a variety of constraints: each train must get sufficient power to pull its load; the total locomotive demand is restricted to the available fleet; it must honor a variety of business rules; and it must produce a plan that is relatively simple to implement and can be repeated from week to week. ILPO models shop imbalances and run-through power to/from foreign railroads. It also examines the cost of active, deadhead, and light traveling locomotives and the cost of ownership.

MAJOR CONTRIBUTIONS. Locomotive planning is a large-scale mixed integer programming problem. Previous solutions could not be implemented, as those plans had unacceptable levels of consist busting or were too complex due to different plans on different days of the week. ILPO plans are simple and perform negligible consist bustings. ILPO is the only model that simultaneously assigns consists to trains and determines optimal locomotive routings.

CASE STUDIES. ILPO has been tested on the data provided by several large US freight railroads. It demonstrated savings of 3-5 percent in locomotive costs. In addition, the locomotive plan can be implemented, is simple, uses only a user-specified set of locomotive consists, minimizes deadheads, and is highly consistent from one day of the week to another.

FEATURES OF THE DECISION SUPPORT SYSTEM. ILPO is a web-based system that helps the user determine a clean-slate locomotive plan or incrementally change a given locomotive plan. The user can create several scenarios and compare any two scenarios. Powerful forms enable the user to drill down into any solution, and various reports and charts allow network-wide, terminal-wide, train-class wide, or locomotive-class wide analysis of any solution. ILPO also contains several web maps.



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