

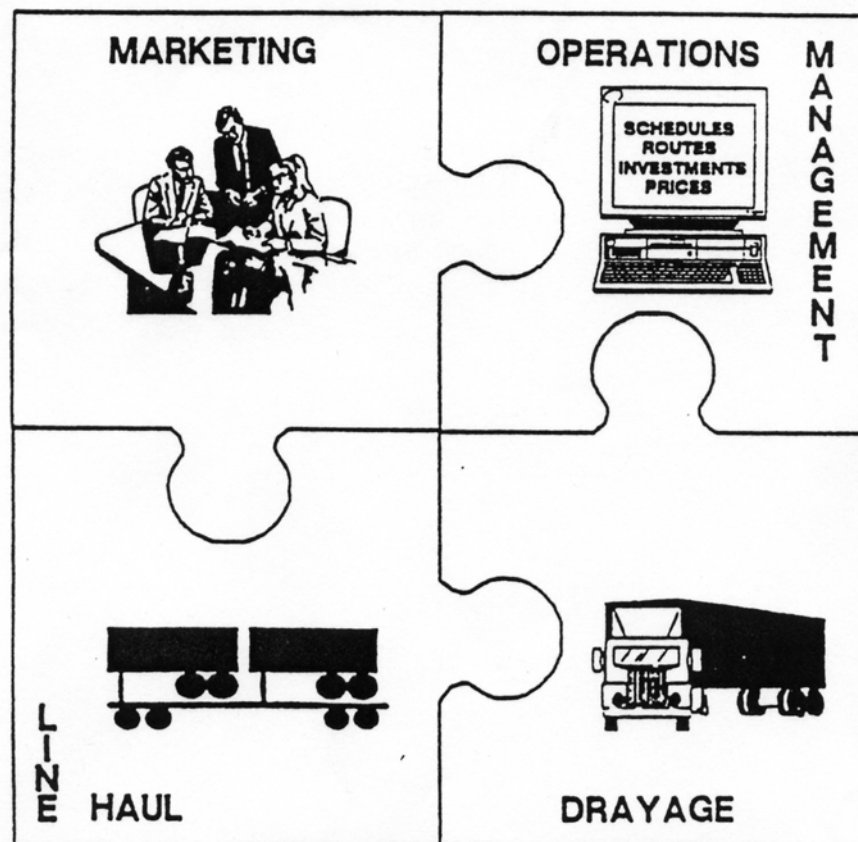


SUMMARY OF RESEARCH RESULTS IN UNIVERSITY OF PENNSYLVANIA STUDY ON REDUCING INTERMODAL DRAYAGE COSTS AND IMPROVING SERVICE QUALITY ON CONRAIL

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The purpose of this study is to identify and evaluate ways in which Conrail can reduce the high cost of trailer drayage in intermodal operations and also improve the quality of drayage service. Intermodal drayage is currently very costly, prior Conrail estimates indicating that payments for drayage can cost up to 40% of the total price paid by a shipper for door-to-door intermodal movements. By consuming such a large portion of intermodal revenue, it is a major factors inhibiting intermodal profitability and expansion of intermodal service.

This study of intermodal service was initiated with a research team from the University of Pennsylvania (Penn), led by Dr. Edward K. Morlok, UPS Foundation Professor of Transportation, assisted by advanced graduate students in the Systems (Engineering) graduate program (Susan F. Hallowell and Lazar N. Spasovic). This research is supported in part by Conrail, and in part by the U.S. Department of Transportation's Regional University Transportation Centers Program. The purpose of this DOT program is to enable universities to initiate transportation research with organizations that will use that research and to establish research partnerships which will ultimately continue on a self-supporting basis. There is one such center in each of the ten Federal Regions. Penn and five after transportation research universities in Federal Region III (encompassing the states of PA, DE, MD, WV, VA, and DC) have formed the Mid-Atlantic Universities Transportation Center in order to participate in this federal program.

The major questions in this research related to Conrail included the following:

1. What is the current cost of intermodal drayage?
2. How much could this cost be reduced and by what means?
3. Could the quality or level of service in drayage operations be improved?

The approach to answering these questions was to undertake a case study of drayage at a particular Conrail terminal. Discussions involving Messrs. Gordon Kuhn, John Sammon, and Ralph Von dem Hagen of Conrail, and the Penn team, led to the selection of the Morrisville terminal, because of its representativeness of intermodal operations and proximity to Penn and Conrail offices. Detailed data were gathered from diverse sources to describe the trailer movements for an eight-day period in February-March 1989. The data gathering process, an activity undertaken primarily by Mr. David Toth of Conrail under the general supervision of Mr. John Sammon, was an extremely complicated task involving merging of many data files, and much manual refinement of the data. These data on trailer flows were to be used for estimating current drayage system costs and for evaluating alternative drayage system designs. The focus of the case study was to be on domestic traffic only, since the drayage of UPS and US Postal Service traffic is normally handled by separate, dedicated drayage operations.

The conclusions reached from the research undertaken to date indicate that very substantial savings, of approximately 25% to 45% in drayage costs, can be achieved. The key factor is centralized drayage operations planning, wherein all domestic trailer movements for a terminal are planned as a whole instead of in the fragmented manner which characterizes the current operation. With the current system, the payments to

draymen for the case study trailer movements are estimated to have been between \$72,400 and \$78,600, depending upon the extent to which movements were under the stay-with or drop-and-pick rate structure. If the movements of all trailers and the underlying tractor movements had been centrally planned considering (1) the delivery of loads to consignees, (2) the pick up of loads from shippers and empties from consignees, and (3) the repositioning possibilities of empties, then the total tractor hours and tractor miles could be reduced substantially. This reduction would then translate into reduced payments to draymen. Using as a basis for such payments rates derived from the current stay-with rates and assuming that payment would have to be made for all tractor movements (including bobtails--ones with no trailer), we estimated that the total cost would be approximately \$45,000, for a saving of about \$30,000 or 40%. This represents a conservative estimate of potential savings, because in general draymen are engaged in other drayage activities and presumably could commingle other drayage with drayage of Conrail traffic so as to reduce bobtail movements. Various assumptions regarding the extent of this commingling would reduce total payments to as low as \$38,000. Considering all of the uncertainties involved, we conclude that it should be possible to reduce costs of drayage by approximately 30%.

Another major concern of the study was the quality of drayage service, and in particular the time delay from the moment when a trailer was delivered to Morrisville by rail to the moment when it was removed from the terminal by the drayman for delivery. This time averaged 2.3 days, with a standard deviation of 1.8 days. Approximately 98 of all trailers were delivered within four days, with 33 being delivered within one day.

Some analysis has begun of the effect of imposing level of service constraints that would require delivery of trailers within a specified time period after placement at Morrisville. Restricting delivery to occur within one day, two days, or three days of placement has been analyzed. Interestingly, tightening of service constraints does not significantly increase the number of tractor hours required for the trailer movements. The reason is that there is sufficient traffic in the Morrisville service area to permit matching virtually all requests for empties by shippers with empties made available by consignees and reassigning of tractors to productive work (instead of traveling without trailers) even with very restrictive time windows for movement. Furthermore, there is considerable flexibility in the timing of actual trailer movements in the centralized planning solutions obtained in our analysis, providing considerable latitude to meet specific customer preferences as to movement timing, without increasing tractor-miles or hours. However, the impact of imposing such service constraints on the dollar cost of the drayage operation cannot be ascertained at this time, as it is not known whether or not, to what extent, draymen would charge more for making deliveries within shorter time windows.

Thus the results of the study obtained to date are quite encouraging in terms of the potential for substantial reductions in the cost of drayage. Still remaining is the question of exactly how these savings can be achieved in practice. The issue arises not because of any doubt as to whether or not such an efficient drayage operation is physically realizable, but rather because of the complex institutional arrangements associated with Conrail's intermodal service. Intermodal retailers, not Conrail, actually deal with the shipper and consignee, and arrange for the rail transportation of the trailer by Conrail and also for the drayage at each end. There are over a dozen intermodal retailers and

approximately 50 drayage companies handling traffic through Morrisville alone. Each intermodal retailer operates independently, as does each drayage company, and thus arrangements by one for drayage may be very sub-optimal from the standpoint of the system as a whole. The gains alluded to above basically arise by virtue of bringing together information on all movements that have to be undertaken, and then optimally determining when each trailer should be moved, how it should be repositioned, and what the sequence of assignments for each tractor should be.

Many ways can be identified for achieving the savings resulting from the overall drayage operation, including various combinations of information sharing among intermodal retailers, consolidation of drayage operations, and centralized operations planning for the Conrail business of the various draymen, among others. (These are described in sketch form in the Appendix.) It may very well be, of course, that some of the gains resulting from more efficient operations will have to be shared with these other parties, and all of the potential gains may not be achievable under some plans. But with gains of the magnitude indicated above this could still lead to very substantial cost reductions for the entire intermodal operation.

The significance of this for intermodal profitability is substantial. Whatever cost savings are achieved and can be captured by Conrail would of course directly increase profitability. There are many strategies that could be used including:

- Maintain overall (door-to-door) rates and service at their current levels and simply apply the cost savings directly to profits.
- Selectively reduce rates where the additional revenue from additional traffic would more than offset the additional cost, increasing the profitability of the entire operation.
- Expand into new markets in which the cost savings make intermodal service competitive with trucking. Conceptually, this is represented in Figure 1 (next page) where the cost of drayage is the major component of the fixed (i.e., independent of length of haul) cost of intermodal service. By lowering this cost, as indicated in the figure, the minimum distance over which intermodal service is more attractive than truck is decreased. This opens up shorter haul markets which are characterized by higher traffic volumes, and thus could increase intermodal traffic substantially. The same concepts apply to service quality improvements in drayage, also enabling truck-competitive service in shorter traffic lanes.
- Offer higher quality service (e.g., guaranteed delivery) at premium rates. At the present time Conrail's trains operate very reliably, but overall intermodal service is perceived by shippers as much less reliable because of the vagaries of drayage. To the extent that drayage service is made more reliable, the overall service becomes more attractive and presumably higher rates could be charged. By virtue of retaining low drayage costs, the overall profitability is thus increased.

Of course, each of the options bears careful evaluation.

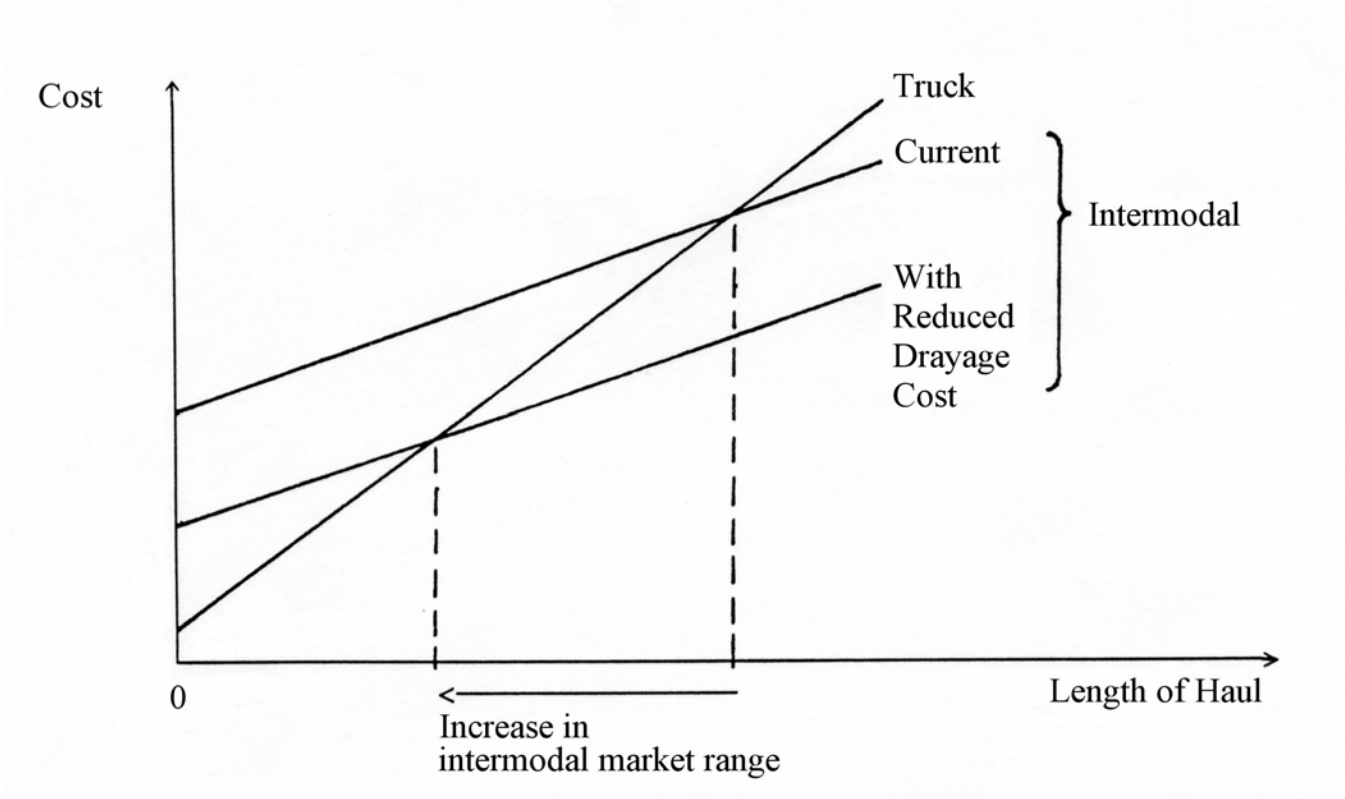
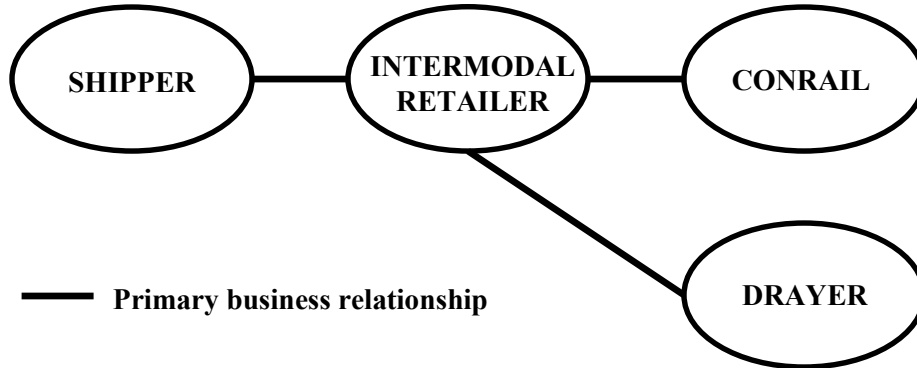


Figure 1. Cost vs. length of haul showing the reduction of breakeven distance between truck and intermodal services resulting from reduced drayage cost.

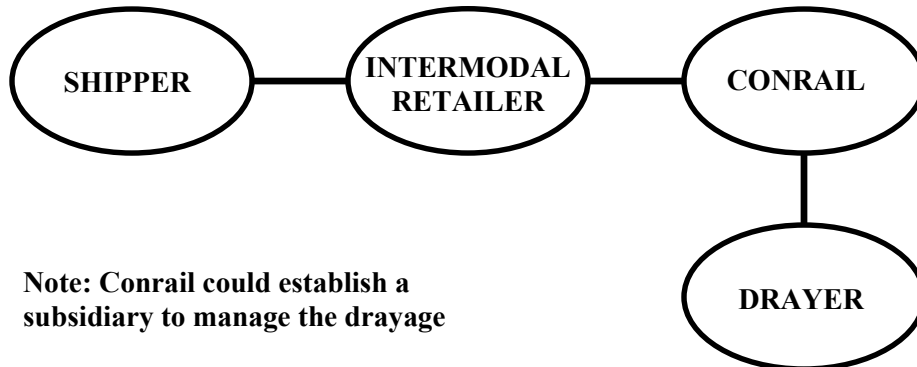
APPENDIX

Examples of Revised Organization of Intermodal System to Reduce Cost and Improve Service

Current Organization



Centralized Drayage Operations Planning



Partnership Between Conrail and Intermodal Retailers

