



Analysis and Comparison
for
Intermodal Transport Chains in European Markets:
Handling and Transport Techniques

elaborated by
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January 2010

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Executive Summary

Introduction:

- **Purpose and aim of this study:** To compare existing techniques for intermodal transport with regard to their environmental implications, the time and the possible cost expenses needed for new intermodal technology systems that are ready for market introduction.
- **Selection of technical systems that are ready for the market:** 1) RailRunner for bi-modal transport and 2) MODALOHR for semi-trailers without crane lifting re-enforcement.
- **Applied method:** The calculations are based on a typical intermodal train model that has been defined with the selected itinerary Hamburg (Germany) to Budapest (Hungary) and compares the carriage of the following intermodal unit load types: 45 ft. European (i.e. pallet-wide) container; 40 ft. ISO-container; 20 ft. tank container; swap bodies; semi-trailers and roll-on roll-off rail applications (RoLa). Selected transport systems are compared based on these different loading units.

Results:

- RailRunner shows very good environmental qualities as far as CO₂ emission and energy consumption is concerned. It also shows an excellent ratio of total weight to payload and advantages vis-à-vis existing technologies especially when using 45 ft. or 40 ft. containers or semi-trailers.
 - RailRunner has an effective ratio of payload and tare weight of 2:1 with 45 ft. Euro containers, while a T5 has a 1,1:1 ratio, a TWIN car has a 1,3:1 ratio.
 - With a 40 ft. ISO container, RailRunner has a ratio of 2,3:1 auf, a T5 car of 1,6:1, a TWIN of 1,2:1.
 - The specific design of the RailRunner chassis always allows for the optimum use of train capacity as the tare weight of the rolling stock remains relatively low. This is especially advantageous when using semi-trailers. The ratio is 2,9:1, T5 1:1, TWIN 1,2:1.
- The environmental efficiency of the RailRunner system, based on the comparison of CO₂ emissions and energy consumption, proves effective especially when compared to 45 ft. and 40 ft. containers and semi-trailers.
 - When transporting 45'containers, RailRunner's energy consumption and CO₂ emission range between 30 % und 43 % higher efficiency when compared to "standard" rail cars.

- With RailRunner, 40' ISO container can be transported saving up to 45 % of CO₂ emissions and in energy consumption when compared to T5 and T4.2 railcars; and up to 35 % when put in comparison to the TWIN / Mega II. As with the 45 ft. container, the available loading capacity per train can be used more efficiently.
- Since the RailRunner system also hauls trailers, the environmental savings increase to 44 % (T5) and 53 % (TWIN) in case of 100 % train capacity utilization.
- In our model calculation from Hamburg to Budapest the net operational transport cost per loading unit (unit cost) for a T5-unit train or an “Ultralow” RORO unit train (35 units per train) is EUR 894. The cost for a tractor with semi-trailer, without considering any toll, amounts to 781 EUR compared to a loading unit transported with a RailRunner unit train (47 units) of 652 EUR. The RailRunner transport cost are 16% lower than trucking and 27% lower than with a T5 unit train. As unit cost in trucking for various volumes always stays the same, rail cost vary according to the actual transported units, however between 35 to 47 units a fleet of trucks requires significantly higher cost.
- In the exemplary calculation of our train itinerary the labour cost per transported unit with the Railrunner system was 9.55 EUR while for the T5 12.69 EUR and with the ‘Ultralow’ 11.84 EUR had been calculated, - the latter explicitly without any driver accompanying the cargo.
- The new RailRunner technology has another advantage when it is compared to existing intermodal rail solutions, which is the high total amount of transport units that can be carried with one block train. This is especially relevant with 45 ft. and 40 ft. containers as well as semi-trailers. While a T5 wagon can handle up to 35 units per block train of the above mentioned loading units and a MEGA II up to 38 units, the RailRunner can handle 47 units of 45 ft. containers as well as semi-trailers up to a length of 13.6 meters. A block train carrying only 40 ft. containers can even carry up to 52 units!
- Another remarkable advantage of the RailRunner system is that it easily can be integrated into existing intermodal transport systems. RailRunner can be fully comprised in existing terminals, thus enlarging the overall terminal capacity. The costs are relatively small.
- The costs of an intermodal terminal in Europe can total 8 million or 10 million EUR, while the concept of Modalohr can cost as much as 3 million EUR (includes concrete loading area). Yet, RailRunner terminals with comparable capacities have an estimated budget of only 2 million EUR.
- The MODALOHR concept leads to a relatively high tare ratio, because the tractor for transporting semi-trailers is included in the rail transport unit, resulting in high energy consumption and emissions relatively to the net payload shipped and is therefore, less efficient when it is used for transports of the “Rollende Landstrasse”, a concept that includes the transportation of the towing vehicle on the flat wagon. But if e.g. a political program asks for the shift

of full truck + semi-trailer units from road to rail, offering funding for the intermodal system for environmental reasons, this system is workable. When it is used to transport only semi-trailers, Modalohr's environmental efficiency is comparable to that of a T5 car. Since the Modalohr wagon is rather expensive, it still needs a maximum capacity utilisation to be compatible to existing solutions such as T5 or MEGA II.

- The time needed for a single road to rail transfer of a unit load in an intermodal terminal is in average slightly higher when using new technologies (A crane move is 2.5 minutes per unit, Reach Stacker require 5 minutes and RailRunner and Modalohr between 3 and 4 minutes) But if the actual time needed for the transfer becomes part of the total transit and shipping time, both MODALOHR and RailRunner offer competitive solutions to conventional intermodal operations. However, both systems offer the possibility to simultaneously transferring several loading (4 to 5) units in parallel. Once this concept is realized, the actual transfer time needed will be much shorter than moves compared to conventional crane or reach stacker transfer.
- Regarding total cost, the MODALOHR concept carrying complete truck + trailer combinations cannot easily be economically compared to conventional container transport. Therefore, this technique can only be justified for specific transport situations, which are politically or socially requested and/or subsidised such as a particular mountain crossings or by passing traffic bottle-necks.
- Investment cost for presently used intermodal (IM) technologies range - depending on type of railcar used - between 2.2 to 3.1 million EUR per 700 m unit train. The Modalohr solution costs 7.5 Mio. EUR and for the comparable RoRo/RoLa "UltraLow" technique the investment would amount to 5.2 million EUR not including investments for trailers/chassis. The investment for a RailRunner unit train using comparable number of unit loads (35) as shipped with conventional IM railcars amounts to 2.9 million EUR which includes the required container chassis as part of the system. If the advantage of carrying more units 52 i/o 35 per train is considered the investment for RailRunner is 4.3 million EUR. When considering the latter case the costs of RailRunner are still fully competitive compared to existing intermodal techniques, because we calculated lower total operating costs, especially because of the reduced transfer cost, operational cost savings and better utilization of train slot capacity.
- Due to lower operating and significant lower terminal cost RailRunner is competitive when compared to existing intermodal transports even as the investment cost for a 35 unit are slightly higher.
- Both RailRunner and MODALHOR show specific advantages in situations where larger shipping volumes require transport into areas where there aren't any existing terminals.

- RailRunner is an especially interesting technology when transporting semi-trailers and on routes with higher cargo flows of containers using certain types of railcars. The transport towards Eastern European regions with their lack of an adequate terminal infrastructure should be a specifically advantageous market for RailRunner.
- RailRunner offers low terminal operating costs (equipment cost are about 200,000 EUR per start-up terminal capacity) and also reduced road and rail operating cost, because the road transport equipment is used more on rail than over the road than regular chassis or trailers and thus has lower tire and brake wear and can be depreciated over longer time periods. Some additional cost components are compensated by advantages and lower costs in rail operation (energy consumption, life cycle, etc.) and in overall systems costs (e.g. lower transfer costs).