PROPOSED LINE OF UNACCOMPANIED COMBINED TRANSPORT

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Abstract: The paper deals with the problems of the traffic of "huckepack" semi-trailers between the Czech Republic and Belgium. The main part of the paper resumes with analysis of a discharge of a new line in the Czech Republic followed by a part giving an account of the present-day status of the traffic between the CR and Belgium by means of road traffic and presenting two new projects - generation of a new transport line and the use of the company Bohemiakombi. The paper concludes with overall assesment and comparison of the proposed solutions.

Keywords: trailer, combined transport, line, Czech Republic, Belgium

INTRODUCTION

Currently, most transport takes place within Europe via road transport. Trend of its use is increasing, but due to the limited capacity of roads, increasing emphasis on ecology and tightening emission limits for road vehicles, it is necessary to look at continental new transport options. Here are gaining prominence unaccompanied combined transport, which is at a certain level of utilization of cost-effective and environmentally much more friendly. This section focuses on the possibilities of combined transport model example between the Czech Republic and Belgium. Are compared proposed variants of regular flights between Combined Transport (CT) Czech Republic and Belgium in two variants. The first alternative is the introduction of a new line a second option involves the use of existing lines operated by Bohemiakombi. (1)

Source: (2), edit author

Fig. 1 - Map showing the terminals of new line

1. INTRODUCTION OF NEW LINE

This proposal envisages the introduction of a new line between the Czech Republic and Belgium. Taking advantage of one of the rail operators and one inland terminal in the Czech Republic and Belgium. The proposed new route has the following criteria:

- Outlets in the Czech Republic - Lovosice,

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- Outlets in Belgium - Genk,
- Roundtrip - 5 times / week,
- Rail cars - Sdggmrss - T (Twin) - 3 sets.

For transportation to the new line to the carrier (in this case, the company that owns the road trailers enabling vertical transhipment) alone hiring railway cars and rail transport her to ensure the carrier. Utilization of this train depends only and only on the carrier, unless there is a train sufficiently engaged, the line loss if the train is busy enough, this line CT profitable. With this proposal, of course, related to the high fixed costs, which are elaborated below.
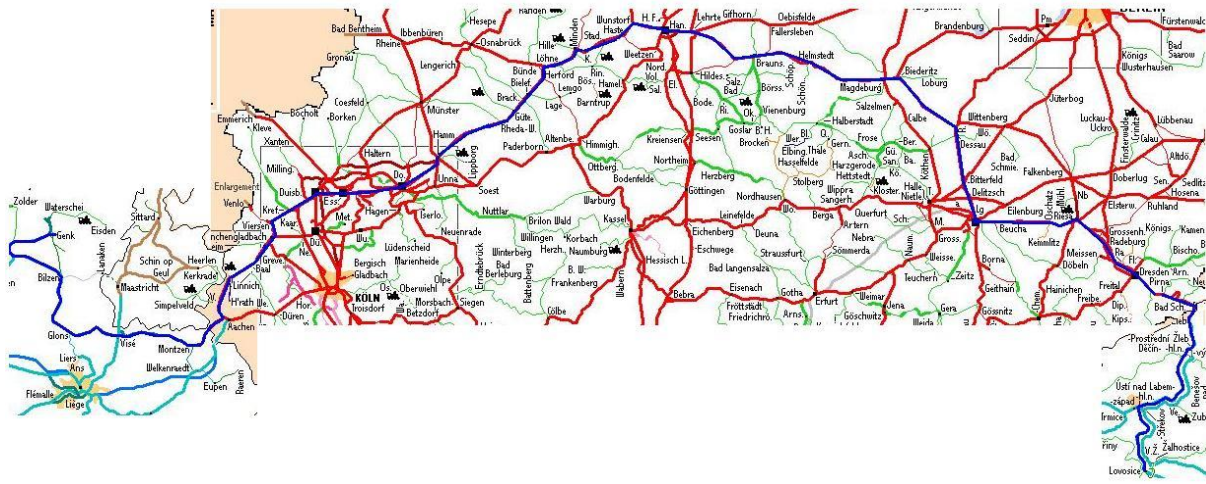

Source: (3)

Fig. 2 - Rail cars Sdggmrss - T (Twin)

The best option technological process for this proposal is that the saddle "Huckepack" semi ran in the so-called "wheel" - it is a turnover between points A and B. In practice, this means that the loaded poppet "Huckepack" trailer is brought from the terminal in Lovosice to customers in the Czech Republic, he lays it again and again loaded a trailer. This is obviously beneficial even for customers in Belgium, as the semi-run 100% busy and do not have a blank drive. These re-loaded trailers are always then transported to the terminal and a transfer to a train to take over.

More often, however, the option will be where the customer in the Czech Republic or Belgium is parked empty trailer that is loaded, transported to the terminal, here is translated to train, that it will take over in the second semi-terminal is unloaded from the train and distributing shipped to the customer the destination, that it lays out a trailer is then freely available for further loading, which usually takes place at another customer and so it is necessary to transport the trailer and unloaded (empty) ride to another loading.

For these wagons loaded semi-trailer is necessary to apply clearance profile C400 (important number 400 is identical to the code number to track semitrailer indicating navigable width of 2.6 m). The route with the clearance profile is conducted from Lovosice in Bad Schandau, then to Dresden, then to Leipzig and then to Hanover, from where the train is headed to Aachen (western border) and then in Genk (Figure 3).

For this transport are selected wagons Sdggmrss - T (Twin). For typed roundtrip 5 times/week (ie 5 routes from the Czech Republic to Belgium and 5 routes from Belgium to the Czech Republic) are needed 3 sets of cars. Limit maximum length is 610 m, the weight limit is either 1600 t, 1800 t, this weight is calculated as gross vehicle weight - the weight of the load and the weight of the trailer, without the weight of the locomotive. This is the basis that one set can be used pocket 17 cars Sdggmrss - T (Twin). Maximum weight allowed (ie 1600 t or 1800 t) is always determined by contract, it follows that it cannot be changed for each shipment, i.e. for each departure. On this vehicle can accommodate 2 units, it means that the full train 34 may be loaded trailers. (4)

Source: (5)

Fig. 2 - Route Lovosice - Genk for rail transport

The total distance traveled by the train on this route is 874 km (800 km is conducted as a limiting distance for use Combined Transport).

Pricing for these large contracts is a matter of several months each trade negotiations and trade secrets, therefore, the authors describe the main track of the prices to complement the approximate calculations by CD Logistik.

The default parameter is the price for traction, she is currently 13 110 EUR for one way for one train (depending on the allowed weight etc..). Another item is the leasing of railway wagons, where the sum is taken as the car rental for a day, rail cars Sdggmrss - T hires firm such as AAE. The big problem with renting these cars is their lack throughout Europe and therefore must be ordered well in advance (usually six months). We must not forget the fact that the price for traction and leasing of railway wagons are fixed items, it means that we pay even when driving an empty car. The following items are variable and depend on the quantity of trailers. Another necessary item that is needed to pay the fee for handling the trailer in the initial and terminal devices, these manipulations are in the tens of euros. An integral part of these charges is the agency fee to the bill of lading, then charge for the carriage of dangerous goods (up to tens of EUR 1 semi 1 ride according to the type of goods) and, if necessary amount for other tasks in addition.

Approximate calculations from CD Logistics is the following:

- import - 13 150 EUR / train / direction,
- car rental - 2 500 EUR / train / direction.

This calculation, however, not included in the terminals handling and other fees in addition to the shipper. On the contrary, it is included in the consignment note.

Duration of the transport itself takes approximately 24 hours, but it depends on the agreed weight limit at the higher weight train than 1600 t is the transport time will extend by about 3-4 hours. This value must be added the further turnover time and time for collection and distribution of a trailer residence time in the terminal. (6)

2. THE USE OF COMBINED TRANSPORT LINES WITH CORPORATION BOHEMIAKOMBI

Bohemiakombi Company, Ltd. currently operates several intermodal lines for transport of tank containers, swap bodies and saddle "Huckepack" trailers. These lines lead from Paskova Lovosic to and from Lovosice to the terminal in Duisburg or terminal Hamburg Billwerder.

To solve this problem would be to use the hotline between the strip and Lovosice and forth between Lovosice and Duisburg.

This carriage collection saddle again uses "Huckepack" trailers in the Czech Republic to the terminal in Lovosice from where they are transported intermodal unit, operated by Bohemiakombi, to the terminal in Duisburg. Duisburg continues distribution in Belgium.

The collection, respectively. distribution, semi-trailers to / from the terminal in Lovosice can Moravia and Silesia use national combined transport line company Bohemiakombi between the strip and Lovosice. In this collection would be to use technology group train, but given the length of transit time and greater clarity, the author does not consider these cartage and is dedicated to transportation only between terminal Lovosice and terminal in Duisburg.

Collection and distribution in the Czech Republic and in Duisburg, again, was conducted with the greatest emphasis on the efficient use of road transport. The route of transmission is de facto identical to the previous route. Clearance profile on this line is for saddle "Huckepack" semi-C400 and again taken from Lovosic in Bad Schandau, then to Dresden, Leipzig, Hannover through to Duisburg.

Source: (5)

Fig. 3 - Structure Profile of the route between Lovosice and Genk

The total distance traveled on the Lovosice - Duisburg is 780 km. In this case the price for transporting a trailer determined by Bohemiakombi, but important role in the price plays a price negotiation, which is always a trade secret between the operator, the rail carrier and the customer. The final price of transport is the result of several months of negotiations.

The average price for transporting a trailer between Lovosice and Duisburg is between 430-450 euros. In this price are included handling trailer in the initial and terminal end and agency fees. Because it is a transportation provided by the other company, they are always set in the contract penalty for canceled transport. The amount of the penalty is usually depends of how early was appointed service is canceled. If this is the abolition of the minimum advance, approaching the amount of the payment is often 100% of the cost for shipping. (7)

Transport time in this case can be determined from timetables Bohemiakombi. It is important to be careful in determining the net transit time because of the timetables states "end loading" and "unloading end."

The time from completion of loading is necessary to add 30 minutes to dispatch a train from the time of its completion, it is necessary to subtract about one hour. This reasoning implies that the approximate time of shipment between Lovosice and Duisburg is 15.5 hours, but the real transport time from the end of loading after its completion is 17 hours.

Comparison of the two options proposed shipment is made by comparing the price of a semi-trailer transported, are then further evaluated as well as other aspects (advantages and disadvantages) of the various proposals such as environmental friendliness, transportation time, etc.

3. THE NEW LINE OF UNACCOMPANIED COMBINED TRANSPORT

The basic element is the cost of transport by rail, then the price for the collection, respectively. distribution in the Czech Republic and Belgium. These prices calculated for the one kilometer, respectively one trailer transported by railway transport, and then determines the total cost for transporting a trailer. (6)

The price for transport by rail is composed of several parts and is calculated for one ride in one direction for 17 railcars that will take over 34 trailers, i.e. for fully occupied train between Lovosice and Genk (7):

- price traction (max. length train 610 m, max weight 1600 t) - 13110 EUR,
- price for renting one railcar - € 140;
- price for 1 handling trailer (1 x CR, 1 x Belgium) - 2 x 20 EUR,
- price for the agency fee - 30 EUR.

Total price for transport is given by equation (1):

$$C_C = C_{tr} + 17 \times C_{žv} + n_{náv} \times C_{man} + C_{ap} \quad [EUR/train] \tag{1}$$

where: C_c…the total price for one ride in one direction for one train,

C_{tr}…price traction,

$C_{žv}$…the price for the rental of the trailer,

$n_{náv}$…the quantity of semi-trailers,

C_{man}…the price for handling 1 trailer,

C_{ap}…price for an agency fee.

Substituting the values into Equation (1) is the result of the total price of the carriage 1 train in one direction:

$$C_C = 13110 + 17 \times 140 + 34 \times (2 \times 20) + 30 = 16880 \, EUR/train$$

The next step is to calculate the total cost of transporting one trailer, which is given by equation (2):

$$C_n = \frac{C_c}{n_{náv}} \quad [EUR/truck] \tag{2}$$

where: C_n…the total price of the carriage 1 trailer.

From equation (2) substituting the values we get for the price of one transport trailer:

$$C_n = \frac{16880}{34} = 497,67 \, EUR/trailer$$

In total fare on this combined transport line must include the price for the collection and distribution in the Czech Republic and Belgium. Price for collection and distribution is usually calculated in turnover when the trailer for the export driven from the sender and imported into the terminal and here is another semi-dry-off of import and it is brought to the intended recipient.

Calculated distance for the collection and distribution in the Czech Republic and Belgium authors identified 150 km (the positions of terminals in the respective countries).

Calculation for the collection, resp. distribution in the Czech Republic is based on the taxes for the operation of vehicles per day, which currently ranges usually around 8000 CZK.

Working time vehicle sales 2 x 150 km is approximately ½ day, so the cost of this transportation is 4000 CZK. From this information shows that Refuse a trailer needs ¼ day and travels a distance of 150 km at a cost of CZK 2000.

The price per kilometer calculated from equation (3):

$$C_{km} = \frac{C_{př}}{s} \quad [CZK, EUR \, / \, km] \tag{3}$$

where: C_{km}… price per kilometer,

$C_{př}$…price of transport,

s…the distance traveled.

When substituted into equation (3) the value of the previous text, the result will be the price per kilometer for the collection, resp. distribution, the Czech Republic:

$$C_{km} = \frac{2000}{150} = 13{,}33 \, CZK/km.$$

This value should be converted to Euro. As at 10 Mai 2015 was published by the Czech National Bank exchange rate of 27.405 CZK / 1 EUR. The conversion is expressed in equation (4):

$$C_{EUR} = \frac{C_{km}}{kurz} \quad [EUR/km] \tag{4}$$

After dividing the value we get 0.547 EUR / km.

You also need to determine the cost for waste collection, respectively. Delivery in Belgium. Currently, the going rate for domestic transport in Belgium around 36 CZK / km. After using equation (4) we get the price of EUR 1.316 per kilometer.

Total price C_{kp} for transport will be calculated according to the mileage rate per kilometer for the collection and distribution and transportation cost of a semi-trailer through rail transport:

- Road Transport of the Czech Republic - 150 km at a rate of 0.547 EUR / km,
- Railway transport - € 496.47,
- Road transport Belgium - 150 km at a rate of 1.48 EUR / km.

However, this price is calculated based on 100% capacity utilization of the train. In real situations, it is reasonable to consider as a normal train capacity utilization of 60%, but because EWALS Cargo Care Ltd. has a large number of partners, especially in road transport, it could provide spare capacity to other road hauliers. For this reason, the authors reported calculations of the total price for shipping in the use of train capacity by 60%, from 70% to 80%.

The author calculated the rates for transporting a trailer from equation (1) and (2) and the collection and distribution of thought as well as in the calculation of 100% capacity utilization.

For 60% capacity utilization:

From equation (1) where it is necessary to adjust the amount of variable costs, i.e. the amount of trailers and associated handling and reduction of agency fee EUR 20, we calculate:

$$C_C = 13110 + 17 \times 140 + 20 \times (2 \times 20) + 20 = 16310 \, EUR/1 train.$$

Further, from equation (2):

$$C_n = \frac{16310}{20} = 815{,}5 \, EUR/1 trailer$$

is calculated by the total price of transporting a trailer using rail transport. This price is substituted into the following equation.

$$C_{KP} = 150 \times 0,547 + 815,5 + 150 \times 1,48 = 1119,55 \ EUR/1 trailer$$

For 70% capacity utilization:

The calculation is performed in the same way, from (1) and (2) is found to be the total price for one trailer and then again summed up with the cost for collection and distribution.

$$C_C = 13110 + 17 \times 140 + 24 \times (2 \times 20) + 20 = 16470 \ EUR/1train$$

$$C_n = \frac{16470}{24} = 686,25 \ EUR/1 trailer$$

$$C_{KP} = 150 \times 0,547 + 686,25 + 150 \times 1,48 = 990,30 \ EUR/1 trailer$$

For 80% capacity utilization:

The calculation is performed again in the same way, from (1) and (2) is found to be the total price for one trailer and then again summed up with the cost for collection and distribution. The agency fee is at 80% capacity utilization for 25 euros.

$$C_C = 13110 + 17 \times 140 + 27 \times (2 \times 20) + 25 = 16595 \ EUR/1train$$

$$C_n = \frac{16595}{27} = 614,63 \ EUR/1 trailer$$

$$C_{KP} = 150 \times 0,547 + 614,63 + 150 \times 1,48 = 918,68 \ EUR/1 trailer$$

4. THE LINE FROM BOHEMIAKOMBI

Calculation of rates for such transportation is somewhat easier than with the new line, as the price for a trailer transported is determined according to the contract. This price usually counted rates for handling trailer and agency fees. The penalty for canceled shipment author included in this calculation because it is a rare phenomenon. (8)

Types of transport rates based on the price for the collection of a semi-trailer to the terminal in the Czech Republic or Belgium, fare prices and a trailer for delivery of a trailer from the terminal in the Czech Republic and Belgium.

Price collection, resp. Distribution in the Czech Republic, is again determined as in the calculation for "a new line of unaccompanied combined transport", i.e. 150 km at a rate of 0.547 EUR / km.

The price for transport by rail is between 430-450 EUR per trailer. The average price of transport is calculated from equation (5):

$$C_{BK} = \frac{C_{dh} + C_{hh}}{2} \quad [EUR \ / \ 1 \ trailer] \tag{5}$$

where: C_{BK}…The average price for transportation from one trailer Bohemiakombi, Ltd.

C_{DH}…lower price limit,

C_{HH}…upper price limit.

Substituting the values in equation (5) released the result:

$$C_{BK} = \frac{430 + 450}{2} = 440 \ EUR/1 trailer.$$

To determine the price for delivery in this case must be approached with a different reasoning. Because transported by rail saddle "Huckepack" semi-ends at a terminal in

Duisburg, the calculations must be credited for delivery kilometers, which is necessary to travel via road transport from Duisburg to Genk. This distance is 136 km. The total amount of miles traveled on the distribution, including wrecker fixed average distance of 150 km, it is 286 km, which again falls rate 1.48 EUR / km.

Total price for this transport will be calculated:

$$C_{KP} = 150 \times 0,547 + 440 + 286 \times 1,48 = 945,33 \; EUR/1 trailer.$$

Tab. 1 - Comparison of rates of combined transport

	CT 60% of capacity	CT 70% of capacity	CT 80% of capacity	CT 100% of capacity	Bohemia-kombi
Price of railway transport	815,5 EUR	686,25EUR	614,63 EUR	497,67 EUR	440 EUR
Total price	**1119,55EUR**	**990,3EUR**	**918,68EUR**	**800,52EUR**	**945,33EUR**

Note: Prices are listed for transporting one trailer   Source: Author

From the Tab. 1 it is clear that the use of KP is very convenient. Minimum profitability of combined transport compared to road transport is achieved at 60% capacity utilization train. Furthermore, we can see that we will take the same train at 100% occupancy of 14 road "Huckepack" trailers more than using road transport.

One of the biggest advantages of CT is its friendliness to the environment, particularly in the saving of greenhouse gases, mainly CO_2. Achieving savings on the proposed line between Lovosice and Genk author calculated from information on the Company's website Kombiverkehr (10), and these results further compared with the amount of exhaust gases from a car for a certain number of miles traveled.

Due to the inability to directly enter the terminal Genk, the authors modified the value of avoided greenhouse gas emissions from transport between Lovosice and Duisburg (lower limit) and Lovosice and Antwerp (upper limit), the terminal Genk is approximately in the middle of the route between the two terminals. The values of CO_2 saved for one semi-trailer with a total gross weight of 29 t are as follows (10):

- Lovosice - Duisburg: Road transport - 1,285 t CO_2 / 1 trailer; Rail transport 0.242 t CO_2 / 1 trailer → saving 1,043 t CO_2 / 1 trailer,
- Lovosice - Antwerp: Road transport - 1,648 t CO_2 / 1 trailer; Rail transport 0.388 t CO_2 / 1 trailer → saving 1.26 t CO_2 / 1 trailer,
- Lovosice - Genk: by averaging the values of the lower and upper limits → saving 1.1515 t CO_2 / 1 trailer.

However, combined transport also has several important aspects to it at a disadvantage compared to road transport. The main disadvantages are its technological complexity and duration of transport. Combined transport is very difficult to correct coordination and management, and the journey time is high. This usually discourages customers because their requirements are that everything went as quickly and simply as possible. The big drawback at present is the lack of "Twin" of wagons, whose majority owner is a company in Europe Kombiverkehr and due to their lack of a need for the setting up of rent long wait, usually up to 6 months. Due to their lack of also increasing the price of their lease, which increases the final cost of shipping.

Another negative transport saddle "Huckepack" semi-trailers is the lack of themselves for this transport. The largest fleet of these trailers in the Czech Republic currently has EWALS Cargo Care Ltd., which currently owns and uses about 40 saddle "Huckepack"

trailers, and will also buy and add. Other road carriers (Josef Micka, LKW Walter, bus Logistik and M + L) using this type semitrailers for transport by rail there are own compared to EWALS Cargo Care half or less than half.
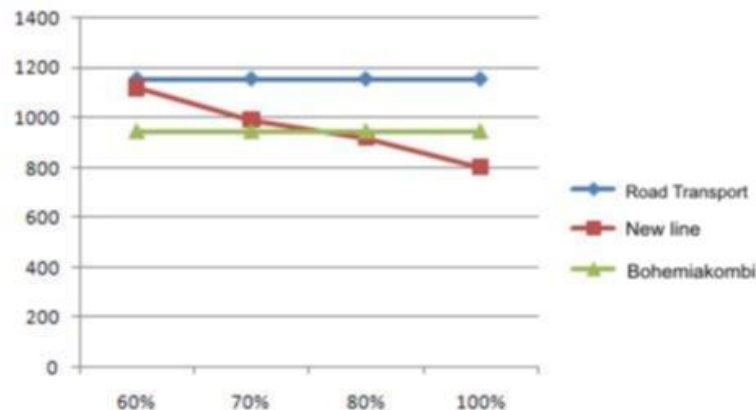
Source: author

Fig. 4 - Comparison of price lines for different values of CT % utilization

CONCLUSION

A comparison of the proposed new line of road transportation authors concluded that making the new combined transport line is worth already at 60% capacity utilization and the train will significantly reduce greenhouse gas emissions.

The only current way to take advantage of combined transport for the carriage of seated "Huckepack" trailers to / from the Czech Republic, the line Bohemiakombi Company, Ltd. between Lovosice and Duisburg. This line does Outlets in Belgium but in Germany, in the Ruhr area. That's it for shipment to Belgium disadvantage partly because of the introduction of a new line to the junction of Genk is worth using 75-80% of the capacity of the train. Great emphasis here must be on the end point of delivery, if the new line would be a region of Belgium, Luxembourg and the Southern Netherlands. If a large number of shipments in the Ruhr district would be preferable to use the services of Bohemiakombi.

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