

## REGIONAL TRANSPORTATION – REACTIVATION

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### **Abstract:**

Passenger quantity histogram was used to measure the character of passengers' migration, pick commuter times, equal intensity and minimal commuter numbers. The measurement was done pre and post changes introduced to the train timetable for both working days and weekends (Saturdays and Sundays). The small numbers of passengers made this connection unsustainable without substantial financial support from the government. The changes introduced to the timetable failed to generate increased demand for the service. The Pareto chart clearly illustrates the changes introduced to the timetable over the period of this research. Other disadvantages of the new timetable were also pointed out in this paper.

*Key words:* number of passengers, intensity of traffic, effectiveness, Pareto, regional trains/commuter trains

### **INTRODUCTION - BACKGROUND**

The aim of this document is to assess the work of regional train transportation between Bytom and Gliwice. This train connection was recently reinstated after being dismantled in the year of 2001 due to the lack of its profitability.

In 1999 the passengers' quantity levels were measured and for 10 trains on the above mentioned connection resulted in 12 to 77 passengers with average of 30.3. Considering the current price of tickets below 3 PLN and exploitation costs of about 370 PLN per train on this line the costs were much higher than income from the tickets. There was a similar result for the year of 2000, when we have randomly measured 24 connections, which showed from 9 to 75 passengers, averaging 27.3. In 2001 the number of measured connections was increased to 33 resulting in 4 to 51 passengers, averaging at 20.1. On average, the profit for the above measured connections was established at 29.01 PLN, the amount includes any existing tickets' discounts with average price of the ticket at 1.44 PLN. The above clearly supports the decision of discontinuing the connection due to extremely low profits and clear decrease of passenger uptake.

Surprisingly, though after 6 years on 31st January 2008 the connection was reinstated, even though the increase of exploitation costs and the destruction of number of stations on the line i.e. Zabrze Biskupice and Zabrze Pótnoc. The only surviving station on the line left was Bytom-Bobrek. There were 21 trains serving the connection both ways, between January and 31st December 2008. Year long

passengers count undertaken by the ticket controllers shown the following. Average number of passengers per train was 23.6. On daily basis there were on average 513.8 people travelling from Gliwice to Bytom and 475.7 people travelling in the opposite direction. It was assumed the difference was prompted by the convenience of other available ways of transportation between those places. There was a substantial difference between the quantity levels of passengers between the working week and the weekends, from 13.7 and 23.6 accordingly. The passenger numbers during the working week were also dependent on the time of day, commencing station, the day of the week and a month.

After reinstatement of the connection between Gliwice and Bytom the price of one-way ticket started from 0.15 to 3 PLN depending on the appropriate discount and average profit per train was 22.27 PLN with average cost of around 461.83 PLN. This clearly creates a deficit. In order to break even, considering the costs of running this connection, the price of tickets would need to be increased to the level of 19.57 PLN during the working week and up to 33.71 PLN for the weekend travel. This substantial increase in price would make the connection rather unattractive to the passengers, who would most probably choose an alternative mode of transport i.e. private bus costing around 3 PLN. However current price of the train ticket with its many discounts (i.e. PKP employee discount bringing the ticket price down to 0.15 PLN) is unsustainable as it doesn't cover the costs of running it, hence the connection must be subsidised on regular basis from other sources.

In order to increase profitability of the above discussed connection there was a new timetable introduced on 14th December 2008.

**THE AIM**

The aim of this article was to assess the impact and the outcomes of the new timetable for the connection between Gliwice and Bytom.

**SCOPE**

The analysis of the new timetable and impact of changes.

**RESEARCH SCOPE**

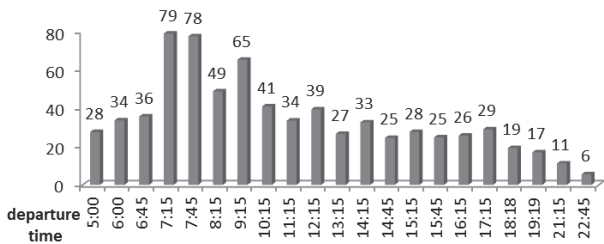
The scope of the research covers measurements of quantities of passengers pre and post timetable change in the month of December 2008 excluding any public holidays and days just prior to those holidays. This limit was introduced to avoid any seasonal fluctuation in passenger numbers influencing the research. The data for this research was accumulated by regional railway ticket inspectors and then passed on to the research group by the railway management.

**RESEARCH**

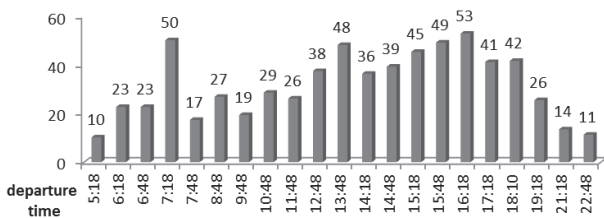
For better clarity, the results of the research were presented in the below charts, histograms divided by departure station, weekends (Saturdays, Sundays), week days (except the day prior to the public holiday) and the period pre (1-13 December 2008) and post the timetable change (14-23 December 2008).

**WORKING DAYS**

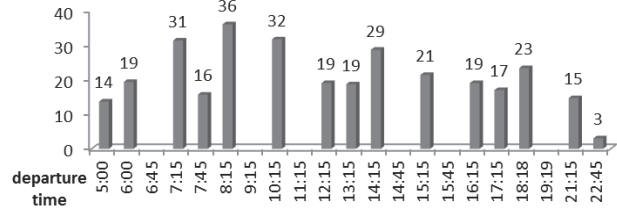
The graph clearly illustrates pick times in passengers' numbers, which are due to people travelling to work and school from Bytom to Gliwice (Fig. 1). The same however isn't the case in the opposite direction (Fig. 2). We believe the discrepancies in returning to Bytom are mainly due to students coming back from school, whereas departure times are due to people commuting to work, for 8am start. Overall there were 1391 passengers leaving from Bytom to Gliwice during one day.



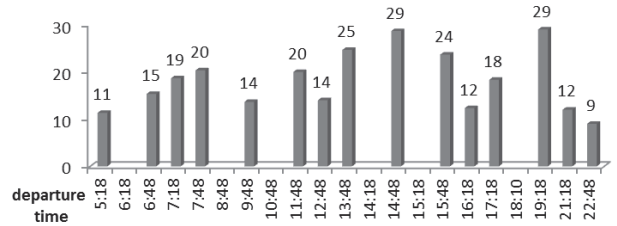
**Fig. 1. An average number of passengers taking a train from Bytom during the working week**



**Fig. 2. An average number of passengers taking a train from Gliwice during the working week**



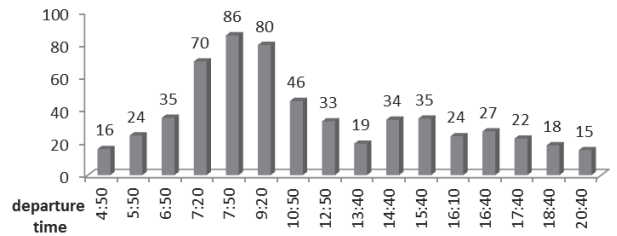
**Fig. 3. Average numbers of passengers taking the train from Bytom on weekends**



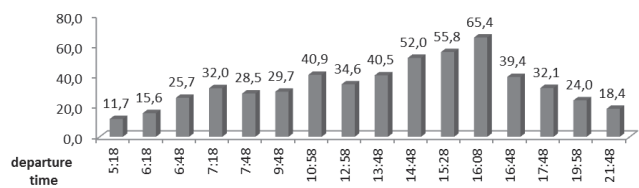
**Fig. 4. Average numbers of passengers taking the train from Gliwice on weekends**

The above graphs (Fig. 3 and 4) also clearly illustrates morning and afternoon pick times for commuters between Bytom and Gliwice. The number of passengers is however much lower reaching the level of 583 people per day.

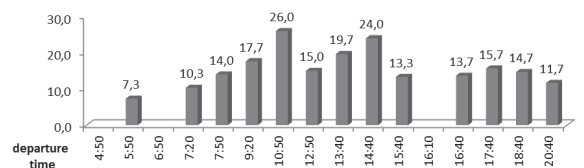
In a bid to increase return on investment, currently at only 10%, the railway company decided to change the timetable and cut number of trains between Bytom and Gliwice. The result of those changes was pictured in the below graphs (Fig. 5, 6, 7, 8).



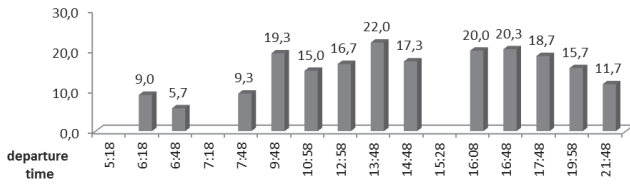
**Fig. 5. Average numbers of passengers taking a train from Bytom during the working week, between 14th and 23rd December 2008**



**Fig. 6. Average numbers of passengers taking a train from Gliwice during the working week, between 14th and 23rd December 2008**



**Fig. 7. Average numbers of passengers taking a train from Bytom during the weekend between 14th and 23rd December 2008**



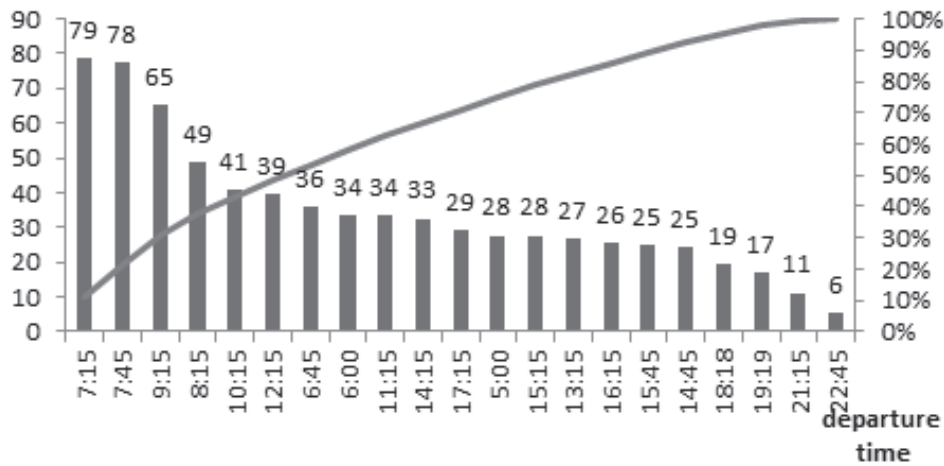
**Fig. 8. Average numbers of passengers taking a train from Gliwice during the weekend between 14th and 23rd December 2008**

Overall number of commuters during the working week has decreased from 1391 to 1130 (17%), while at the same time the railway company has decreased the number of trains on that line from 21 to 16. Similarly the number of

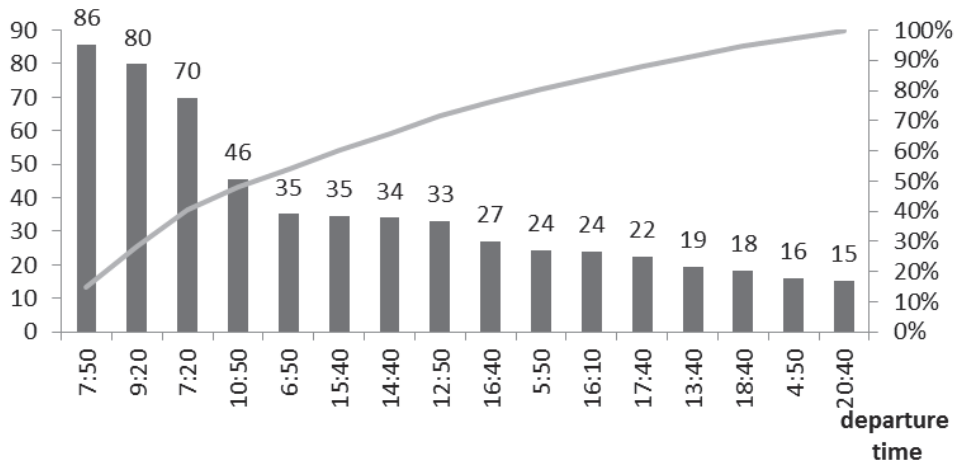
passengers during the weekend has decreased from 583 to 404 (31%), while only 2 trains on the line were cut. We have also noticed the decrease of average number of passengers per each train. It is obvious the introduced change wasn't beneficial either for the passengers or the costs per passenger. Due to an average number of 15 passengers per train it would be more beneficial to cancel more trains on weekends and replace those with an alternative service i.e. bus, which has much lower running costs.

Pareto chart [1, 2, 3, 4] below graphs (Fig. 9, 10) presents in a clear manner which trains should be eliminated from the timetable.

The four last trains departing after 6pm should be cancelled from the timetable (Fig. 9).



**Fig. 9. Pareto chart for passengers taking the train from Bytom during the working week between 1st and 13th December**



**Fig. 10. Pareto chart for passengers taking the train from Bytom during the working week between 14th and 23rd December (after changes in the timetable)**

**CONCLUSIONS**

The introduced changes weren't sufficient to effectively impact return on the investment or to encourage higher numbers of passengers to use trains as their main mode of transport on that line.

Considering low numbers of passengers on that line, replacing trains with buses would be much more cost effective.

When researching, we have decided to introduce a division between working week and weekends (Saturdays and Sundays) as the train utilisation varies dramatically. There are clear pick times for quantity of passengers during the week in the morning and afternoon, which we believe are

due to people commuting to school and work. The morning pick time is more pronounced, we see higher numbers of commuters than in the afternoon. The main pick time is for people travelling in the morning from Bytom and then returning in the afternoon, however in much smaller numbers. The traffic between those pick times seem to be rather stable and decreases radically and staidly after the afternoon pick time into the evening, with only few passengers using this connection..

There doesn't seem to be a pick time during the weekend. The number of passengers using this connection is very low throughout the day, almost by twofold. The above was noted for both pre and post timetable change.

Our research showed that the introduced changes were unsuccessful in reaching their goal of increased profitability due to the below:

Introducing changes and decreasing number of trains during the Winter season, when many people decide against using their own vehicles due to the challenging driving conditions

Decreasing the number of trains during pre Christmas time, which normally is a very busy period for people travelling, also changing the departure times adding to the pre Christmas chaos.

The introduced changes have not only not increased in the uptake in train travel, but contributed to the lower numbers of people travelling up to almost 30%, against the normally busy Christmas period. We believe the future changes should address passengers' comfort as well cost effectiveness.

The changes should consider the best choice of the mode of transport on particular line i.e. bus, Express bus and train: as well as cooperation between various providers and their timetables.

Any changes in the timetable and train quantity should be made based on the usage, which was clearly indicated

on the above graphs no 9 and 10. We recommend cancellation of trains which are used the least (early morning, late evening and weekends) and rationalisation of connections throughout the day depended on the numbers of passengers using them.

There should be less discrepancies between ticket's prices and discounts on offer. Any changes to the timetable should be introduced during slower periods, when there aren't that many people travelling.

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