Study on the application of access management in the Analysis of the Snow Effect on Traffic Volume of Jingjintang Expressway

TANG Jun-jun

Research Institute of Highway, MOC
8 Xi Tu Cheng Road Beijing China
100088 Beijing, China
Phone: ++86-10-82022479
Fax: +86-10-82013867
E-mail: jj.tang@rioh.cn

Abstract

Depending on traffic statistical graphs of Jingjintang Expressway's Maju bridge and Caiyu toll stations on November 18th and 25th in 2006, the paper compares traffic volume under the clear weather and snow weather condition in the same time and section, and analyses traffic volume in the snow weather on November 25th, in order to provide beneficial suggestion and enlightenment for national highway weather forecast and driving under snow weather.

Key words: Snow; Expressway; Traffic volume; Influce; Forecast

1. Introduction

On November 25th 2006, it first snowed in Bejing since last winter came. It was light snow judging from the day snowfall, which began from 1:30am. By 8:00am on 25th, the maximum of snowfall was measured in Mi Yun that was 3 millimeters, and Huai Rou ,Zhai Tang ,Xia Yunling's snowfall was 2 millimeters respectively , the snowfall of the other areas was relatively less. Because the ground temperature was higher, snow melt very quickly as soon as getting to the ground, leading to that road surface was wet and smooth, and the toll stations appeared a little seeper, but there was a little snow in the roadside. About 12:00am, light snow stoped and turned into light rain gradually at this section which is from Maju bridge toll station to Caiyu toll station.

2. Choosing surveying section

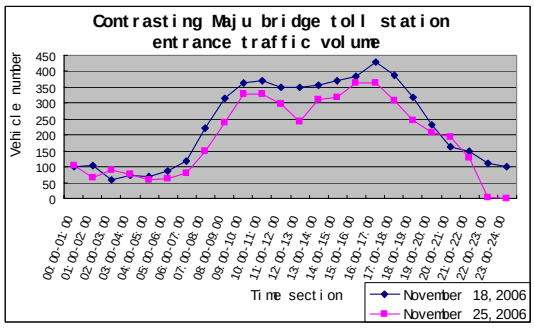
To analyse the impact of the first snow on traffic volume of Jinjingtang expressway's Beijing section, the section from Maju bridge toll station to Caiyu toll station is elected for surveying.

Figure1. Maju bridge to Caiyu section of Jinjingtang Expressway

3. Analysing traffic volume

By analysing comparatively traffic volume of Maju bridge and Caiyu toll stations on November 18th and 25th in 2006,which the former is the clear day on Saturday, and the latter is light snow on Saturday, we can draw the following conclusions:

3.1 Traffic volume at Maju bridge toll station



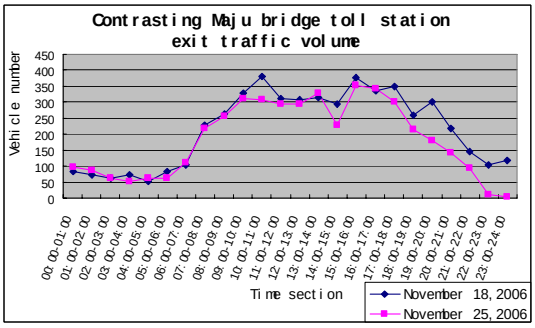


Figure2.Contrasting Maju bridge toll station entrance traffic volume
Figure3.Contrasting Maju bridge toll station exit traffic volume

(1) Although snowfall was not very big on November 25th, both entrance and exit traffic volume came down at Maju bridge toll station. Obviously, the effect on the traffic volume of the entrance is more serious than the exit. Generally, entering and coming out Maju bridge toll station's traffic volume on 25th is still in accord with the traffic trend at corresponding time interval under good weather, and AHT(average hour traffic) is above 300 between 9:00am and 7:00pm.

(2) Entrance traffic volume began to come down abruptly between 1:00am and 2:00am, which is also according with that time of beginning to fall snow.

(3)From the beginning of 5:00pm, both entrance and exit traffic volume came down obviously on November 25th. Especially after 10:00pm, AHT(average hour traffic) descended to zero almostly.

3.2 Traffic volume at Caiyu toll station

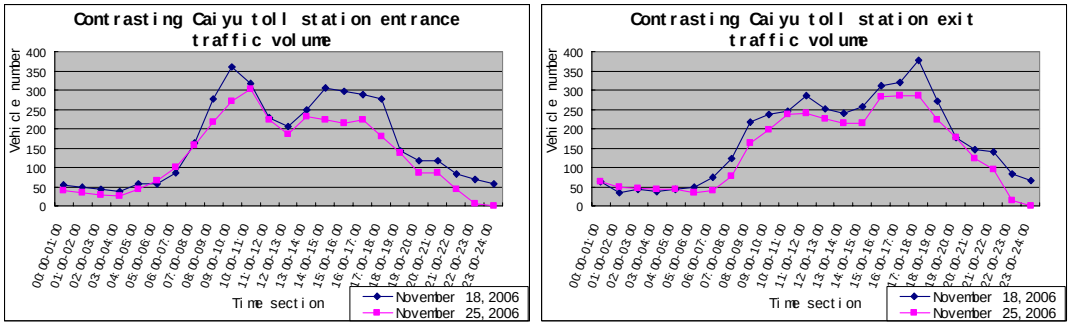


Figure4.Contrasting Caiyu toll station entrance traffic volume
Figure5.Contrasting Caiyu toll station exit traffic volume

(1) Both entrance and exit traffic volume came down to some extent at Caiyu toll station on November 25th. Entrance traffic volume did not be affected basically before 7:00am, but there was an obvious decrease after 7:00am, and came back to the normal between 10:00am and 2:00am, but came down again after 2:00pm. Exit traffic volume didn't be affected before 6:00am, but an obvious decrease occurred in 6:00am. Generally speaking, entering and coming out Caiyu toll station's traffic volume on 25th is still in accord with the traffic trend at corresponding time interval under good weather, and AHT(average hour traffic) is above 200 between 9:00am and 6:00pm.

(2)After 10:00pm, both entrance and exit AHT(average hour traffic) at Caiyu toll station descended almostly to zero on November 25th.

3.3 Conclusion

Comprehensively analysing entrance and exit traffic volume at Maju bridge and Caiyu toll stations, the first snow in 2006 hasn't brought serious effect on Jinjingtang Expressway's traffic volume,and the traffic trend is still in accord with the good weather. But the traffic volume has still a little less than it in the good weather, and the effect on the traffic volume of the entrance is more serious than the exit. In a word, snow made the driving decrease. Especially after 10:00pm, there were no vehicles almostly to go through the toll stations.

4. Inquiry of the vehicle's speed

This survey measured the speed of the vehicles going to Tianjin at the fixed point, where is the export of Maju bridge service area in Jinjingtang Express. Speed was measured at 09:35am and 11:20am respectively on November 25th, and 200 datas were collected. The survey was related to multi-motorcycle type that included medium and mini car, large-scale car, medium and light truck, and large-scale truck. In these different vehicles, middle and

mini car means the saloon and passenger car with 9 seats or less; large-scale car means the passenger car more than 9 seats; medium and light truck indicates the truck with 2 scroll; and large-scale truck indicates the truck more than 2 scroll. Concrete analysis results as follows:

4.1 Sample data

medium and mini cars were mainly measured as the sample of this survey, which accounts for 73% of the whole vehicle number.

Table 1. Sample data of every motorcycle type

Motorcycle type	medium and mini car	large-scale car	medium and light truck	large-scale truck
Sample number	146	12	32	10

4.2 Average speed

Average speed of Jinjingtang expressway is usually about 85 km/h, but this survey measured that average speed is about 77 km/h in the snow weather. It can be seen that the snow hadn't affect running speed seriously on November 25th. Average speed of every motorcycle type as follows:

Table 2. Average speed of every motorcycle type

Motorcycle type	medium and mini car	large-scale car	medium and light truck	large-scale truck
Average speed (Km/h)	81.055	77.333	66.625	60.3

4.3 Frequency of every speed

Figure 6 shows that, there are three different speeds appearing with maximum frequency in this section that is 60 km/h , 75 km/h and 84 km/h. With the speed higher and higher, speed frequency is appearing to change as parabola, and the acme of which is 75km/h.

Table 3. Frequency of every speed

Speed (Km/h)	Frequence	Speed (Km/h)	Frequence	Speed (Km/h)	Frequence	Speed (Km/h)	Frequence
52	3	68	6	81	5	94	4
54	2	69	6	82	6	95	3
55	5	70	4	83	6	96	4
57	5	71	6	84	8	98	2
58	5	72	4	85	4	99	5
59	1	73	4	86	7	101	1
60	8	74	5	87	3	104	1
61	2	75	8	88	2	108	1
62	2	76	5	89	2	110	1
63	5	77	5	90	7	112	1
64	4	78	4	91	2	113	1
65	4	79	4	92	2	119	1
67	3	80	6	93	4	120	1

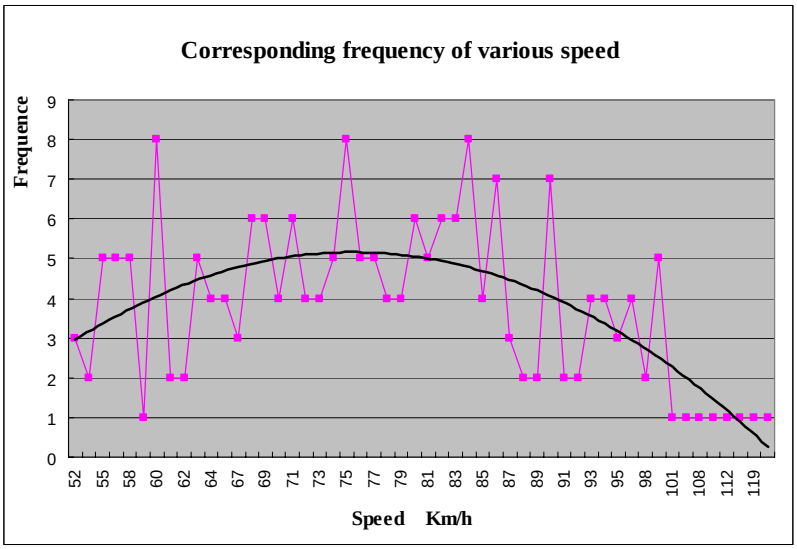


Figure6. Corresponding frequency of various speed

4.4 Conclusion

Usually the proportion of large-scale truck that goes through Maju bridge toll station to Caiyu toll station on Jinjingtang expressway is bigger than the other motorcycle types, but which only accounted for 5% of all traffic volume because of the snowfall on November 25th. Although the average speed was 77.49 km/h in this survey, and didn't reach to daily speed, the speed was high at large.

5. Inquiring into driver

We made an investigation to the drivers which went through the entrance and exit of Maju bridge and Caiyu toll stations respectively. Usually the proportion of large-scale truck is higher, so the truck drivers were main surveying objects in this survey, which included the drivers of large trucks with 12 tons and 5 tons as well as small cars.

Figure7. Inquiring into driver

The ways of obtaining the road real-time situation are mainly broadcast and TV through surveying. Most drivers felt the ground smooth, and accordingly reduced the speed on November 25th. If toll stations are closed, 75% drivers will choose another way as passing round , contrarily 25% drivers will not leave until expressway is opened.

6. Conclusion

The following results were obtained from the analysis in this paper:

(1)Although this snowfall was not very big on November 25th, both entrance and exit traffic volume came down at Maju bridge and Caiyu toll stations by comparing the traffic volume at corresponding section under clear weather. And after 10:00pm, vehicles hadn't passed basically at Maju bridge and Caiyu toll station on that day.

(2) This snow had bigger effect on large-scale truck than others, and reduced large-scale truck to driving, leading to that the proportion of large-scale truck only accounted for 5% of all traffic volume. But the snow had no basicly effect on mini-car, so average speed of the surveying section reached 77 km/h.

(3) Before forecasting meteorological disaster to affect highway traffic, messages need to be announced in time to society by various means such as radio, television, and network, and should clew drivers to reduce the speed and drive slowly, decrease to go out as far as possible. If expressway closes , passing round must be announced in time to avoid resorting vehicles.