

Possibilities and duties of ITS for large events

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ABSTRACT

In 2006, the FIFA World Soccer Championships was hosted by Germany. On that occasion new approaches on co-operative traffic management, new duties for ITS and new safety and transport strategies were developed and tested in and between the twelve hosting cities. Its success depended mainly on an actual and reliable information and guidance strategy as well as on a perfect operation of innovative ITS systems, on the way to the stadium and - maybe even more important - on the way back home. So traffic management with ITS played an important role in a suitable organization and operation of it. And the results would be good hints for other cities, regions or countries who will host similar events in the future.

KEYWORDS: ITS, traffic management

1. Introduction

The traffic management in the Hannover Region played and plays an important role during events as the worlds largest exhibition CeBIT, the EXPO 2000 and the 2006 FIFA Football World Cup. Instead of large and extremely expensive infrastructure measures for these special occasions, a variety of management systems and a multi-modal management center guarantees an excellent mobility for all users. Here, the strategic approach of a tidal flow system for exhibitions and the operational system during FIFA World Cup 2006 are in the foreground.

The Hannover Region with its one million inhabitants is an important intersection of European traffic routes – an also an important place for large events as the worlds largest exhibition CeBIT, the EXPO 2000 or the FIFA Football World Cup. The development as a meeting point for different types of events is supported by the good situation in the network of high quality traffic routes. Important European freeways with more that 100.000 vehicle/

day and high speed rail routes run through Hannover in all directions forming an important road junction. Moreover, Hannover is located at an essential and vital inland waterway

1.1. Traffic Management for exhibitions

The Hannover Region also provides a high quality metro system and other very efficient transport networks. All together the traffic system is able to handle not only the whole commuter traffic, but also up to 300.000 more people arriving or departing as guests. But to handle this extra traffic which occurs only in certain weeks or months of the year, an extensive addition to the road infrastructure seemed not suitable. So an extensive traffic management system with the main goal of handling tidal traffic streams was developed and installed. The essential components of the extensive and unique traffic management system for vehicular traffic in the Hannover region are:

- conventional dynamic road network management systems as an alternative route control,

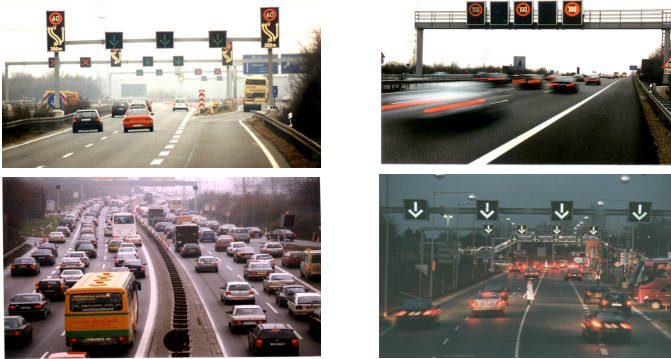


Fig. 1. Operational view of the Tidal flow system on the fair highway

- new dynamic road network management systems using LED technique and programmable displays (dynamic signposts with integrated congestion information) which are also able to indicate and give information about incidents and alternative routes,
- the complete equipment of the freeways in the Hannover area with control systems,
- the construction of an intersection management system at all heavily used intersections between freeways and fair expressway,
- temporary use of breakdown lanes during high volume time,
- an unique tidal flow system of more than 15 km length at the fair expressway with a semiautomatic control
- facilities of a dynamic parking guidance system for up to 45.000 slots and
- the implementation of a multimodal traffic management center for Niedersachsen in Hannover, where all these systems as well as the public transport management are controlled.

One of the innovative cornerstones is the tidal flow system on the fair expressway, where every morning and evening the incoming and outgoing traffic can use “double capacity” using also the opposite lanes. In a semi-automatic system with over 1.000 dynamic parts, hydraulic beacons, automatic barriers and video support a 16 km long area can be switched within 20 minutes – and with only 6 responsible persons acting in the center and on the site.

The fair expressway is the connection between the surrounding freeway system and the largest fair ground of the world. For many years the fair expressway has been used as a temporary one-way-street both for the arrival and for the departure at large events. These measures always required a large logistic and personnel effort, for example 350 policemen were used for this. When the planning for the 153 days lasting EXPO 2000 begun, it was clear that an innovative management had to be created to solve the problems.

2. Functional description

The main item of the system is the semi-automatic control of the fair expressway as a tidal flow system with numerous variable message signs and lane control signals. The system allows to assign at least four lanes – in sections with temporary use of the breakdown lane even six lanes – to the terminating or originating traffic depending on the traffic volume.

The protection of the motorists driving against the oncoming traffic and to design safe road conditions even in the weaving and sorting areas are a substantial issue of this control, that had to be tested in several experiments. Particularly innovative components are used to secure the connection area at the expressway intersection with the main freeway and the main sorting area.

Other individual components are variable message signs, lane control signals and newly designed marker posts that can be lowered pneumatically. Illuminated road studs at the main intersections and weaving areas are used as a variable stripe. In particular at the road junctions a wide range of components are necessary to create a high level of road safety as selected combinations of variable message



Fig. 2. Traffic flow on the highway system around the exhibition ground (Messe)

signs, horizontal swing barriers as well as corresponding signal controls.

The link located just north of the fair ground is equipped with facilities for a temporary use of the breakdown lane. The opening of the breakdown lane is indicated by variable message signs. While the breakdown lane is in use as a through lane dynamic traffic signs and even dynamic (illuminated) stoplines indicate this temporarily change of traffic control to the merging traffic.

At the intersections with the freeways an intersection management system helps to assign the lanes at the access ramps and the through lanes to either the ongoing traffic or to the merging traffic in dependency of the respective traffic volume.

The secondary road network close to the parking lots of the fair ground is equipped with variable message signs and lane control signals which allow another, smaller tidal flow system. A dynamic parking guidance system provides the distribution and guidance of the terminating traffic to free parking lots.

Components of the traffic management system:

- 104 signs on bridges with variable message signs or lane control signals
- 154 variable message signs
- 170 lane control signals
- 80 fibre optic displays for variable traffic signals e. g. speed limits
- 40 horizontal swing barriers
- 450 illuminated road studs
- 167 pneumatically lowered and raised marker posts
- 18 videocams at the fair expressway – 250 in city and region

When the operators in the traffic management center make up their decision to start the one way traffic the main program with detailed control sequences works automatically for about 20 min. With a control of almost 1.000 devices it switches the traffic management system to a safe state, prevents motorists from driving into the opposing traffic at the junctions, sets the signposting to the new operating state and indicates an appropriate speed limit. There are five control programs for different traffic situations. Additional broadcast information guides the motorists to the system and the opposing traffic to alternative roads.

Compared with the usual operation state a capacity increase of almost 100% can be obtained by using the tidal flow system at high traffic volumes. The incidents unavoidable at large events are reduced considerably. An additional safety profit results from speed limits indicated by dynamic displays depending on traffic conditions.

The success of the fair expressway traffic management system has helped to minimize investment on

construction work for the road infrastructure just for temporary big events like fairs or sport events. This has proved to be especially successful for the world exhibition EXPO 2000 in Hannover when almost 20 million visitors were transported successfully within five months. By concentrating the traffic at the fair expressway the traffic volume on the municipal main roads and cross-town links could stay in a compatible quiet and mobile way.

The high flexibility makes it possible to use the available infrastructure including the traffic management center and its experience as well for the operation and control of the upcoming large events.

2.2. Traffic management for Large events

Tested since 1998 in its first elements, the traffic management system was ready for use for the EXPO 2000. But since then, it also demonstrated its capabilities at other events like rock concerts near the fairground. Then, in 2006, the FIFA World Soccer Championships was hosted by Germany. On that occasion new approaches on co-operative traffic management, new duties for ITS and new safety and transport strategies were developed and tested in and between the twelve hosting cities.

One important part of the strategy is to separate different "fans" to ensure a large scale of security. This can be guaranteed in Hannover by guiding all the individual traffic to the exhibition parking spaces at the outskirts of the city and using only railroad systems for the connection to the stadium. This approach can minimize congestion, maximize the flexibility of the whole system, separate the fans of the different teams and leads to a 100% public transport arrival. But its success also depends mainly on an actual and reliable information and guidance strategy as well as on a perfect operation of innovative ITS systems, on the way to the stadium and - maybe even more important - on the way back home.

The 12 chosen World Cup cities were used in managing the traffic of a "Bundesliga" game every second weekend. But there are a lot of differences, as

- In the most cases it was not a Saturday or Sunday afternoon when the game was started, it sometimes was right during the peak hours of traffic. The beginning was at 3, 6 and 9 p.m. And above all a lot of people arrived much earlier in the morning or at noon.
- A lot of people were not used with the infrastructure in the destination city and even not known with the German language.
- The amount of media, sponsored and honorary guests was enormous (for the final game only two third of the entrance tickets were no "special tickets" in any case)

- A lot of visitors travelled with their teams over the whole period so there was additional traffic in other regions that could not be calculated before.
- Some minor groups of football fans were also of importance to the security group of the organisation. Certain matches were of a special obstacle for the whole organisation team.
- In every city there were large outdoor screens for the people who were not lucky enough to get a ticket. So additional traffic problems occurred that should not collide with the “normal” football traffic.

The traffic management organisation team Hannover started its work over three years ahead of the event, but an important step was to see what infrastructure could be used also after the World Cup and how special problems only occurring then could be solved with a reasonable approach and above all with a minimized amount of money. The main approaches were already tested during the “Confederation Cup” in June 2005, when Hannover hosted three games.

For the World Cup, Hannover (as some other cities) renewed and enlarged their stadium. Changes in the rapid transit systems, new stations and enlarged parking facilities are other important measures for the infrastructure. But above all there are some operational approaches that are also a future hint for other events of this size and structure:

- The traffic management on the main highways reaching for all the 12 cities or connecting them is organized in a co-operation between the federal ministry and the road authorities of the different states and cities. Technically, large dynamic road signs are able to offer an alternative road in case of incidents, additional radio announcements and dynamic TMC notations will be able to actually guide the visitors – and the normal traffic on the routes – on the optimal relations. For Hannover this led to a highly flexible system that enlarges the “tidal flow system” on the fair highway to a multi-entry multi-exit system for the whole region.
- The parking spaces of the City of Hannover were solely used for the citizens, for the parking facilities for the visitors were shifted to large exhibition grounds with a good public transport connection to the stadium. In Hannover the CeBIT fairground was used for all “normal” visitors, and from there they had a free ride with

two different light rail lines (who separated the “fans”) directly to the stadium. Only press, VIP and buses reached the inner city with the stadium area.

- The guidance of the teams, the officials, the media and other special guests was separated from the normal visitor guidance. This made it necessary to work with a lot of dynamic road signs as well as public transport information systems, both flexible to incident measures and some even mobile for different purposes.
- The high number of visitors from other countries or at least other states in Germany made it necessary to enable the information systems to a higher flexibility. The main problem here was not the route to the stadium (and the traffic that approaches in the hours before the game) but the people leaving the stadium for their car or their public transport station. Here transport and security had to enable everyone to board the right right rapid transit for their parking facilities or even to go home without problems with “critical” groups of the other team.
- Above all the measures were fixed in a wide spread management strategy, a common management plan had been created, signed and was already fulfilled in a test during the “confederation cup” by all involved authorities in the transport and security sector, and a suitable operational group with all responsibilities and rights was installed similarly to the EXPO management years ago.
- At last a network of transport responsibilities in each city was informed instantly about things happened the evening before in the cities which had games then. So the information exchange was not only good in the preparation, but also during the event.

The World Football Championship 2006 in Germany was one of the largest events in the first decade of our century. Traffic management with ITS played an important role in a suitable organization and operation of it. And the results would be good hints for other cities, regions or countries who will host similar events in the future.