Testsite for traffic detectors, setup and results

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Background

Traffic measurements are of crucial importance for traffic management systems. It is necessary that within a few seconds measure for example speed and dangerous traffic situations to be able to warn the road user on variable message signs (VMS) or inform through other forms of media. These measurements are useful also for a broader knowledge about traffic development and congestion problems.

A test site on one of the major roads enables the Road Directorate to try out new equipment and technologies. Experience has shown that it is difficult by normal tender procedures to secure that the selected type of detectors are the right ones. Among other things, determination of the detector accuracy can be accomplished only when it is finally adjusted to the traffic management system. Furthermore, it is necessary to get experience about operation to lay down the requirement for maintenance and adjustment needs. Therefore, the Road Directorate has found it necessary to set up a test site in order to be able to test traffic detectors before deciding what to procure.

Basic considerations

- Increased traffic information quality
    - Less need for adjustments, higher availability
- Make the optimal choice of detector in regard to the final working environment in which it will operate
- Opportunity to try out new equipment and technologies
- Get experience from maintenance and operation
- Support development of new products and technologies

The test site has been established at one of the Motorways close to Copenhagen, outlined primarily for the test of traffic detectors. It is prepared for handling of detectors mounted over the road, beside the road or under the road surface. Efforts have been made to be able to accomplish any kind of technology.

Location criteria

- Typical cross profile for motorway, 2-3 lanes and a hard shoulder
- Traffic variation should vary from periods of queuing to free traffic flow and high speeds
- All different types of vehicles should be represented within the traffic flow
- Traffic parameters should last for a long period of time, > 5 years

- The location should represent a road stretch with “normal driving behaviour”
- Traffic safety and environment

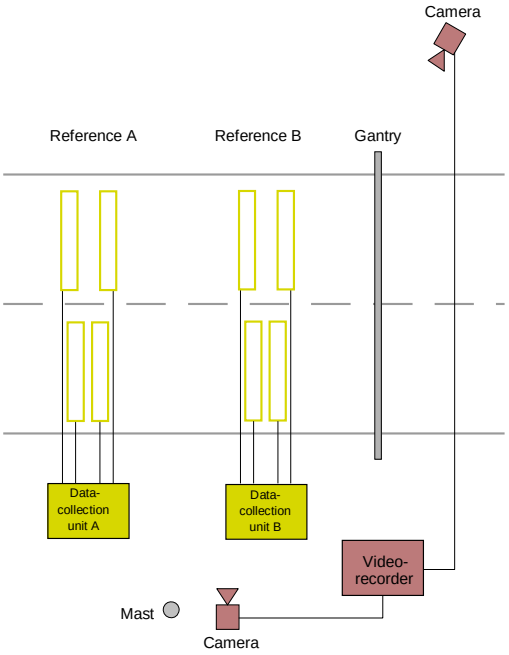
Site traffic characteristics

The Annual Average Daily traffic was 21000 vehicles during year 2006 with a presence of approx 6 % trucks. There is a distinct morning peak hour between 6.30-8.30 am, which holds about 3500 vehicles per hour. The queue situation derives from incoming ramp traffic some kilometre after the test site. During rush hour, the speed decreases to about 30-40 km/h. (Figures from year 2006). There are no plans to take action and improve the situation in the nearest future.

Test site facilities

Main components at the test site are a gantry, two masts, two measurement references, surveillance cameras and an office container.

On top of the gantry there is an electrically manoeuvrable rail system which allows the detectors to be moved out to the side in order to facilitate mounting and adjustment without interfering passing traffic. All necessary work to mount or maintain detectors, can be done while only occupying the hard shoulder.



All measurements can be compared against two permanent references, each one with its own set of double loops and data acquisition units. These inductive loops also have different layout configuration regarding length and spacing. One of the loop configurations are widely used by DRD since long time and proven reliable, while the other type has been utilized for traffic statistics purposes only, but with very good results.

For detailed analysis of traffic situations there are two video cameras, one on each side of the road, continuously recording the traffic.

A roadside office container facilitates for storage of servers, computer network connection and power supply. The computer network is a 10Mbit connection. All data, both traffic data and video recordings, are stored locally on the site and data can be remotely managed and retrieved from the Road Directorate.

In case of power failure there is a backup power station, which can hold the test site running for a few hours.
All units to be tested as well as the references and cameras are time synchronized using a common time server. Time synchronisation is decisive to be able to analyze the data.

First test conducted

The first use of the Testsite was in springtime 2008, when a test was conducted involving overhead- and side shooting detectors. The purpose of the test was to get a shortlist of detectors that fulfil the requirements for expansion of the traffic management system at Motorring 3 and 10 in the vicinity of Copenhagen. The aim of the shortlist was to make it possible to acquire additional detectors without a full tender procedure the nearest years to come and in this manner also have access to the latest technology within the field.

The test comprised of four vendors and twelve detectors. 8 detectors were mounted on the gantry and 4 on the mast. There was a mix of technologies but most of the detectors were conventional radars of which one was of the so called “second generation type” using higher frequency, or resolution. Two was of a camera type technology and one using a technique with a mixture of radar/ultrasound/infrared.

The prerequisites for the vendors were to present detectors applying to the minimum demands laid out by the Road Directorate which was set up as seen in the table below:

Type	Mode	Calibration error	Std. dev
Overhead mounted	Average speed	3 %	5 %
	Count	5 %	5 %
Side shooting	Average speed	3 %	10 %
	Count	5 %	10 %

Data analysis procedure

From the testing period, 6 days was selected, and data aggregated in 1-minute intervals. Only minutes including 10 up to 15 vehicles was used in the calculation and a minimum of 20 intervals should be available for conducting the calculation.
Data was then compared with the two references, using statistic procedures.

- 1-minute values
- $10 \leq$ no. of vehicles ≥ 15

- Minimum 20 intervals
- Assumed normal distribution
- Calibration error – two sided T-test
- Std deviation – X2 test
- Visual checks
- Minimum of reference error

Special notes from the test

Apart from the statistical results, the following have been recorded at the test

- Radar using higher frequency, performed much better than conventional radar
- Big spread in counting, maybe too high initial demands
- Radar measure speed very well
- In general, counting meet demands
- Same type of detector, from different vendors, gave big differences in result.