The Federal State of Hessen is focusing on a consistent use of Intelligent Transport Systems in order to optimise traffic flow and increase road safety on the TERN. The temporary hard shoulder use is one of the key elements to reach this goal. The additional lane increases the capacity during peak hours significantly on the TERN around Frankfurt with traffic loads of up to 150,000 vehicles per day on particular road stretches. Evaluation shows that traffic congestion can be reduced and the risk of accidents can be lowered.

BACKGROUND

The Traffic Centre Hessen is successfully running a large number of traffic control systems. Temporary hard shoulder use is one of the relevant applications. Hessen contributed significantly to research and studies carried out prior to the implementations especially with regard to the aspect of the effectiveness of such measures. Further results of the studies were, that temporary hard shoulder usage may only be set up under special circumstances – e. g. only on motorway sections where congestion or serious accidents frequently occur and for which a proper expansion has already been planned.
One of the reasons that temporary hard shoulder usage is so interesting is that laborious planning approval procedures are not usually required. Unlike a proper expansion, additional capacity can be created relatively quickly. Another factor supporting temporary hard shoulder usage is that it can often be realised for relatively low structural effort. If the hard shoulder is adequately constructed, only the markings have to be adapted.

**HOW IT WORKS IN HESSEN**

The temporary use of hard shoulders is controlled by the Traffic Centre Hessen. As soon as a certain traffic volume is exceeded, the traffic counter of the line control system suggests that the hard shoulder is released. Video cameras installed along the entire section are then used to check whether the hard shoulder is free of broken-down vehicles, objects or other obstacles.

A total of approx. 80 video cameras are provided for this purpose. To help the operator, fixed movement sequences are programmed into the pivoting cameras. During the scanning operation, the cameras are controlled so that even small objects can be detected. During the release process too, the Traffic Centre Hessen regular carries out video monitoring of the hard shoulders. Unlike with the scanning operation, the cameras use the “waggle programme” to show large sections of the released hard shoulder for a few seconds. If the operator detects a broken down vehicle during the release process, the release is cancelled for the period of time concerned.

Outside peak times, the hard shoulders remain closed to flowing traffic. As per its real function, it then offers additional space for accidents, breakdowns and maintenance work. This guarantees safe motorway usage.

**RESULTS AND LESSONS LEARNT**

Evaluation conducted by the Traffic Centre Hessen shows that temporary hard shoulder usage on Hessian motorway sections has proved to be successful. Traffic flow has been notably improved; accidents and congestion have been significantly reduced. Releasing the hard shoulder increases the capacity of the standard three-lane motorway sections by 20 %. This permits traffic volumes of over 7,000 vehicles per hour without traffic breakdown.

Evaluations for the section of the A5 between the Frankfurt NW intersection and the Friedberg junction revealed that temporary hard shoulder usage saves congestion-related losses amounting to approx. 3,200 vehicles per hour. Converted using the corresponding time cost rates; this means economic benefits from avoided time losses amounting to 50,000 euro per day and/or over 10 million euro per year. Not
included in this consideration are the additional benefits created by minimising environmental damage from exhaust and noise emissions due to the more steady traffic flow. The extent of the positive effect of temporary hard shoulder release on traffic flow is demonstrated when occasional vehicle breakdowns or accidents interrupt or prevent the release of the hard shoulder; in these cases kilometres of congestion often occurs.

The fact that the extremely positive effect on traffic flow is also shared by road users is demonstrated by the host of phone calls and emails from car drivers who comment hard shoulder usage very positive.

As far as road safety is concerned, no negative changes were found. Evaluation shows that in this area, neither the number of accidents nor the number of accidents involving serious injury have increased. A positive effect on safety will certainly be that reduced congestion will also reduce congestion-related accidents.

**CONCLUSIONS AND OUTLOOK**

Overall, temporary hard shoulder usage has shown to be swift to implement, relatively cost efficient and most important a highly effective measuring for improving mobility. The procedure is especially suitable for motorways that show pronounced traffic peaks due to high volumes of commuter traffic.

Temporary hard shoulder release can achieve a highly cost-efficient relieving of the existing infrastructures and is therefore a good example of how the existing infrastructure can be used intelligently using traffic telematics. For this reason, the intention is to use the hard shoulders on other highly impacted motorway sections in Hessen on a temporary basis to help guarantee smooth traffic flow.

Hessen will implement in the next five years additional temporary hard shoulder use projects on selected motorway sections round the conurbation regions of Frankfurt and Darmstadt. Through this, Hessen is making a significant contribution to increase road safety and efficiency on the TERN.