



CAMERA SURVEILLANCE ON THE SWEDISH RAIL NETWORK

Helena Rådbo

Senior advisor railway safety

Trafikverket, Swedish National Transport Administration

Erik Lindberg

Senior advisor railway safety

Trafikverket, Swedish National Transport Administration

Abstract

Sweden has a "Vision zero" for fatal accidents (including suicides) on the rail network, and since 2012 the Swedish infrastructure manager Trafikverket works with different measures to reduce the number of fatalities. The goal is that fatalities on the railways should be reduced by 50 % from 2010 to 2020. In research and accident investigations we can see that the majority of the fatalities are due to suicide. To reach, or come closer to the goal, we therefore need to focus on prevention of suicides.

In October 2015 a project started with camera surveillance using a new camera system. The aim was to prevent suicides and trespassing and to decrease their impact on traffic. The camera system was installed in the south part of Sweden in Skåne County between the cities of Lund and Malmö. This area is a densely populated part of Sweden, and it has two of the major rail lines connecting Sweden to the European continent. The frequency of trains is one train every third minute, and if there is a traffic disturbance in this particular area, the traffic in the whole southern part of Sweden is affected.

In combination with fencing, 15 cameras of two different kinds were installed. Thermal cameras, which trigger an alarm to the train control centre, were supplemented by high resolution verification cameras that are possible to operate and zoom to cover a specific area. This helps a lot when there is a need to decide whether a person still is in the area or not.

The cameras have been tested during the last six months, and they are now used on a permanent basis. The tests have been evaluated, and the results show that together with good fencing the cameras have contributed to solving the problem with unauthorized people in the track area. There have been several occasions with intervention by the Police, and trespassers have been removed from the track area. The camera surveillance has also supported the train dispatcher in making good decisions that lead to less disturbances of the train traffic.



INTRODUCTION

The Swedish rail network has about 100 fatal accidents annually (excluding subway lines). Sweden has been spared from train collisions and in the last decade there has been only one fatality among passengers on board a train. The biggest problem Trafikverket has to deal with is the accidents due to train-person collisions on the track line and at stations and level crossings. A train-person collision usually has fatal consequences for the person involved, and it also causes sizable delays for passengers on the involved train and other trains. Sweden has a "Vision zero" for fatal accidents (including suicides) on the rail network, and since 2012 the Swedish infrastructure manager Trafikverket works with different measures to reduce the number of fatalities. The goal is that fatalities on the railways should be reduced by 50 % from 2010 to 2020.

CAMERA SURVEILLANCE SYSTEM

Several measures have been taken to prevent train-person collisions and one of these is to install a camera surveillance system. In October 2015 a project started with 15 cameras in the south part of Sweden, between and within the two bigger cities Lund and Malmö. This area is a densely populated part of Sweden and a number of suicides and trespassing incidents have caused considerable disturbances of the train traffic in the region. Through this particular area runs two of the major rail lines connecting Sweden to the European continent. The frequency of trains is more than 400 trains per day, and if there is a traffic disturbance in this specific area, the traffic in the whole southern part of Sweden is affected.

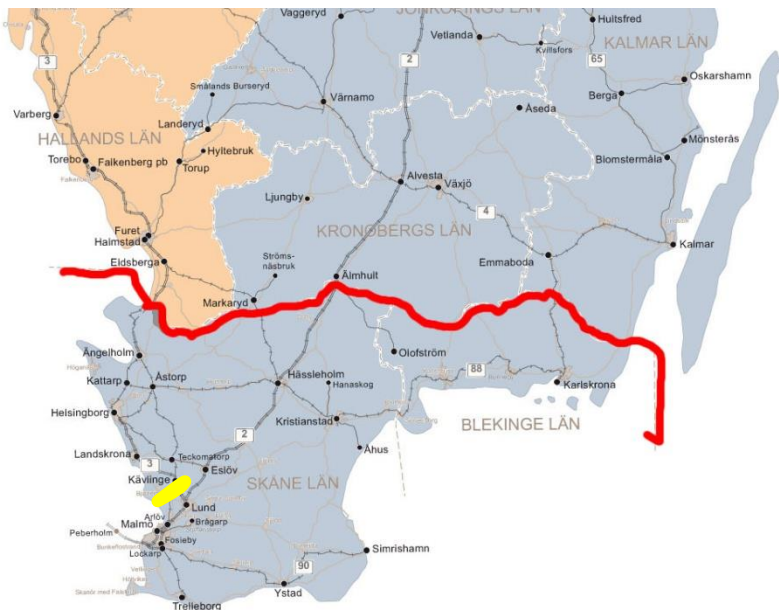


Figure nr 1: Map of the south part of Sweden where the camera surveillance system is installed (yellow line).

The aim of installing the new camera surveillance system thus was to prevent suicides and trespassing and to decrease their impact on traffic.

When a new alarm system is installed it is important to overview the whole process from the triggering of the alarm until resuming the train traffic. Previously other types of cameras have been used for monitoring in some places, and they were managed by a security company that informed the traffic control centre when the cameras



were triggered. With the new camera system, it was important to shorten the response times by sending the alarms directly to the traffic control centre and to the people that monitor the train traffic.

The camera system consists of thermal cameras that in many (most) places are supplemented with day/night cameras with high resolution that can zoom in an area of 500 meters. The thermal cameras detect human activities, using advanced video analysis that immediately alerts the event to operator. The day/night cameras are activated by the thermal cameras and both cameras record and store the events on secure servers for 7 days. To have a fast response, the alarm at the traffic control centre is complemented with a special light/lamp unit (and sound) that indicates a new alarm. This is installed to separate it from other alarms from e.g. stations and tunnels.

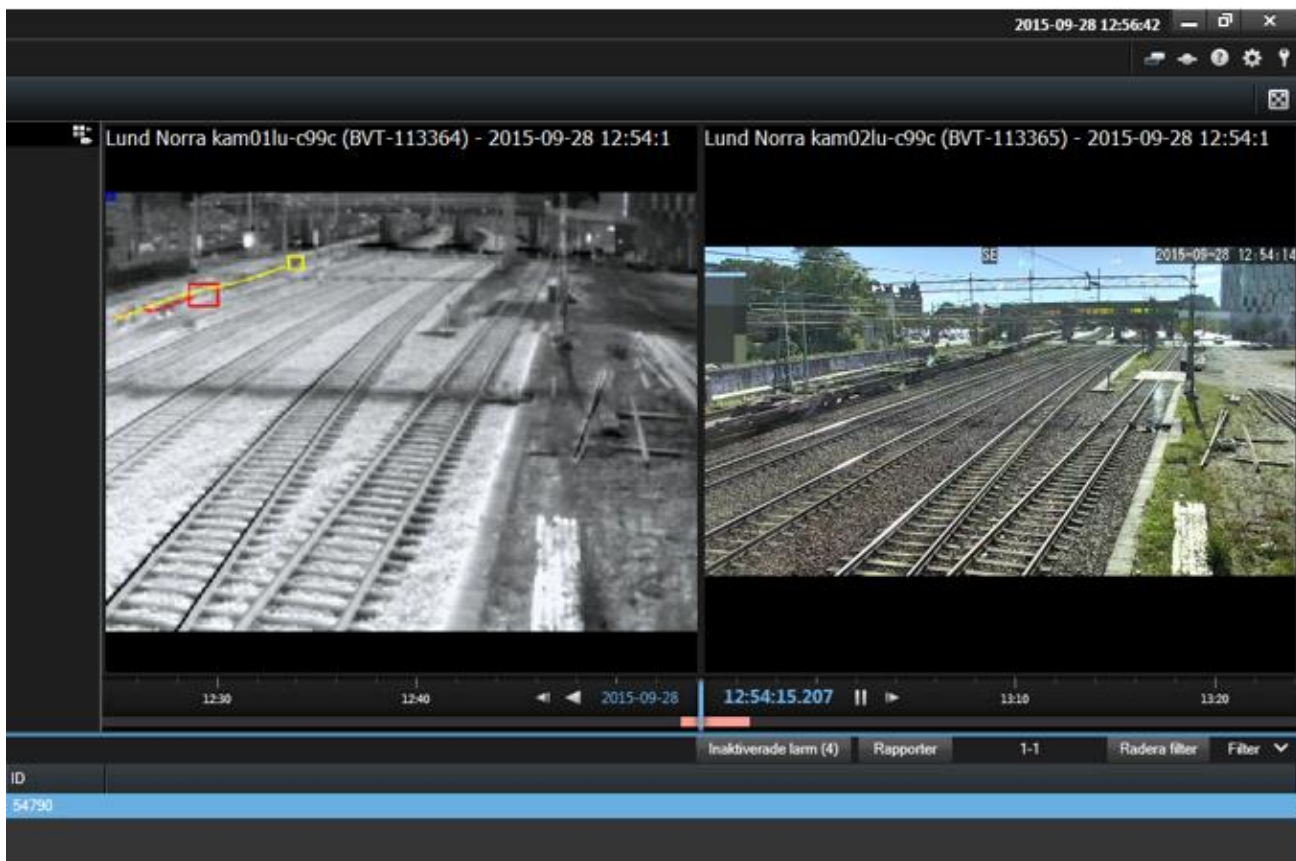


Figure nr 2: Pictures from thermal camera and day/night camera

The camera system can contribute to better safety and control of the railway network in several ways:

- Prevention of trespass, including suicides
- Access protection
- Intrusion detection
- Surveillance at platforms
- Surveillance of the tracks (e.g. switches)
- Collecting data on the train traffic, passengers



RESULT

The result from the test period shows that the technique, the routines to monitor the system and the response to the alarms all work well. There was a short “learning period” in the beginning for the engineer who monitors the equipment, but after a few adjustments the alarm system was implemented in the daily work.

In the test period of 20 weeks there were 1185 alarms in total, with 908 (73%) correct alarms and 277 (23%) false. In practice it was 1 correct alarm/4 hours and 1 false alarm/ 12 hours.

The causes of the registered alarms were trespassing by outsiders (e.g. graffiti painters) and trespassing by contractors. In several cases the traffic control centre stopped the traffic and asked for intervention by the police. We can also notice that many of the alarms were triggered by contractors who sometimes had not informed the traffic control centre that they would be working in the area and sometimes just were taking a short cut. The camera system supports and makes it easy for the train control centre to notice what kind of trespassing it is and if the person is leaving the track area or remains within it. The information is obtained in a much faster way than if the police or others have to go to the area and inspect it visually. Optimal for managing alarms are thermal cameras for detection in combination with a high resolution controllable day/night camera (or similar) for verification.

There are some challenges to cope with for the system and its operators:

- Differences between people, animals and trains,
- Weather conditions like wind, rain, snow, fog.
- The distance to the object
- Heat differences on the trains (heat from wheels)

In most of the cases, the video analysis filters out trains and other bigger objects. Compared to older systems of CCTV equipment this system yields fewer false alarms. However, it is difficult to deal with all circumstances in reality and any system can never give 100% correct response on what has occurred.

CONCLUSION

The aim of the project was to install a camera surveillance system to prevent suicides and trespassing and to decrease their impact on traffic, and as a conclusion of the project we can see that the aim has been fulfilled. The camera surveillance has also supported the train dispatcher in making good decisions that lead to less disturbances of the train traffic. It is critical to have a good overview of where trespassing occurs in the railway system if we want to have a better safety, higher security and fewer interruptions in the train traffic.

In total, all persons involved agree that this new camera surveillance system is working very well. There have been positive reactions from the engineers who monitor the system at the traffic control centre and respond to the alarms, from stakeholders who are responsible for the camera technique and from safety managers working with the prevention of train-person collisions in the area. After the test period the system is still in place and Trafikverket plans to install additional cameras in this region and also in other regions.