

## Clyde and tested

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By Graham P. Heywood  
Image Sensing Systems, Inc.

*The Clyde Tunnel in Glasgow is being modernised. As well as new lighting, cladding and air extraction systems, state of the art incident detection technology has been fitted to improve response times and provide an archive for motoring offenders*



Figure 1: Car crosses over the double-lines into next lane where it collides with a bus



Figure 2: Bus pushes the car into the left lane and the original car collides



Figure 3: Bus and both cars have come to a complete stop. Driver of the second motor car inspects damage to his vehicle as traffic slowly passes by

One clearly demonstrated area of success by Intelligent Transport Systems (ITS) is the application of video vehicle detection systems to enhance tunnel safety. The Mont Blanc Tunnel fire in March 1999, followed two and half years later by the Gotthard Tunnel fire in October 2001, were both a wake up call highlighting the need to improve safety in tunnels. One component in response to this call has been the development of automatic incident detection (AID) systems.

It has become nearly standard in every tunnel project since the Mont Blanc accident, to install CCTV cameras to provide complete, continuous video coverage throughout each tunnel bore with video vehicle detection systems to detect incidents as they occur. It is no longer acceptable to detect the backup queue from an incident beyond the field-of-view of the camera.

The Clyde Tunnel under the river Clyde in the heart of Glasgow, Scotland is a vital traffic route connecting the city centre with the M8 motorway. Two tunnel bores provide dual lane road access carrying 65,000 vehicles per day. Built in 1961, the tunnel is being completely refurbished with new air extraction systems, sump pumps, lighting, and cladding. Glasgow City Council, the local authority responsible for the tunnel, decided as part of the refurbishment program to adopt the new European Tunnel guidelines issued after the Mont Blanc Tunnel accident. One of the recommendations to improve tunnel safety was the installation of an automatic incident detection system.

### Right turn, Clyde

Following a market review of available systems, Glasgow City Council and the Clyde Tunnel Master chose the Autoscope® Video Vehicle Detection System as their preferred system. A contract was awarded through the tunnel refurbishment civil engineering contractor with Techmiracle, Image Sensing Systems exclusive distributor in the United Kingdom and Ireland. Techmiracle designed an automatic incident detection system around the Autoscope Solo® Pro product which is a colour camera with zoom lens integrated together with a sophisticated video image processor in a weatherproof housing. Eighteen Solo Pro cameras were installed in



Figure 4: Autoscope Detector Rack Card interfaced with SCADA system

December 2002, nine in each bore, with the Autoscope Communications Interface Panel (ACIP) and video amplifiers being housed in steel cases below the road-deck in the air ducts. Twisted pair connectivity is used for transmission of both data from the ACIP and video, the latter output from the video amplifiers, back to the control room. Techmiracle installed an interface unit to convert the twisted pair video back to composite video in the control room. Equipment was also installed in the control room to provide I/O from three Autoscope Detector Rack Cards and to provide RS422 conversion to RS232 for the data communications.

The system is monitored from the Clyde Tunnel Control room. Eighteen high resolution monitors are used to display the Autoscope Solo Pro video images for tunnel surveillance. The video and data are additionally connected to the SCADA system for incident management, as well as a digital video recorder system with seven day storage that records compressed colour video continuously and stores up to 12 frames per second. The video storage option, provided by Techmiracle, allows digital video to be easily reviewed by control room operations personnel.



Figure 5: Clyde Tunnel control room

When an accident occurs, an alarm is given according to the SCADA protocol. Video of the respective camera is automatically book marked and stored, and an alarm is given instantaneously. The Clyde Tunnel Control room operators can select the pre- and post-incident time interval, relative to this alarm, for the automatic incident recording. It is possible to later retrieve this compressed video segment from the digital video recorder and store this on the AID computer.

## Early signs

The system has been operational for approximately nine months, and has met the specification criteria required at contract outset. An early operational test of this system occurred in March 2003 when a motor vehicle accident occurred in the south-bound bore in which a motor car collided with a passenger bus. The incident detection system responded correctly and produced “stopped vehicle” alarms as well as recording the incident automatically. Tunnel control personnel were alerted and dispatched emergency personnel into the tunnel. Local police officers were able to view the incident pre- and post-event and were given an archived copy of the complete incident on CD-ROM. Figures 1-3 show three video frames from the AID system digital video. When reviewing the digital video, one can clearly see the near car in the left lane; pull across the double-line separating the two lanes, where by it is stricken by the bus. In turn, this motor car is pushed and strikes the motor car in front of it next.



Figure 6: Entrance to the Clyde Tunnel

A video-based automatic incident detection system to supplement tunnel operations personnel responsible for the safe operation and quick response to incidents within the tunnel is an essential ITS component of modern tunnel management systems. A professional CCTV video camera installation must provide 100 percent coverage of the tunnel with an accompanying video vehicle detection system that can automatically detect incidents occurring within the tunnel. Image Sensing Systems in partnership with its distributors worldwide, is pleased to provide the Autoscope Video Vehicle Detection System as one component of tunnel management systems to meet this important need for improved tunnel safety. ■