



Leissigen Tunnel

### Task

It has been reported, that sudden wind screen fogging may occur under special thermal and meteorological conditions. Sudden wind screen fogging represents a considerable risk for drivers, as collisions with other vehicles or with the tunnel wall may be direct consequence of inhibited visibility. Related to this effect, several car accidents have been reported in the Leissigen Tunnel and in several other tunnels in 1997. Wind screen fogging may be observed while vehicles enter a road tunnel.

### Description

In general, wind screen fogging occurs, when the temperature of the glass is lower than the dew point temperature of the tunnel air. The dew point temperature depends on the temperature and humidity of the tunnel air.

Critical situations have been observed under the following conditions:

- The tunnel is used in bi-directional traffic
- The in-tunnel temperature is higher than the ambient temperature, e.g. in summer, following a thunderstorm.
- Rain or snow-fall cause increased intake of humidity into the tunnel.

In these conditions, as the traffic is bi-directional, warm humid air is discharged from the tunnel through one of the tunnel portals. The vehicles approaching the tunnel are relatively cool due to the lower ambient temperature. When such a vehicle enters the tunnel against the current flow direction, the conditions for the sudden wind screen fogging may be present.

From this general description of the effect, it becomes clear, that car accidents due to sudden wind screen fogging represent a risk for every bi-directional road tunnel.

### Dew Point Ventilation in Leissigen Tunnel

The Leissigen Tunnel, where sudden wind screen fogging caused several car accidents, is a bi-directional road tunnel. The tunnel is equipped with longitudinal ventilation with mid-point air extraction. HBI Haerter was tasked by the tunnel operator to investigate the phenomenon of wind screen fogging and to develop measures to reduce the risk.

The ventilation control system was optimised by introduction of a special routine against wind screen fogging. The ventilation operation is controlled by readings of several monitors for humidity and temperature inside and outside the tunnel. The control routine was developed by investigating the critical parameters and their variation with time.

### Conclusion and recommendation for other tunnels

The development work done for the Leissigen Tunnel may be adopted to fit the specific requirements of any other tunnel. Measures can be developed to reduce the risk of sudden wind screen fogging significantly.