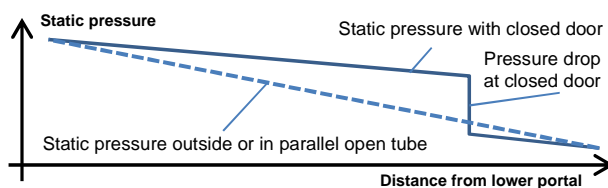
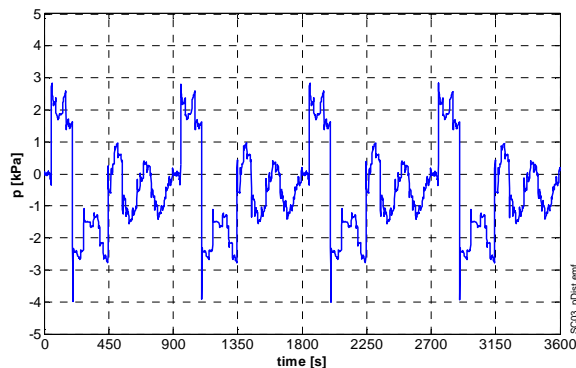


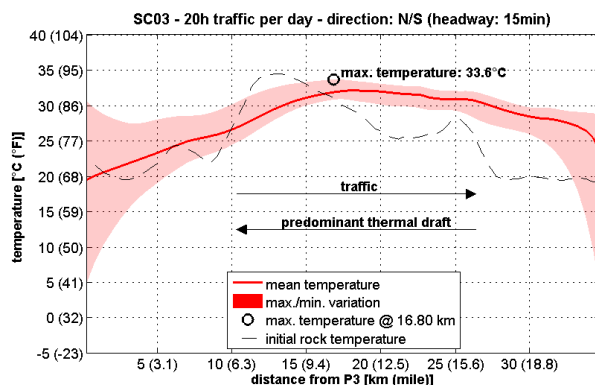
TVS concept with central fans at mid-tunnel shaft and rail tunnel doors as well as jet fans at portals for a 35 km long tunnel



Static pressure along inclined tunnel with closed rail tunnel door



Pressure deviation from normal pressure in the middle of tunnel during tunnel passage of trains within one hour of operation



Temperature variation along the tunnel during one year of operation

Description

The California High-Speed Rail Project (CAHSR) comprises the construction and operation of a new high-speed rail network in the state of California. In the Palmdale to Burbank section, the crossing of the San Gabriel Mountains north of Los Angeles requires the construction of tunnels. Depending on the alignment, tunnels of different length are to be built. The longest tunnel would have a length of 35 km and would be designed as twin-tube, single-track system with cross-passages every 244 m and without crossovers.

The tunnels require a tunnel ventilation system (TVS) in order to keep the temperatures, pressures, velocities and air quality in an acceptable range during all modes of tunnel operation. The TVS shall assure a safe, healthy, comfortable and functional tunnel environment.

The project owner is the California High-Speed Rail Authority (CHSRA). For the Palmdale to Burbank section, Sener Engineering and Systems Inc. has been awarded to develop the engineering and to investigate the environmental impact at a preliminary design stage.

Services

HBI Haerter Consulting Engineers has been mandated to propose and evaluate appropriate ventilation concepts for the different possible tunnels taking the exceptionally high thermal draft pressures into account. In addition, HBI simulated the environmental conditions inside the tunnels (temperature, humidity and air flow). The following services have been delivered:

- development of ventilation concepts for tunnels of different length
- evaluation of TVS concepts based on a quantitative assessment
- sizing of major TVS equipment, estimation of power demand and space requirements inside the civil structures for the TVS
- prediction of the environmental conditions in the tunnels for normal operation by means of one-dimensional, unsteady, aerothermodynamic simulations (THERMO and THERMOTUN)
- requirement analysis for mechanical dry cooling of tunnel during maintenance works