Experts in Tunnel Fire Safety

FOGTEC Tunnel Systems – Project SAFE – Eurotunnel
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Contents
- FOGTEC tunnel department
- Services
- Networking and testing
- References
- Eurotunnel SAFE project
- Fire tests
- Implementation
- Challenges
- Conclusions
- Future of tunnel safety – SOLIT2 research project

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FOGTEC Tunnel Department – Services
- Team of specialists from different fields
- Services:
  - Consulting
  - Design (FFFS, detection, control/SCADA, video surveillance)
  - Simulation (Fire Tests where applicable)
  - System integration
  - Component supply
  - Installation
  - Service and maintenance 24/7 with local support
  - Trainings
- Active in number of working groups and participation to standardization

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FOGTEC Tunnel Department – Networking
- United Nations
- International Water Mist Association Member of the Board
- German Norming Institute
- CEN
- European Norming Institute
- ITA COSUF Managing Party
- FIT Member of TC 502
- Water mist technology provider
- Managing Party
- Member of FIT
- Member of TC 130
- NFFA
- Member of TC 750
- SOLIT
- Managing Party
- NFFA
FOGTEC - Recent references 2009/2010 (Road/Rail tunnels)
- FOGTEC awarded to protect tunnels of NTC in Newcastle, UK
- Based on cost-benefit analysis
- FOGTEC awarded to develop fire protection concept to Channel Tunnel (Eurotunnel)
  - Including detection, control, SCADA and video systems
  - Full scale fire tests, 200+MW!
- FOGTEC awarded to develop and install fire protection concept to Dartford Crossing, UK
  - Full scale fire tests, 100+MW

PROJECT SAFE – FIRE TESTS: Program
- Full scale fire tests:
  - Organised in TST in Northern Spain
  - IFAB carried out and recorded the tests with GSSG (simulations together with BG)
  - Efectis, Setec and STUVA have worked as independent party in SAFE project
  - Very safe protection concept was tested
- Challenges:
  - Extreme HRRs of the fire:
    - Design HRR 100 and 150MW fully developed Class A (HGV) (measured 200+MW)
    - Not only tunnel structure but equipment was put on their limits
  - Having fast fire development to design HRR
  - No reference available from previous tests

PROJECT SAFE – FIRE TESTS: Mock-up

PROJECT SAFE – FIRE TESTS: Test tunnel

Very good results were recorded:
- Fire development followed the simulation and design HRR sizes were reached within short time
- Even in case of 200+MW HRR fire, temperatures around the fire were got in control in two minutes
- FOGTEC system was able to achieve all aims which were set for SAFE project
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PROJECT SAFE – FIRE TESTS: Results

TEMPERATURE CURVES WITH VIDEOS

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PROJECT SAFE – IMPLEMENTATION

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PROJECT SAFE – SYSTEM COMPONENTS

- State-of-art fire suppression system based on high-pressure water mist
- Full scale tested 100/150/200MW
- Sophisticated linear heat detection system
- Detection concept developed by FOGTEC for high redundancies and multiple detection cables (fibre optics)
- Tested in full scale fire tests
- Control system
  - Fully automatic
  - SCADA interfaces
- Video surveillance and recording

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PROJECT SAFE – FFFS

- One pump station for 2 SAFE areas (one in both France and UK side)
- Following UPTUN R251
- Requirements completely different than for other WM applications
- Only very high corrosion resistant materials used, minimum AISI316
- Very innovative solutions for different technical aspects:
  - Dilation design criteria (1000°C)
  - Maintenance operations
  - Redundancies / RAMS studies

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PROJECT SAFE – CHALLENGES

- Implementing the tested system to real tunnels
  - Very limited installation times (slots) available for rail tunnel
  - Reaching the installation areas
- Full integration to Eurotunnel safety concept
  - Integration of control systems
  - Integration of operating protocols
- Very challenging design aspects
  - Tolerance against possible high temperatures
  - Harsh environment
  - Extreme high availability (proper RAMS studies)

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PROJECT SAFE – Conclusions

- Very effective fire suppression system was developed to specification of EUROTUNNEL:
  - Design specs were generated with the knowledge of real fires
  - Fire sizes were extreme demanding for test equipment, test tunnel and for FFFS
  - All tests were passed with excellent results
- Implementation and integrations is challenging for tunnel which is in operation most of time:
  - Limited installation times
  - Harsh environment
  - High availability for SAFE system
- EUROTUNNEL tunnels have already very high standard of life and fire safety, but new SAFE system is new improvement and very historical application for whole industry
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Slide 19

FUTURE CHALLENGES - SOLIT2 RESEARCH PROGRAM

Slide 20

SOLIT2 – Future approach (following UPTUN and SOLIT)

Today’s accepted safety measures (prescriptive)

Increasing Safety Level

→ higher costs

Increasing Safety Level

→ same costs

Same Safety Level

→ less costs

Today: prescriptive based model:

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Slide 21

THANK YOU FOR YOUR ATTENTION!!!

Slide 22

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