

### **Concerns from Recent Tunnel Fires on Possible Disaster for Oil Tank Fire at Tsing Yi**

從近期隧道大火看青衣油庫火災的可能性

W.K. Chow and Edgar C.L. Pang

Research Centre for Fire Engineering, Department of Building Services Engineering

The Hong Kong Polytechnic University, Hong Kong, China

Residents on Tsing Yi Island [1] are worried about the potential danger of fire hazards, as fuel tanks storing large volume of flammables, including liquefied petroleum gas (LPG), are located near their homes. Report released to the public [2,3] claimed that storing those fuel tanks in the areas is safe. However, it is not clear how such conclusion was drawn. Two fires recently broke out in tunnels [4,5] in Hong Kong. Although they were not large-scale fires, it has raised the concern of the public. If a big fire breaks out in oil tanks, the consequences will be disastrous.

#### **Deep Concerns**

Existing fire safety systems in Hong Kong were developed based on the systems used by the UK years ago [6]. However, the Buncefield Incident [7] revealed the inadequacy of the systems to stop the fire and mitigate the impact on the community.

Using different methods, possible fire sizes were estimated with the corresponding heat flux imposed on the occupants at various distances from the storage tanks. As the fire size and consequences vary in the estimations, the current practice of fire safety analysis should be improved by taking more situations and outcomes into account.

Based on the data from literature [8], the ranges of possible fire sizes for the fuels stored on Tsing Yi Island can be estimated [9,10]. Burning a 500 m<sup>2</sup> gasoline tank might induce a fire over 1200 MW, while a pool fire of the size of 104200 m<sup>2</sup> might give 250000 MW. The possible heat flux at nearby highways, residential buildings and school will range from 7 kW/m<sup>2</sup> to 60 kW/m<sup>2</sup>. On top of the thermal impact, the fire ball and smoke plume can affect the people, vehicles and even the aeroplanes flying above.

## **Points for Consideration**

The following suggestions on fire safety should be considered:

- Rigorous and holistic engineering solutions should be adopted in the storage plants.
- Getting a full understanding of the actual system performance with reference to all possible scenarios.
- Building a water shell to cover the related fire area and lower the radiative heat imposed on other area.
- Storing higher amount of foam to prepare for disasters.
- Purchasing fire robots to fight against any big fires.

The above estimation suggested that emergency management under big fires must be enhanced immediately. Additional fire safety equipment, which can limit the impacts imposed on the adjacent areas, should be worked out properly. If a fire breaks out, the consequences will turn disastrous and go far beyond our imagination.

## **Conclusion**

It is easy for owners to claim that the big oil tanks that are proximate to the residential area are safe.

However, a question should be asked:

Where are the estimated data from theory and experimental evidence backing the notion that protection system will work in a big fire?

## **References**

1. The Standard, "Oil firms reject 'time-bomb stations'", 14 November 1995.
2. Tsing Yi Hazard Potential: A Study for the Public Works Department, Hong Kong Government: Principal Findings, Produced by Environmental Resources Ltd. and Technica Ltd. in associated with Watson Hawksley Asia, April 1982.
3. Tsing Yi Island Risk Reassessment Report, Final Report, by Technica Ltd. in association with Dames and Moore Hong Kong (for the Electrical & Mechanical Services Department Government of Hong Kong), April 1989.
4. The Standard, "More tunnel chaos ahead", Hong Kong, 9 March 2012.
5. Sing Pao, "貨車隧道起火車頭焚毀", p.A04, Hong Kong, 28 April 2012.

6. The Right Honourable Lord Newton of Braintree, “The anatomy of the Buncefield independent major incident investigation”, Proceedings of the Sixth International Seminar on Fire & Explosion Hazards (FEH6), 3-15, April 2010, Leeds, UK, p. 3-15.
7. D. Bradley, G.A. Chamberlain and D.D. Drysdale, “The Buncefield Explosion”, Proceedings of the Sixth International Seminar on Fire & Explosion Hazards (FEH6), 11-16 April 2010, Leeds, UK, pp. 16-27.
8. M. Shokri and C.L. Beyler, “Radiation from larger pool fires”, SFPE Journal of Fire Protection Engineering, Vol. 1, No. 4, p. 141-150, 1989.
9. W.K. Chow and Edgar C.L. Pang, “Fire safety of adjacent areas to oil tanks and fire protection systems proposed”, Poster paper, The 2<sup>nd</sup> Asian-US-European Thermophysics Conference - Thermal Science for Sustainable World, 3-5 January 2012, Hong Kong.
10. W.K. Chow and Edgar C.L. Pang, “Fire safety of residential areas adjacent to oil tanks and fire protection systems proposed”, International Journal of Engineering Performance-Based Fire Codes – To be published (2012).

HEOTFire1E