9th ISHPMIE

The Upper Big Branch Coal Mine Explosion

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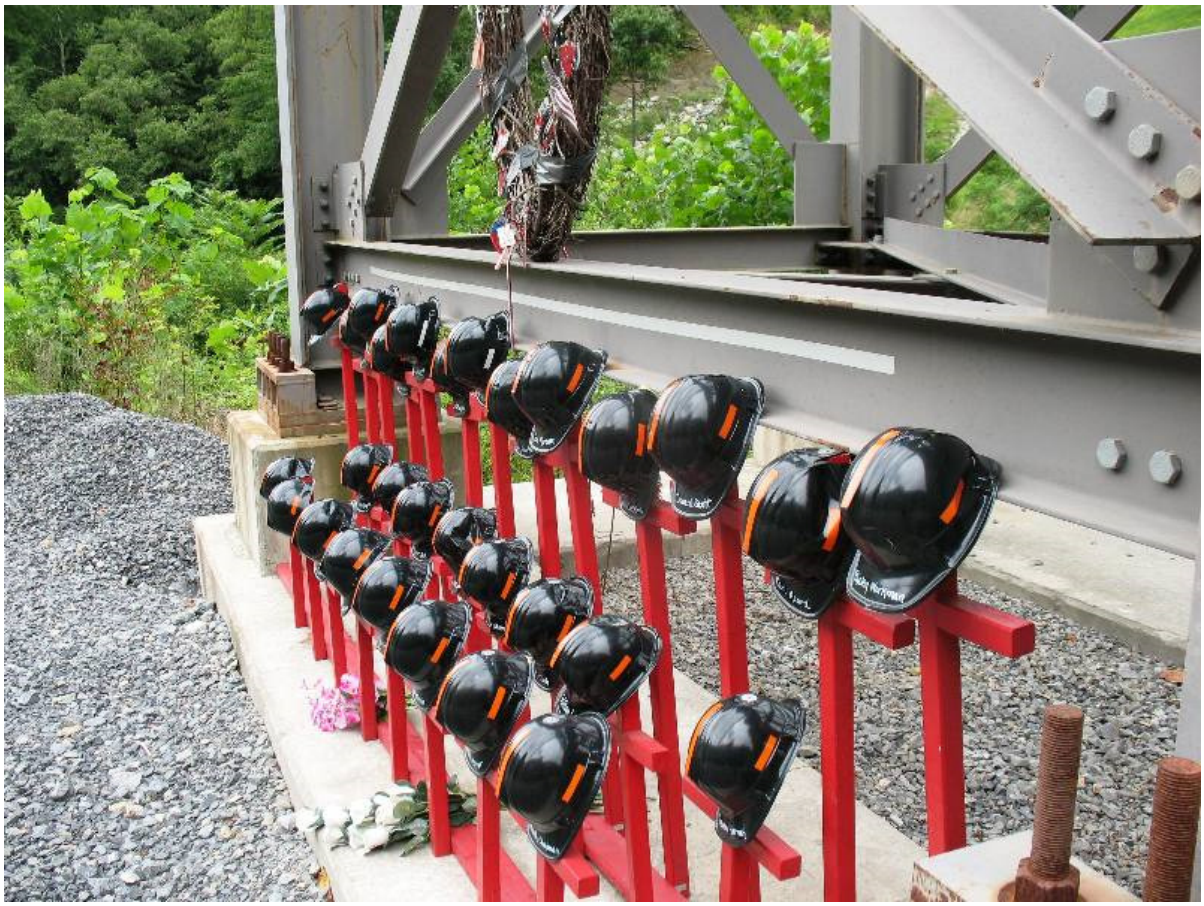

Malcolm Logan, http:// My American Odessy.com/dirty-business-investigating-a-mine-disaster-in-beckley-wv/

At approximately 3:01 PM on Easter Monday, 5 April 2010 the Upper Big Branch Coal Mine owned by Performance Coal Company/Massey Energy located at Montcoal WV, USA exploded killing 29 miners and seriously injuring two more. This followed the Sago, 2006, 12 killed, 1 injured, and Farmington, 1968, 78 killed, 21 rescued, disasters which led to significant safety related legislation: The Coal Mine Health and Safety Act and the Miner Act. Five reports have resulted related to this disaster which may be found on the websites of the originating organizations with the last two being especially lengthy:

1) **Massey Energy Company, Preliminary Report of Investigation Upper Big Branch Mine Explosion, April 5, 2010**

2) **United Mine Workers of America, Industrial Homicide, Report on the Upper Big Branch Mine Disaster**

3) **Report to the Governor, Governor's Independent Investigation Panel, Upper Big Branch, The April 5, 2010, explosion: a failure of basic coal mine safety practices**

4) **U. S. Department of Labor, Mine Safety and Health Administration, Report of Investigation, Underground Coal Mine Explosion, April 5, 2010, Upper Big Branch Mine South, Performance Coal Company**

5) **West Virginia Office of Miner's Health, Safety, and Training, Report of the Investigation Into the Mine Explosion at the Upper Big Branch Mine, February 23, 2012**

6) **NIOSH, An Independent Panel Assessment of an Internal Review of MSHA's Enforcement Actions at the Upper Big Branch Mine South , 22 March 2012**

The information which is summarized here is based upon the information reported on in items two through five above and the observations made by three of the authors (CWK, SG, KL) in their visit to the UBB Mine as a result of being retained for civil litigation purposes by the firm of Conaway and Conaway who represented the interests of one of the survivors. They inspected the disaster site after the above noted investigations had been completed. The civil litigations have resulted in many settlements with a Federal criminal investigation in the Southern District of West Virginia currently ongoing resulting to date in one conviction and one charge.

A large scale schematic of the mine is shown in Figure 1 while a more detailed drawing of the active portion is shown in Figure 2.

The explosion was initiated at the long wall face, which was inadequately ventilated, in a methane air mixture formed by the migration of methane from the gob area. The ignition was provided by worn bits on the continuous miner and the water spray suppression system was non- functional. This primary explosion lifted and ignited large deposits of coal dust spread widely throughout the mine which contained inadequate quantities of rock dust thus causing a secondary explosion to propagate up to a mile distant from the long wall face.

This complete event is thoughtfully illustrated in the attached animation produced by MSHA and available on their website.

The global mine ventilation scheme showing the paths of both the fresh air as well as the exhaust air is shown in Figure 3 while the micro ventilation path in the vicinity of the point of ignition is visualized in Figure 4.

In addition to the usual coal bed emissions of methane some gas outbursts had occurred during the history of the working of this mine associated with a geological fault whose path through the workings is shown in Figure 5 along with the date of the outburst incidents. An alleged point of outburst is shown in the floor heaving of Figure 6. These outbursts are no-where near the volume magnitude that was released prior to the explosion which occurred in the Cargill Salt Mine, Belle Isle LA, 8 June 1979, resulting in 5 dead and 17 survivors.

The ignition source was identified to be failed teeth on the tailgate shearer of the longwall miner, Figure 7, which struck sandstone creating a shower of sparks. Such an incipient ignition process should have been controlled by a water spray produced by the nozzles on the long wall miner, but the failed condition of this system is visualized by the water streams illustrated in Figure 8.

The rapid spread of the explosion through-out the wide expanse of the mine was fueled by significant accumulations of coal dust as represented by the coal dust pile in Figure 9.

The beginnings of the explosion at the longwall face due to the presence of an ignition source, the gob area methane, and the failure of the explosion suppression system are shown in the detailed mine drawing of Figure 10. This initial explosion then propagated inby as indicated by Figure 11 and outby as shown in Figure 12.

The extensive propagation of the explosion throughout the mine is delineated on the flame boundary map given in Figure 13. One will recognize that there is a correlation with inadequate incombustible content (rock dust) found with the coal dust as mapped in Figure 14.

With the exception of the findings in the report prepared by the Massey Energy Company the others are in substantial agreement relating to the details of the explosion, and the conclusions taken from the MSHA report are given in Figure 15. These describe a basic coal mine explosion which occurred because all of the components of the Explosion Pentagon were present contradicting all mine safety practices and regulations. This is distressingly similar to the causes of the Westray coal mine explosion that occurred in Nova Scotia, Canada in 1992 resulting in the deaths of 26 miners (Amyotte, P.R. and Oehmen, A.M., "Application of a Loss Causation Model to the Westray Mine Explosion", Process Safety and Environmental Protection, 80, 55-59, (2002)).

The major cause of contemporary mine explosions seems to be related to human misbehavior among various stakeholders: mine owners, government regulatory agencies, and unions with the dead and injured miners and their families playing no role but suffering the consequences. Safety management systems and technical safety barriers are only useful if accompanied by a willingness to adopt an effective safety culture that puts miner's health and welfare first. Before new rules and regulations are introduced with great fanfare, existing prevention and mitigation measures must be implemented, followed, and enforced. Politics and politicians must no longer interfere with mine safety.