

**Coal dust explosion at Mitsui Miike coal mine
November 9, 1963. In the tunnels at Mitsui Miike in Omuta, Fukuoka**

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An explosion occurred in a mine tunnel at Mitsui Miike coal mine (Figure 1) roughly 500 meters below the mine ground-level entrance. The blast and flame caused roof fall in many areas in the tunnels, which then quickly filled with carbon monoxide. 458 people were killed and 555 people were injured. It was the worst postwar mine disaster. Lack of safety provisions was the primal cause. Figure 2 indicates the cross-section of the accident site. The coal beds at Mitsui Miike sloped towards Ariake Sea, and mine openings had also shifted over time towards the sea (to the left in the figure) from mountainside. At the time, coal beds roughly 350 to 450 meters below the sea level were being mined.



Figure 1: Location of Mitsui Miike Coal Mine

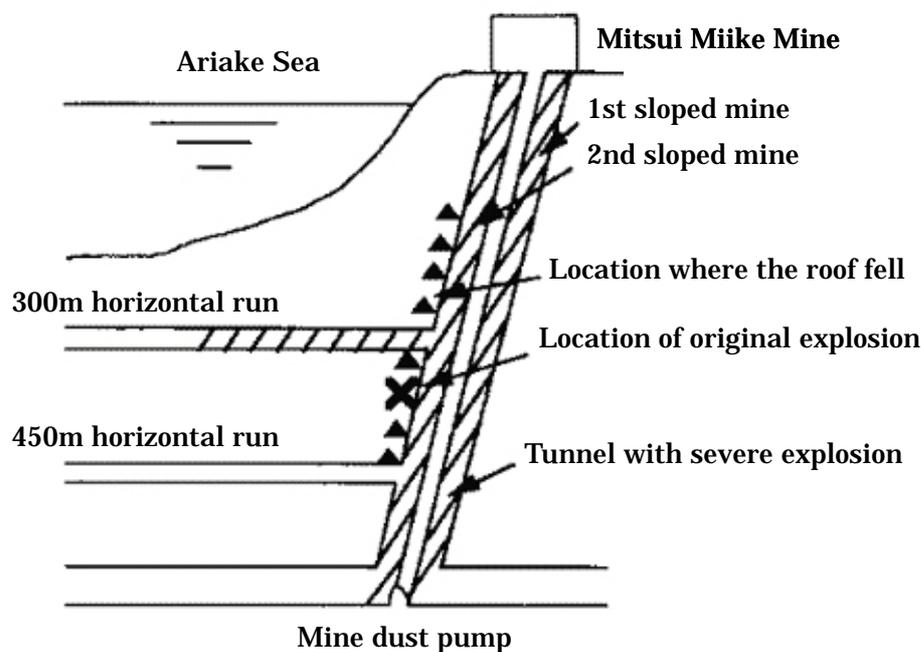


Figure 2: Cross section of the accident site [1]

1. Event

An explosion occurred in a tunnel at Mitsui Miike coal mine roughly 500 meters below the mine entrance. The blast and flame collapsed the roof at multiple locations in the tunnels which filled with carbon monoxide. The accident killed 458 people and injured 555 others. It was the worst postwar mine disaster.

2. Course

- (1) The industry shifted its primary energy source from coal to oil during the period of 1959 to 1960 and Mitsui Mining was forced to reorganize itself with mass layoffs.
- (2) Labor dispute took place between the workers and corporate management, however, the labor side lost the battle and the work force was reduced.
- (3) The number of employees dropped to 10,000 from 15,000, whereas, production increased to 15,000 tons per day from 8,000. The per capita efficiency multiplied by 2.8.
- (4) The efforts to cut production cost forced less safety personnel.
- (5) On November 9, 1963, an explosion occurred roughly 500 meters below the mine entrance. The blast and flame collapsed the roof and carbon monoxide filled the tunnels. As a result, 458 people were killed and 555 others injured.

3. Cause

The explosion was the so-called “coal dust explosion”. A technique to prevent coal dust explosion had been established over 50 years before the accident and there had been no major

coal dust explosion accidents since the Taisho era (1912-1926), and not even minor ones after world war 2. Coal dust was dangerous, however, manageable and it was common knowledge then that maintaining the site clean and making the area moist by watering could prevent such explosions. These easy preventative measures had been in place on a routine basis before the labor dispute. However, after the dispute, the insufficient number of safety personnel, caused by the employer's productivity-first policy, failed to take those measures. Furthermore, the union, which was supposed to be the organizational checking system, knowingly ignored the facts of neglecting the explosion preventative measures because of their peace accord with management (Employees were paid extra in lieu of staying out of strikes).

4. Immediate Action

After the explosion, rescue efforts took place immediately. Investigation of the cause of the accident began. The mining operation was suspended.

5. Countermeasure

After the investigation of the cause of the accident, the management improved the emergency procedures of the security measures resumed the mine operation -- until March of 1997, when the mine was abandoned.

6. Summary

The coal dust explosion at Mitsui Miike was a direct result of neglecting the safety measures under productivity-first policy during the energy revolution.

7. Knowledge

- (1) Keep in mind that rationalization from the management perspective can damage safety factors, and such ill-conditioned operations can lead to tragedies. It is important to make sure that organizational checking systems function properly in order to prevent accidents.
- (2) Fine powder of flammable material is the same as flammable gas when the powder is dense. Even wheat flour can cause explosion. This phenomenon is called "dust explosion". Dust does not explode by directly catching flame, however, small particles of dust in the air, when they build up to a certain density, are flammable with the normal oxygen density and can easily catch fire. Coal dust explosion is a form of dust explosion.

8. Background

The industry shift from coal to oil forced restructuring in the coal industry. Mitsui Mining, who mined for coal, executed large layoffs during the period of 1959-1960. Workers such as Miike Labor Union went on strikes, attracting nationwide support from other labor unions, and the dispute continued for 313 days. This was the "Mitsui Miike Labor Dispute".

Eventually the company prevailed and the mass rationalization took place. The number of workers dropped from 15,000 to 10,000. On the other hand, the capacity was increased from 8,000 ton a day to 15,000. Productivity per person multiplied by 2.8. In order to reduce the production cost, the number of safety personnel was reduced. The coal dust explosion took place under these circumstances.

9. On the side

Series of large-scale accidents at large-scale enterprises occurred in October of 2003, such as explosion/inflame of coke oven gas tank at Nippon Steel Corporation's Nagoya Works and fire at Bridgestone's Tochigi factory. These accidents may have had direct causes, with background factors like on-going implementation of facility maintenance outsourcing across the industrial arena, aging facilities and reduction of experienced workers by corporate restructuring. I, however, would conclude that these cases, including the accident at Miike Mine, shared the same problem of neglecting safety, which had been a human factor.

<References>

[1] The Practice of Machine Design Book 3, Learning from Failure, Yotao Hatamura ed., Practice of Machine Design Research Group, The Nikken Kigyo Shimbun, Ltd.