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Case Study on Mahabir Colliery Disaster on 13.11.1989

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***Abstract*: According to mining legislation, mishaps that result in more than five fatalities are referred to as disasters and must be looked into by a court of enquiry that is established by the government. For the first time in India's mining history, 65 trapped workers were able to be rescued using a sizable borehole that was bored from the surface. A case study of mining inundation and a brief presentation of recent technological advancements are included in this research article. A specifically built capsule miraculously saved 65 workers from the disaster at the Mahabir colliery on November 13, 1989, setting a new world record in which it played a significant part. The capsule went on to take home the top honour at the international trade fair in New Delhi in 1990, and Readers Digest published a piece on the epic saga in June 1991. It resembled a natural calamity, but the lack of ancient survey records was the underlying cause.**

***Keywords*: Mahabir colliery disaster.**

1. Mahabir Colliery Disaster

Date of Accident	: 13.11.1989
No. of person killed	: 06
No. of person rescued	: 65
Owner	: Eastern Coalfields Limited
Place	: Raniganj Coalfield

The distinction between a natural disaster and man-made disaster is sometimes not easily discernible.

There are two aspects of disaster management,

(1) preventive with forecasting

(2) and rescue with relief.

Now, with the advances in technology, forecasting techniques, preventive measures can be planned like drilling advance boreholes while approaching water logged barriers, most of the mining disasters which are related to inundation can be prevented with this technique.

2. Introduction

In the mining industry, mine flooding is typically recognized as a major and ongoing risk.

Numerous issues, such as earth movement, roof and side collapse, abrupt inflow of water, air blasts, etc., plague underground mining. With the exception of coal mine-specific gas and dust explosions. It is a terrifying undertaking for the rescue crew to get to the trapped miners, regardless of the accident's source, nature, or degree of damage.

In addition to a lack of oxygen, the accident's irrespirable zone has higher concentrations of explosive gases like methane, dangerous gases like carbon monoxide, and carbon dioxide. The goal of the Mine Rescue and Recovery operation is to rescue survivors and recover dead bodies from a mine in which a disaster has happened. However, vision for rescue personnel is hampered by the gallery or highway being completely covered in dust, smoke, or water in the case of inundation. The most fulfilling aspect of being a mine rescue squad is rescuing survivors.

The Mine Rescue Rule of 1985 lays forth the duties related to my rescue and recovery operations in India. It includes regulations for the use of equipment such breathing apparatus, reviving apparatus, smoke helmets, gas detectors, self-rescuers, flame safety lamps, etc. as well as provisions for the rescue station and rescue chamber.

The Mine Rescue Rule of 1985 also specifies requirements for the qualifications and responsibilities of the superintendent of the rescue station in the execution of rescue operations, as well as training programmes for mine rescue team members.

Mine Rescue and Recovery Operations also serves the purposes of training rescue personnel in the use of equipment for protection in irrespirable atmospheres, the detection of noxious gases, specialised emergency response equipment, and a general understanding of accepted procedures for rescue and recovery operations during or after a mine emergency. Other objectives include emergency response policy, mine gas protection policy, and preparedness during any emergency.

The colliery was using two 86 m-deep shafts, A and B, to work the Narainkuri seam. The seam had already undergone substantial development, and at the time of the tragedy, work was still being done in the mine's rise-most region. The underlying Ningah seam (parting 22 m) was water-filled and had been exploited and abandoned in the past. A heading in Narainkuri seam penetrated into an abandoned shaft (Pit No. 34, which was not included on the plan of Narainkuri seam) on November 13, 1989, at around 4 a.m., causing water from Ningah seam to begin flowing into Narainkuri seam. There was a heavy flow for around 45 minutes.

In the night shift, there were 232 people working underground, and 161 of them, who were near the shafts, could exit. The roads leading to the shafts were inundated, making it

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impossible for 71 to reach them. Both shafts were quickly flooded up to a height of 12 m above the pit bottom.

Fortunately, there was a phone line running from the trapped miners' subterranean workings to the surface, and it was via this line that it was discovered that 65 workers had taken refuge in the upper part of the workings. 6 miners were so unaccounted for.

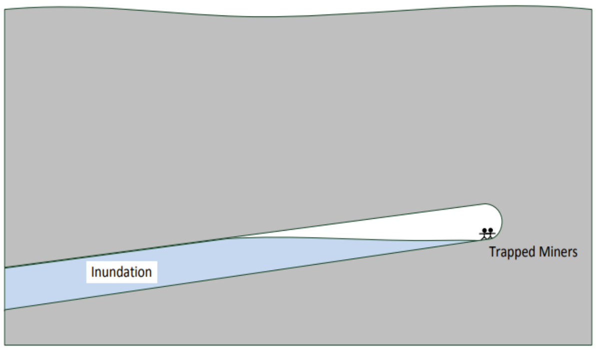

Fig. 1. General entrapment-scenario during inundation

A. Pumping

In order to dewater the mine, it was decided to put as many submersible pumps in the two shafts as possible. At the same time, a big diameter hole was also drilled in the section closest to the rise in order to establish communication with the trapped miners.

On November 13, 1989, at 1:45 p.m., the first submersible pump began operation. Additional pumps were added as they arrived, and by November 18, 1989, at 3:30 p.m., eleven pumps totaling around 1750 m3/hr were operating in the two shafts. However, it was discovered that the actual amount provided by the pumps was only about 1150 m3/hr, or a dewatering rate of 25000 m3/day.

Unexpectedly, the decline in water level in the pits only matched to a dewatering rate of roughly 5000 m3/day. Clearly, there must have been significant water recirculation. According to the underground workings, shaft on 34 was still receiving a significant amount of water. Therefore, it was determined that surface fractures were the primary route through which the pumped-out water was entering the old workings of the Ningah seam. Pit No. 34, which is 30 metres deep, was reactivated in order to block the flow through it; on November 20, 1989, this shaft was plugged to stop the flow from the Ningah to Narainkuri seam. The water level in shafts A and B started to drop once this was completed.

B. Drilling of Communication Borehole

The foundation of a coordinated catastrophe response is information and its communication. It is human and natural to want information. The case studies have demonstrated that emergency managers must communicate not only with other participating rescue organisations but also with external parties and stakeholders. Communication respects the needs of journalists as well as the grievances of the affected families. Managing a multi-agency response mission is also necessary.

Two exploration boreholes had been dug in the past to demonstrate the depth and thickness of the coal seam, and one of these boreholes had subsequently been discovered in one of the subterranean galleries, according to information obtained from the mine officials.

When this borehole was discovered, a drilling equipment was placed there. On November 13, 1989, at 9:30 p.m., a 255 mm (10″) dia. hole was commenced, and after cutting through 8 metres of alluvium, 200 mm (8″) casing was placed within the borehole. The borehole then continued with a 200 mm diameter up to 15.65 m through strata that were semi-hard but sticky and required a lot of time to travel through. In this section of the borehole, a second casing of 150 mm (6″) in diameter was installed. The next stage of drilling continued with a 150 mm (6″) diameter through medium-hard rocks. The hole contacted the gallery at a depth of 27.80 m of inundation at 3.30 in the morning on November 14, 1989 (that is, after 6 hours of drilling). The stranded miners were instructed to report to the drill site over the phone as a lit torch was lowered through this hole. Thus, a firm connection to the trapped miners was made around 4 a.m. on November 14, 1989 (exactly 24 hours after the inundation). Through this borehole, supplies including torches, food, water, medicine, etc. were lowered.

Fig. 2. Drilling of borehole for information and communication

C. Drilling of Rescue Borehole

Near the initial borehole, a second hole with a diameter of 200 mm (8 inches) was bored. Drilling began on November 14, 1989, at 9.30 a.m., and the subsurface gallery was penetrated at 11.30 a.m. The hole was extended from 12 inches to 15 inches, 18 inches, and eventually 21.5 inches. The 21.5-inch-diameter hole was finished around 1:30 pm on November 15, 1989. It was feared that the borehole's alluvial section may cave in and suffocate it. In order to better accommodate ventilation, the top 11 metres were increased in size to 28.5″ in diameter and lined with 24″ steel ducting.

A steel capsule with a 17″ internal diameter and 2.5m height had been constructed while drilling was taking place. A derrick and a 10t hand winch were used to lower this capsule into the borehole. On November 16, 1989, at 2.30 a.m., the rescue of men began following a few practise trips up and down the hole. Each cycle was found to be lasting around 15 minutes by the time six males were removed. A 12-tonne crane was used to lift and lower the capsule more quickly, cutting the cycle time in half to only three minutes. On November 16, 1989, all 65 people were removed from the mine by nine in the morning

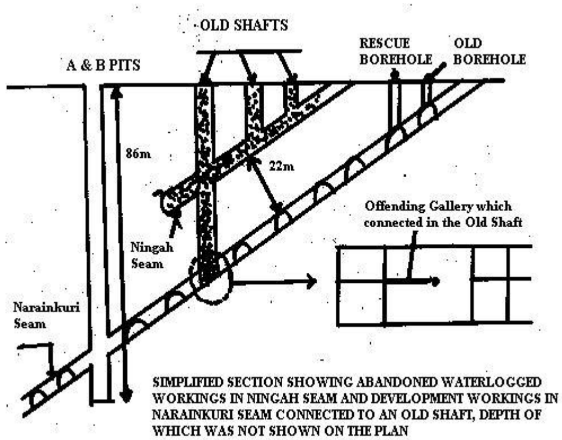

Fig. 3. Section which was water-logged in Ningah Seam

D. The Hero of the Rescue Operation

Shri J. S. Gill, Assistant Chief Mining Engineer, risked his life by entering the capsule through the borehole and orchestrating the safe evacuation of the imprisoned miners. Top officers, including the chairman of the CIL, initially opposed this action because they didn't want to endanger a senior officer's life. He unlatched the capsule as it touched down in the muddy and wet area, picked up the first person he spotted, placed him inside, and then gave the order for the capsule to be hoisted. This enabled him 20 minutes to organize the 65 stranded miners who were still trapped.

A crowd of almost 20,000 people had gathered to see the tense rescue effort. The 65 miners had to be brought up one at a time over the course of nearly six hours, and when Shri Gill finally emerged from the capsule, everyone lost it and started crying hysterically. He was carried on their shoulders while being covered with garlands. The scene is impossible to explain in words; it is better left to the reader's imagination to recreate it in his own thoughts. With this, a dazzling chapter in the history of Indian mining came to an end.

Fig. 4. The capsule by which Shri J. S. Gill rescued 65 miners

The President of India presented Shri Jaswant Singh Gill the Sarvottam Jeevan Raksha Padak (SJRP), the nation's highest civilian gallantry award, for saving the lives of 65 miners. No live person had ever received this gallantry medal prior to Shri Gill. Many people have, however, received it posthumously. Coal India Ltd. observes November 16 as "Rescue Day" in honour of his legendary feat of bravery.

3. Conclusion

It is inferred from the Mahabir Colliery event that the pumped-out water was finding its way back into the Ningah seam’s historic workings through surface fissures. Pit No.34, which is 30 metres deep, was reactivated to stop the flow of water through it. A temporary helmet and winder were put in place, and the shaft was later shut on 20.11.

The officials tried using pumps to lower the water level inside the mine, but this didn't prove to be very successful. Additionally, it would take them between 60 and 90 days to remove the water out.

When Mr. Gill's proposal was implemented, he said that officials had drilled a number of borewells to connect with the miners and to provide them with food and water. In order to send a 2.5 m tall, on-site manufactured steel rescue capsule to lift them out, they dug another well. It was lowered into the pit using a crane that was tied to an iron rope.

Mr. Gill offered to participate in the rescue effort and stated, "You only get one life; make it count."

Mr. Gill assisted the exhausted and severely shaken miners in using the capsule to reach the surface. After exerting strength and courage, it was his commitment, courage, and passion that allowed him to prevail in the end.

From this incident of Mahabir colliery it is concluded that if we have courage, dedication, presence of mind and dedication towards our work so we can come out of any calamities or disaster.

Acknowledgements

The idea and methodology for a detailed analysis of the mine rescue mission, the use of essential resources, and how to work with it to ensure the success of the rescue operation are provided by this research paper on the case study of the Mahabir colliery event. The courage and bravery required for any rescue operation to maintain the job in progress and lead to its success are considerations to be considered as well as other lessons to be learned.

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