

DIRECTOR OF MINES ANNUAL REPORT 1977

COAL

The Duncan mine at Fingal operated by the Cornwall Coal Company was the only producing coal mine. Output was increased by 9 477 tonnes to a total of 198 966 tonnes, compared with 189 489 tonnes in 1976.

Difficult mining conditions continued to affect production and hinder development work. In February, a serious accident occurred underground causing three fatalities and other serious injuries.

Upgrading of the Duncan mine made it necessary to curtail development of the proposed new mine at Cornwall. Anticipated increases in oil prices together with the threatened energy crisis have renewed interest in the coal deposits of the State. The company is at present awaiting the completion of test work now proceeding at the George River Mines Port Latta plant. If successful it could mean a significant increase in orders.

COPY

9 March 1977

The Director of Mines,
HOBAFI

Ignition of methane at Duncan Colliery

I regret to record that an ignition of methane occurred at the Duncan Colliery of the Cornwall Coal Company N.L. on Monday 7 February 1977 at approximately 9.02 a.m. Six men were working in the area where the ignition took place. The list of victims is:-

| <u>Name</u> | <u>Age</u> | <u>Marital status and occupation</u> | <u>Address</u> | <u>Injuries</u> |
|--------------------------|------------|--|--------------------------|---|
| Personal Info Removed | | Single. Shuttle car driver and relief miner. | Personal Info Removed | Deceased |
| | | Married. Miner operator. | | Critically injured and subsequently died 12/2/1977. |
| | | Married. Shiftman | | Seriously injured. |
| | | Married. Shiftman. | | Seriously injured. |
| | | Married. Shuttle car driver. | | Facial burns and shock. |
| | | Married. Shuttle car driver. | | Bruises and shock. |

The accident has been loosely termed as an explosion but for a number of reasons I believe it should be considered to be an ignition. I have the following reasons for this belief:-

- (1) An explosion is defined as a gas going off with a loud noise and this results in considerable devastation. Ignition is defined as making intensely hot.
- (2) No devastation was obvious at the scene of the accident and all the timber props used as roof support were still standing. The machine miner was undamaged.
- (3) The scene of the accident showed every evidence of intense heat being generated. The helmets that the men were wearing were badly burnt and warped, the plastic brattice cloth was badly burnt away and this is consistent with the intense heat generated by the ignition of methane which is estimated to be in the region of 735°C.

- (4) The explosive range of methane air mixtures is regarded for safety purposes as between 5-15%. Experimental work has seldom been able to achieve an explosive effect below a concentration of 6.5% methane and a concentration of 9.5% is generally accepted as being the most explosive point in the methane air mixture range.
- (5) An ignition of methane rather than an explosion would explain why there was no subsequent coal dust explosion.
- (6) An ignition would also explain why there were no appreciable concentrations of after damp on the accident scene and this can be concluded due to the fact that rescue operations continued for at least 30 minutes after the accident.
- (7) Toombs, Posworth, Barnes, Stanley, Underwood and Hallows all mentioned flame, smoke and air blast, but no noise. The only two statements that mentioned noise were Hall and Davenport and in the case of Hall when he gave his statement he was suffering severe shock and it was difficult to get clear facts from him.

From the evidence the ignition was caused by a build up of methane in the development heading, the facts being:-

- (1) Methane was first detected in the mine on 15 October 1976, and there was a continuous, although slight emission from that date. Instructions on control were listed in my record book entry of 20 October 1976.
- (2) At 5 p.m. on the day of the ignition 0.4% methane was detected at the face.
- (3) On the morning of 8 February 1977, the day after the ignition, methane concentrations in excess of 5% were recorded at the face.

The evidence is conclusive and the accident could only be due to an ignition of methane gas.

The sequence of events is as follows:

1. The mine works a 9-day production fortnight and work ceased on Thursday 3 February 1977. The mine remained idle over the long week-end. I have been assured by the management that the upcast fan was running continuously and no power cuts were experienced. The methane concentration must have built up over that period. It has been claimed the build-up was due to an outburst of methane gas. This theory can be discounted as outbursts occur only where methane concentrates under great pressure and there is no previous evidence of this at the Duncan mine. In addition an outburst would have left definite evidence at the face, as it results in roof collapse or severe bursting of coal. No disturbance was found. Methane seepage has been checked since last October and has always been slow and of negligible volume. Methane recordings subsequent to the ignition confirm this.

I suspect ventilation in the development heading has been poor since the resumption of work following the Christmas holiday. I have three reasons for this belief.

1.1 The condition of the main return airway to the upcast fan has deteriorated further since my last inspection of that area on 16/11/76 when I recorded that the return airway required back brushing to remove the restrictions to air flow. This is a basic principle in mine ventilation and if the pressure energy available at the fan is being used to pull air through a severe restriction, it is not available to pull air through the deepest part of the mine (viz. the development area).

1.2 The fact that two booster fans were being used to induce air to flow through the development area indicates that problems were being experienced and natural planned ventilation could not be maintained. These fans were switched off on Thursday 3/2/77 and not restarted.

1.3 The ventilation checks I have carried out since May 1975 indicate that mine ventilation fluctuates and the ventilation system is very sensitive to a number of factors, some mentioned being:-

- (a) Placing and maintaining brattice cloth.
- (b) Restrictions in return airways.
- (c) Recirculation of air due to bad siting of booster fans.
- (d) Failure to replace brattice cloth with brick stoppings.
- (e) Leakage at ventilation doors, and failure to ensure they were closed.
- (f) Short circuit leakage from intake to the return airway.

2. On the morning of 7 February 1977 the deputy Mr J.L. Hall made his pre-shift inspection in accordance with regulation 196(1) and (2) of the Mines Inspection Regulations 1975, (E.F. No. 231, 1976). He claims no methane was detected in the development heading. He is a conscientious official who takes his responsibilities seriously. However, he was not adequately trained for this work. He admits to not having seen a gas cap on a flame safety lamp until methane was struck last October. He admits to being unable to measure ventilation flows and I recorded on 17 November 1976 that it was his duty to do so. His statement indicates the pre-shift inspection required that he trace electrical faults and check that machinery and equipment was in working order - he did these things before making his statutory checks. Coal Mines Acts throughout the world recognise this as a bad practice, and require deputies to devote their time to the duties specified for the safety and health of the workmen.

All the evidence points to the methane building up over the long week-end and the deputy did not detect this for a number of reasons, namely:-

- 2.1 Pressure of other work forced him to rush his inspection and this it was not sufficiently thorough.
- 2.2 Lack of training made him incapable of appreciating the gravity of the situation.
- 2.3 Lack of practical experience rendered him incapable of carrying out the necessary examination, or of reading the methanometer accurately. (He may have left the cap on the instrument).
- 2.4 Lack of knowledge of the properties of methane rendered him incapable of testing in the area where methane was likely to build up.
- 2.5 From the evidence of the ignition, there was not a large quantity of gas, and he may have missed it.

Whatever the cause the methane was undetected, and the men entered the working place, where a flammable atmosphere had built up. They did not appreciate the hazards of lack of through ventilation or smoking. The evidence from statements and questioning prove that cigarettes and matches were being carried and the booster fans were switched off because they were too noisy. Inspection of the accident scene indicates that the switches to the two fans were in the off position, and without them, a flow of fresh air to expel the methane atmosphere, could not be achieved. These fans had not been running since work ceased on the night of Thursday 3/2/1977.

3. The six men in the development crew began work at approximately 8 a.m. on maintenance to the machine riner and the shuttle cars. C. Scales serviced the cutter head on the machine by replacing the worn picks. He used a hammer and steel punch to do this task.

A. Targett was greasing the machine riner and I. Naylor was putting oil in the gear box.

At approximately 9.02 a.m. an ignition of methane took place in the face area. It is not possible from inspection of the accident scene to determine the exact starting point of the ignition. Scales and Targett sustained the gravest injuries, which may indicate they were closer to the source of ignition. The pathologist's report on the extent and nature of the injuries may be of assistance in this regard. Vincent and Naylor may be able to explain what happened, but at this stage they are not in a condition to permit being interviewed.

Ignition may be caused by:-

- (a) Naked lights,
- (b) defective or damaged safety lamps,
- (c) shot firing,
- (d) fires,
- (e) electricity,
- (f) friction from falling rock producing sparks,
- (g) overheating of mechanical equipment,
- (h) oxy-acetylene, and arc welding.

The report by Mr Earthus (Electrical engineer, Department of Mines) rules out electricity as a cause. The safety lamp was found after the explosion still hanging from a timber support well back from the face - it was undamaged and can be discounted as a source of ignition.

Cause (f) can be excluded as there is no evidence of any rock fall. All the other causes do not apply except cause (a). It is concluded that a naked light was the source of the ignition, and the evidence of the box of matches and spent match head confirm the evidence.

The ventilation of the mine has been of concern to me, and I enclose copies of my record book entries which record fluctuating ventilation conditions and the remarks I have made. Sudden drop in barometric pressure can cause fluctuation in the quantity of air passing through the mine. I enclose records from the Bureau of Meteorology of recordings for 4, 5, 6 and 7 February at the three stations closest to Pingal, which indicate no significant pressure drop occurred. Atmospheric pressure was not the cause of the failure in the ventilating system which prevented an effective dispersal of the methane gas.

Over the past 18 months considerable work has been done to improve ventilation generally and meet my requirements. In particular the following work has resulted in significant improvement in conditions:-

- (a) Building 65 brick stoppings.
- (b) Installing 3 self-closing air doors.
- (c) Constructing an air crossing.

However, these improvements were not sufficient, and the failure to install the additional fan and clear the obstruction in the return airway as requested on 16 November 1976 was the cause of the failure in the ventilating system. This was subsequently proved as the ventilation in the development area was not re-established until 14 February 1977 when the additional fan was put into commission.

(H. Purchie)
DEPUTY STATE MINE ENGINEER

COPY

COPIES OF RECORD BOOK ENTRIES

14.5.75

Inspected the workings of the Cornwall Coal Co., accompanied by Mr. J. Brennan. I am not satisfied with ventilation generally. Steps must be taken to improve conditions as regards face ventilation. I believe the quantity of air may be inadequate and increasing the quantity on the upcast fan should be considered.

H. Marchie (S.M.I.)

4.7.75

I have inspected the workings of the colliery accompanied by Mr. R. Mellows, J. Lind and H. Seymour. Conditions were found to be satisfactory and I am pleased with the improved ventilation conditions

H. Marchie (S.M.I.)

30.7.75

I have today inspected the colliery workings accompanied by Mr. Symons, Hartus, Brennan and Mellows. Conditions generally were found to be satisfactory with the exception of electrical installations which were found to be faulty in the following respect:

- (1) 3.3 kv cable - broken earthing gland belts to be replaced on cable couplings.
- (2) All switch boards and sub-switch boards with exposed live terminals to be enclosed.
- (3) Open type joints up to 32 V to have connectors and insulation.
- (4) Main sub-station distribution to have approved couplings.
- (5) Low voltage cable joins to be enclosed in junction boxes.
- (6) All motors to have overload protection.
- (7) Cable connected into junction boxes to have proper cable glands.
- (8) No danger signs on transformer and main sub-station. These to be provided.
- (9) Fire extinguishers required at each sub-station.

H. Marchie (S.M.I.)

15.10.75

I have today inspected the mine workings and have found conditions to be satisfactory. The progress in eliminating electrical hazards has been satisfactory.

H. Marchie (S.M.I.)

15.12.75

I have today inspected the mine workings accompanied by Mr. J. Brennan. I have found conditions to be satisfactory. Rubbish must be cleaned up in the crib room area. Tests for methane were made with a methanometer at the miner face, in the return and in a number of blind headings - no trace of methane could be detected.

H. Murchie (S.M.I.)

17.2.76

Inspected the mine workings accompanied by Mr. Mellows, Mr. Lind and Mr. Jeymour. Conditions were found to be satisfactory.

H. Murchie (S.M.I.)

30.3.76

I made an inspection of the Duncan Colliery on Tuesday 30th March and records:

- (1) Water is accumulating in the underground workings affecting travelling ways beside conveyor belts and shuttle car roadways. Effective measures are required to eliminate these hazards.
- (2) The amount of rubbish being left underground in the vicinity of crib areas and workshops is disgraceful. To prevent health and fire risk, a good clean up is required.
- (3) Following complaints from employees the change house was inspected and found to be below standard. I understand that plans are in hand to construct a new change house and this should be done without delay.

H. Murchie (S.M.I.)

17.6.76

Inspected mine workings accompanied by Mr. H. Mellows. Pillar extraction is progressing satisfactorily. Face ventilation is poor and more attention is required on installing and maintaining brattices.

H. Murchie (S.M.I.)

1.8.76

Inspected mine workings accompanied by Mr. H. Mellows. Observed pillar extraction in operation and was satisfied with the way the work was being done. Conditions generally were satisfactory and improved ventilation conditions were noted.

H. Murchie (S.M.I.)

20.10.76

I was advised on the afternoon of 19th October 1976 that explosive quantities of methane had been detected in a main development heading in the mine. I made an inspection of the mine accompanied by the registered manager Mr. H. Mellows and Mr. J. Brennan. Explosive pockets of gas were detected early on the shift but with the installation of brattice cloth and good air flows these were quickly dispersed and I am satisfied that the immediate danger has been reduced. I am confident the management has control of the situation and are competent to ensure no dangerous situation arises.

To ensure that full safety measures are taken, and since the source of the gas is not yet certain, it is essential that the mine be treated as a fiery mine on a temporary basis until extensive tests are undertaken and a reasoned decision made with regard to safety precautions.

I require that gas tests be taken in each working place at intervals of not more than 2 hours and elsewhere at least daily. I will make a further inspection next week when fuller records of the situation are available.

In the meantime the following rules will apply to the mine.

- (1) No smoking, matches, naked flame or other means of ignition will be permitted underground.
- (2) Ventilation methods at working faces will be arranged in a more efficient manner. The object is to exhaust dust or gas from the area in which the men are working and not to re-circulate the air flow. air velocities of +50 ft/min and quantities of 7000 cfm are not adequate for a machine miner heading.
- (3) Rubbish, paper and other materials subject to the ready encouragement of fire must be completely cleaned up. At least two production shifts will be allotted to this task and done without delay. This includes abandoned explosives and detonators.
- (4) Electrical hazards will be systematically corrected to ensure the safety of the mine and all persons underground.
- (5) Where flame cutting or welding is necessary underground this may be done in a designated safe area in an intake fresh airway and under the personal supervision of the registered manager using a flame safety lamp or methane detector.

I commend the management and their staff on the prompt manner in which they have controlled this situation and the assistance they have given to me.

H. Murchie (S.M.I.)

28.10.76

I have inspected the mine workings accompanied by Mr. H. Bellows. The methane emission has been located at a small roof fissure in the development heading and the intake air is readily dissipating it. Readings of +5% CH₄ at the fissure and 0.2% CH₄ immediately below it were recorded. No trace of methane could be detected elsewhere. I am satisfied the situation is under control and will relax my previous ruling on safety measures. My only requirement now is that:

- (1) No smoking or naked flame will be permitted in the development area where the gas is being made.
- (2) Gas tests continue to be made at regular intervals and results recorded in the inspection book.

It is recorded that the clean up is satisfactory and the fire risk reduced - every effort must be made to keep the mine clear of rubbish.

Ventilation is improved at working faces measured quantities of 10 000 cfm and 16 000 cfm. The exhaust booster fan in the pillar area requires to be adequately guarded.

H. Murchie (S.M.I.)

16.11.76

I have inspected the mine accompanied by Mr. A. Hellows. Methane emission is unchanged and is under control. Ventilation at the working faces is not as good as on my previous visit, readings taken were:

- Station 1. Main exhaust fan 42 525 cfm.
- 2. Main return 31 200 cfm.
- 3. Main development face 4 992 cfm.
5 760 cfm.
- 4. Main development return 6 210 cfm.
- 5. Pillar area face 7 650 cfm.
- 6.) Pillar return combined 6 300 cfm.
- 7.) 4 950 cfm.

Ventilation conditions must be carefully watched and every effort made to increase the quantities flowing. I would like the following matters treated as urgent:

- (1) Install additional fan in Duncan Tunnel.
- (2) sack brush some of the return airways.
- (3) Brick stoppings into main development area.

H. Murchie (S.S.I.)

17.11.76

Inspected the mine accompanied by Mr. A. Hellows, .. Bartkus and C. Stanley. Electrical work generally is not satisfactory and I will send a written report on the work to be done to the Mine Manager after I have received Mr. Bartkus' report. Ventilation had improved at the working faces and the following measurements recorded.

- Station 1. 40 160 cfm at 1" .0
- 3. 8 256 cfm
- 6. 6 300 cfm) = 14 220 cfm in total section.
- 7. 7 920 cfm)

The fluctuation in ventilating conditions, illustrates how important constant checks must be in ensuring adequate air quantities are reaching the working places. Deputies should check air quantities on each shift and again when breakthroughs require alteration to brattice cloth positions. These results to be recorded. Glass bottles must not be left underground.

H. Murchie (S.S.I.)

14.12.76

Inspected the Duncan Colliery accompanied by Mr. A. Hellows. Conditions generally were satisfactory. Ventilation checks.

- Station 3. 8 400 cfm at 70 ft/min
- 5. 7 000 cfm at 57 ft/min

Some brattice seals were leaking and siting of booster fans must be watched. Methane was being dispersed by intake air and could only be detected at the point of emission.

H. Murchie (S.S.I.)

7.2.77

I received a telephone call from Mr. J. Brennan at approximately 10 a.m. notifying me that an explosion had occurred at the mine and rescue operations were under way. I arrived at the mine at 2.45 p.m. and made an inspection in the development heading where the accident happened. I was accompanied by Messrs. P. Allan, J. Brennan, R. Mellows, L. Miles, B. Birrel and L. Mason. Methane was detected at 0.4%, and CO at +40 ppm at 5 p.m., and as ventilation could not be established in the heading a full investigation of the accident could not be made. Instructions were given to the registered manager, Mr. R. Mellows that only work on safety of the mine and ventilation would be permitted. Permission was given to run the pump on the intake side of the section.

H. Murchie
Deputy State Mining Engineer

8.2.77

I went underground at 8 a.m. accompanied by Mr. R. Mellows and V. Parkinson. At the scene of the accident methane concentrations of +5% were detected. There was no flow of through ventilation and again a full investigation could not be done. Work will continue on restoring damaged brattice cloth stoppings.

H. Murchie (D.S.M.E.)

9.2.77

I went underground at 8 a.m. accompanied by R. Mellows, J. Brennan, L. Miles, V. Parkinson, B. Birrel, T. Underwood, L. Mason and L. Gatty. Methane in concentrations above 4% was detected and I could not permit the surveyor to measure up the accident scene. All persons were withdrawn except J. Brennan, B. Birrel and T. Underwood who proceeded to make the roof safe above the miner and replace the roof supports moved by the explosion on 7/2/77. The heading is barricaded off and no person may enter without authorisation from myself or the registered manager.

Ventilation checks were made in the returns of both the development heading and the pillar area.

Results were:

- (1) In development area -
Air flow 60 ft/min
Quantity 6 720 cfm.
- (2) In pillar area -
Air flow 40 ft/min
Quantity 3 360 cfm.

However no positive through air flows could be detected in the intakes. It is apparent that ventilation conditions in the mine have ceased to function as required and until the situation is rectified no work other than that required to make the mine safe and restore adequate ventilation is permitted. In view of the situation in the mine regulations 197, 198 and 199 must be carefully observed.

No evidence may be removed from the accident scene and it must remain undisturbed until I can carry out a full investigation when ventilation is restored.

H. Murchie (D.S.M.E.)

15.2.77

I have made an inspection of the accident area accompanied by J. Brennan, R. Mellows, E.C. Leyland and E. Bartkus and B. Birrell. Ventilation has been re-established and methane concentrations have been dispersed. Air flow in the return airway was 19 380 c.f.m.: the new upcast fan is working effectively. Work may commence in the pillar area tomorrow and once the accident survey is completed tomorrow work may resume in the development area.

H. Murchie (D.S.M.S.)

16.2.77

I have today inspected the mine accompanied by R. Mellows, E.C. Leyland, E. Bartkus and B. Birrell. Photographs were taken at the accident scene by E. Lansdale of the Tasmania Police, once it was ascertained it was safe to do so. The area was surveyed by S. Benn of the Department of Mines.

Mr. Bartkus inspected the electrical equipment and it is required that all the electrical equipment within 100 metres of the face in the development area is flameproof.

Ventilation checks were carried out at the key points in the mine with the following results:

| | | |
|---|-----------------|----------------|
| Station 1 | 41 760 c.f.m. | |
| Station 8 (New return airway for new fan) | 41 745 c.f.m. | |
| Total air quantity exhausted | - 83 500 c.f.m. | |
| Station 3 | 10 800 c.f.m. | |
| Station 4 | 19 380 c.f.m. | |
| Station 9 (Return at overcast) | 18 900 c.f.m. | |
| Station 10 " | 23 800 c.f.m. | |
| Station 5 (Velocity only) | 100 ft/min. | |
| Station 6 | 12 240 c.f.m. | } Total 23 040 |
| Station 7 | 10 800 c.f.m. | |

The return airways for the two splits give a total of 42 000 c.f.m. which is just over 50% of the air being exhausted from the mine. This indicates excessive leakage and is not acceptable. In the two splits flow in the exhaust airways is greater than at the face and leakage again is unacceptable. The return airway to the original main fan has suffered a further severe collapse since my last inspection of this area on 16 November 1976 when I requested that the restriction be cleared and treated as urgent. This can no longer be considered to be a return airway due to the restriction and the inability to make safety inspections. An alternative proposal is required. With regard to mine ventilation generally, although the situation has improved, considerable work is still required and must be tackled without delay. Air flows of at least 50 ft/min. are required at all production faces and if deputies cannot measure an air flow of less than 25 seconds over 20 feet, work must cease until adequate air flow is restored. Deputies to be given adequate equipment and instruction for this duty to fulfil the requirements of regulation 196 (2) (a).

To eliminate all fire risk rubbish, waste and inflammable material to be removed from the mine.

No person other than a competent person appointed by the Manager in writing shall operate mechanical ventilating equipment in the mine.

Where a build up of methane occurs all productive work will cease if the percentage in the general body of air exceeds 1.25% CH₄. Power is to be shut off and all men withdrawn if the % exceeds 2-1/2% CH₄.

Everyone who works underground in the mine must have knowledge of the properties of methane gas and the safety measures to take in dealing with it.

A barometer is required to be provided at the entrance to the mine and barometric pressure readings are to be recorded at the commencement of each shift.

H. Murchie
Deputy State Mining Engineer