

State-Of-The-Art Total Safety Solutions for Mining

Prof. Dr. Albert Jugel

- **China Coal Mining Safety Practise**
- 1. **Before '2000 the investment in coal mining safety in China was very low, due to strict price control of coal squeezing profits and due to less direct involvement from the government on safety issues.**
- 2. **From '2000 onward the government established the State Administration of Work Safety (SAWS) to enhance attention on safety issues in coal mining**
- 3. **The new regulation for safety investment covers both state-owned and private coal mining enterprises.**
- 4. **It is the aim to reduce the accident rate by more investment into safety equipment and by more training and higher awareness**

Work safety watchdog to be given more power

By

The newly-upgraded work safety watchdog will get more teeth to curb the growing incidence of fatal accidents.

The State Council has decided to grant more power to the State Administration of Work Safety so that it can conduct inspections and supervise more effectively, especially in coal mines where at least 6,000 were killed last year, Huang Yi, spokesman for the administration, said.

"Giving us more power is a very important step to stop the rising trend of fatal accidents," Huang told China Daily in an exclusive interview.

The administration was last month "promoted" from a deputy-ministry department to cabinet-ministry level.

According to an industry insider, the administration was often ignored in the past by provincial and local governments, which thought it was not powerful enough.

In one such instance, a gas explosion in a mine killed at least 23 workers last week in the coal-rich province of Shanxi. Due to poor safety measures, Xiangyunqiu coal mine in Jiaocheng County was ordered to be closed last summer by the inspection authorities, but it continued to operate in defiance of the order.

Dangerous conditions are common in the coal mining sector. Last year, miners dug out 1.95 billion tons to sustain the country's economy, but only 1.2 billion tons were mined with the proper protection measures in place.

Huang said China's State-owned



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— HUANG YI
spokesman for the State Administration of Work Safety

coal mines have a comparatively better safety record than private mines. Despite that, a string of fatal gas explosions at State-owned coal mines in Henan, Shaanxi and Liaoning provinces have killed about 450 miners since last winter. Half of China's 25,000 small private coal mines do not meet safety standards and have failed to invest enough in the safety of their workers.

State Council task forces have been conducting surprise inspections

to eliminate hazards at State-owned coal mines in 21 coal-rich provinces, municipalities and autonomous regions, said Huang.

R.C. Lao, resident project manager of the Canada-China Project for Cleaner Production said coal mines gas, mainly methane, causes a great number of coal mine explosions and many casualties.

"But on the other hand, it is a valuable and clean fuel," said Lao, suggesting that extracting it can reduce the amount of coal needed and make mine operations much safer.

Premier Wen Jiabao has said the government would spend 3 billion yuan (US\$610 million) this year in upgrading safety technologies at State-owned coal mines to "truly make coal mining safer."

A Beijing-based mining safety expert told Xinhua that he believed the funds would mainly be used to deal with the problem of coal-bed gas, as gas explosions are the "top killer" in Chinese coal mines.

Apart from upgrading alarm systems and improving underground ventilation facilities at coal mines, the money might also be spent on research to use coal-bed gas as a new source of energy, said the expert.

Despite such efforts, Huang said the safety situation in China's coal mines is still grave.

He said a severe energy strain caused by China's rapid economic growth has prompted coal mines across the country to over-stretch their capacity. More than 70 per cent of the energy fuelling China's robust economy is from coal. Nearly 90 per cent of China's coal pits are underground and about half of them are rich in gas.

"Poor management, insufficient supervision and ignoring safety requirements are the factors that have led to frequent coal mine accidents," said Huang.

◆ Urgent, Page 2
◆ Editorial, Page 4

From China Daily, March 2005:

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GENERAL INFO

COAL MINING CHINA

Rooting out deadly coal mine accidents

CHINA ONLY
17.02.05

The nation has been thrown into unfathomable grief in the wake of the Sunjiawan coal mine gas explosion in Northeast China's Liaoning Province on February 14.

The death toll had risen to 240 by yesterday afternoon, five others remained missing.

Spring Festival has not ended in the traditional sense. Many people are still steeped in the lingering festive happiness while families of the more than 200 dead have to bear helplessly the agony of losing their beloved ones.

We hope relatives of the lost workers will be properly settled and the cause of the tragedy be clarified soon.

Knowing why this has happened may help us prevent more such disasters.

Admittedly, lessons are being drawn from previous tragedies.

Supervision has been strengthened continually. And a slew of laws and regulations have been put in place to promote work safety.

Despite all this, last year saw the country's most lethal - at the end of the year - coal mine accident in Northwest China's Shaanxi Province, claiming 166 lives. At the same time, another accident in Henan killed 147.

The whole year of 2004 saw 6,027 miners killed. The figure is appalling.

The situation prompts us to dig deeper into the issue.

We used to point the finger at the avarice of private mine owners seeking profits at the sacrifice of miners' safety. Defying our habitual assumption that small private collieries are the source of evil, however, the three major accidents, including the current one, have all happened in standard State collieries.

It indicates something is wrong in the whole industry - it lacks adequate safety input.

The State used to subsidize industrial

safety in the planned economy period. Since the 1993 corporate reforms, collieries have been required to put aside capital to finance work safety by themselves.

Unfortunately, the 1990s saw sluggish demand for coal and declining prices, which made mine owners unable to refurbish their safety equipment.

It is estimated that the country's key State coal mines owe a debt of 50 billion yuan (US\$6 billion) in safety investment.

Without filling the yawning gap, it is impossible to root out accidents that cause heavy casualties.

The State is expected not to pour much fiscal capital into the sector, which is deemed as commercial after a series of market-oriented reforms in recent years.

What it should strengthen is its supervisory role. Adequate subsidies must be guaranteed, which is no longer a mission impossible as coal prices soar.

Past experiences show owners of small mines tend to skimp on money for safety input while some large State collieries are equally unwilling to put in extra money, which increases their production costs and worsens their balance sheets during industrial doldrums.

Central and local safety regulators must play a strong role in both cases.

In other cases, financial weakness of some inefficient State collieries goes against their wish to increase safety input. The State could consider launching ownership structure reforms to introduce more non-State funds to replenish the safety funds of the capital-thirsty collieries.

Whatever the cases, the State must strengthen supervision and production safety law must be unwaveringly enforced - for the sake that no more avoidable accidents occur.

From China Daily, February 2005

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FRIDAY, FEBRUARY 25, 2005



Mine owners must pay a higher price for poor safety

By Li Shi

China is planning to implement harsher compensation policies to protect the interests of industrial injury victims. The highest compensation level could equal 20 times that of the average yearly salary in places where accident occurs.

The unified policy will apply to all industrial accidents and injuries. The latest coal mine accident in Northeast China's Liaoning Province on February 14, which claimed 210 lives with five others still missing, reminds us how urgent it is to find quick and effective measures to the Gordian knot of accidents in the workplace.

There have occurred a string of fatal accidents in coal mines across the country in recent months, although policy-makers have never ceased to try new methods to stop the human tragedies.

The new compensation policy marks a shift of the mentality of the policy-makers in solving the thorny problem.

China used to mainly resort to stringent administrative measures to clamp down on safety-ignoring coal mines. It has closed a number of small mines that have failed to meet safety standards.

But given the rising profit levels, administrative measures have proved ineffective at curbing fatal accidents.

The current compensation level is too low to force employers to be serious about work safety. For example, the total compensation and funeral allowances for every victim in the Chongjiasan coal mine accident, which occurred in Northwest China's Shaanxi Province last November, was only about 50,000 yuan (US\$6,020). Bereaved families of miners elsewhere can get even less.

Low compensation means employers do not suffer economically as their profits can well offset expenditure for industrial injuries.

Only by forcing them to pay a higher price will they become willing to increase safety and standardize production.

The new compensation policy will exert more economic pressure on employers, including coal mine owners, to care more about safety in production.

The policy, if implemented, could require employers to pay four times as much as the sum paid by the Chongjiasan coal mine.

It is obvious that the policy-makers want to make employers pay more than they potentially gain from production if they ignore safety standards.

Such a policy will prove more effective than administrative clean-ups.

This year, more power plants will be constructed, which will increase market demand for coal. Experts have predicted coal prices will grow further on the basis of the year-on-year 12 per cent rise last year.

Mine owners will castle on the opportunity to increase production to gain more profits. If no effective measures are taken to strengthen safety standards, more otherwise avoidable tragedies might occur.

With the policy line set down, the current task is to hammer out details of the compensation policy and make sure it be strictly implemented.

A shortcoming of the policy may be the 20-time cap it sets for industrial injury compensation. Policy-makers may fear too much compensation will bog down the employers and ultimately make it hard to fulfill liability.

It is clear and understandable. But the mentality of mine owners just ignores the interests of workers in their wild pursuit of profits. Harsh punishment must be meted out to curb their indiscriminate practices.

Despite the flaw, the new policy nonetheless marks a good start in our protection of workers' interests. We are looking forward to its formal implementation at an early date.

From China Daily, February 2005

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-Government determined to increase safety
STATE ADMINISTRATION OF WORK SAFETY

SAWS is the government department related to coal mining safety and general work safety in China.

In 2004: 136 755 work place casualties were reported
6027 deaths occurred in coal mines (compensation raised to up to 200 000 Yuan)

- Trends in Coal Mining

Due to many accidents in private coal mines the government closed down small mines, and increased the capacity of big coal enterprises to satisfy the huge increase in coal demand (assuming enough funds for safety investment by larger corporations)

The output has been increased from 1.4 billion tons to 1.9 billion tons in 2004.

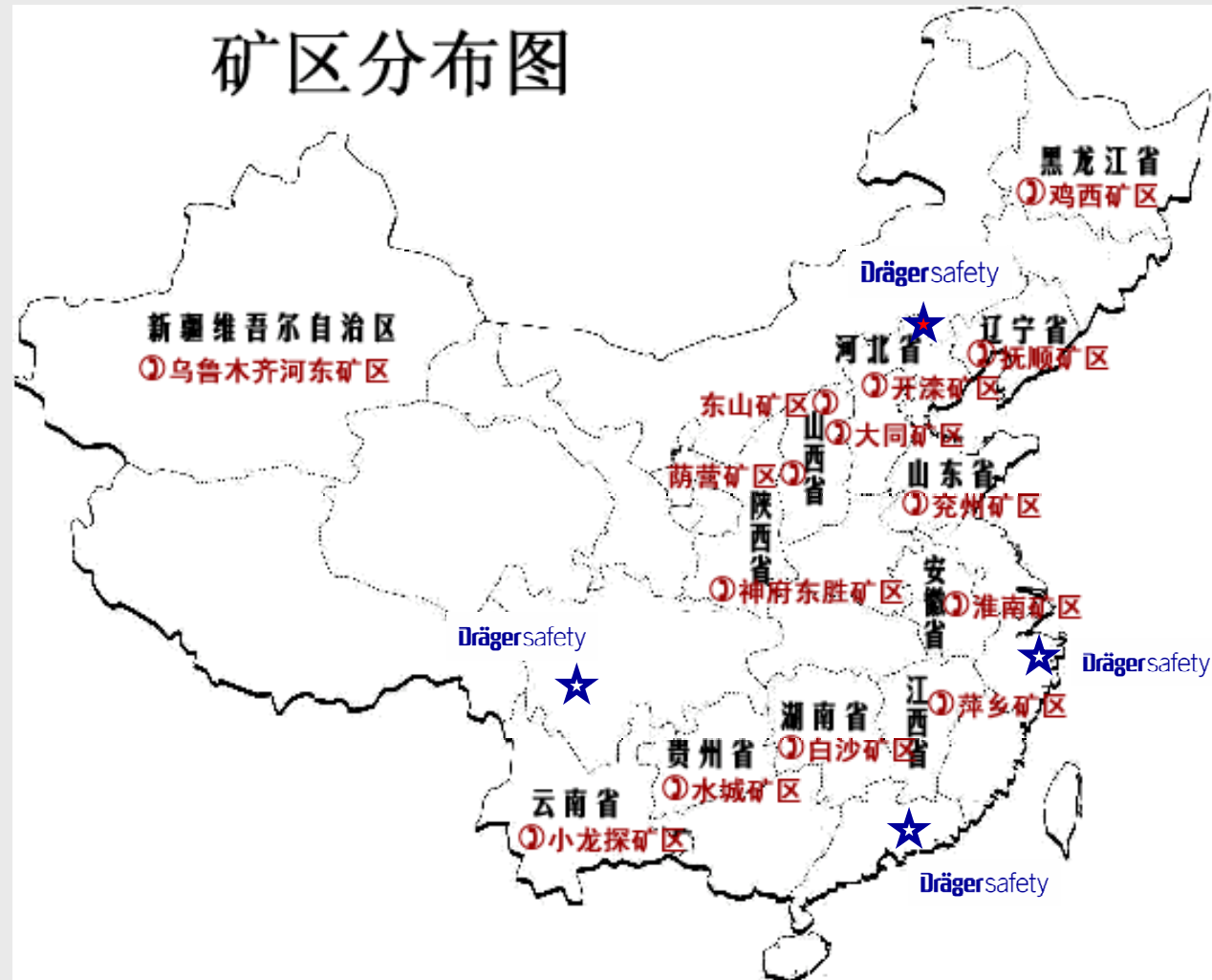
Again in 2005 China will increase output of coal due to higher demand.

GENERAL INFO

COAL MINING CHINA

•Major coal mining areas in China (21 coal-rich provinces, municipalities and autonomous regions)

- Heilongjiang
- Innermogholia
- Xinjiang
- Hebei
- Shanxi
- Shaanxi
- Henan
- Sichuan(including Chongqing)
- Gansu
- Guizhou
- Anhui
- Jiangxi
- Guangzi
- Shandong
- Yunnan



DANGERS AND RISKS IN THE MINING INDUSTRY

UNDERGROUND COAL MINES

CO, CH₄, H₂S, Lack of Oxygen, NO_x,
Particles/Dust

UNDERGROUND METAL MINES

CO, Lack of Oxygen, NO_x, Particles/Dust



SURFACE COAL MINES

H₂S, NO_x, Particles/Dust

SURFACE METAL MINES

H₂S, SO₂, HCN, Particles/Dust

DETECTION, PROTECTION, SAFETY SOLUTIONS

OUR CUSTOMERS – MINING

Your challenges

- Presence of explosives
- Lack of oxygen
- Self rescue from hazards
- Rescue
- Recovery of Materials



Drägers offering

Detection



- Portable gas detection
- Tubes
- Chip Measuring Systems
- fixed systems

Protection



- Breathing apparatus
- Masks and filters
- Long duration escape sets
- Head protection systems

Solution



- Consulting
- Safety and Product Training
- Hardware & solutions for gas management
- customer driven solutions

GAS DETECTION



A range of products and services designed for the identification and early detection of gaseous hazardous substances, including:

- toxic gases and vapours
- explosive gases and vapours
- oxygen
- alcohol and drugs



PROTECTION



Devices and systems which supply breathing air for use in extreme situations and protect people in hostile environments.

Including:



- filtering devices
- escape apparatus
- compressed air breathing apparatus
- closed-circuit breathing apparatus
- chemical protection suits
- diving apparatus



DRÄGER SAFETY SOLUTIONS

Consulting



Hardware and Solutions for gas management



- Breathing supply systems
- Escape chambers
- Quick fill station
- Oxygen booster pump

Safety and product training





Safety consulting and prevention



Accidents



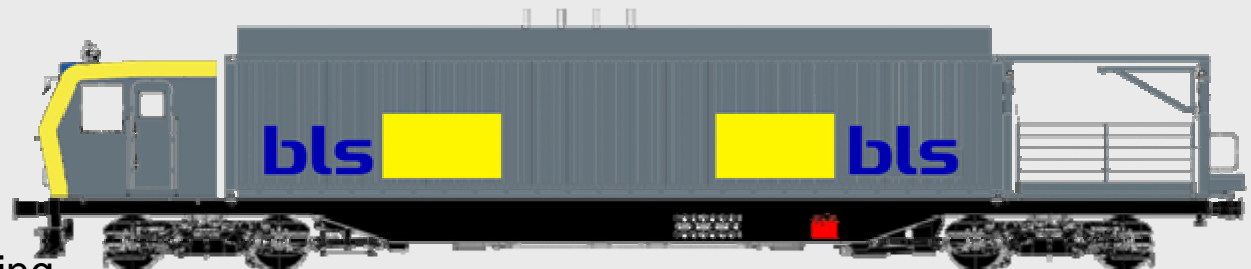
Health
risks



Fires/explosions

Integrated solutions in the tunnel

- Self-rescue measures
- Rescue by fire crews
- Consulting, training
- Service management
- Gas detection and monitoring





SAFETY CHAIN

SAFETY CHAIN

**1. DEFINE PROCESSES &
DETERMINE POTENTIAL DANGERS**

2. GAS MONITORING

3. DAILY WORK & MAINTENANCE

4. SELF-ESCAPE

5. RESCUE

6. RECOVERY OF MATERIALS

1. DEFINE PROCESSES & DETERMINE POTENTIAL DANGERS

SAFETY CHAIN

- Appropriate and efficient mine safety and rescue plans are dependent on understanding and optimizing internal processes.
- The location and the potential of dangers can be established.
- Workers can then be protected from exposure and outfitted with the correct safety equipment.

Transponder Gate
(example: Self-Rescuer)

Filter Self-Rescuer

Oxygen Self-Rescuer

Helmets

Masks and Filters



2. GAS MONITORING

SAFETY CHAIN

- Gas monitoring is necessary to ensure the quality of the breathing air.
- Dust, irrespirable, toxic and/or explosive atmospheres endanger the worker's health and life.
- Harmful substances can occur suddenly and without warning.

Portable Instruments

Dräger-Tubes

Chip Measurement System (CMS)

Filter Self-Rescuer

Oxygen Self-Rescuer

Helmets

Masks and Filters



3. DAILY WORK & MAINTENANCE

SAFETY CHAIN



- Working in a mine can be dangerous at all times. Daily risks are created by normal operations of the mine.
- In order to complete daily work, the miner must be protected from everyday hazards.
- Through the maintenance of the mine and it's equipment, the risk to the miner's safety and the safety of the material being mined is lowered.

Portable Instruments

Oxy Test Station

Oxygen Booster

Filter Self-Rescuer

**Alcohol and Drug
Detection**

Oxygen Self-Rescuer

Helmets

Masks and Filters

**Powered-Air Purifying
Respirator**

4. SELF-ESCAPE

SAFETY CHAIN



- When concentrations of toxic gases and/or explosive gases exist, the oxygen level increases or decreases, and the dust level becomes unbearable, then the worker must remove himself from the dangerous atmosphere.
- In order to successfully exit the dangerous atmosphere, breathing protection is needed.
- The worker must also remain aware of his environment.

Portable Instruments

Quickfill Station

Escape Chamber

Compressed Air

Breathing Equipment

Full Face Masks

Filter Self-Rescuer

Oxygen Self-Rescuer

Helmets

Communication Systems

5. RESCUE

SAFETY CHAIN



- When workers were unable to escape themselves or are trapped within the mine, then the mines rescue team is employed.
- Mines rescue is the practiced response to a mine emergency situation that endangers life, property, and the continued operation of the mine.
- Mines rescue teams work in dangerous atmospheres and must carry with them equipment to save trapped workers.

Thermal Imaging Camera Helmets

**Compressed Air
Breathing Equipment**

**Closed Circuit Breathing
Apparatus**

Full Face Masks

Communication Systems

Filter Self-Rescuer

Masks and Filters

Oxygen Self-Rescuer

6. RECOVERY OF MATERIALS

SAFETY CHAIN

- The main objective of recovery work is to return the mine or the affected area of the mine to normal operations after a disaster.
- Through the use of ventilators, the mine is rid of explosive or potentially explosive gas mixtures and normal ventilation is restored with the normal amount of oxygen to all mine workings.

Portable Instruments

Thermal Imaging Camera

Compressed Air Breathing Equipment

Full Face Masks

Oxygen Self-Rescuer

Helmets

Closed Circuit Breathing Apparatus

Communication Systems



WHY IS DRÄGER POSITIONED WELL TO GIVE ADVICE FOR SAFETY SOLUTIONS?

- Draeger's **over 100 years of experience** in breathing technology
- **Reputation in coal mining** rescue equipment (safety, reliability, quality)
- Many major coal mines world-wide (South-Africa, Australia, USA, Germany, etc) rely on **Draeger's competence in coal mining safety solutions**
- **Experienced staff developing safety solutions:** from advice/consulting, implementation, to service and maintenance
- **Draeger's commitment** to support China's drive to improve coal mining safety, by having its operations in China – customer proximity
- **Coal mining safety has to be managed in a comprehensive approach** covering all aspects of personal safety and rescue operations: gas detection, personal protection, rescue equipment, initial training and regular continuing education/drills, simulation of critical events and how to handle it, integrated safety solutions, service & maintenance, etc
- **This all can be found in one company – in our company – it makes us unique and well positioned to support China in its efforts to increase coal mining safety to the internationally accepted and expected level**

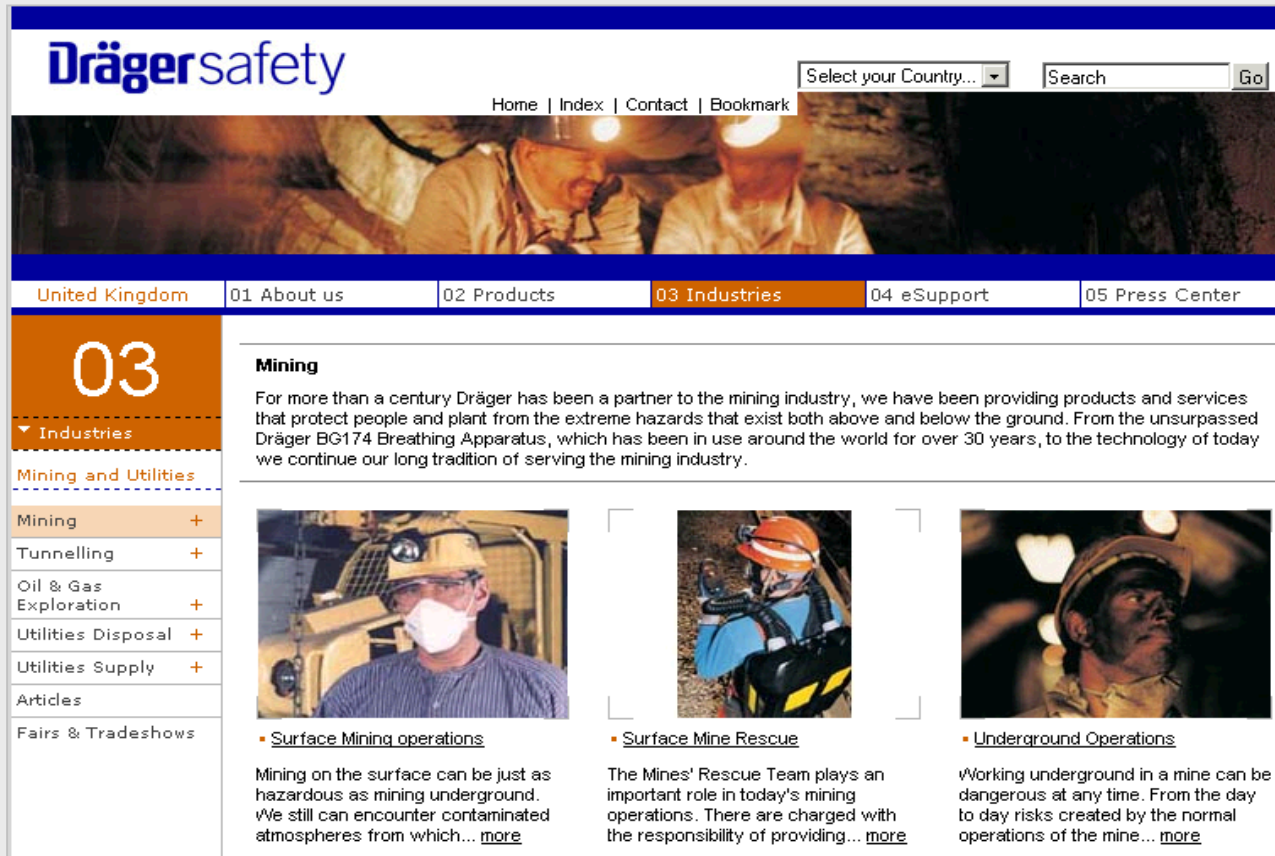
REFERENCE CUSTOMERS

COMPANY	PRODUCTS
BHP Billiton, Australia	microPac Pac III Multiwarn II MiniWarn E-Cal Systems
Anaconda Nickel, Australia	microPac Multiwarn II
Deutsche Steinkohle, Germany	Piccolas PSS BG 4
Ashanti Gold Fields, Ghana	Oxy Alcotest 7410/ 7410 Plus PSS BG 4 Gas Detectors Training Gallery

COMPANY	PRODUCTS
Y.C.R.T, Argentina	PSS BG 4 Oxybox K
Tabas Coal, Iran	Piccola FSR 990 PSS BG 4 Panorama Nova
Singareni Collieries Co. Ltd., India	PSS BG 4 Oxyboks K microPac
KGHM Polska Miedź S.A. , Poland	PSS BG 4 Oxy K 50
Richard Bay Minerals, S. Africa	Pac III
Anglogold, S. Africa	Pac III CMS

FURTHER INFORMATION....

... can be found in the Internet at www.draeger-safety.com or at your local Dräger subsidiary or dealer.



The screenshot shows the Dräger safety website. The header features the Dräger safety logo, a navigation menu with links to Home, Index, Contact, and Bookmark, and a search bar with a dropdown for 'Select your Country...'. Below the header is a large image of two miners in a dark tunnel. A secondary navigation bar includes links for United Kingdom, 01 About us, 02 Products, 03 Industries (highlighted), 04 eSupport, and 05 Press Center. The main content area is titled '03 Industries' and 'Mining and Utilities'. The 'Mining' section is expanded, showing a list of categories: Mining, Tunnelling, Oil & Gas Exploration, Utilities Disposal, Utilities Supply, Articles, and Fairs & Tradeshows. The 'Mining' category is selected, displaying three articles: 'Surface Mining operations', 'Surface Mine Rescue', and 'Underground Operations'. Each article includes a small image and a brief description of the hazards and Dräger's role in providing safety solutions.

Dräger safety

Home | Index | Contact | Bookmark

Select your Country... Search Go

United Kingdom 01 About us 02 Products **03 Industries** 04 eSupport 05 Press Center

03

▼ Industries

Mining and Utilities

Mining +

Tunnelling +

Oil & Gas Exploration +

Utilities Disposal +

Utilities Supply +

Articles

Fairs & Tradeshows

Mining

For more than a century Dräger has been a partner to the mining industry, we have been providing products and services that protect people and plant from the extreme hazards that exist both above and below the ground. From the unsurpassed Dräger BG174 Breathing Apparatus, which has been in use around the world for over 30 years, to the technology of today we continue our long tradition of serving the mining industry.

Surface Mining operations

Mining on the surface can be just as hazardous as mining underground. We still can encounter contaminated atmospheres from which... [more](#)

Surface Mine Rescue

The Mines' Rescue Team plays an important role in today's mining operations. There are charged with the responsibility of providing... [more](#)

Underground Operations

Working underground in a mine can be dangerous at any time. From the day to day risks created by the normal operations of the mine... [more](#)

Extremely important is the continuous inspection by independent organizations to ensure compliance to safety standards and severe penalties in the event of non-compliance.

THANK YOU FOR YOUR ATTENTION!

END OF GENERAL PRESENTATION

BACK UP PRODUCTS IN DETAIL



SINGLE GAS:

microPac



microPac Plus



Pac III



MULTI-GAS:

Pac Ex 2



Dräger X-am 3000



MiniWarn



Dräger X-am 7000



Dräger E-Cal



- Measurement of CO, H₂S, O₂, CO₂, PH₃, and HCN
- **Up to 2 years of use without calibration**
- Basic monitoring functions including **vibration alarm**
- Renewable for the next measuring period
- Changeable dust/mist and chemical filter



- Up to **28 DrägerSensors** (Toxic & O₂)
- **Interchangeable sensors for flexible detection**
- Large display for easy recognition of danger
- Attention demanding audible & visual alarms
- Flexible Menu and operation



- **Two-in-one instrument** for the measurement of explosive hazards and a lack or surplus of oxygen.
- **Modular design** enables high flexibility.
- **Long operation time** with minimal charging time.



Ex Version



Ex-O₂-Version



- **3- or 4- gas measurement: O₂, CO, H₂S, Ex**
- **Attractive price, low cost of ownership**
- **Ease to use** – Design concept – Low training costs
- **Rugged and Robust** – e.g IP 65 water protection rating of the enclosure
- **Optional internal pump**

- **4- gas measurement – up to 30 different, interchangeable DrägerSensors**
- Complete line of accessories
- **External pump** with up to 10 M hose
- **Methane: 0- 100 Vol% CH₄**
- **Worldwide mining regulations**
- Easy to use





- **Up to 5 gas measurement**
2 HPP ports : for IR or Cat-Ex Sensors
3 electrochemical ports : 20 different sensors
FLEXIBLE!
- **All Smart DrägerSensors - interchangeable**
- **Robust housing, IP 67 – waterproof**
- Full-range mode with CH₄ (switches between UEG and Vol.%)
- **Leakage mode**

- **Compatible with Pac III, Pac Ex 2, Dräger X-am 3000, MiniWarn and Dräger X-am 7000**
- Calibrate and configure **up to 10 instruments** simultaneously
- **Features:**
 - bump testing
 - fresh air calibration
 - zero calibration
 - span calibration
 - instrument charging
 - automatic execution of routine procedures



DRÄGER-TUBES

SAFETY CHAIN

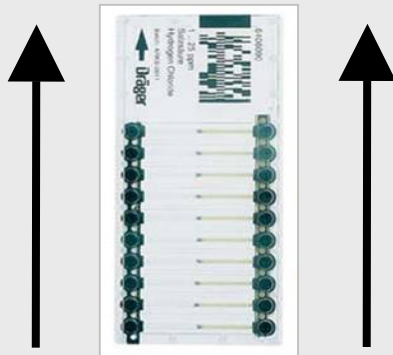


- Glass tube filled with chemical reagent
- Air pulled through the tube with a pump
- Reagents change color if the targeted chemical is present
- **More than 200 Dräger-Tubes – detection of more than 500 substances**
- **Extremely portable and easy to use**
- Can be **specific to a chemical or detect general family of gases.**
- Can measure low/sub ppm levels to Vol. %
- Accuracy varies from +/- 5 to 25 % depending on gas and measuring range





- **Dräger's proven chemical reagent system**
- Ten individual tests per CMS Chip
- **Single Slide Switch - Easy as 1,2,3**
- Digital Display - **precise concentrations** every time, no interpretations
- Safely contains hazardous glass fragments





ALCOTEST

- Exceptional **measuring quality** with electrochemical DrägerSensors
- **50 years of experience**
- **Modular concept** suitable for all applications



DRUGTEST

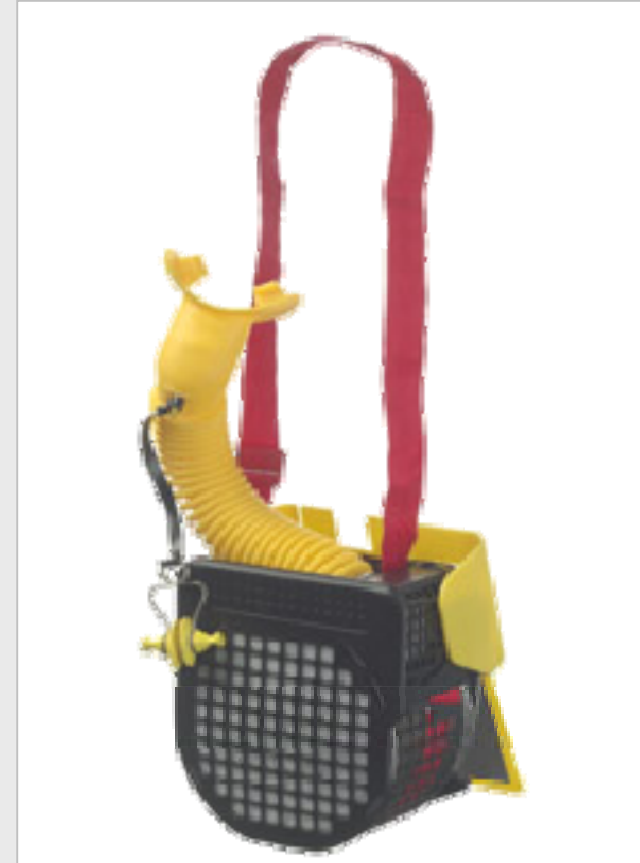
- Detection of up to **6 substance classes**
- Uses oral fluid – **fast and practical**
- **Self-explanatory menu guide**

FILTER SELF-RESCUER FSR 990

SAFETY CHAIN



- Makes an escape situation safe and manageable
- Provides **more than 120 minutes** of escape time
- **Simple, light-weight design**
- Donning is **self-explanatory**



ESCAPE APPARATUS:



Oxyboks K 25



Oxy K 30/50 S



Oxy K 30 H

LIGHT WORK RESCUE APPARATUS:



Oxy K pro

OVERVIEW PRESENTATION



- **Immediate access** in case of fire or explosion
- Simple design allows **quick and easy donning**
- The starter cartridge supplies oxygen immediately **while donning**
- Freedom of movement is not restricting during escape
- **Maintenance-free for 5 years**
- **Duration: 25 minutes** (according to EN 401)

- **Easy to operate**, with little or no training required
- Simple opening mechanism – easily **donned in seconds**
- Quick starter cartridge provides and **instant oxygen supply**
- Equipped with shoulder straps
- **Maintenance free for 10 years**
- **Duration: 30/50 minutes**
(according to EN 13799)





- Especially designed for personnel that is **inexperienced with escape equipment** or personnel with **glasses**
- Incorporates a hood instead of a mouthpiece for **better communication**
- **Protection for the head, face and eyes**
- **Maintenance free for 10 years**

- Designed to carry out **small tasks** where only a **short duration** is required
- Equipped with a **full-face mask** for an **optimal field of vision and verbal communication**
- Includes a **residual warning device** based on the used time





TALISMAN
ELITE



TALISMAN
ELITE LITE





- **Smallest and lightest** micro bolometer camera with 320 x 240 pixel
- **Dual transparent color function** to clearly identify the danger zones
- Includes a **temperature function** with digital display and an **audible low battery warning**
- **Wireless transmission of thermal images**

- **Detailed and sharp thermal images** in all situations
- Can also be viewed by several persons on the **large LCD display**
- Temperature measurement function
- Digital readout and transmitter systems for **wireless transmission of thermal images** with various receiver stations are available upon request





- **Highest standards of mining applications**
- **Excellent field of vision**
- Double sealing frame for a **tight and comfortable fit**
- **Easy to adjust** 5-point harness and practical neck strap
- Stainless steel speech diaphragm for excellent **communication quality**



SELF-CONTAINED BREATHING APPARATUS



EXTERNAL AIR SUPPLY



PAS AIRPACK



PAS COLT

- **Wide variety** of Dräger breathing apparatus sets to suit many different environments and applications
- **Special configurations** for the mining industry are available





- Positive pressure airline trolley units
- Optimal for operations lasting **several hours**
- **Several users can be supplied simultaneously**
- Able to carry **different sizes and number of cylinders** according to the customer's needs
- **Extended duration** combined with increased **freedom of movement**

- Positive pressure, **hip-mounted** compressed air breathing apparatus
- Optimal for **emergency escape or short duration operations**

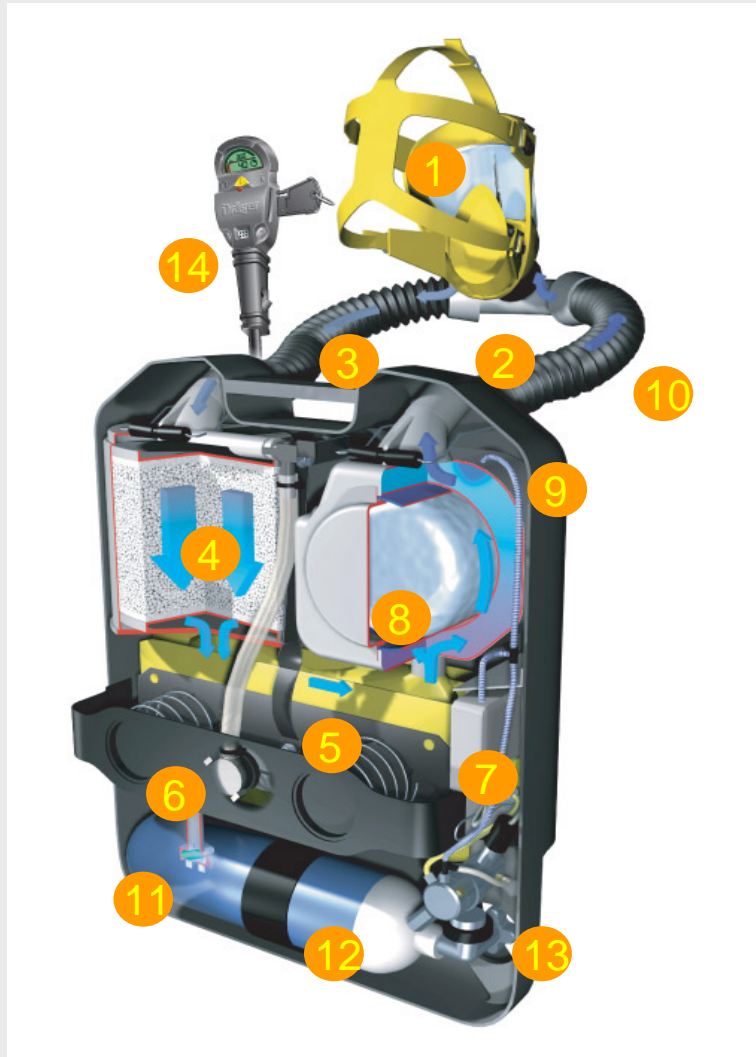


CLOSED-CIRCUIT BREATHING APPARATUS BG 4

SAFETY CHAIN



- CO₂ from the exhaled air is eliminated and the air is supplemented with oxygen
- Usage time is up to **4 hours**
- Especially designed for **extended mine rescue and recovery operations**
- **Positive** pressure protection



- 1 Mask
- 2 Breathing connector
- 3 Exhalation hose
- 4 CO₂ absorber
- 5 Breathing bag
- 6 Relief valve
- 7 Minimum valve
- 8 Cooler
- 9 Constant dosage
- 10 Inhalation hose
- 11 Drain valve
- 12 Oxygen cylinder
- 13 Pressure reducer
- 14 Bodyguard



- Especially designed for working in **underground environments**
- Optimal for normal mining worker or the mine rescue brigadesman





- **Universal and flexible**
- **Adaptable** to a multitude of masks and helmets
- **Robust** and nevertheless **light** design

POWERED AIR PURIFYING RESPIRATORS

SAFETY CHAIN



- **Low breathing resistance**
- **Constant air flow**
- Guarantee the best comfort possible in area with a **high particle volume**



- **Extensive range** of masks and filters – including disposable filtering face pieces masks, combination filter with a full-face mask
- **Adaptable** based on the dust and gas concentrations

FILTERING FACE PIECE PICCOLA

FEATURES AND BENEFITS



Piccola -- for Comfort
 -- for Quality



the Piccola from Dräger provide you with the following:

- ◆ Lower breathing resistance
- ◆ Higher Efficiency
- ◆ Longer duration due to Pre-Filter
- ◆ Softer more comfortable inner layer

Because *Synsafe™* material

FILTERING FACE PIECE PICCOLA

FEATURES AND BENEFITS



Piccola -- for Ease of Use



The Piccola is:

- ◆ Folded - for easier carrying and storage
- ◆ Individually wrapped & sealed, always clean and ready for use
- ◆ Looping Elastic Head strap - easy adjusted to any head size and long enough to carry on chest

X-PLORE 1300 SERIES

AVAILABLE PRODUCTS



X-PLORE 1310 = FFP1



X-plore 1310 FFP1



X-plore 1310 FFP1V

X-PLORE 1320 = FFP2



X-plore 1320 FFP2



X-plore 1320 FFP2V

X-PLORE 1330 = FFP3



X-plore 1330 FFP3V

ODOUR-STOP

carbon layer filters out nuisance odours



X-plore 1320 FFP2V Odour



X-plore 1330 FFP3V Odour

X-PLORE 1310 = FFP1



X-plore 1310 FFP1



X-plore 1310 FFP1V



- **Colour Coded Nose Clip & Valve**



Same coloring as the Piccola! Easy to distinguish between P1, P2, & P3.

- **Plastic Coated Nose Clip**



No sharp edges get in your way.

- **Foam Nose Pad**



Ensures a secure seal on your nose.

- **Ergonomic Design**



Comfortably and securely fits a wide range of face shapes.

- **Climate control comfort valve**



Low breathing resistance without heat build-up.

- **Advanced Filter Media**



Filters out both solid and liquid particles.

- **One size fits all**

Keeps logistics easy.

- **Fit with safety goggles**

Good nose sealing = no fogging.



X-PLORE 1320 = FFP2



X-plore 1320 FFP2



X-plore 1320 FFP2V



- **Colour Coded Nose Clip & Valve**



Same coloring as the Piccola! Easy to distinguish between P1, P2, & P3.

- **Plastic Coated Nose Clip**



No sharp edges get in your way.

- **Wide Nose Seal**



Ensures a secure seal on your nose.

- **Ergonomic Design**



Comfortably and securely fits a wide range of face shapes.

- **Climate control comfort valve**



Low breathing resistance without heat build-up.

- **Advanced Filter Media**



Filters out both solid and liquid particles.

- **Flexible, textile Head Straps**

As seen on the Piccola! No hair pulling, straps don't break.

- **One size fits all**

Keeps logistics easy.

- **Fit with safety goggles**

Good nose sealing = no fogging.

OXY TEST STATION

SAFETY CHAIN



- A mobile **fully automatic** test station for Dräger self-rescuers
- Guarantees **steady test procedures, reliable test results and complete test documentation** on Drägerware Equipment Management software



OXYGEN BOOSTER DOB-H PUMP UNIT

SAFETY CHAIN



- The Dräger Oxygen Booster DOB-H is operated **manually**. The oxygen from the storage cylinders is filled with an adjustable lever into another cylinder
- Equipped with a **complete filling logistic**, including valves, prolongation hose and pressure gauges, the Dräger Oxygen Booster DOB-H can be used **everywhere flexibly**
- **Always ready for operation** both in emergency situations and at places without current supply

ESCAPE CHAMBER MODEL 20/12-T

SAFETY CHAIN



- A **resource room** for employees in the event of non-breathable ambient air, for instance in case of fire.
- **Modular design** for the effective use in different mines.
- After activation, the inside of the chamber is supplied with breathable air and is applied with **a slight positive pressure** which prevents contaminated ambient air from entering the chamber.
- Air in the chamber is **reconditioned** by supplying oxygen and absorbing carbon dioxide via a CO2 absorber.

QUICKFILL STATION

SAFETY CHAIN



- Respiratory protection system independent of ambient air and is used to **rapid fill** compressed air breathing apparatus cylinders **while still being worn**
- Different batteries of cylinders are available to suit **every type of application**
- Economical utilisation of the air banks volume due to the **automatic 4-stage cascade system**
- Unit is designed for the **tough use** in a mining environment



THANK YOU FOR YOUR ATTENTION!