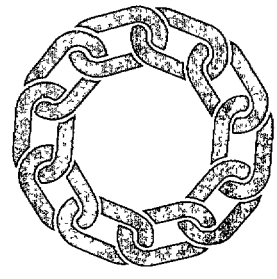
Commission of the European Communities

Information Bulletin of the Steel Industry Safety and Health Commission



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Accidents

1. Trapped by/in moving material

A labourer, working inside a mineral bunker, sustained minor injuries after being trapped up to the waist in mineral pellets.

The accident occurred inside a mineral bunker, one of 25 in the Merchant Iron Plant. They contain materials prior to weighing and charging to furnace skips by scale car. At the time, certain bunkers were being emptied of ferrous materials. The standard procedure was that the bunkers were drawn off by the scale car until the material inside the bunker was at such a level that it would not flow freely from the bunker ports. At this stage a layer of residual material would be left on the inclined back of the bunker. It would then be necessary for men to enter the bunker in order to complete the emptying process.

Three men had been detailed to clear residual material from one of the bunkers in furtherance of the operation already described.

A shift manager, checking the progress of the work, found that one of the men was trapped by his lower legs in pellets. He was not wearing a safety harness as required by the Safe Working Procedure.

The shift manager instructed the two other men to secure a safety belt to the man who was trapped and to fasten it to the back of a conveyor structure. He radioed the scale car driver engaged in this changeover operation and instructed him not to draw any further material from the bunker. He then went to join the scale car driver in order to supervise the careful and controlled withdrawal of some pellets from the bunker. After this had been done he told the scale car driver not to withdraw any more material until instructed to do so. The shift manager then returned to the bunker where he found that more pellets had been withdrawn from the bunker on the instructions of the two men there so that the trapped man was now buried up to his waist. The shift manager then made arrangements to have corrugated sheets positioned around the trapped man in order to keep the pellets back. He also summoned assistance from shift tacklemen and the Medical Centre.

When the medical personnel arrived at the site they instructed the scale car driver to withdraw more pellets with the result that the man became buried up to his ribs. A second line attached to a harness was secured to the trapped man and, with the tackleman holding him on a vertical line, he was pulled clear of the pellets by the line running down the back of the bunker. He was examined by medical personnel in this position and, after determining that he had no serious injuries he was pulled up the back of the bunker and taken into a conveyor housing.

After considering the aforementioned facts, a Panel of Enquiry concluded that the accident had occurred because the correct procedure for cleaning bunkers had not been implemented. Additionally, a contributory factor had been the scale car driver's failure to obey the instructions of the shift manager.

Recommendations

1. The 'Procedure for cleaning ore bunkers at the merchant iron plant' as follows, to be re-issued to all men engaged on the job and all staff:
   Procedure
   The day foreman/shift manager will:
   (i) Inform the scale car driver at the particular furnace that men will be working inside the particular bunker.
   (ii) Ensure that warning notice boards are affixed over the bunker bin gates, 'Danger men working in bunker'.
   (iii) Instruct the scale car driver only to draw material from that bunker when instructed by the observer appointed to watch the cleaning operation.
   (iv) Instruct the gantry tippers that men are working inside the particular bunker and that no material must be tipped in this bunker.
   (v) Instruct the coke beltman that the tipper carriage must not be moved across the back of that bunker.
   (vi) Ensure that the openings at the top of the bunker are sheeted over with corrugated sheeting.
   (vii) Ensure that an observer is stationed at the bunker top to observe the men during the cleaning operation and to pass messages to the scale car driver to draw material as requested by the men working in the bunker.
   (viii) Ensure that no more than three men are allowed to work inside the bunker at a given time.
   (ix) Ensure that entry at the back of the bunker is by means of a sound wooden ladder which has been lashed to the superstructure.
   (x) Ensure that all men entering the bunker wear helmet and goggles and are fitted with a safety harness and lifeline which is secured to the handrail at the back of the bunker.
   (xi) Ensure that all safety harnesses and lifelines are returned to the store for inspection after the teaming operation.
2. Staff to ensure all men work to procedure when engaged on this job.
3. Refresher teach-ins related to Safety Working Procedures and aspects of the Health & Safety at Work Act to be arranged.

2. Machinery struck by moving object

A crane driver sustained serious head injuries after being struck by a piece of scrap wood which was being broken up in an unorthodox manner, with the aid of pneumatically operated tube handling machinery.

The accident occurred in a finishing area of the tube making process. Tubes are rolled manually on to pneumatically operated arms whilst they are in the 'up' position, and these are then lowered to allow the tube to come to rest on the Weighs Rack in order to obtain the weight. After weighing, tubes are lifted by another set of pneumatically operated arms and deposited on a Stencil Rack where details concerning de-

spatch etc. are applied. During a break in legitimate production activities on the day of the accident the throw-over arms were being used in an unauthorized and potentially dangerous manner, in order to break scrap wood for use in a brazier type fire which was being used to provide heat in the are. Because of the break a group of men were in the area. Whilst section wood measuring 3" x 3", approximately 5'0" in length, was being broken up in the aforementioned manner, a piece approximately 2'0" long was ejected from the arm, it struck the concrete floor of the bay, ricochetted and struck a crane driver, who was standing talking to a workmate, approximately 20'0" from the installation. It hit him on the right side of his face, knocking him backwards on to the floor where he struck the back of his head. He sustained facial lacerations, a fractured skull and injury to his left eye.

The accident occurred during a period of extremely cold weather. On the previous night the doors to the bay had been damaged in a storm and could not be closed. Propane gas heaters were normally used for space heating in the area. Fresh cylinders of propane gas were only issued from the stores when empty ones were returned. On occasions when supplies were limited areas closest to the point of issue used up available supplies on a 'first come, first served' basis. During investigations, it was established that it was not uncommon for a brazier to be used when propane fuel heating was not available, and even on occasion, in preference to propane heating. It was also established that it was not uncommon to break wood using the throw-over arms at the weighing machines. Before making recommendations the Panel of Enquiry investigating the circumstances surrounding this accident, concluded that:

(i) Breaking wood in the manner described meant that equipment was being used for a purpose other than that for which it had been designed. Action taken on the misuse of plant and machinery might have prevented the accident.

(ii) It was the responsibility of local management to ensure that there was an effective system for heating workplaces. If this system was to be bottled-gas fired, then adequate supplies of bottled gas should be available at all times.

Recommendations

1. The use of wood fired braziers inside the plant to be banned.
2. All existing, and future, employees to be warned of the possible hazards and dangers of mis-using plant and machinery.
3. Management to investigate the existing system of local heating in the plant with a view to improved supply and control of gas. If this is not feasible the possibility of a more efficient heating system to be examined.

3. Rail

A shunter's foot was injured when it was crushed against a stack of ingots alongside the railtrack as he was riding on a diesel locomotive travelling through a Melting Shop.

The 'Janus' type locomotive involved had crew refuge steps at each of its four corners. The steps which gave access and egress to and from the locomotive consisted of four treads. The refuge was 1ft 7 1/2" wide and 11 1/2" deep. At the time of the accident the locomotive was being driven out of a Melting Shop with the shunter standing in a front refuge. As it rounded a curve the leading edge of the locomotive struck a stack of ingots which had been placed 2ft 2" from the track. It was at this time that the shunter's foot was injured.

During investigations after the accident it was established that the stacking of materials used in the melting shop in close proximity to rail tracks sometimes caused obstruction and, in addition, rubbish underfoot could create further hazards for shunters.

During the enquiry it was also agreed that whilst travelling through certain areas of the Melting Shop the cab of the locomotive offered better protection for shunters than the refuge.

Recommendations

1. Melting Shop supervisory staff have been formally instructed not to stack materials within a 4 ft margin of the rail track.
2. Rubbish alongside rail tracks within the Melting Shop is to be regularly removed by mechanical means.

4. Carbon monoxide poisoning

Because of the loss of a water seal blast furnace gas leaked to atmosphere and 15 contractors' employees working in the vicinity were affected, in varying degrees, by carbon monoxide poisoning.

The leakage occurred from an 8" diameter drain valve leading to a 'U' seal drain. The valve was attached to a water seal on a 96" diameter Blast Furnace gas main (see sketch). The contractors-pipe fitters, electricians, a welder, a storeman and a foreman, were working in the vicinity of an open Circuit Pump House and Contractors' Compound approximately 55 yards from the water seal. During the morning, a fitter's mate who had been engaged on aligning pumps, collapsed in the Contractors' Compound. Approximately 15 minutes later an electrician collapsed and other personnel were taken ill at the open circuit pump house. The work's surgery was informed of both incidents and 15 persons were treated for carbon monoxide poisoning.

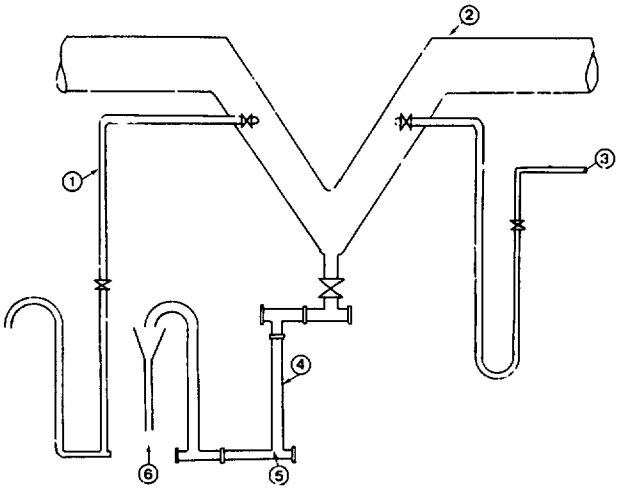
Examination of the installation showed that the gas leakage had resulted from the corrosion and subsequent holing of the drain seal pipework and consequential loss of the water seal. The corrosion had not been detected because of the lagging enclosing the pipework. The lagging was made of polystyrene and it is possible that this would tend to prevent any water escaping and increase the risk of corrosion of the pipework. Weather conditions at the time, mist with very little breeze, were not conducive to gas dispersal.

The Security Department had been aware of the location of all contracting firms involved and were in possession of a location diagram. The Medical Department had not been aware of the site location of the Contractors. During investigations after the accident it became apparent that contractors' personnel were not aware of the symptoms of carbon monoxide poi-

soning and therefore did not realize that they were being affected by gas.

Recommendations

1. The lagging on the drain seals and inlet and overflow water pipework on all 26 main water seals on the plant will be removed. The exposed pipework will be examined and repaired or replaced as necessary.
2. Specialist advice will be sought on corrosion protection for this pipework and the desirability of future re-lagging. If re-lagging is recommended, a suitable frequency for pipework examination will be determined from this source.
3. Contractors' personnel to be instructed as to the possible effects of carbon monoxide poisoning.
4. The medical department must be advised of the site locations of contractors.



1. Water seal overflow
2. 96" in. dia. blast furnace gas main
3. Water inlet
4. 8" dia. drain seal lagged with polystyrene
5. Holes in pipework
6. Drain to soakaway

5. Accidental tilting of an electric arc furnace

Whilst preparations were being made to tap an electric arc furnace 80 tons of molten metal were lost because of the accidental operation of the furnace tilt lever. Considerable damage was caused to surrounding installations but no personnel were injured.

The furnace metal car was being brought to the furnace tapping position prior to tapping. The controls for this equipment are located in a tapping pulpit on the launder side of the furnace and included on the control desk is an operating facility for the tilting of the furnace. Operation by lever control can give fast operation or slow, together with inch selection by means of push, bottom control. On the day of the incident the operator accepted control of the steel car from the casting bay personnel and by operating controls in the tapping pulpit proceeded to bring the car into the furnace position ambush. At this time, the furnace tilted into the slagging position so that 80 tons of liquid steel was discharged onto the stage and into the cellar levels of the furnace. Damage was caused to the furnace stage support beam, removable stage section, pulpit door, power cables and other equipment in the vicinity. Emergency procedures as laid out in the local site disaster plan were activated, key personnel were called out but it was not necessary to fully implement the plan.

Checks were made on the electrical control for the tilt operation of the furnace and these were found to be in good working order. The operator stated that at no time did he purposely operate the furnace tilt control mechanism. It can only be assumed that his protective molten metal jacket had caught the tilt operating control and moved it to the slagging position whilst he was observing the movement of the metal car.

Recommendations

1. A manually actuated interlocking gate to be fitted to the tilt motion with the aim of preventing a reoccurrence.
2. Electrical engineers to examine the possibility of modifying the electrical circuits of the furnace to allow it to tilt for tapping and return to the neutral position only (as operated from the tapping pulpit). The possibility of providing a master control switch for furnace tilt control is to be examined. This switch would be situated in the main furnace pulpit and would produce the possibility of selecting which pulpit had control of the tilt. The furnace tilt control is to remain the same as for operation from the furnace control pulpit.
3. Other furnaces in the Melting Shop to be examined for potential risk factors and possible modifications as previously quoted.
4. Procedure for implementing call-out of key personnel to be reviewed and tightened.

6. Leakage of blast furnace gas into a steam circuit

Two blast furnace fitters were replacing a defective steam valve at the outlet from the boilers. As steam was leaking from one of the flanges, the two fitters, after consulting their superiors, closed the main valves on the boilers and also closed the other cut-off valves and released the pressure in the steam circuit. They then dismantled the valve, returned to the workshop to clean the bolts by which it was held in place and to prepare new seals, and then went back to replace the valve, at which point they began to feel ill. It was obvious that their condition was due to gas. An investigation and examination of the steam circuit gave rise to the suspicion that some blast furnace gas had escaped through the shut-off valve of one of the blast furnace gas washers. In spite of the high number of valves included in this circuit, it turned out that the blast furnace gas had managed to reach the spot where the defective valve had been dismantled, following a somewhat complicated path in the steam circuit of about 150 metres, which explains the time that elapsed before the workmen were affected by it.

The accident was due to two simultaneous events:

(i) the decompression of the steam circuit to atmospheric pressure;

(ii) leakage of gas from a defective valve on one of the washers.

Preventive measures:
(i) replacing the valve on the washer;
(ii) installing two cut-off valves with an intermediate venting valve on the main steam distribution pipe;
(iii) revision of existing instructions.

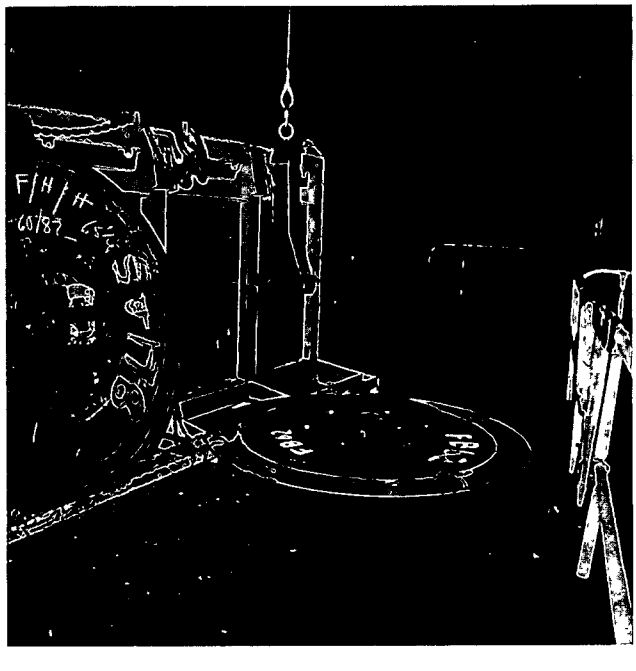
7. Circular saw blade falls onto fitter

A circular blade, weighing approximately 600 kg, which had been removed from a fixed saw in a mill fell onto a fitter, who had been assisting in the operation, inflicting severe injuries.

The accident occurred in a Medium Section Mill whilst the blade on a fixed saw was being changed. The old blade had been removed from the saw with the aid of a purpose made lifting device (porter bar) suspended from an EOT crane. The crane had then transported the blade to a storage area.

The blade was positioned over a stillage, on which it was to be stored, and then lowered into its channel base. The crane was then cross travelled in order to ensure that the blade was on the centre line of the blade park position. Whilst the crane was carrying out this manoeuvre the blade tilted towards the fitter, who was standing to one side of it, and during the tilting motion a securing device on the porter bar became disengaged and allowed the blade to fall against a handrail. It then slid down the lower part of the fitter's body causing serious injuries.

Examination of the site after the accident showed that the stillage had been slightly slewed out of the line of the mill. This would have made the approach for the crane driver more difficult than had the stillage been at 90° to the line of the mill. The fitter, watching the lowering operation, realized that the blade was not lined up correctly and had raised his hand to stop the crane. None the less, it is probable that the blade came into contact with one of the bottom wedge blocks. Tests carried out afterwards showed that the effect of the blade coming into contact with the wedge results in a



slack rope condition which could change the centre of gravity of the load and cause the blade to tilt forward. Tests also revealed that under certain circumstances it was possible for the porter bar to fall out.

Recommendations

1. Ensure that stillages are placed at 90° to the roller tables, ensuring that the crane has only to execute long travel, or cross travel movements in order to land blades. The area is to be surveyed with a view to marking it with white lines to indicate the best position for the stillage.
2. Instructions to be issued that porter bars are to be subjected to stringent inspections on a routine basis. If bars and pins are found to be bent they are to be sent to the blacksmiths for straightening.
3. Ensure that the blade is centrally positioned, midway between the chocks on the channel, during lowering from EOT cranes.
   An additional plate to be fitted to the stillages as a guide to ensure that the blade is directed into the channel at the bottom.
4. The lifting lugs must be positioned entirely through the saw-blades hub at all times before and during transportation of the assembly.
5. The porter bar to be redesigned to ensure that once the blade is attached onto the pins it cannot become free under any circumstances. Modification to be carried out through the Crane Design Department.

8. Ignition of Benzene vapours by static electricity

A chemist suffered an accident while filtering hot benzene under an extractor hood. Just as he was completing this task, static electricity generated a spark between the chemist's hand and the metal funnel he was using. This spark ignited the vapours and resulted in burns to the victim's hands.

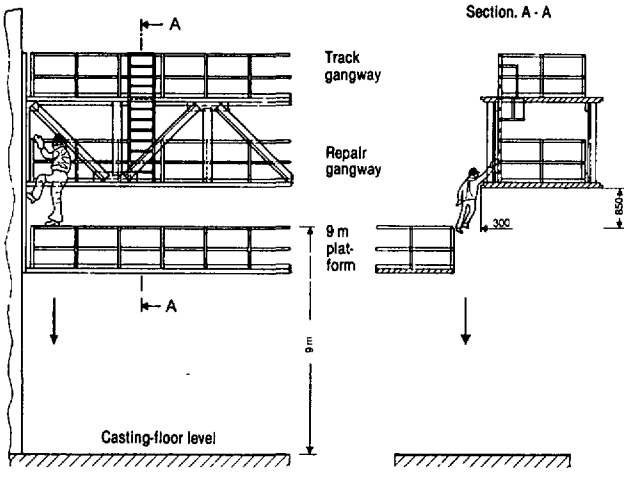
Action
(i) earthing of metal funnels;
(ii) wearing of antistatic shoes;
(iii) antistatic floor covering in front of the extractor hood.

9. Fall from a height of 9 metres

A crane driver in a steelworks had transported a casting ladle to the repair shop for stripping of the refractory lining. The stripping operation took rather a long time, so he left his crane and, in order not to have to take the 60 metres long regulation track gangway to descend, he climbed down a ladder from it onto the repair gangway below. He climbed over the railing of this gangway to get down onto the railing of the 9 m platform, and in doing so lost his hold and fell 9 metres onto the shop floor, where he died of his injuries.

The cause of this tragic accident was that the crane driver took a short cut in the form of the 'climbing operation' described above, instead of taking the completely safe descending stairway at the end of the regulation track gangway.

Action:
All possible short-cuts were fenced off.



10. Coking plant — conveyor belt

Four workers were busy cleaning the return drum of an inclined conveyor belt, jammed by an accumulation of coke. The belt drive is equipped with an automatic anti-reverse system. When the drum jammed, the belt was stretched upstream and downstream of the tensioning unit mainly due to several attempts to start up the belt whilst workers were trying to release the jammed drum. At the moment when the victim and his colleague succeeded in releasing the drum, the tension of the belt and the weight of the material on it caused it to slacken, sag and turn the drum sharply. The left arm and torso of the victim, who was scraping the drum, were caught. Death was instantaneous.

Action
(i) The management decided to contact the suppliers to find out if there was any means of equipping the conveyor belt with a caliper brake and possibly a coupling allowing the anti-reverse system to be disengaged if necessary.
(ii) Certain instructions have been tightened up. Henceforth if any work necessitates removal of the guards, it must be authorized by the foreman and carried out by skilled personnel.

11. Electrician falls from an EOT crane

Two electricians were carrying out routine maintenance work on No 3 10 tonne EOT crane in the scrap bay. In order to carry out tests after completion of the work, one of them entered the crane control cabin. The other electrician observed that the braking of the translation movement was too violent. He therefore set about adjusting the brake, steadying himself, on the platform alongside the travelling cross shaft, on one of the two beams in the middle of the crane. He adopted a semi-kneeling stance in order to adjust the compression of the brake during crane travel.

As the crane was returning towards the end-of-travel buffers the first electrician saw that the brake was not responding and attempted to reverse the travel movement. Despite this precaution, the gantry struck the buffers.

Unbalanced by the impact, the second electrician fell approximately 13 metres onto a pile of scrap.

Consequences of the accident: multiple bruising, one fractured rib, fracture of the left index finger, injury to the left leg.

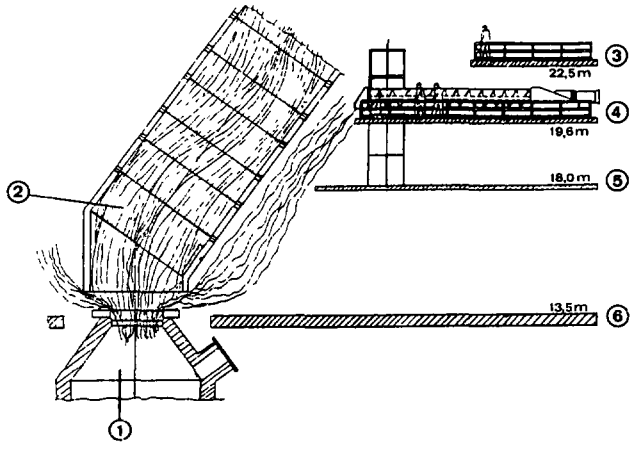
The inquiry into the accident did not establish the cause of brake failure. Be that as it might, the reversal manoeuvre which should have stopped the crane was undertaken too close to the buffers.

In view of the risk of fall faced by operatives during certain tasks on overhead cranes, particularly while the crane is moving, a safety harness should henceforth be worn. However, the problems involved in the introduction of this measure have yet to be studied.

Action taken: setting up of a working party to establish appropriate safety measures.

12. Men severely burned at a steelworks

A shift foreman and three fitters were on the 19.6 m. platform above the converter of a BOP shop, engaged on repairs to a continuous conveyor. The men began their work whilst the converter was being charged with 15 t. scrap and 0.8 t. molybdenum oxide. The charging box was then moved to the side and pouring of the pig iron began. As there was trouble with the tilting of the pig iron ladle (skull formation), this process had to be suspended after 12.1 t. of pig had been charged. To rectify the fault, the ladle was withdrawn and the converter tilted towards its original position. Immediately after the converter had reached the vertical, an unusually large quantity of carbon monoxide emerged from the mouth and caught fire. The flames were not completely trapped by the hood but escaped between it and the converter. They reached the working platform at 19.6 m on which three of the four men were busy with repairs. These men received severe burns and despite immediate first aid measures, died.



1. Converter
2. Hood
3. Platform
4. Repair platform
5. Platform
6. Platform

The investigation of the accident revealed that the carbon in the pig iron reacted spontaneously with the oxygen of the molybdenum oxide when the converter was tilted back to the vertical. The quantity of carbon monoxide formed by this very rapid reaction was so great that the hood was not able to trap all of it.

In order to prevent such accidents in the future, it was forbidden for men to be above the mouth during converter operation.

The danger zones were determined for every part of the converter by means of a hazards survey analysis. In addition, it became a formal requirement that the system of 'free-for-operation certificates', introduced some time previously, be respected to the letter. A further finding from the investigation was that molybdenum oxide should be distributed over the scrap charging box so that it is also well distributed in the converter.

13. Fatal accident caused by a reversing wheel loader

During the first shift, a wheel loader was transporting scrap from the rolling shop to the stockpile. An unskilled workman was helping the driver of the vehicle at the stockpile to remove any scrap remaining in the shovel.

When the load had been discharged, the unskilled worker indicated to the driver of the wheel loader that he should reverse to carry out an operation at the request of a foreman from another department. He then went ahead, turning his back on the vehicle. The driver reversed and ran him over.

Action:
Loaders are now equipped with acoustic signals which function when reverse gear is engaged.

14. Killed while trying to hook up a moving railway wagon

A locomotive had pushed two wagons loaded with billets onto a dead-end track. Thinking they were travelling too fast, the shunters tried to hook the wagons up to the locomotive to stop them. One of the men took up a position between the first wagon and the locomotive. He stumbled, fell and was crushed by the rail guard of the locomotive although it stopped almost immediately.

This accident was mainly due to safety rules not being observed.

A decision was made to:
(i) remind personnel of safety rules;
(ii) pay particular attention to training of shunters.

15. CO-poisoning during maintenance of the gas cleaning plant of an oxygen steel shop

During downtime on No 1 converter, a six-man team was finishing up after test runs of the gas cleaning plant. Two men were engaged in closing the explosion doors of the washer and the waste gas stack, two others were carrying out repairs on the grate at the bottom of the washer and the remaining two were installing spray nozzles in the fume extraction duct.

At around 0.15, the four men working inside the installation were caught by a sudden arrival of carbon monoxide and slightly intoxicated. The foreman identified the hazard, ordered his fellow workers to leave immediately and raised the alarm.

As soon as the fire brigade arrived, they took samples of air in the fume extraction duct; the reading was 280 p.p.m. of CO. Another reading taken two hours later during blowing of the No 2 converter gave 3000 p.p.m. A third sample taken outside the blowing period of No 2 converter gave 300 p.p.m.

The gas originated from the sludge sewer (common to the gas cleaning plants of both converters) — although the extraction fan of No 2 converter was running — as the isolation valves to the sludge sewer had been left open.

The work carried out by the company is sub-divided into three phases:
1. cleaning,
2. rinsing (or test run of the gas cleaning plant),
3. installation of the spray nozzles.

The fume extraction system must be shut down before cleaning is carried out, i.e. spraying pumps and fume extraction fan switched off and the isolation valves to the sludge sewer closed.

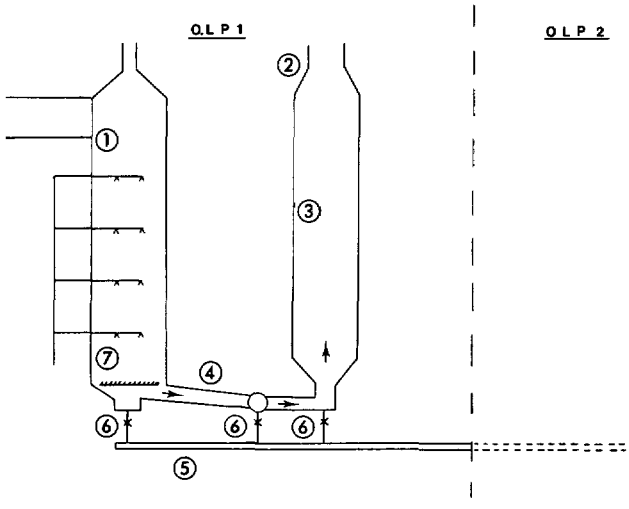
Rinsing has to be done with the installation running, i.e. explosion doors closed, fan and spraying pumps switched on and isolation valves to the sludge sewer opened (to prevent water rising inside the washer).

The third operation, requiring personnel to enter the cleaning plant again, calls for closing down the installation as when the converter is shut down.

On the day of the accident, the safety regulations applicable to the task (shut down) were not observed for the third operation mentioned above, for the isolation valves to the sludge sewer had not been closed.

Action:

(i) Stressing to supervisory staff of the importance of the safety regulations applicable to this task.



1. Washer (secondary cleaning)
2. Flare
3. Stack
4. Fan
5. Sludge sewer shared by both installations
6. Valve
7. Grate

(ii) Reminder to the workers concerned of these regulations.

(iii) Check *in situ* on the sound application of the shut-down procedure.

16. Mechanic sustains serious burns while working on a blast furnace platform

A maintenance mechanic was working as a greaser on blast furnace No 3. One hour after casting, just after greasing the taphole drill, he changed position to grease the clay gun.

While stepping over the main trough, his left foot slipped to the bottom of the runner in a place which still contained a little molten pig iron.

Assistance arrived immediately (the flames were extinguished, the victim's shoe removed and his foot wrapped in an isothermic blanket) but nevertheless the mechanic sustained third degree burns to the left foot.

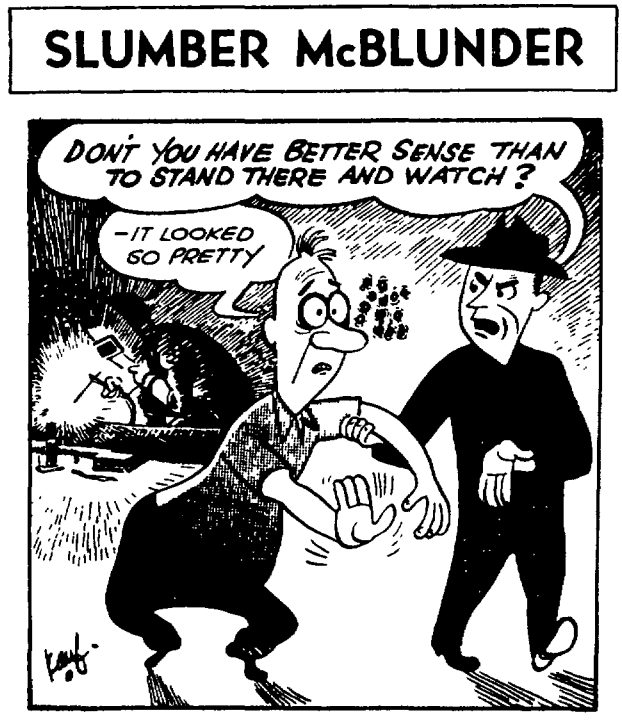
N. B. The maintenance man in question had been working as a replacement for the usual greaser for a week before the accident.

Action:

(i) Study the installation of water outlets for emergency spraying of burns.

(ii) Training by supervisory staff of the blast furnace shop of maintenance workers along with blast furnace operatives.

(iii) Analysis of the working procedure: ensure that workers concerned do not have to step over the runner in order to grease the drill.



Basic principles of making safety an integral part of the running of the enterprise

— The role of Management
— Training of Management Staff and first-line Supervisors

The following text has been prepared by the working parties 'Accident Prevention Organization' and 'Safety-Training' of the Steel Industry Safety and Health Commission and adopted by this Commission on 9 July 1983.

1. Introduction

The right to live free is recognized by all the countries of the Community. It includes the right to a safe and healthy environment. Therefore the protection of persons is a major task of society.

A corollary to this is that in all countries of the Community the employer has a duty to ensure that his employees remain in good health, and to protect them from accidents at work.

However, this duty is exercised within the wider context of society, which through the governmental bodies, has laid down obligations in the form of Health and Safety legislation.

It is the Steel Industry Safety and Health Commission's view that mere compliance with statutory obligations is not enough to ensure optimum safety since there are and always will be preventive measures to be taken even if they are not compulsory, for example those relating to working conditions specific to the enterprise.

It would not be in the employer's and workers' interest if, owing to insufficient initiative on the part of firms, governments were obliged to take legislation on Health and Safety at work to excess.

In addition, since the behaviour of each individual is influenced by the importance attached to Health and Safety[1] by society, the higher the priority given to Health and Safety in society's scale of values the easier it will be for heads of enterprises to achieve their objectives of 'Health and Safety at work'. In this context, any initiatives likely to improve safety should be introduced, encouraged or developed, for example:

(i) at school — starting at primary school — children should be taught to follow safety practices and to realize that accidents are due to human error or mechanical agencies and can therefore be avoided;
(ii) technical schools and universities should give an appropriate place to accident prevention at work to their study and training courses, whatever the qualifications these lead to;
(iii) enterprises should be encouraged to invest with a view to increasing industrial safety and be given tax concessions on such investment.

[1] The term 'Health and Safety' must be understood to mean all forms of accident prevention and health protection, whether it be in a professional context or in private life.

2. Integration of health and safety

Making health and safety an integral part of the running of the enterprise means that all measures to prevent accidents at work should form part of the enterprise's normal activities. This means, in turn, that:

(i) all production or ancillary processes should incorporate measures which are conducive to avoiding accidents at work, injuries, damage to health or other factors detrimental to the wellbeing of employees;
(ii) supervisory staff in charge of a unit should be responsible for accident prevention in the unit;
(iii) all personnel doing jobs which could affect safety at work should be constantly aware of this fact;
(iv) employees can work without being unduly exposed to hazards or creating them;
(v) such hazards can be eliminated or controlled from installations and equipment at the design stage.

Making health and safety an integral part of work means putting into practice the well-established principle that safety is everybody's business. It is also applying the principles of accident prevention which the Steel Industry Safety and Health Commission adopted in 1966 and especially the following, viz:

3. Safety and hygiene measures must be incorporated in production operations in such a way that they become inseparable. The way this is carried out must be clearly defined for all departments and at all levels.
4. In the matter of accident prevention measures, it is essential that the management of an enterprise and its various departments should be able to call on the advice of a special safety department under the management's direct authority, although the management must retain ultimate responsibility in this field. (This principle may need to be modified in smaller firms which do not have a safety department.)
5. All members of the hierarchy, whatever their position, are responsible for accident prevention in the sector for which they hold responsibility and must account to their superiors for their activities in this field. Consequently, in assessing personnel this entails attaching the same importance to qualities relating to accident prevention as to other qualities.
6. All accident prevention activities must be coordinated within an overall programme, which must be punctuated by periodic reports indicating progress made and enabling it to be kept constantly under review.

7. It would be appropriate that the opinion of the workers' representatives on this programme should be invited as their cooperation in every sphere of accident prevention is of the greatest importance.
10. Alongside the technical and organizational aspects of accident prevention, training in safety matters at all levels of management and for all workers employed is of the highest importance. With this aim in view, the trend must be towards safety training becoming an integral part of vocational training, but insofar as it may not be possible to achieve this, the firm's programme should include additional training in this field.

But to make health and safety an integral part of running the enterprise it is essential for senior management to be conscious of their role and to take the most appropriate measures to attain this objective.

To provide better information for the enterprise and in particular for its managers, the Steel Industry Safety and Health Commission instructed its Working Party on the Organization of Accident Prevention to study this problem and report back. The conclusions are given below.

3. Role of management

Safety at work[1] must be a prominent and essential objective of the firm, just as important as profitability, production or the quality of the manufactured product. The manager must make sure that this attitude is clear to each worker, whatever his level or role.

In order to integrate health and safety[1] into the running of the enterprise an employer who lays down the administrative and management duties and powers of managerial staff in a specific area of responsibility must at the same time stipulate their duties and powers in respect of health and safety matters for the same area.

The same should be done with members of certain functional services, such as the maintenance department, planning department or the purchasing department, whose activities can influence the safety of workers in the operational sectors, or help to ensure same.

The way to make safety an integral part of the operational process of the firm is therefore to include it in the establishment of managers' duties and powers. These should make it clear what concrete steps should be taken as part of the day-to-day activities, including health and safety, and in particular indicate:
(i) the kind of decisions which may be taken,
(ii) the area of competence,
(iii) the size of the group of workers over whom authority is exercised,
(iv) the period during which authority may be exercised,
(v) any restriction of the decision-making power.[2]

However, to make health and safety an integral part of work, it is also necessary that those in positions of responsibility at all levels have adequate knowledge in keeping with the functions exercised or the powers delegated and, morever, that they be advised or consulted by the functional services such as the department of safety and occupational medicine. This is all the more necessary since non-performance of an obligation in the area of occupational safety could violate the objectives of the enterprise and be considered a serious professional shortcoming in the light of these objectives.

Furthermore, when a decision is taken which may entail a risk for employees, it is up to those in positions of responsibility to point this out to the department in which the decision originated.

It is the task of management to coordinate activities common to various sectors of the enterprise or which overlap between sectors.

The fact that health and safety tasks are delegated to all members of the managerial staff and to some persons in other departments and that activities common to various sectors are organized at the highest level does not release the head of the enterprise from his overall responsibility for health and safety, in particular the obligation to monitor the proper performance of the tasks which he delegates, whether these relate to health and safety or to other objectives of the firm.

In order to ensure that making health and safety an integral part of the firm's operation actually leads to improved health and safety it is not sufficient for the head of the enterprise to define functions, delegate relevant powers or ensure that those in positions of responsibility undergo the appropriate training, he must also act with dynamism and perseverance, and believe that the final objective is to convince all the employees, at whatever level, that safety is really and truly an objective of the firm and that every effort is being made to attain this objective.

4. Training of manager staff and first line supervisors

The General Commission considers well-informed management staff and supervisors to be one of the most important prerequisites for the integration of industrial safety with the other activities of an enterprise, and directors should therefore organize their training. The Working Party on Safety Training has considered this problem, and its conclusions are given below.

The problem of providing supervisors,[1] especially junior supervisors, with adequate training to tackle competently in conjunction with their subordinates the various aspects of safety at work can no longer be considered in isolation, as was frequently the case in the past, but must today be seen in the context of supervisor/worker relations.

[1] The expression 'health and safety' must be understood in its widest sense, that is including hygiene, ergonomics, occupational medicine and working conditions.

[2] Decision-making powers may be restricted, for example by:
— laws, regulations, agreements between workers and employers, etc;
— considerations of a higher order at policy level (e.g purchasing policy, existing contracts and rules, budgetary considerations, etc.),
— the special responsibilities of other sections of the enterprise (obligations with respect to consultation, workers' rights to representation, etc).

The social, economic, technological and legislative changes which are making themselves felt in the world of today have also affected the relationships between people, sometimes radically modifying traditional patterns.

In the company the position of the supervisor has also changed. While he continues to provide a command role, and thus represent management to his workforce, he also feels he is a member of a group of supervisors at the same level, and, together with his subordinates forms a more unified group.

Any safety measures the supervisor has to introduce with regard to the workers under him must therefore be based on mutual consent on the one hand, and on an understanding of the *desiderata* of the personnel on the other. Since this is the case, his safety training must cover *inter alia:*

(i) the problem of the coexistence in the same working area of young and senior workers and the resulting differences in behavioural patterns;
(ii) the changing circumstances, to which the supervisor must continually adjust his own attitude;
(iii) the need for constant updating of educational and technical knowledge particularly with respect to problems of working environment and occupational health and safety.

Furthermore, consideration must be given to what workers expect of their supervisors, and as far as safety and health are concerned:

(i) to be able to organize the work in such a way that limits risks as much as possible;
(ii) to inform them of the special nature of any residual hazards and the way to avoid, obviate or control them;
(iii) to enable him to cooperate, either with individuals or a group, and evaluate his suggestions and ideas for improving occupational safety and health.

Hence the guidelines for the training of supervisors in safety environmental and industrial hygiene should be based on these principles.

Among the main guidelines for this are:

(a) supplying the necessary information for an understanding of all aspects of work safety for which the supervisor is responsible;
(b) encouraging in supervisors an attitude leading them to delegate tasks and to encourage and coordinate the work of their subordinates so that the relationship between supervisor and subordinate is based on their respective skills and safety becomes a shared activity;
(c) render the supervisor aware of the importance of messages to and from subordinates so that he is informed at all times of abnormal situations arising in the sector entrusted to him being able to remedy the situation in good time; moreover he should be aware of the need for creating conditions which enable each and every one to express themselves freely. Such an open dialogue can only confirm his authority.

First line supervisors play a key role in maintaining health and safety standards as indeed they do in the other fields for which they are responsible. They have practical first-hand experience of things and are thus able to observe the difference between the real world and theoretical postulates in matters of technique, organization and behaviour more easily and more quickly than their superiors; they are also capable of taking the initiative themselves to deal with these differences and give the orders appropriate to the situation.

In the opinion of the Steel Industry Safety and Health Commission, the training of management staff and first-line supervisors in safety and health at the place of work should be included in the enterprise's accident prevention programme[2] and therefore, like other preventive measures, be prepared, carried out and assessed in collaboration with the workers' representatives.

But although the basic principle that all members of management staff and first-line supervisors must have received adequate and satisfactory training for all their duties is an integral part of proper accident prevention policy, the individual needs which have to be met vary considerably depending on his level of responsibility and even his specialization (allowing for varying job experience, length of service in the works, previous vocational and school training, etc).

The problem facing the enterprise is to plan its accident prevention programme to include courses of training or more often back-up training which are suited to the individual needs of existing management staff and first-line supervisors or of persons, who are about to become such. These courses of training should preferably form part of more general job training so that safety is seen as an integral part of the job and not as an afterthought.

The SISHC and its Working Party on Safety-Training feel that because of the similarity in the duties of management staff and first-line supervisors in the steel industry throughout the Community, a relatively harmonized training plan would not only encourage safety, but may also facilitate the free movement of workers in the future. For this reason the SISHC is suggesting which subjects it would like to see adopted by enterprises in their safety training programme for this staff. Each enterprise should decide, depending on the exact nature of their employees' duties, to what degree of detail these subjects should be covered.

Refresher and updating courses should be organized at regular intervals.

In most countries in the Community, there are possibilities for training outside the enterprise; these may be public or private teaching establishments, bodies or departments of bodies set up by employers' or workers' professional organizations, regional or local business associations, state or private compensation schemes, organizations for the promotion of safety, etc.

It is up to enterprise to seek the best possible training arrangements, taking account of the size and potential of both its own departments and of those of out-

[1] The term 'supervisor' used in this document refers to a member of the managerial staff, foreman, acting foreman chargehand, or leading hand in his capacity as a person with responsibility at any level.

[2] Please see document 'Accident Prevention Programme', 1977, EUR 5922, published by the Publications Office of the European Communities.

Subjects for a training programme on safety for management and supervisory staff

1. Importance of accident prevention at the following levels
   - human
   - social
   - economic

2. Legal aspects
   - legislation — regulations
     - responsibility
     - rights and duties (also in dangerous situations)
   - obligations in the works — instructions
     - responsibility

3. Technical aspects of safety
   - general hazards (electricity, gas, fire, transport, etc)
   - specific hazards (installations, workplaces, working conditions)
   - accident prevention — elimination of hazards
     - protection — collective protection
       - personal protection

4. Methodological aspects
   - techniques — inspection
     - job analysis
     - training — of new recruits
       - of transferred staff
     - accident analysis
     - ergonomics
   - procedure for applying rules (fire permits, deposits, etc.)

5. Physiological and psychological aspects
   - communications between individuals and groups — with higher-grade staff
     - with equals
     - with lower-grade staff
   - health, hygiene and occupational disease risks
   - working conditions, assigning of staff

6. General aspects
   - organization of safety — company policy
     - organization structures and cooperation
     - organization for cooperation with labour representatives
     - accident prevention programme
   - first-aid and rescue arrangements
   - good order and cleanliness

side organizations, so that all the management staff and first-line supervisors receive practical and effective training.

It is confirmed, in reference to the 10th principle of the SISHC — Accident Prevention, that any supervisory member of a firm whatever his rank or function must receive safety training tailored to meet the responsibility conferred upon him.

However, the success of any training measure will depend upon the extent the trainees' superiors actively support the training programme. This causes the first management to be aware of the need for safety training. Management can then pass down the managerial structure its commitment to such training schemes thus favourably influencing them.

5. Conclusion

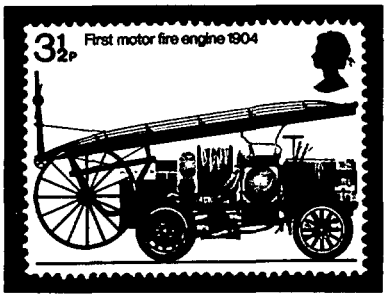
Making health and safety an integral part of the firm's operation leads to real, effective and continuous accident prevention.

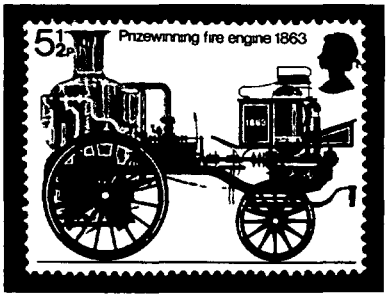
However, the Steel Industry Safety and Health Commission points out that making health and safety an integral part of work will only bear full fruit if it forms part of a set or organizational measures within the firm. The SISHC has already prepared other studies, all of which merit the same attention as the present document, viz.:

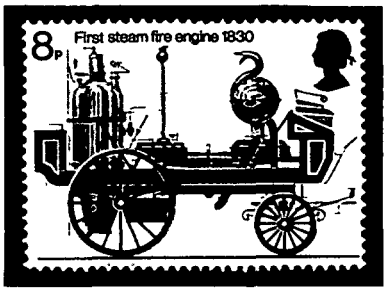
(i) Principles of accident prevention.
(ii) Check questionnaire of the accident prevention organization within the enterprise.
(iii) Accident prevention programme (EUR 5922).
(iv) Training of industrial safety advisers (EUR 6091).
(v) Cooperation of workers and their representatives in accident prevention within the enterprise.
(vi) General considerations in the training of workers' safety representatives in safety and health matters.

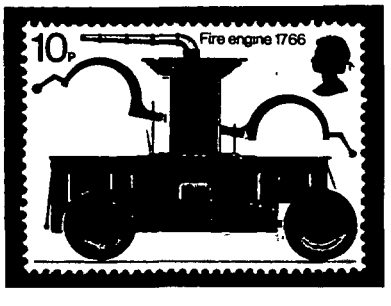
The Steel Industry Safety and Health Commission earnestly hopes that an increasing number of firms will make safety an integral part of their operation. Properly applied this will undoubtedly lead to improved health, safety and working conditions.

Stamps and fire fighting









Gas boosters

The following text has been prepared by the working party 'Safety-Gas Lines' of the Steel Industry Safety and Health Commission and adopted by this Commission on 9 July 1982.

Gas boosters for exhausting or boosting gas used in the steel industry present a risk of leaks, and hence gas-poisoning and explosion, as a result of either inadequate sealing or the rupture of the casing for mechanical reasons. Furthermore, if not equipped with satisfactory safety devices, they may cause low-pressure conditions upstream in the network, thus allowing air to enter and form explosive mixture.

These various risks as well as adequate preventive measures are studied below.

1. Installation of boosters

Boosters may be installed in the open air or inside rooms. Whichever solution is adopted, the location must be selected with due consideration for the risks mentioned above and to avoid any concentration of personnel, vital installations or intense traffic in the vicinity.

Booster rooms should be permanently ventilated, provided, with at least two emergency exits and should serve no other purpose (e.g. as a workshop, stores, etc.).

Electrical installations for motive power or lighting in such rooms are in most cases subject to national regulations. Where no official provisions exist, such equipment must be of particularly safe design: flameproof motors, gas-tight electrical systems and equipment.

Each gas booster must be equipped with an *in situ* emergency cut-out capable of bringing the installation to an immediate standstill. All such cut-outs must be readily identifiable.

A continuous automatic gas detection system must be installed in booster rooms to trigger an audible and visual alarm in a central control station at a distance from the booster, as well as audible and visual alarms inside the booster room and outside each entrance to it. Where boosters are provided with sound-proof enclosures, a detector should also be installed inside the enclosure.

A system should be installed to draw off gas which may leak from the seals or stuffing boxes; it should permit the injection of inert gas and the extraction of the leaking gas to a safe place outside.

Boosters located in the open air must be installed in an enclosure surrounded by wire fencing, with at least two emergency exits. Entry to the enclosure should be restricted to authorized personnel. Notices should be posted forbidding entry to the enclosure and indicating the danger of gas in the vicinity.

Operations involving the creating of sources of ignition must not be allowed, either in booster rooms or within open-air enclosures containing boosters, without special authorization by way of a 'fire permit' procedure, in which the fire-fighting procedure and practice are set out.

It must be possible to isolate each booster separately from the network, following the procedure described in the document 'Insulating and degassing lines' of the Steel Industry Safety and Health Commission.

2. Risk of disintegration of a booster casing

The rupture of a booster casing for mechanical reasons will cause gas to escape and consequently create serious risks of poisoning and explosions.

As a result, there is a need to ensure that rupture is prevented and that the amount of gas escaping in the event of failure is limited.

2.1. *Prevention of casing rupture*

Prevention should take two forms: maintenance of the booster in a clean state and good working order, and the use of reliable automatic safety devices.

The contaminant entering the machine consists of dust contained in the gas which can form deposits on the impeller and create vibration.

In order to prevent such deposits, certain types of gas boosters are equipped with a water injection system which begins to operate when the booster is switched on. In such cases, the water used must be sufficiently clean and of adequate quality; it must be sprayed finely and drained off in a suitable manner. Moreover, the impeller of this type of booster must have a corrosionresistant coating if the material employed is not corrosion resistant.

The impeller wheels of coke-oven gas boosters can be cleaned by injecting light oil at regular intervals.

Where boosters are not equipped with an injection system deposits must be removed from the impeller as frequently as necessary.

With regard to good working, there would be periodic inspections to check the impeller for wear and cracks, as well as to ensure that the injection system functions properly.

Furthermore, each booster must be equipped with vibration detectors and temperature probes which trigger individual alarms at the central control station as soon as their first respective operating thresholds are reached. When a second threshold, higher than the first is reached, the machine must be switched off by the device.

The materials used for these detectors and temperature measuring elements, as well, must be corrosion-resistant.

These safety systems must be highly reliable and, like the other systems recommended below, be subjected to regular tests to ensure correct operation.

2.2. *Restriction of the amount of gas escaping in the event of rupture*

In spite of the above recommendations, a mechanical fault may result in the fracture of a booster casing; in such cases, the amount of gas released must be kept to a minimum.

For this purpose, a rapidly operating isolating device at the inlet of each booster must close automatically, as a result of a fall in pressure occurring downstream of the boosters when the casing is fractured and the pressure is measured between the booster and its downstream non-return gas valve.

It should be noted that the rapid isolating device must also be under the control of the central control station.

3. Risk of underpressure in the network

Whatever the gas booster's position may be within a network (at a gas cleaning plant outlet or near the service outlets), there is always a minimum pressure level upstream of the booster beyond which pressure should not be allowed to fall in order to create a depression and, therefore the possibility of air entering the network.

Two minimum upstream pressure threshold values must be defined for each booster. The first is the limit below which an adjustment of the gas flow is necessary. When the second limit, which is lower than the first is reached, the booster's motor must be stopped automatically.

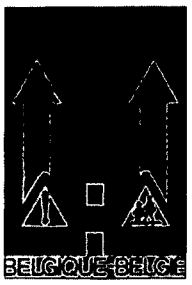
Highly reliable monitoring and safety equipment must be installed to meet these requirements.

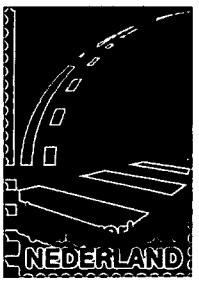
Moreover, in the event of failure of one or more of the boosters, or any other incident, a drop in pressure in the network downstream of the booster must be prevented by suitable means.

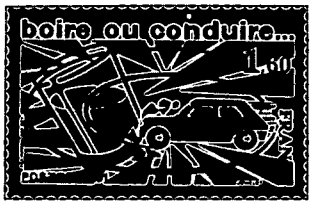
4. Personnel training

It is most important that the personnel who operate, check and maintain boosters should have received a broad training on the characteristics of the installations, the various risks that may be present within the existing safety systems, possible types of breakdown and the remedial action for each case. In addition, each of these persons must be equipped with a self-contained face mask, have been instructed on how to wear it and have received the first aid training for specific risks mentioned in the document 'First aid and rescue' published by the Commission of the European Communities as part of its work on safety and health in the steel industry.

Stamps and road safety







Readers' correspondence

One of our readers has asked us to specify, preferably by means of examples, the manner in which industrial accidents are recorded for the purposes of the annual Community survey which was recently modified, on industrial accidents in the steel industry.

Changes made to the annual Community survey on industrial accidents in the steel industry

The Statistical Office of the European Communities has made certain changes to the annual Community survey on industrial accidents in the steel industry in order to increase the usefulness of the statistics for accident prevention departments. The relevant SOEC working party drew up and approved these amendments in conjunction with the Directorate General for Employment, Social Affairs and Education.

The main methodological changes incorporated as from 1 January 1983 (and therefore applicable to 1983 statistics) are shown hereafter:

1. Field of survey

The survey henceforth covers accidents to all workers irrespective of whether or not they deal with products covered by the ECSC Treaty and working in one of the following technological departments:

(i) iron and steel coking plants,
(ii) blast furnaces, including burden preparation,
(iii) melting shops,
(iv) rolling mills, tinning, lead coating and galvanizing workshops,
(v) finishing operations and storage for rolled products,
(vi) maintenance departments,
(vii) transport departments. This includes rail, port and road vehicles, their installations and workshops, which are common to more than one department,
(viii) other auxiliary departments, including any manual workers who could not be classified elsewhere,
(ix) administration, including any non-manual workers who could not be classified elsewhere.

2. Accidents

The accidents to be recorded are those which occur during the calendar year. They should be broken down into three categories:

(i) *non-fatal* accidents resulting in absence from work of *more than three calendar days* excluding the day of the accident;
(ii) *non-fatal* accident resulting in an absence from work of *over 21 calendar days* excluding the day of the accident;
(iii) accidents resulting in the death of the victim within 30 days of the accident.

Examples:

(i) an accident causing an absence from work of 27 calendar days is entered in the first and the second categories above;
(ii) an accident resulting in absence from work of 19 calendar days is entered in the first category only;
(iii) a fatal accident is entered only in the third category, even if the victim did not die until 15 or 25 days after the accidents.

3. Days lost

The 'days lost' refers to the number of calendar days actually lost through accidents which occur during the reference year, until the victim returns to work; the day of the accident itself is not counted.

To this number is added, according to the system used in your country, either:

— the calendar days lost during the reference year through accidents which occurred in the previous year (system A)

or

— the calendar days lost in the following year for accidents which occurred in the reference year (system B).

The two figures thus obtained are broken down into two categories:

— one category covers non-fatal accidents resulting in a total absence from work of over three days;
— the other category covers non-fatal accidents resulting in a total absence of over 21 days.

Examples:

— An accident occurs in February, causing 32 calendar days' stoppage (excluding the day of the accident). These 32 days are counted both in the category of days lost through accidents involving absence from work of over three days and in that of accidents involving an absence of over 21 days.
— An accident occurs in January causing 15 calendar days' absence from work. These 15 days are counted only in the category of days lost through accidents causing a minimum absence from work of 3 days.
— An accident occurs on 21 December 1983 causing a stoppage of 40 days, i.e. 10 days in 1983 and 30 days in 1984. It should first be noted that as the total stoppage is 40 calendar days the accident belongs both to the 'over 3 days' absence' category and to the 'at least 22 days' absence' category.

The classification of the number of calendar days lost will, moreover, differ according to whether system A or system B is selected in the country where the plant in which the accident occurred is situated.

Using system A, an absence from work of 10 days will be recorded and an absence of 30 days in the 1984 records for each of the categories of length of absence (> 3 days and > 21 days).

Using system B, the 40 days' stoppage will be recorded in the two categories of seriousness for 1983 only.

4. Size-class of establishment

All plants (establishments) should be classified in one of the following size-classes:

(i) less than 500 workers (irrespective of whether or not they deal with products covered by the ECSC Treaty);
(ii) between 500-1 999 workers (ditto);
(iii) 2 000 or more workers (ditto).

Stamps and accident prevention

This periodical is published in English, French, German and Italian, and can be obtained free of charge by simply applying to the Commission of the European Communities, Directorate-General XIII, Division for Scientific and Technical Communication, PO Box 1907, L-2920 Luxembourg.

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