

NOTE ON THE USE OF PLASTICS IN COAL MINING*

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The use of plastics in the coal mining industry is making slow progress whereas these materials could make a greater contribution to safety, to a reduction of working costs and to the higher productivity of mine workers. Possibly the reluctance to experiment with the new material of our age is due to the low profit margin of coal mining.

This note has been prepared to present a brief survey of what has been done in the last few years and to mention some of the investigations the author has made and is making in an attempt to develop more use of plastics in the industry.

Some of the plastics used on the mines have taken their place in the industry in the same manner that they are used in everyday life while others have been introduced because there has been a need for them. New uses and applications are being developed and these are the ones that are most interesting. The plastic that is specially developed to give the maximum benefit and not the one that is a modification of some other everyday product is the next development in the field.

Many manufacturers are keen to promote such investigation but are not aware of the problems the mines wish to solve and therefore it is only through management itself that this development can be carried out.

This note deals with plastic material under three headings:

- (a) Plastic as the superior material, and briefly describes how plastic has replaced a few major items which are better when made from plastic.
- (b) Plastics of necessity, being a short summary of how plastics had to be introduced because of laws and conditions making it a necessity.
- (c) Development of new ideas, being briefly some of the ideas being developed overseas and some of the ideas being tried by the author.

Plastic items in common use such as in housing, electric cables, laboratory equipment, awnings, nylon bearings, locomotive brake linings, etc. being well known are not discussed.

PLASTIC AS THE SUPERIOR MATERIAL

Plastic belting underground

Following a fire in a belt road in England resulting in the deaths of many workers, and subsequently a fire accompanied by fatalities in a belt road in a mine in this country, a law was introduced which states that only flameproof belting is to be used underground. This ruling forced the mines to use P.V.A. belting as no other was available. This belting has non-inflammable characteristics that are superior to rubber. Due to the high tension on long-distance belts used today the need for stronger belting material called for something better than cotton and the answer to this was nylon. Nylon also has the ability to withstand dry-rot which reduces the life of a belt very quickly.

*Read at meeting of Witbank-Middelburg Branch on 22nd August, 1968.

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Hard hats

In the last 30 years we have seen many types of hard hats but for general use the plastic hat has been superior to most. It is light and durable; this is a great asset as it has to be worn for eight hours per day. It can be made in many colours and this has many applications when identifying workers at crush barriers and in sections underground. It also has advantages over aluminium hats in fiery collieries as it lessens the dangers of ignitions or fires from sparks created by aluminium and rusty iron work. A simple experiment to illustrate this point is to place a piece of aluminium foil on a rusty piece of old rail and to strike a glancing blow with a hammer on the aluminium foil; an array of bright hot sparks will follow.

Plastic sampling bags

A mine which rigidly controls its grade and samples the underground sections and development regularly uses a large number of sample bags which are usually made of canvas: these are difficult to keep clean. Sample bags made of plastic are easy to keep clean, are strong and come in many sizes and are superior in all respects.

Plastic beer mugs

When the purchase of beer by Bantu in the compounds became permissible it became necessary to equip the liquor outlets with bigger and better beer mugs. Ardent Bantu drinkers are not satisfied with a glass or a tankard but want a container to hold half a gallon of beer. The plastic tankard provided the answer as it does not chip, is easy to keep clean and holds all the beer the Bantu requires.

Identification armbands

A small item in our stores but very important in the case of a worker who can neither read nor write or speak 'Fanakalo', the common mine language, is the plastic identification armband carrying his Company number.

Plastic fibreglass tarpaulins

These covers for valuable stores left in the open are much stronger than canvas, are light and completely waterproof. Their lightness is an extremely important feature.

PLASTICS OF NECESSITY

Plastic pipes

The acid water encountered in our coal mines is a major problem and without plastic pipes would mean endless work, continually replacing pipes eaten away by the action of the acid water on metal pipes. The plastic pipes come in lengths of up to 400 ft, which can be unrolled and, being flexible, conform to the undulating floor of the mine. It is very simply laid and connected, by unskilled labour. The acidity of the water pumped in some mines is such that 3 in. pipes to surface only last a week.

Plastic stoppings for ventilation control

The use of plastic curtains in excavations 20 ft wide by 10 ft high is becoming widespread in mechanized mining because it is much simpler to erect than brick stoppings. An inverted plastic T-shaped anchor piece is stuck to the roof, floor and sides by means of a plastic adhesive. In a short space of time the anchor is stuck to the solid and the sheeting is attached by means of the same adhesive. A brick stopping

costs slightly less but the inconvenience of moving bricks, sand and cement and controlling the labour required to do the bricklaying is outweighed by the simplicity of the plastic curtain. The increasing use of these curtains is evidence of their necessity in the bustle of high speed mechanical mining.

Fibre-glass mahawe and beer tanks

The use of these vessels is a necessity on account of the corrosive action of beer and mahawe. The old fashioned wooden tanks or slate lined tanks involved a great deal of maintenance. Fibre-glass tanks are resistant to corrosion, clean in appearance, simple in structure and do not give an offensive taste to the beer.

Compound changehouses

The walls of changehouses are troublesome as normal paints cannot stand up to the perpetual moisture and washing down required for the sake of cleanliness. Glazed tiles are the usual covering but rarely do they give real satisfactory service. Plastic sheeting glued to the walls with plastic adhesives has proved very satisfactory.

DEVELOPMENT OF NEW IDEAS

Plastics with their many uses and their many properties can be combined with other substances to extend the life of present units or even replace them.

Mine tubs

The mine tub was given this name in the early days of mining because it consisted of a wooden tub or barrel mounted on wheels for the transportation of coal. The weight of the average steel tub, in use for the last 70 years, and a ton of coal is approximately 3,200 lb. It is usually filled and trammed to an endless rope haulage by two labourers 40 times in an 8½ hour shift. Development of a plastic container that weighs only about 800 lb is in progress. The estimated cost of this new tub is less than that of the steel one and with a reduction in weight would require less effort to handle.

Plastic coatings and fibre-glass sheets

It is almost impossible to prevent rapid corrosion of fences, steelwork and corrugated iron in the vicinity of waste dumps which invariably burn and give off acrid fumes. By giving fencing a plastic coating the corrosion is reduced considerably. The use of fibre-glass corrugated sheeting has eliminated the use of steel windows and frames from buildings and current experiments indicate that it may soon be possible to get a plastic coating which will eliminate 90 per cent of our corrosion problems on structural steelwork. In the areas to the north of Witbank plastic covered diamond mesh wire has been effectively used to fence off underground fires which have broken through to surface.

Aluminium casting covering

The use of aluminium castings for drill cases and other items of machinery is forbidden in certain coal fields due to the possibility of sparks being generated in a fiery mine. An attempt to overcome this drawback of aluminium, which on account of its lightness has a considerable advantage over other materials, is to give it a hard plastic 'skin'.

Impervious dam floor covers

The use of plastic covers on the floor of newly constructed dams in pervious soils has been attracting a great deal of attention and recently have been used underground with some success.

Sprags

A sprag, as used by most mines, is made of $\frac{7}{8}$ in. round iron and has two guards; it is used to stop a tub by pushing one end into the wheel spokes when the tub is in motion. They are consumable, heavy and unwieldy. A 1 in. pipe filled with a fibre-glass rod weighing $6\frac{1}{2}$ lb in comparison with the 10 lb of the usual iron sprag lasted eight days and broke only due to failure at a weld. This field requires further investigation.

Screens

The use of fibre-glass rods and combs in a fine coal screen in the screening plant has proved unsuccessful. Nylon combs have been fabricated and are under test. This field has interesting possibilities.

General

The field for investigation into the use of plastics in mines is wide open to those who wish to carry out experimental work and pursue ideas which arise from day to day.

Some of the immediate projects that need research are those which deal with corrosion of plant and machinery due to acid water and dump fumes, abrasiveness of wet coal on chutes, the use of fibre-glass for tanks in coal preparation plants in order to reduce weight and corrosion, and the use of fibre-glass for bodies for underground vehicles and containers.

The manufacturers wish to help and it is for the benefit of the whole industry if managements endeavour to get the most out of the material of the age.

ACKNOWLEDGEMENTS

Technical Memorandum No. 36, 1965, of the Fuel Research Institute of S.A. by P. C. van Zyl.

Prospect Magazine published by African Explosives and Chemical Industries.