Control of air pollution at Rand Carbide Limited, Witbank

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SYNOPSIS

The measures taken by Rand Carbide Limited from the 1950s to 1976 to control dust emission from the electric furnaces at its Witbank factory are described. A new design of furnace for calcium carbide followed by a dry-fabric filtration plant for the furnace gases was not successful in arresting the dust. A 131 m chimney commissioned in 1968 effectively dispersed the dust-laden gases from both carbide and ferrosilicon production and so brought considerable alleviation. In 1974 a bag-filter dust-collecting plant was successfully commissioned on a 6 MV.A carbide furnace, and this was followed in 1976 by a bag-filter plant on a 46,5 MV.A ferrosilicon furnace. The company has spent considerable effort and money over two decades in trying to combat dust emission, but eventual success had to await technological development.

SAMEVATTING

Die stappe wat Rand Carbide Limited vanaf die vyftigerjare tot 1976 gedoen het om die afgee van stof deur die elektriese oonde by sy fabriek in Witbank te beheer word beskryf. 'n Nuwe oondontwerp vir kalsiumkarbied gevolg deur 'n droë-materiaalfiltreeraanleg vir die oondgasse het nie daarin geslaag om die stof te keer nie. 'n Skoorsteen van 131 m wat in 1968 in gebruik geneem is, het die stofbelaaide gasse afkomstig van sowel die karbied- as die ferrosilikonproduksie doeltreffend gedispergeer en so heelwat verligting gebring. 'n Sakfilterstofversamelaanleg is in 1974 suksesvol in gebruik geneem by 'n 6-MV.A-karbiedoond en dit is in 1976 gevolg deur 'n sakfilteraanleg by 'n 46,5-MV.A-ferrosilikonoond. Die maatskappy het oor twee dekades baie inspanning en geld bestee aan pogings om die afgee van stof te bestry, maar die uiteindelike sukses moes vir tegnologiese ontwikkeling wag.

Introduction

Rand Carbide Limited, which came into being in 1918 in Germiston for the production of calcium carbide, moved to Witbank in 1926 to avail itself of cheaper power and because it envisaged the use of the coal there as a raw material. Since those early days, the production of carbide has been greatly expanded, and the company has diversified into the production of ferrosilicon and intermediate products, char, electrode paste, electrode casings, and steel drums, both for its own use and for supply to other manufacturers employing electric furnaces.

The site, which was initially almost 2 km from the town, is now inside the residential area, and the reduction or elimination of dust from the electric furnaces is a subject that has occupied the close attention of management from the early 1950s. In overseas countries, the problem of dust from carbide furnaces was solved by the use of closed electric furnaces and of wet scrubbers to wash the uncombusted gases evolved. This procedure could not be adopted here on account of the greater impurities in the available raw materials. In general, the grade of carbide that can be produced on a closed furnace is lower than that on an open furnace, and with poor raw materials the grade is lowered even further. This was a matter of concern to the company's customers, who insisted on being supplied with carbide of the highest possible commercial grade either to save on transport or because a high grade was necessary for synthesis of the end product.

The volume of combusted gases from an open furnace is about fifty times that of the unburnt gases from a closed furnace, although recent developments in the semi-closure of furnaces can reduce this to about thirty times. It is thus apparent that plant for scrubbing the gas from an open furnace has to be very much larger, and consequently more expensive, than that required for a closed furnace.

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Collection of Dust from 25 MV.A Carbide Furnace

Measures taken up to 1970 to deal with dust emissions have been reported previously[1], but, in the interests of presenting a coherent account, they are summarized here.

An open 25 MV.A electric furnace was commissioned in 1952 to replace one 2,5 MV.A and two 6 MV.A carbide furnaces. To produce a satisfactory grade of carbide, these smaller furnaces had to be run with open arcing, which gave rise to appreciable dust and fume. It was expected that the new furnace, being designed to give much greater concentration of power, would be capable of being operated with submerged arcs, which would result in only a faint plume of dust issuing from the chimney. It subsequently transpired that the furnace did operate with submerged arcs, but, owing to the poor quality of raw materials available, electrode immersions in the charge were too shallow to reduce the generation of fume to what could be considered an acceptable level.

By 1955 serious thought began to be given once more to means of dealing with the dust. After a first-hand study of the various overseas methods, both dry and wet, of abating or collecting dust, the conclusion was reached that dry filtration would be the most suitable. The necessary measurements were made to collect data for the design of a plant, and an apparently successful pilot-plant test was carried out with glass-fibre media, the use of which would obviate the need to pre-cool the gases before filtration. A local firm working in conjunction with a reputable American supplier of dust-collecting equipment was awarded a contract in 1963 to supply a plant consisting of multi-cyclones followed by glass-fibre filtering media at a total estimated cost of R150 000. The plant was to be commissioned by December of that year.

The plant was never commissioned satisfactorily, the difficulties encountered being numerous and, at the time, insoluble. The glass-fibre medium disintegrated on being vibrated for cleaning, and the abrasive nature of the dust caused excessive wear in the cyclones and on the fan blades. The glass fibre was replaced with terylene and nylon, but these artificial fibres could not withstand the gas temperature or sparks emanating from occasional 'blowing' of the furnace. Cooling of the gases with water sprays was tried, but the action of the water on the lime in the dust led to clogging of the filter cloth. A change in filter medium was accompanied by a need to reduce the filtering velocity, but the larger plant thus required could not be accommodated in the restricted space available.

In an effort to solve the difficulties, the services of an expert from Imperial Chemical Industries was solicited, and bags of a newly developed British knitted glass-fibre cloth interwoven with fine stainless-steel wires were flown out for trial, together with technicians from the firm who manufactured the cloth. The result again was complete failure: the porosity of the cloth was too high, allowing dust to escape through, and mechanical rapping impaired the cloth life. Reverse flow of gas combined with sonic rapping was tried but did not clean the bags effectively.

While the struggle continued to get the dust plant to work, a new 16 MV.A dual-purpose furnace for the manufacture of calcium carbide and ferrosilicon was erected in 1965. The need for plant that could deal effectively with dust from both carbide and ferrosilicon manufacture on the 25 and 16 MV.A furnaces became more urgent than ever. It was realized that there was no alternative but to abandon the existing dust plant at considerable financial loss, and a study team was sent once more to investigate developments in Europe.

Tall Chimney

It was concluded, after visits to many factories in seven European countries in 1966, that technical progress had not reached the point of proving dust-collection plants on either open carbide or ferrosilicon furnaces, let alone the mixed dusts from the manufacture of the two products. The only certain method of alleviating the dust nuisance at Witbank appeared to involve erection of a very tall chimney: the Electrozuur-en-Waterstoffabriek N.V., located within 3 km of the centre of Amsterdam, reported favourably on the effect of its 101 m high chimney erected in 1960 for connection to its four carbide furnaces. Rand Carbide thus took a decision in 1967 to build a tall chimney to disperse the dust-laden gases from its 25 and 15 MV.A furnaces. It was recognized that this would not be the ultimate solution, but it would gain the company time until a proven means of collecting dust had been developed.

The assistance of the National Chemical Research Laboratory was enlisted for determining gas volumes, dust loadings, and chemical and particle-size analyses of the dust. Calculations were made of plume rise and maximum ground-level concentrations of the dust emitted from stacks of different heights, and the advice of the Head of the Air Pollution Research Group, C S I R, was sought on the height of the proposed stack. He recommended a minimum height of about 90 m in order to ensure penetration of the atmospheric inversion layer, but said that, for increased effectiveness, it should be further raised to an extent weighed against the extra cost involved. A chimney height of 130 m was finally authorized, and the completed chimney was commissioned in mid-1968 at a cost of R220 000.

The chimney is of reinforced concrete with an internal diameter at the top of 3,7 m, and is lined partly with stockbricks and partly with firebricks. It deals with 400 000 m^3(s.t.p.)/h of gas — equivalent to 800 000 actual m^3/h at the conditions of 175 °C and 83,3 kPa in the chimney. The average dust loading is 1,5 g/m^3 (s.t.p.), and the upper size of the dust particles is approximately 50 μm.

The combined dusts from carbide and ferrosilicon manufacture have an approximate analysis of 28 per cent CaO, 47 per cent SiO_2, 7 per cent MgO, 5 per cent free C, and 8 per cent $Fe_2O_3 + Al_2O_3 + Mn_3O_4$, the remainder consisting mainly of hydroxyl, sulphate, and carbonate radicals.

The gases are drawn up the chimney by the natural draught of approximately 0,4 kPa (g) and emerge from the top at a velocity of 20 m/s. The plume penetrates the inversion layer most effectively, rising for several thousand feet on a windless day and at other times travelling at an angle to the ground for 25 km or more while becoming progressively more tenuous.

The effectiveness of the chimney was assessed quantitatively by the Air Pollution Research Group, who measured the rate of dust deposition at various distances from the factory over a period of 12 months before and 12 months after the commissioning of the chimney. It was found that, at distances of $\frac{1}{4}$, $\frac{3}{4}$, and 1 km from the factory, the dust deposition after installation of the chimney was reduced by 71 per cent, 32 per cent, and 19 per cent, respectively. At distances of 1,4 and 2,1 km the reduction was only 9 per cent, and at 4,2 km nil.

It was concluded that the tall stack virtually eliminated fall-out, in the general area of the town, of dust emitted from the factory. It caused dispersion of the dust beyond the town boundaries in a reduced fall-out rate per unit area. It was also apparent that sources other than the factory contributed significantly to the average fall-out of 9,2 t/km^2 month for Witbank. The value compared with 9,5 t/km^2 month, which was calculated as the average of the nine industrial towns with the highest fall-out in England in 1966.

Further Planning for Dust Control

During 1970 a project for the construction of a new 46,5 MV.A ferrosilicon furnace was approved by the Chief Air Pollution Control Officer on the understanding that a portion of the furnace fumes would be by-passed to the 131 m chimney and that a dust-collecting plant would be installed later after technological advances had indicated that there would be reasonable prospects of such a plant being successful. In the meantime, he urged that Rand Carbide, being one of the only two producers of calcium carbide in the country, should concentrate on finding a solution to dust collection from carbide manufacture, while leaving the search for a dust plant for use on ferrosilicon production and ferro-alloys generally to the several other companies making such alloys in South Africa.

When the 46,5 MV.A ferrosilicon furnace was commissioned in April 1972, tenders were invited for a plant to collect the dust from the 25 MV.A open carbide furnace, while at the same time measurements were made again of gas volumes, temperature, dust loadings, etc., and pilot-plant tests were initiated. In early 1973, the author visited Europe, the U.S.A., and Japan to view installations of the tenderers for collecting dust from ferrosilicon and carbide production, with the emphasis on dust plants attached to open carbide furnaces. Only in Japan did he come across an installation fitted to an open carbide furnace, and operating satisfactorily on collecting mixed dusts from carbide, ferrosilicon, and silicomanganese. His assessment of the situation was that the best chance of obtaining a successful plant on an open carbide furnace would be to install one of the type seen in Japan. An alternative was an impulse-jet bag-filtration plant; on a pilot replica of such a plant, successful tests had been carried out with dust from the 25 MV.A carbide furnace.

The dust from open carbide furnaces has a calcium oxide content of 55 to 65 per cent and, in the presence of moisture, has a tendency to cake on filter cloth. Bag-filtration plants in which the dust is dislodged from the bags by an impulse jet of compressed air during the cleaning cycle offer a more effective means of cleaning than the more usual type of plant, in which cleaning is carried out by the reversal of air through the filter surface, shaking, collapse of the bags, or a combination of these. The sudden expansion of bags followed by the collapse that results from the injection of a jet of compressed air dislodges dust very thoroughly. A further attraction is that the initial capital outlay is less than for conventional bag plants; this is because the system can use filtration velocities that are up to three times higher than in conventional plants, so that the whole installation is considerably smaller in size.

Before the decision was made to go ahead with the installation of a dust plant on the 25 MV.A carbide furnace, the question of dust control from the factory as a whole was re-examined. It was concluded that the most pressing need, in view of the factory's close proximity to the residential area, was elimination of the 46,5 MV.A open ferrosilicon furnace. This created a

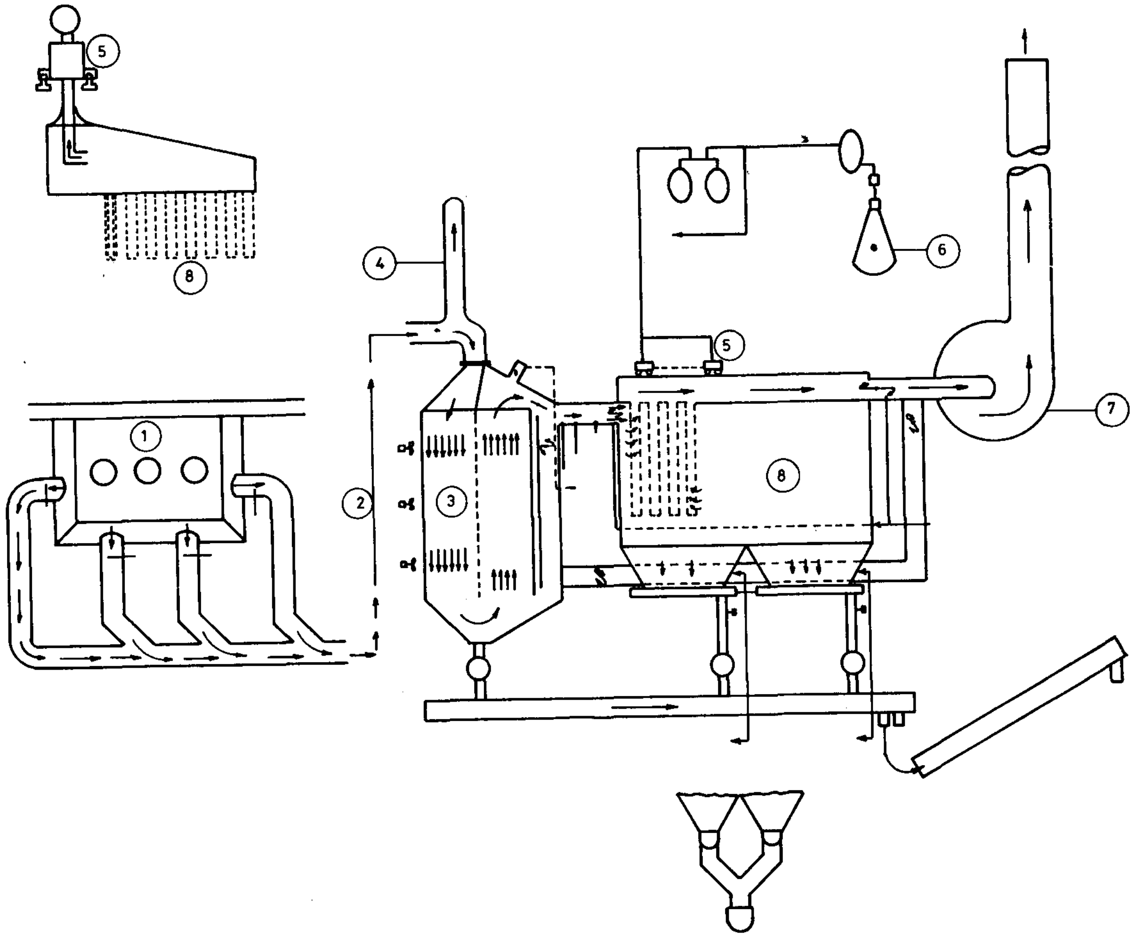

Fig. 1—Schematic diagram of filter plant for 6 MV.A open carbide furnace

1 Furnace
2 Cooling fans
3 Heat exchanger
4 Emergency to atmosphere
5 Trolley units
6 Compressor
7 Main fan
8 Baghouse

nuisance to residents, while the dust from the 131 m chimney passed mainly right over the town and was thus less objectionable. Installations for collecting silica dust from ferrosilicon production were comparatively new, being two years old or younger, but the technology was well advanced and plant performances were satisfactory. With the approval of the Chief Air Pollution Control Officer, it was thus decided to install a dust plant on the ferrosilicon furnace as the first step. At the same time, owing to a serious shortage in meeting the demand for carbide, it was decided to re-commission an idle 6 MV.A open carbide furnace, but in conjunction with an impulse-jet dust-collecting plant, which it was trusted would eliminate any escape of dust and fume. Moreover, a plant of this type would provide valuable experience for any future installation on the larger carbide furnace.

Impulse-jet Bag-filter Plant

The 6 MV.A furnace had three electrodes in line and dated back to 1931. The raw materials, burnt lime, anthracite, and char, were fed manually by spade to the open top, and the efficiency of power utilization could not compare with that on modern electrode-in-triangle furnaces. Nevertheless, the need for more carbide dictated that it be brought into production once more.

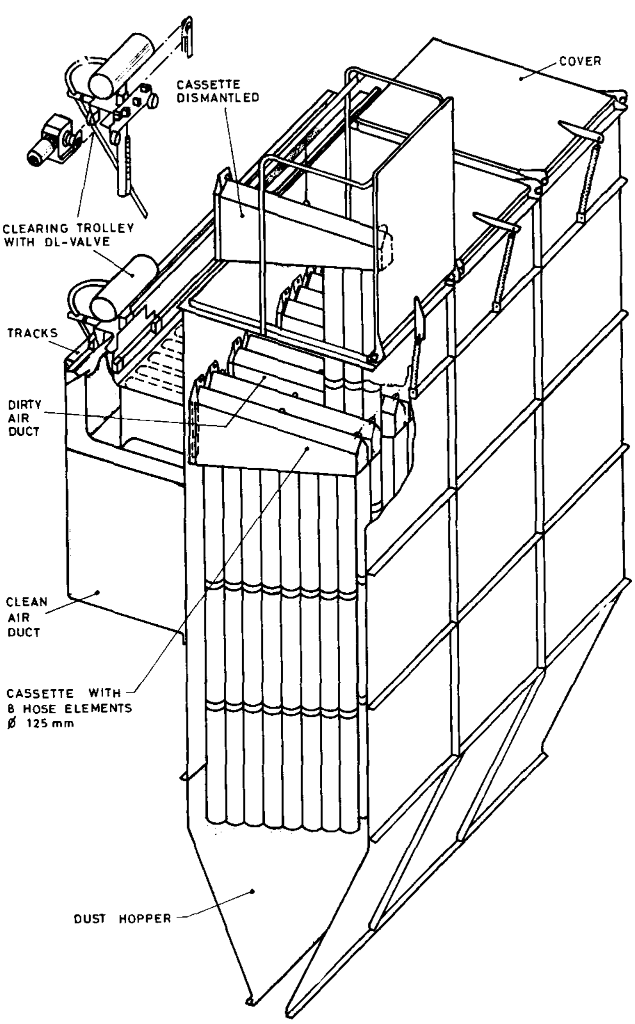

Fig. 2—Detail of filter plant for 6 MV.A open carbide furnace

Previously the dust-laden combustion gases had merely been allowed to rise from the open top of the furnace into the building, and thence escape through a crude chimney in the building roof. For the re-commissioning of the furnace, a mild-steel hood was designed to cover in as much as possible of the top of the furnace, leaving a gap through which raw materials could be fed and rabbled. Fume ducts from the three tap-holes led into the hood, from which the gases were evacuated at four points into a common duct leading to the dust-collection plant (Figs. 1 and 2).

The dusty gases were first passed through an air-cooled multi-tubular heat exchanger and then to the impulse-jet bag-filter plant, backward-bladed fan, and exit chimney. The design data for the plant are given below, and a typical analysis of the dust is shown in Table I.

Volume of furnace gas = 50 000 m^3 (s.t.p.)/h at 220 °C
= 84 000 actual m^3/h at 110 °C and 84,6 kPa site pressure

Volume ex air-to-air gas cooler, allowing for 10 per cent leakage gain = 92 400 actual m^3/h

Filtration area consists of 12 sections each incorporating 6 cassettes of 8 filter bags each, size 125 mm dia. by 2 800 mm long — thus a total of 576 bags having a total area of 633 m^2

Filtration velocity = 2,43 m/min

Filter material = Polyester needlefelt

Compressed air consumption = About 3,5 m^3 (s.t.p.)/min at 400 to 600 kPa

Total power = Approx. 150 kW.

The plant was commissioned in August 1974 and, after the inevitable teething troubles, is eliminating the furnace dust successfully. It was designed to extract 50 000 m^3 (s.t.p.)/h at an actual temperature of 220 °C from the furnace hood, but, because the leakage of air into the cooler is greater than anticipated, it draws only 30 000 m^3 (s.t.p.)/h at an average temperature of about

TABLE I

TYPICAL ANALYSIS OF DUST FROM 6 MV.A OPEN CARBIDE FURNACE

Constituent	Analysis % (by mass)	Particle size μm	Cum. distribution % (by mass)
H_2O	1,3	> 50	11,5
SiO_2	14,6	> 40	15,5
Fe_2O_3	1,5	> 30	20,0
Al_2O_3	6,2	> 25	22,5
Mn_3O_4	3,2	> 20	25,0
CaO	65,2	> 15	28,0
MgO	5,8	> 10	33,0
P_2O_5	0,02	> 7,5	38,0
SO_3	1,0	> 5	49,0
Free C	1,2	> 2,5	81,5
		< 2,5	18,5

240 °C from the hood while the volume handled by the fan is 42 500 m³ (s.t.p.)/h. The reduced volume from the hood causes some slight spill-over of fumes there.

The dust concentration in the duct from furnace hood to cooler is 2,8 g/m³ (s.t.p.), and in the cleaned gas issuing from the exit stack 80 mg/m³ (s.t.p.). The dust collected averages 1,9 t/d, which is equivalent to 80 kg/t of carbide produced. Initially, the gas flowed through the multi-tube cooler in a single pass, but this gave insufficient cooling and dust was deposited in the tubes owing to the low gas velocity. The cooler was modified by division of the 800 thin-walled tubes (70 mm dia. by 6 m long) into two sets of 400 tubes in series to give the gas a double pass through the cooler. This improved the cooling efficiency by some 30 per cent, and the doubling of the gas velocity prevented the deposition of dust on the walls of the tubes. The overall drop in pressure, however, increased from 10 to 40 mm w.g.

The impeller blades of the fans curve slightly backward, but even so dust builds up on the blades and has to be scraped off physically once a week. Cleaning with a jet of compressed air is ineffective. The adhesive properties of the dust are also demonstrated in the discharge chutes from the dust hoppers below the filter. Screw conveyors in the hoppers convey the dust to these exit chutes, which became blocked in spite of being inclined at 70° to the horizontal. The build-up of dust was reduced by the fitting of pneumatic impact vibrators, but the internal walls of the chute still have to be scraped off every few days. The dust adheres to metal surfaces and, if allowed to agglomerate and compact, can be removed only by scraping or breaking of the resulting 'cake'. An effective way to eliminate sticking would be to line the surfaces with Teflon.

The polyester needlefelt bag material filters gas at about 110 °C but can withstand temperatures up to 140 °C, and at times the gas temperature from the filter to the fan does reach this temperature. Initially, this caused the fan bearings to overheat, but, after the fitting of cooler rings and guards to protect them from direct sunlight, no further problem was experienced.

The compressed air for cleaning the bags is injected into one cassette at a time via a trolley that moves to and fro along the sections. Maintenance problems have been experienced with these trolleys and with wear on the sealing lips associated with them. It would seem preferable to regulate the supply of compressed air by stationary diaphragm valves as supplied by some manufacturers of this type of plant.

A bag life of 18 months was guaranteed by the suppliers of the plant, but it was expected that the life would exceed 2 years. It has been found that the average life is only 12 months. When it was determined that the volume of gas handled by the plant was less than that specified, the volume of compressed air for cleaning was doubled, and this gave better cleaning and some increase in volume handled through the plant. However, it undoubtedly also contributed to a reduction in bag life.

The total cost of the plant in 1974 was approximately R120 000. It operates with an on-line time of about 95 per cent, and, while it is apparent from this discussion that the design can be improved in several respects, the plant nevertheless performs the duty required in adequate measure.

Dust-collecting Plant on 46,5 MV.A Open Ferro-silicon Furnace

Immediately after the decision in April 1973 to furnish the 46,5 MV.A ferrosilicon furnace instead of the 25 MV.A carbide furnace with dust collection, the tenderers were asked to requote, and a contract was awarded in February 1974. The successful tenderer was required to check independently for himself all the data supplied on gas volumes and temperatures, dust loading and analysis etc., and the onus of supplying a suitable plant was wholly his. At the time of tendering, an impulse-jet type of plant had not yet been tried anywhere on dust from the manufacture of ferrosilicon, so that the plant accepted was of conventional design with reverse air cleaning. It was stipulated that it should be designed to be completely interchangeable between glass-fibre and Nomex bags as it was desired to test the life and economics of both types of filter fabric. There was at that time a sharp difference of opinion among acknowledged experts on which was the more economical material to employ[2].

Design data for the plant are given below, and a typical dust analysis is shown in Table II.

Volume of furnace gas = 411 500 m³(s.t.p.)/h at about 230 °C
= 862 000 actual m³/h at 205 °C and 84,6 kPa site pressure

Bag house of 16 compartments each containing 12 rows of 17 bags each sized 300 mm dia. by 10 200 mm effective length, i.e. 3264 bags in total

Total filter area = 30 290 m²

Volume of reverse air for cleaning = 65 000 actual m³/h at 190 °C

Filter velocity gross, i.e. all compartments filtering = 0,47 m/min

Filter velocity net, i.e. one compartment off for cleaning = 0,54 m/min

Two compartments fitted with bags of Nomex fabric containing interwoven antistatic metal threads (maximum working temperature 225 °C)

Fourteen compartments fitted with bags of glass fibre having silicone graphite and Teflon finish (maximum working temperature 260 °C)

Normal gas temperature at baghouse inlet = 190 °C

Maximum gas temperature at baghouse inlet = 205 °C

Volume of gas for pneumatic transport of dust to storage bin = 4750 actual m³/h at 20 °C

Total absorbed power = Approx. 1600 kW

Pressure drop across baghouse with one compartment off for cleaning = 180 to 200 mm w.g.

TABLE II

TYPICAL ANALYSIS OF DUST FROM 46,5 MV.A OPEN FERROSILICON FURNACE

Constituent	Dry analysis % (by mass)	Particle size μm	Cum. distribution % (by mass)
SiO_2	83,7	> 50	8,5
Free C	7,9	> 40	10,8
Fe_2O_3	3,4	> 30	13,5
Al_2O_3	2,4	> 20	17,3
Mn_3O_4	0,1	> 15	20,5
MgO	1,6	> 10	23,8
S	0,2	> 5	28,8
P	0,01	> 2,5	34,0
		< 2,5	66,0

Guarantees by supplier

Bag life 2 years, but up to 3 years' life expected

Dust concentration in exit gas will not exceed 50 mg/m³ (s.t.p.)

Available operating time not less than 97 per cent.

The dust- and fume-laden gas is evacuated from the furnace hood by 4 offtake ducts to the base of the primary chimney (Figs. 3 and 4). From there it is con- conveyed by twin 2,5 m diameter ducts to two pairs of cyclones that act as precleaners for the removal of incandescent particles, which if not removed could damage the bags. The gas passes via the two main fans to a 16-compartment baghouse. The cleaned gas emerges from the baghouse roof through 4 short chimneys of Cor-Ten steel, while the collected dust is transported pneumatically to a 500 m³ silo. The dust is pelletized with the addition of 20 per cent water in an Eirich pelletizing pan of 5 t/h capacity and is removed to dump by lorry. Adequate gas cooling occurs in the two main ducts conveying the gas from the furnace building. Nevertheless, the inlet-gas temperature to the baghouse is measured, and, if the design temperature is exceeded, a damper opens to suck in cold atmospheric air. Should this fail to control the temperature, the furnace primary chimney is opened to the atmosphere and the main fans are isolated and stopped.

The presence of sulphur dioxide in the furnace gas renders it highly corrosive if the gas temperature falls below the acid dewpoint. To counteract corrosion, the compartment partitions and baghouse walls are of corrugated asbestos, the bag caps and suspension chains of stainless steel, and the exit chimneys of Cor-Ten.

The plant was commissioned at a cost of R1,7 million in December 1975 but, owing to numerous teething troubles, came into continuous full-time operation only from the beginning of July 1976. It very effectively performed the function of cleaning the furnace gas to give absolutely clear exit stacks, the difficulties encountered being associated mainly with the following.

(a) There was fairly severe vibration, resulting from turbulent gas flow, in both the inlet and outlet ducts to the fans and the fan housings. Measures to reduce the vibration consisted in strengthening of the fan housings and insertion of vanes in the ducting to streamline the flow. The fans themselves were well-balanced and at no time actuated the out-of-balance warning devices.

(b) At first, the fan bearings overheated. This was cured by modifying the circuit of the cooling oil and by fitting cooler discs to the shafts.

(c) The ducts, cyclones, and structural steel had to be completely re-painted.

(d) The designed output of the dust pelletizer could not be achieved because the silo activator and the rotary discharge valve did not feed the pelletizer uniformly. This caused variation in the ratio of dust to water addition, and thus in the quality of the pellets produced.

(e) Initially, phase imbalance resulted in tripping of the main fan motors by the out-of-balance relays. This trouble gradually disappeared, and the real cause was never definitely established, although it was suspected that the fault lay in the electrical supply and was not caused by furnace out-of-balance conditions.

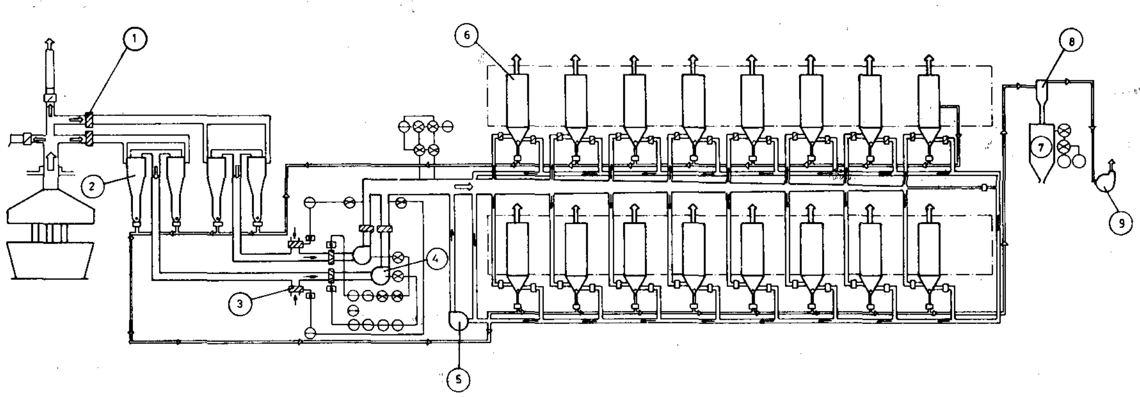

Fig. 3—Schematic diagram of filter plant for 46,5 MV.A open ferrosilicon furnace

1 Main gas louvre damper
2 Cyclone
3 Bleed in air damper
4 Main gas fan
5 Reverse air fan
6 Filter compartment
7 Dust silo
8 LKGB filter
9 Fan for pneumatic transport

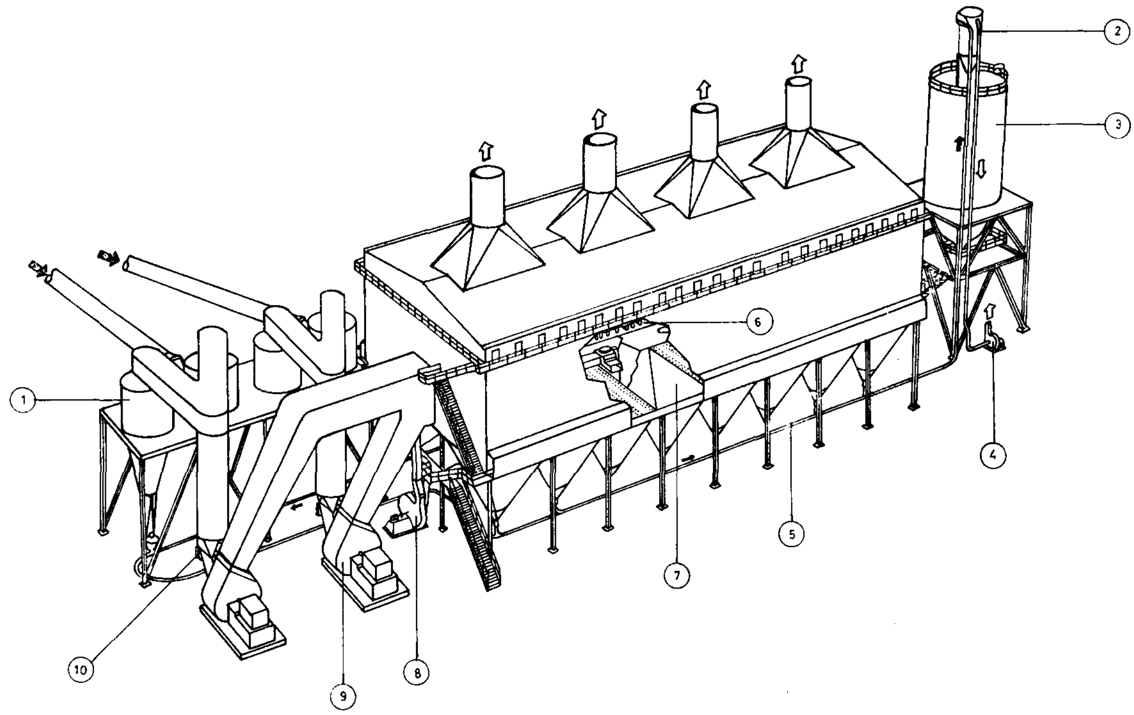

Fig. 4—Filter plant for 6 MV.A open carbide furnace

1 Cyclone	6 Filter bags
2 LKGB filter	7 Dust hopper
3 Dust silo	8 Reverse air fan
4 Fan for pneumatic transport	9 Main gas fan
5 Dust transport duct	10 Bleed in air damper

The dust collected amounts to about 16 t/d on a dry basis, which is equivalent to 220 kg/t of 75 per cent ferrosilicon produced or a dust loading of 1,7 g/m^3 (s.t.p.) of gas.

Conclusions

The growth of Witbank since the company first established its factory well outside the town's borders has resulted in its now being located inside the residential area. Since the factory is the nearest visible source of atmospheric pollution, it is customary for all, or almost all, the blame for the town's polluted atmosphere to be laid at the door of Rand Carbide Limited, whereas it has been shown that other sources in the neighbourhood contribute significantly to the fall-out over the town.

Examination of the record reveals that the company has been making real efforts over a lengthy period to minimize or eliminate emissions from its factory and has spent considerable sums of money to that end. Ultimate success, however, had to await technological progress.

References

1. Meintjes, J. Dealing with dust and fume from electric furnaces at Rand Carbide Ltd., Witbank. *S. Afr. Mech. Engr*, vol. 20, no. 11. 1970. pp. 373–375.
2. Glen, H. (ed.). *INFACON* 74. Johannesburg, South African Institute of Mining and Metallurgy, 1975. pp. 256–257.

Plastics

Readers are reminded of the First South African Conference on Plastics in the Service of Man, which is to be held in Johannesburg from 29th August to 1st September, 1977. Participants may register for one or more days of the Conference, depending on their interests.

Monday, 29th August, is the day set aside for plastics in mining, and the following speakers have accepted invitations to present papers on that topic:

Dr P. J. D. Lloyd, Chamber of Mines of S.A.: *Limitations on the use of plastics in mining*

Dr G. E. F. Mears, AECI Limited: *Plastics in mining.*

Enquiries should be directed to:

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