SPOTLIGHT
on visit to Sasol Two and Three

by John Freer*

On 25th November, 1983, nearly forty members of The South African Institute of Mining and Metallurgy, together with Doris Gardner and Judith Money from Kelvin House, travelled by luxury motor coach to Secunda, there to visit the coal-mining and conversion operations of Sasol Limited.

Programme for Visit

The full programme arranged for us by Sasol required that we leave Johannesburg at 06h30, but the shock of the early start was cushioned by hot coffee and delectable sandwiches served en route by our smiling hostesses.

We were joined at the gates of the plant by a few more members—from the eastern Transvaal—who had made their own way by car, bringing the total number of visitors to 45.

After refreshments, Mr Peter Cox, Sasol's General Manager Mining, welcomed the party and outlined the programme for the day, starting with an audiovisual slide presentation of the mining operations, to be followed by underground visits by four groups of visitors to see various mining methods. After lunch there would be an audiovisual presentation and discussion of the process operations, followed by a coach tour of Sasol Two and Three.

History of the Sasol Group

The history of the Sasol group started in 1950 with the establishment of a synthetic oil-from-coal industry at Sasolburg.

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Institute visit to Secunda

The Sigma Colliery, which feeds Sasol One, has mined 100 Mt of coal since its inception at a rate of some 6 Mt per year, and still has a 40-year reserve. By contrast, the four Secunda Collieries are rapidly building up to a demand of 30 Mt of coal a year to feed Sasol Two and Three over a life span currently estimated at 70 years. The Sasol collieries represent the world's largest coal-mining operation, and together account for 25 per cent of South Africa's coal production.

No doubt the exceptionally rapid build-up of coal production at the Secunda collieries will be regarded as one of the great achievements of South African coal mining.

To-day the Sasol group operates a highly developed and integrated series of plants, producing a complete range of liquid fuels from coal and crude oil, pipeline gas and fertilizer from coal, and petrochemicals such as ethylene, propylene, styrene, waxes, ketones, and alcohols from coal and petroleum feedstocks. These are exported world wide.

The decision to develop Sasol Two was taken in 1975 and was based on economic considerations in the face of rapidly rising prices of fuel oil. In 1979 a further milestone was reached with the strategic decision to proceed immediately with the construction of Sasol Three, using all the design elements of Sasol Two. As a result, 1983 has seen the extraordinarily successful commissioning of Sasol Three, which has been operating at virtually full production since June 1983—only six months after Sasol Two had reached full normal operation. These gigantic undertakings have come on stream in the space of only eight years.

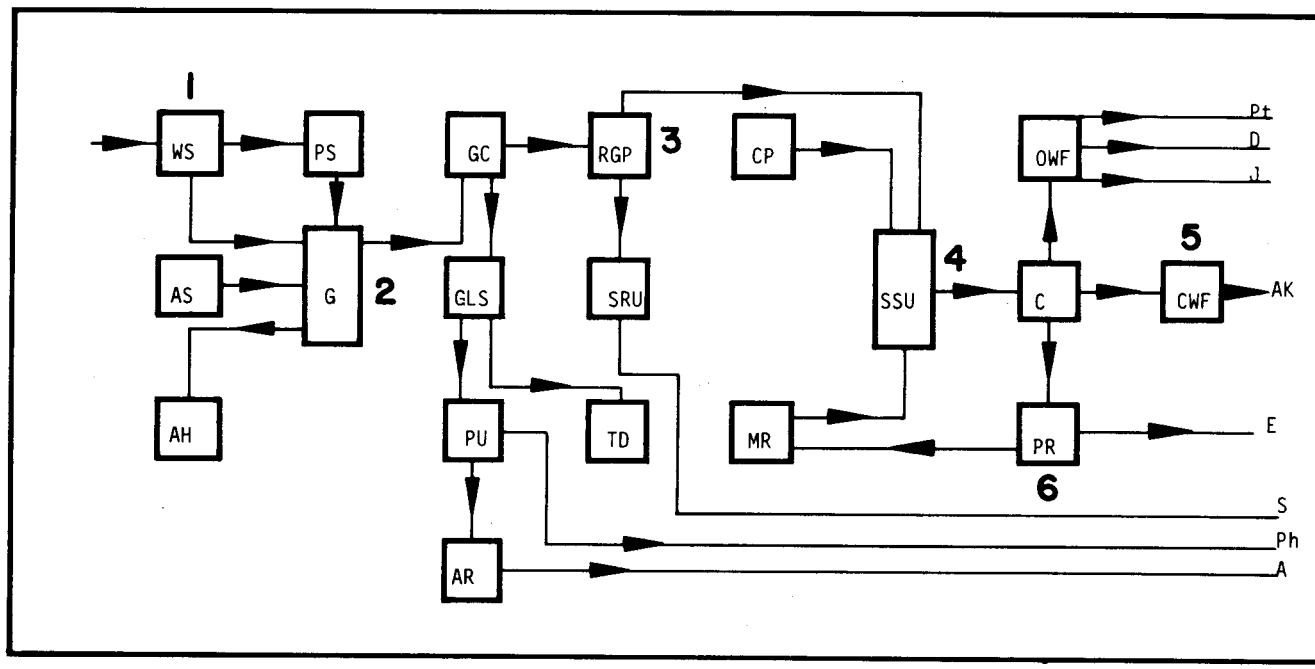
Mining Methods

Three methods of mining are practised: bord-and-pillar, long-walling, and rib-pillar extraction, to suit the overall development requirements of the mines, to optimize the percentage extraction, and to provide a substantial proportion of coarser coal to suit the requirements of the Lurgi gasification reactors. Although No. 2 seam is present in some areas of the mines, it is too thin for extraction and all the mining is concentrated on the No. 4 seam.

The concentration of production into a single unit with high-powered double-drum ranging-arm cutter and rugged shield-roof units was most impressive.

Everything pointed to detailed attention to planning for sustained performance. In-seam conditions appeared excellent, with a total absence of stone inclusions and negligible sloughing of the face. Systematic advancing of supports was accompanied by good goafing action, resulting in only limited voids behind the shields.

The underground visits were both interesting and impressive, and built up the thirst, appetite, and subjects



Key to symbols used

AH	Ash handling
AR	Ammonia recovery
AS	Air separation
C	Cooling
CP	Catalyst preparation
CWF	Chemical work-up facilities
G	Gasification
GC	Gas cooling
GLS	Gas–liquid separation
MR	Methane recovery
OWF	Oil workup facilities
PR	Product recovery
PS	Power station
PU	Phenosolvan unit
RGP	Rectisol gas purification
SRU	Sulphur recovery unit
SSU	Sasol synthol unit
TD	Tar distillation
WS	Wet screener for coal

Products

A	Ammonia
AK	Alcohols and ketones
D	Diesel
E	Ethylene
J	Jet fuel
Ph	Phenol
Pt	Petrol
S	Sulphur

Flowsheet for the Synthol Process at Sasol

for conversation to do justice to the excellent lunch that awaited us at the Sasol Club.

Synthol Process

After lunch, Alf Barnard gave us an audio-visual presentation of the Synthol Process (Fig. 1), which uses water (90 Ml daily), oxygen from the air (13 kt daily from a six-unit oxygen plant drawing 45 MW each), and carbon from coal (40 kt daily). The plant covers 13 km^2.

The coal from the mines is not washed, but merely screened at 3 mm into a coarse fraction for gasification and a fine fraction, which is used in the boiler plant for generating steam. The coarse coal, in the presence of oxygen and steam at 1100°C, yields a raw gas, which is cooled to 40°C to condense out phenols and tars. The gas is further purified at −70 °C in the Rectisol plant in columns 70 m in height to remove carbon dioxide and hydrogen sulphide by absorption in methanol. These columns were brought from Japan through Richards Bay fully fabricated, and were transported by road to Sasol.

The purified synthesis gas is fed to the Sasol Synthol unit, where it is entrained with powdered iron-based catalyst in the Synthol reactors. The product gas consists of hydrocarbons and oxygenated chemicals. Cooling separates the gas, liquid hydrocarbons, and an aqueous chemical mixture from which alcohols and ketones are recovered. The hydrocarbon liquid is fed to a fairly conventional refinery for the production of petrol, diesel fuel, and oils.

The uncondensed portion of the Synthol effluent is used to produce a methane-rich stream, which is sold as such or is reformed to hydrogen and carbon monoxide for recycling. Ethane and ethylene are used for the production of pure ethylene. Further treatment of the aqueous effluent results in commercially saleable anhydrous ammonia, which in future will also be used for the manufacture of fertilizers.

The visit was rounded off by a conducted coach tour of the plant in which the sheer size of the whole operation was put into perspective. It was remarkable to note how the Oil Work-up Section, which is the only plant normally required for a petroleum refinery, was dwarfed by the boilers, gasifiers, gas-cleaning equipment, and Synthol units that precede it.

Grateful Visitors

All-in-all, it was a most interesting, varied, and instructive day, and the visitors were most grateful to Sasol management for the well thought-out tour, and for the friendly hospitality extended to them.

Corrigenda: The absorption of gold cyanide onto activated carbon. I. The kinetics of absorption*

by M. J. Nicol, C. A. Fleming, and G. Gromberge

(a) On page 51, the equation numbered (1), near the bottom of the right-hand side, should be numbered (6), thus:

$$[Au]_c - [Au]_{c,o} = kK[Au]_s/t \quad \ldots\ldots (6)$$

(b) On page 52, the equation numbered (6), in the middle of the left-hand side, should be numbered (7), thus:

$$\frac{[Au]_c - [Au]_{c,o}}{[Au]_s} = k't^n. \quad \ldots\ldots (7)$$

(c) On page 53, the arrangement of the equation numbered (10), near the bottom of the left-hand side, may be confusing. It should have been as follows:

$$M_c \frac{d[Au]_c}{dt} = ([Au]_s^{in} - [Au]_s) \cdot V_s - M_s \frac{d[Au]_s}{dt}. \quad \ldots\ldots (10)$$

* *J. S. Afr. Inst. Min. Metall.*, vol. 84, no. 2. Feb. 1984. pp. 50–54.

Canadian reports

The following reviews of the activity and developments during 1982 in respect to the chief minerals produced or consumed in Canada are now available. Prepared by members of the Mineral Policy Sector staff, they are for sale at $1.25 per copy.

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