SPOTLIGHT

on Iscor's Corex Plant

The first commercial Corex Plant in the world capable of producing liquid iron from a variety of low-grade coals was commissioned in 1990 by Iscor at its Pretoria Works. The Plant has an annual production capacity of 300 kt of liquid iron. Because the compulsory use of coke is eliminated, the new method offers an economic and revolutionary alternative to liquid-iron production. Coke used in traditional blastfurnaces is manufactured from high-grade coal of which the available sources in South Africa are limited.

Development of the Process

The infrastructure required by the Corex process is fairly simple, and the ordinary low-grade and power-station coal used is relatively cheap and abundantly available in South Africa. The Plant can even produce at a reduced rate and still operate economically while complying fully with the stringent requirements for air-pollution control.

During the past decade, Iscor investigated several new processes for the production of liquid iron, and in 1985 it decided on the 'Kohle Reduktion' process, which had been developed by Korf Engineering GmbH of Kohl in West Germany and Voest-Alpine Industrieanlagenbau of Austria. The companies formed a consortium to erect and commission the Plant in Pretoria as a turnkey project. A major condition of the contract was that the contractors should employ South African equipment and labour. (Korf Engineering later became Deutsche Voest-Alpine Industrieanlagenbau.)

Description of the Plant

The structure of the Corex Plant rises higher than 103 m, and the two main components are the 20 m reduction shaft and, below it, the 28 m gasifier-melter. Jointly, they are responsible for the reduction, gasification, and smelting functions, which are basically similar to those of a blastfurnace. However, a blastfurnace cannot operate without coke, which is produced from high-grade coal in a coke-oven battery. The coking process gives rise to various byproducts that have to be processed. Most of Iscor's coking plants have been, or will be, decommissioned during the modernization phase of the Pretoria Works.

The production of liquid iron by the Corex process takes place at a rate of 40 t/h, and every 2½ hours 100 t of molten metal and 35 t of slag are tapped. A tap is comparable with the customary technique applied at conventional blastfurnaces.

Top gas with a high calorific value is drawn off at the top of the reduction shaft, cleaned in a scrubber, cooled, and then supplied in abundant volumes to a distribution network. Use is made of the Corex Plant's export gas by several sections of the steel-melting plant: the casting bay; the blooming, heavy, and small-section mills; the reheating furnaces for the forge press; and some of the workshops.

Iron from the gasifier-melter is delivered in liquid or solidified form to the electric-arc furnaces where, together with scrap steel, it forms part of the total charge to be refined into a variety of steel qualities. The slag tapped from the hearth of the Corex is water-cooled rapidly to granulate it. It is sold in this form as a byproduct to cement manufacturers.

Professor A.N. Brown, President of AS&TS, presenting the AS&TS 1990 National Award to Mr H.M.W. Delport of the Iscor team responsible for the design changes made to the Corex Plant

Commissioning of the Plant

Construction of the Corex Plant was completed within 22 months, and the first commissioning on a trial basis took place in December 1987. This first campaign was terminated after 10 days.

In the seven months that followed, certain adaptations and repairs were carried out that enabled the plant to produce 65 kt of liquid iron in a second campaign lasting six months. During the second campaign, part of the product met the high standards required.

From February to November 1989, further adjustments were made before the start of the third campaign, in which the plant soon reached 90 per cent of its production capacity.

The Corex Plant was finally commissioned on Friday, 22nd June, 1990, by the State President, Mr F.W. de Klerk, at Iscor's Pretoria Works. At a banquet for about 400 guests marking the event, he unveiled a commemorative plaque. The plant has been named after the late Mr Keith Prince, who had been Iscor's General Manager, Research and New Developments, and who had been closely involved in the decision to build the Corex plant. Mr Prince died in the Helderberg air disaster while returning from a trip to the East in connection with the Corex plant.

Public Recognition

In recognition of the Iscor team's dedicated work in bringing the Corex Plant to full production, to the benefit of both Iscor and South Africa, the team was awarded the 1990 National Award by The Associated Scientific and Technical Societies of South Africa (AS&TS). During the two major stoppages in the commissioning period due to operational problems, the engineers and technicians in the team made a major contribution, if not a breakthrough, in technology. They initiated innovative research projects and re-evaluated the design, suggesting extensive design changes and eliminating the original deficiencies.

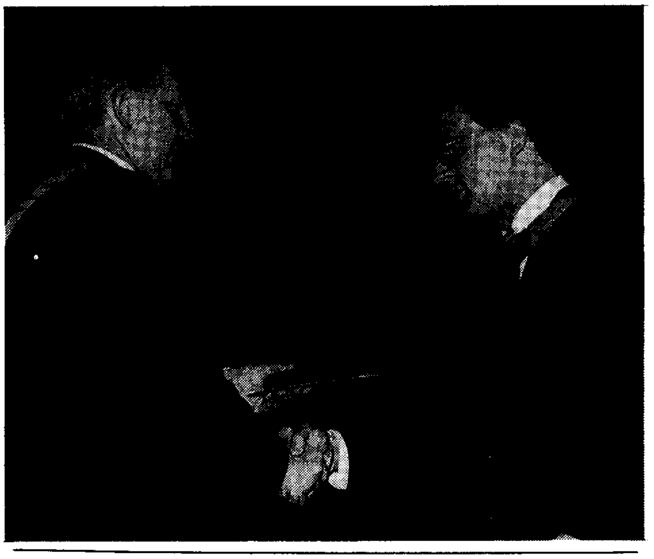
The plant has also attracted international attention. A symposium on the subject arranged by Voest-Alpine and Iscor in Pretoria during 1990 was attended by about 260 experts, including 73 overseas guests from 18 countries.

Production

The Keith Prince Corex Plant reached its annual design capacity of 300 kt of liquid iron within 3 months and has maintained it ever since. The quality of the product delivered is controllable and complies with the most stringent requirements.

With this Plant, Iscor has demonstrated beyond reasonable doubt that the Corex process is an economical, environmentally friendly method of producing hot metal.

Gold Medal for Wits Metallurgical Engineering Student*



Mr Clive Knobbs (left), President of the Chamber of Mines, presenting the prestigious Chamber of Mines Gold Medal to Wits University graduand Paulo Fernandes. Paulo was the most distinguished candidate in the branches of mining and metallurgical engineering in 1990. He was handed the award, which includes a R20 000 research scholarship, at the Engineering Faculty's graduation ceremony, where he graduated with distinction.

The Faculty of Engineering conferred 206 BSc (Eng) degrees, 44 MSc (Eng) degrees, and 7 doctorates, and awarded 51 post-graduate diplomas at the ceremony.

Guest speaker, Mr John Martens, Deputy Technical Director (Engineering) of Anglo American, told guests at the ceremony that the next wave of professional engineers would have to bear a wide range of responsibilities. These included building and adapting engineering into the new South Africa, helping trade unions to progress to greater maturity, raising the country's productivity, conserving the environment, and functioning in a less rigid and more integrated multi-disciplinary mode.

* Issued by Lynn Hancock Communications, P.O. Box 1564, Parklands 2121.

Soil

A Symposium on Soil is to be held at Mintek (Randburg) on World Environment Day, 5th June, 1991, at 17:00. The Symposium is under the auspices of the Society of Professional Engineers (SPE), The Associated Scientific and Technical Societies of South Africa (AS&TS), the Habitat Council, and the Environmental Planning Professions Interdisciplinary Committee (EPPIC)

The papers to be presented include the following:

- Economics of soil degradation, by C. McKenzie (Development Bank of SA)
- Engineering uses of soil, by R.M.H. Bruin (TC Watermeyer Group)
- Soil environment and engineering works in the Highlands of Lesotho, by D.M.T. Nkalai (Lesotho Highlands Development Authority)
- Our dwindling soil resources, by P.J. McPhee and D.M.S. Scotney (Department of Agricultural Development)

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