

| J | N(r/min) and T(Nm) for liner no. 2 | | | | | | | |
|-------|------------------------------------|-------|------|-------|------|-------|-------|-------|
| 0,128 | 60,7 | 45,8 | 70,7 | 46,0 | 75,7 | 46,8 | 80,0 | 45,0 |
| | 85,7 | 46,4 | 90,7 | 45,4 | 95,7 | 44,4 | 100,7 | 45,1 |
| 0,193 | 60,2 | 64,4 | 70,2 | 65,4 | 75,2 | 65,7 | 80,2 | 66,1 |
| | 85,2 | 66,4 | 90,2 | 66,6 | 95,2 | 66,9 | 100,2 | 67,1 |
| 0,289 | 61,6 | 91,5 | 71,6 | 92,8 | 76,5 | 93,1 | 81,5 | 92,9 |
| | 86,5 | 91,4 | 91,5 | 87,8 | 96,5 | 82,9 | 101,5 | 76,6 |
| 0,385 | 61,6 | 96,3 | 71,6 | 97,9 | 76,5 | 97,8 | 81,5 | 96,1 |
| | 86,5 | 91,6 | 91,5 | 86,8 | 96,5 | 80,8 | 101,5 | 72,7 |
| 0,481 | 62,2 | 108,2 | 72,3 | 110,0 | 77,3 | 109,0 | 82,4 | 107,0 |
| | 87,4 | 101,9 | 92,5 | 91,1 | 97,6 | 77,8 | 102,6 | 67,4 |
| 0,575 | 61,8 | 103,1 | 71,9 | 105,1 | 77,0 | 105,1 | 82,1 | 103,5 |
| | 87,2 | 99,5 | 92,2 | 90,4 | 97,3 | 76,4 | 102,4 | 60,3 |
| 0,670 | 61,8 | 88,0 | 71,9 | 89,7 | 77,0 | 90,3 | 82,1 | 89,0 |
| | 87,2 | 85,9 | 92,2 | 80,3 | 97,3 | 71,2 | 102,4 | 58,1 |

| J | N(r/min) and T(Nm) for liner no. 3 | | | | | | | |
|-------|------------------------------------|------|------|------|------|------|-------|------|
| 0,195 | 61,3 | 70,6 | 71,4 | 65,0 | 76,5 | 61,0 | 81,5 | 56,6 |
| | 86,5 | 51,2 | 91,6 | 44,1 | 96,7 | 35,9 | 101,7 | 30,0 |

| | | | | | | | | |
|-------|------|-------|------|-------|------|-------|-------|-------|
| 0,339 | 61,3 | 108,0 | 71,4 | 105,6 | 76,5 | 102,4 | 81,5 | 98,5 |
| | 86,5 | 92,0 | 91,6 | 82,5 | 96,7 | 70,7 | 101,7 | 61,5 |
| 0,481 | 60,0 | 123,4 | 70,0 | 124,9 | 75,0 | 123,2 | 80,0 | 120,3 |
| | 85,0 | 114,0 | 90,0 | 103,6 | 95,0 | 89,4 | 100,0 | 74,6 |
| 0,578 | 60,0 | 123,7 | 70,0 | 126,7 | 75,0 | 125,7 | 80,0 | 124,1 |
| | 85,0 | 114,3 | 90,0 | 108,6 | 95,0 | 94,1 | 100,0 | 77,6 |
| 0,672 | 61,4 | 115,9 | 71,3 | 117,8 | 76,3 | 117,8 | 81,2 | 115,9 |
| | 86,0 | 110,0 | 91,0 | 102,1 | 96,0 | 88,4 | 101,0 | 73,6 |

| J | N(r/min) and T(Nm) for liner no. 4 | | | | | | | |
|-------|------------------------------------|-------|------|-------|------|-------|-------|-------|
| 0,195 | 61,4 | 71,7 | 71,3 | 72,7 | 76,3 | 72,7 | 81,2 | 71,7 |
| | 86,2 | 68,7 | 91,1 | 63,8 | 96,0 | 57,9 | 101,0 | 51,5 |
| 0,338 | 61,4 | 110,2 | 71,3 | 111,9 | 76,3 | 111,0 | 81,2 | 108,0 |
| | 86,0 | 102,1 | 91,0 | 93,3 | 96,0 | 82,8 | 101,0 | 71,3 |
| 0,482 | 61,4 | 127,7 | 71,3 | 130,1 | 76,3 | 129,9 | 81,0 | 126,7 |
| | 86,0 | 118,8 | 91,0 | 108,0 | 96,0 | 94,3 | 101,0 | 77,6 |
| 0,578 | 61,4 | 128,6 | 71,3 | 131,6 | 76,0 | 131,6 | 81,0 | 128,6 |
| | 86,0 | 121,8 | 91,0 | 110,0 | 96,0 | 95,3 | 101,0 | 79,3 |
| 0,674 | 61,4 | 121,8 | 71,3 | 124,7 | 76,3 | 125,7 | 81,0 | 123,7 |
| | 86,0 | 118,8 | 91,0 | 109,0 | 96,0 | 96,2 | 101,0 | 78,6 |



ENVIRONMENTAL Feature

Columbus's commitment to environmentally friendly development

A decision by joint-venture partners Anglo American, Gencor, and the Industrial Development Corporation to proceed with the expansion of the Columbus Stainless Steel plant in Middelburg will contribute significantly towards the economic growth that South Africa needs so desperately. The expanded facility, expected to come on-line in 1995, will be the largest single-plant producer of stainless steel in the world, and the company will rank sixth overall in world production.

Middelburg, the eastern Transvaal, and the country as a whole will undoubtedly benefit from the accelerated industrial and commercial activities generated by the expansion, but the partners recognize that this activity must be undertaken in an environmentally sound manner. Columbus's policy and approach to sound environmental management are guided by several key tenets, one of which is the belief that legislative requirements *vis-a-vis* environmental matters are merely a minimum requirement that should be met as the company becomes a significant player in the stainless steel markets of the world.

THE MISSION

The importance of the environment to Columbus is clearly demonstrated by the fact that environmental policy is guided by the first clause in the company's mission statement. In this guiding document, it is stated that the company 'will mobilize people and other resources to create wealth' by becoming the preferred and competitive supplier in the stainless steel industry in a manner that takes account of 'respect for and commitment to the individual and the environment'.

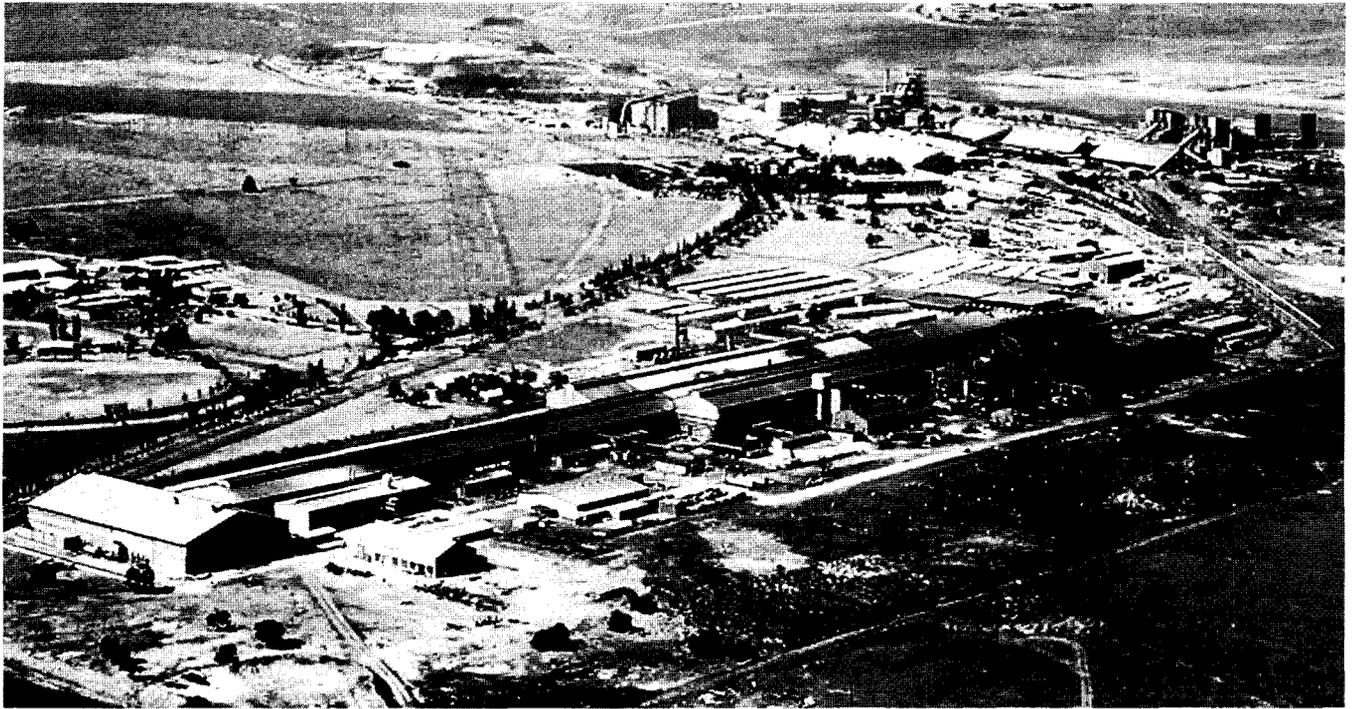
This statement, enunciated in the document that drives the fundamentals of the company, gives rise to a clear approach to the operation of the existing facility, and the development of the expansion project. Columbus is unique in that it shares its site with a sister, but nonetheless sep-

arate, company, Samancor's Middelburg Ferrochrome: this means that any approach to site environmental policy must be tackled jointly, since the environmental impact of one company's actions is inextricably tied in with the other, sited side-by-side as they are. The overall control of environmental aspects for the site and the two companies resides in the Joint Environmental Council, chaired by the Chief Executive of Columbus, Fred Boshoff, and composed of senior staff from both firms, as well as Denis Bruckmann, an environmental consultant with over 25 years of experience in dealing with steelmaking and the environmental matters entailed in its production.

Involved with Highveld Steel since its conceptual stage in the 1960's, and latterly as their director in charge of engineering, Denis has once again been involved in bringing a world-class steel facility from concept to reality, paying special attention to its interaction with the environment. He notes that, in this time when South Africa and her products are once again being welcomed into overseas markets, Columbus must 'do the right thing' from an environmental perspective, both because of international concern over the production of industrial goods in an environmentally friendly manner, and because of industry's responsibility to have a genuine concern for the environment. In his opinion, 'few companies appreciate the importance of grass-roots involvement with the community as Columbus does'. This commitment to the community in which Columbus is the largest employer has been demonstrated by the company's involvement of the community in environmental forums in various stages of project planning. All this adds up to Columbus's pro-active environmental policy.

PRO-ACTIVE POLICY

Columbus has grasped the nettle as far as the environment is concerned, and has been working with the Environmental Evaluation Unit of the University of Cape Town to



The stainless steel plant at Columbus

manage environmental aspects of the existing and future development of the facility. Involved in the project since the development stage, and understanding the importance of preserving and, indeed, cleaning up the world around us, this independent body formulated a Best Practicable Environmental Option (BPEO), and Phase I of a two-phase undertaking is now under way. This initial phase will ensure interim containment of liquid and solid wastes on site, and will allow proper time for the necessary research-and-development efforts to deal with these challenges in the longer term. The long-term goal of the BPEO will be to minimize, in an economical manner, the impact of the production on the environment, and this will be achieved by

- ensuring that environmental management is a top corporate priority
- measuring environmental performance and conducting regular environmental audits
- continuously striving to improve performance, with legal requirements as a minimum starting point based on scientific and technical developments
- striving towards appropriate international standards for pollution control
- educating, training, and motivating employees to conduct their activities in an environmentally responsible manner
- conserving and maximizing efficiency in the use of energy inputs
- minimizing the generation of waste, and ensuring safe and responsible disposal of residual wastes
- conducting and supporting research into the environmental impact of raw materials, products, processes, emissions, and wastes
- developing and maintaining emergency preparedness plans where there are significant hazards
- sharing environmentally sound technology with other organizations.

PROOF OF COMMITMENT

Concrete proof of commitment to a cleaner environment as a result of the expansion project can be seen in the fact that the current gas-from-coal plant, which produces the fuel necessary for the firing of annealing furnaces and other key processes, will be replaced by the use of clean-burning and more thermally efficient gas piped in from Sasol. The benefits of this action are the removal of a relatively dirty, inefficient process that produces sulphur dioxide and phenol, and replacing it with one that is both superior from an air- and water-pollution perspective and requires less fuel to produce the same thermal impact.

True proof of Columbus's commitment is seen, not only in one or two isolated investments but, on a much larger and fundamental level, in its additional investment in elaborate equipment needed to meet international standards. This is equal to an additional 1,5 per cent of the total project cost over the minimum needed to meet the existing legislation. In addition, as a part of Phase II of the BPEO, it is expected, subject to further research, that all the old dumps of slag material will be re-worked, thereby reclaiming valuable products such as chromium and nickel, and leading towards dumps that will not be subject to leaching. The reclamation of material from the dumps means that the amount of new ore that would have had to be mined will be reduced, leading to better usage of scarce resources, and that the local environment will be in considerably better shape than it was previously. The treatment of waste on site will follow an integrated approach, which will use the waste of one process to aid in the activity of another process, or which will foster the minimization or treatment of waste from another process. This integrated perspective to the challenge posed by waste will result in an overall balance that is optimal from both the environmental and the economic angle.

In rising to the task of bringing this world-class facility on-line in the next few years, Columbus can assure the public at large that the expansion project and the company's future position as a world-class competitor will be both environmentally friendly and pro-active.