Comment on G.J. de Korte's 'Dense-medium beneficiation of fine coal revisited'

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Some 30 years ago exposure to dense-medium separation in South Africa, culminated in the adaptation of the process for the treatment of -0.5 mm fines. The first commercial plant at Greenside Colliery apparently operated for some 18 years. Three further plants followed, including one treating tin ore. It is gratifying to learn, therefore, that there is renewed interest.

The objective of making the process easier to operate ('more practical'?) is commendable but the cumbersome technical approach could be counter productive. Perhaps a brief outline of the original thinking might be helpful when analysing the problem.

A paper[1], presented in Australia in 1981 outlined the design of the Greenside plant, together with the preceding test work and subsequent commissioning. This material was covered in greater detail elsewhere[2].

The plant was specifically designed to effect an exceptionally difficult separation at a low cut point. Studies had shown that an Epm in the region of 0.02 would be required. Data derived from limited overseas published material suggested correlation between Epm and vortex acceleration, see Figure 1. Extrapolation indicated that acceleration approaching 1 000 g might be required.

Capacity of an individual cyclone was also a consideration, and an arbitary figure of 5 tonnes per hour was fixed. Further studies indicated that a 150 mm diameter cyclone of appropriate geometry and operating at suitable pressure would meet all requirements. The results of a test on a prototype confirmed this vew, see Figure 1. It should be stressed that the design arrived at was never regarded as a 'standard' for all fines applications.

The density profile within a dense-medium cyclone depends, *inter alia*, upon cyclone geometry, vortex acceleration, solids concentration of the circulation medium and the size distribution of the medium solids. Because of the low cut point (hence low solids concentration) and high acceleration, the use of fine medium was essential. This in turn would require meticulous plant operation, but not beyond the capacity of adequately trained personnel, as was proved early in the commissioning phase.

When designing for a relatively easy separation, such as the No. 4 seam, the problem becomes much simpler. Firstly, to achieve an Epm of 0.05–0.06 the required vortex acceleration falls to about one-third of that required at Greenside. Secondly, the medium solids concentration is high at a cut point of the order of 2.0. This means that a larger cyclone operating at lower pressure and with coarser medium should prove satisfactory. It is unlikely, however, that it will turn out to be an 'off the shelf' model.

In other words, the development of a suitable single-stage design is suggested as a more practical approach to the problem. Furthermore, the incorporation of modern (and probably more efficient) ancillary equipment should ensure the success of the project.

References

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2. Van der Walt, P.J., Advances in coal washery performance in South Africa, Ph.D. thesis, University of Cape Town, June, 1982. ◆

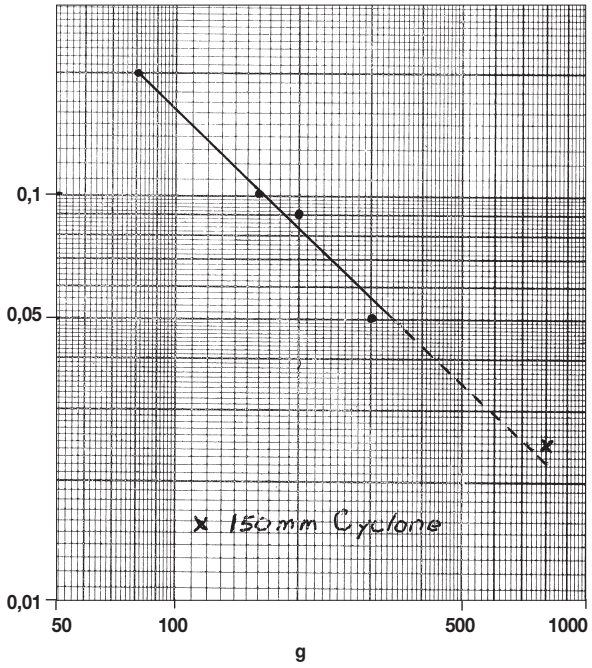

Figure 1—Epm vs Vortex A^{cm} 0,5 + 0,15 mm coal

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