

SPOTLIGHT

on project management in the metallurgical industry

by J. D. KOCH

The past ten years or so have seen many changes in the methods and approach adopted for projects in the metallurgical and mining industry in South Africa. These changes have led to an increased use by operating companies of the project and construction management services offered by engineering contracting companies. For a variety of reasons, this development has been slower in the metallurgical industry than in other areas of production, but that industry is also now showing an increasing trend in this direction.

It was therefore most opportune that project management in the South African metallurgical industry should have been the subject of a colloquium organized by the South African Institute of Mining and Metallurgy on 16th September, 1980, during the Electra Mining exhibition. The one-day colloquium attracted five papers on the subject, as well as a session of short presentations by four representatives of the metallurgical and mining industry. Four of the five papers were presented by delegates of engineering contracting companies, and the fifth by a representative of the South African Iron and Steel Corporation (Isacor). The views of both operating and contracting companies were therefore presented. The colloquium was attended by approximately 220 delegates, of whom roughly 75 per cent were representatives of the metallurgical and mining industry, and 25 per cent of contracting organizations. This attendance is a clear indication of the interest in project management.

Opening Address

Dr P. R. Jochens, President of the S.A.I.M.M., welcomed the delegates and expressed his appreciation to Professor Peter King for initiating the colloquium, and to Mr Henry James and his committee for organizing the details.

In his opening address, Dr Jochens gave a broad review of some aspects of the changing scene of project management in the industry. In the early days, the metallurgical companies themselves had undertaken most of the tasks from the process design stage to the project management, and the contracting organizations had contributed to the supply and installation of the plant. This had resulted mainly from the need for the mining and metallurgical industry to be technically self-sufficient in a developing country. However, increases in capital costs and interest rates, as well as increasing plant complexity, have given rise to a tendency for mining companies to rely increasingly on outside organizations for the combination of skills required for

research, engineering, and project management. Another factor in this development is the great shortage of trained engineering manpower, which makes it difficult for metallurgical companies to maintain the necessary staff for the design, project management, and construction management of plants in addition to its own operating staff.

This gradual evolution of the increased interaction between producing companies and engineering contracting organizations in the sphere of new production facilities has of necessity required adjustments. The greater use of engineering contracting companies does not in any way reduce the necessity for metallurgical companies to maintain and improve their technical infrastructure. The need remains to ensure that the technology is continually developed and used in new and existing plants and processes, particularly in improved control and optimization. Dr Jochens concluded by saying that both parties could learn from each other's problems in this interaction between them.

Engineering Contracting Papers

The viewpoint of the engineering contracting companies was presented in four papers by J. D. Koch, R. J. Knott and E. R. Davis (presented by R. J. Knott), P. Lloyd and K. Levin (presented by P. Lloyd), all of Engineering Management Services Ltd, and F. van Heerden, of Edward L. Bateman Ltd.

The topics ranged from a general overview of project management, covering such aspects as the difference between the management of a project and that of a production company, project phases, the organization of the task force, project control and commissioning, and reimbursable management contracts. The following points emerged clearly. A project manager needs to be divorced from the tasks in the functional organization of a production company. This applies equally to other members of the project management team so that there is no conflict between the needs of the project and the production company. The changing nature of a project through various phases from conceptual design to commissioning requires project task forces that are organized in different ways.

These principles had also applied to the Grootegeluk coal mine project, as shown by the excellent paper on this project presented by Mr B. C. Alberts of Isacor.

Definition Phase

In his paper, Mr Koch emphasized the importance of the definition phase of a project, when the conceptual and basic designs are established. It is during this phase that the ground rules are laid down and the thinking

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is done, at comparatively little cost since no commitments have yet been made in regard to expenditure on plant and equipment. It is therefore important that this phase should be executed thoroughly, which also means that the production and commissioning staff, in addition to the process and design engineers, should be fully involved. The making of models to arrive at a suitable plant layout should be considered at this stage. The early inclusion of project and construction management expertise will contribute significantly to the sound development of a project into the implementation phase. The major costs are incurred during this phase, which includes the detailed design, the procurement of material and equipment, and the construction. The commitment of the staff of the operating and project groups to the principles and basic design established in the definition phase will result in better implementation, and will avoid the unnecessary and usually expensive changes in this later phase. This does not mean that changes can be totally avoided, but only those which show definite advantages after a thorough evaluation should be considered.

The longer period available to the Grootegeluk team for this preparation was a significant factor in the success of that project as outlined by Mr Alberts. For various economic and other reasons outside Iscor's control, a longer period than usual was available for this definition phase, and Iscor utilized that time with good results.

Commissioning

Similarly, Mr Lloyd indicated in his paper that, to meet the objectives of commissioning, the commissioning group has to be involved from the start of the project. Mr Van Heerden enlarged on this subject, pointing out that the responsibilities for the commissioning tasks should be established early in the project. That this aspect is often the most under-estimated part of a contract and often not thoroughly planned was mentioned in the summing up at the end of the colloquium by Mr Fox-Smith of Mitchell-Cotts Projects.

Project Team

For the project objective to be attained within the defined time, within the budget, and to the required quality, a dedicated task force should be established under the leadership of a project manager. This team should include a variety of staff with different interests and objectives, and it is the responsibility of the project manager to manage this diverse group (even though he often has limited authority) through the application of leadership qualities. The integration of the project team with the personnel of both end-user (or the client) and the project management organization is highly desirable. Such integration is increasingly being encountered, particularly where cost reimbursable contracts are involved. This leads to better communication between the parties, and an understanding of one another's needs and problems. Ideally, the task force should be located in one area for effective and speedy communication, as well as for the creation of good team spirit, which is so essential in the successful execution of a project.

Project Control

The increasing complexity and cost of projects have led to a need for the effective control of time and money as an essential part of good project management. However, this is often a misunderstood subject, and, as Mr Knott stated, effective control depends on the timely evaluation of potential cost and planning hazards and the accurate reporting of these hazards with recommended solutions to the project management. The most important function is therefore a forward look, and anticipation and evaluation of events.

Contractual Arrangements

Various views on the involvement of engineering management contractors in projects were expressed by E. B. Viljoen (Assistant Consulting Metallurgist, Gencor), C. Moll (Assistant Consulting Mechanical and Electrical Engineer, Gold Fields of South Africa), T. P. T. Page (Consulting Engineer, Rand Mines), and J. Dyer (Technical Consultant, Anglo American Corporation). They expressed a general preference for projects to be managed in-house, particularly the front-end package of feasibility study and conceptual and basic design, with the engineering contractor becoming involved in the detailed design, procurement, construction, and commissioning in a variety of ways. The shortage of manpower resources and the retention of in-house expertise are important considerations, as is the availability or lack of suitable detailed specifications in turnkey enquiries. Turnkey contracts have the disadvantage that the design executed by contractors is dictated by competitive tender conditions, and, unless detailed specifications are issued with the tender, this can lead to unsatisfactory design. Where mining and metallurgical companies are continuously involved in many projects, uniform cost and other controls, as well as data banks, are developed in-house. Engineering contractors are then expected to utilize such systems and to demonstrate their capability in a supporting role, as well as linking their own control systems to the client's systems.

Of various contractual arrangements, Mr Van Heerden pointed out that the cost reimbursable plus fee contract is highly flexible, giving the client a variety of options on the degree of control to be exercised and retained. Some of its other advantages are a reduced need for the detailed definition of scope and proposal time, the flexibility resulting from the integration of the client's and the contractor's staff in a combined project team to take advantage of the expertise available in both organizations, and the elimination of costly negotiations if many changes are contemplated. However, as stated by Messrs Page and Van Heerden, tight control must be exercised to prevent overrun on costs and time, and the optimization of costs is difficult. A variation of this type of contract, which incorporates a bonus/penalty clause on both time and cost, was stated by Mr Viljoen to have been used in a highly successful project both from the client's and the contractor's point of view. Iscor used another variation in their contract for the construction of the Grootegeluk plant: Iscor was

protected against escalation claims that might result from an unduly slow start by the contractor in the early phase of the contract. The principle involved the use of the Californian envelope for the evaluation of progress in financial terms on an agreed programme. Thus, by the establishment of acceptable envelopes before a contract is awarded, escalation can be limited if the delays are within the contractor's control.

Summing-up

In his summing-up of the colloquium, Mr Fox-Smith mentioned that the use of lump-sum firm-price bids for the engineering phase of a project is undesirable since this is probably the most important phase and represents one of the smallest costs of a project. Firm-price bids for this work under competitive conditions may lead to undesirable design.

The variety of contracts used in South Africa should be reviewed by the South African Bureau of Standards, so that standard contract conditions can be introduced both for the supply of equipment and the construction. These could then be used throughout the industry as in other countries.

Closure

In closing the proceedings, Mr Fox-Smith thanked the S.A.I.M.M. for holding the colloquium, Dr Jochens for opening the programme, and the session chairmen, speakers, and executives of the mining companies for their valuable contributions.

The colloquium ended with a cocktail party, by courtesy of Engineering Management Services Limited, which was enjoyed by the delegates and rounded off a most successful day.

SAIMM diary

2nd-6th February 1981

9th-13th February 1981

University of the Witwatersrand

Vacation Schools on 'Increased Underground Extraction of Coal'

23rd April 1981

Kelvin House

Colloquium on 'Wear and Abrasion in Industry' in collaboration with the Institution of Metallurgists (South African Branch)

5th June, 1981

National Institute for Metallurgy

Colloquium on 'The influence of a high gold price on a low-grade mining area'

29th June-3rd July 1981

University of Pretoria

Vacation School on The 'Heat Treatment of Steel — Theory and Practice' (organized by the SAIMM Material Engineering Division)

27th-31st July, 1981

National Institute for Metallurgy

Vacation School on 'Uranium Ore Processing — Extraction of Uranium'

26th April-2nd May, 1982

Pre-Congress Tours

3rd-7th May, 1982

Carlton Hotel, Johannesburg

Twelfth Mining and Metallurgical Congress in collaboration with the Geological Society of South Africa

10th-23rd May, 1982

Post-Congress Tours