



TOGETHER
for a sustainable future

OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.



TOGETHER
for a sustainable future

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche



07970



Distr.
LIMITED

ID/WG.274/10
21 March 1978

ENGLISH

United Nations Industrial Development Organization

Expert Group Meeting on Fertilizer Plant Cost
Reduction and Ways to Mobilize Sufficient
Financing

Vienna, Austria, 11 - 14 April 1978

**THE EFFECT OF PROPER PROJECT MANAGEMENT ON
REDUCING COSTS FOR FERTILIZER PLANTS ***

by

P.V. Clifton **

-
- * The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO. This document has been reproduced without formal editing.
 - ** Chairman and Managing Director, Scientific Design, Bush House, Aldwych, London, WC2B 4QB, United Kingdom.

id.78-1521

The factors affecting the economics of an industrial complex are the sales income compared with the cost of sales which comprises the day to day running expenses plus the repayment over a period of time of all the costs of establishing the complex.

Market prices of product and raw materials are subject to the general economic environment and in present conditions are particularly difficult to forecast some four or five years ahead when planning the investment for say a fertiliser complex. However if there is a large enough potential national market, and a reliable source of raw materials within the same country, the effects of the world economic situation are of somewhat less significance. A make-or-buy decision still has to be made but in certain products such as fertilisers, and say plastics, there is a long term, basic underlying growth pattern which can be depended upon.

Uncertainties still remaining, after these considerations, are those strongly influencing the total costs of establishing the complex, namely the costs of:

1. The basic plant.
2. Financing.
3. Training of management and operatives.
4. Development of the infrastructure and the market.
5. Inefficiencies of execution at all stages of the project.

This paper will dwell on the subject of reducing the total cost of establishing fertiliser plants with particular reference to sites in the Developing Countries. It will deal principally with the production of ammonia and urea in integrated plants, but suggestions will be put forward which might prove useful in the broader areas of fertiliser and petrochemical construction during the 1980's in those countries. During this period the writers are persuaded that no dramatic new technology will emerge so as to benefit materially the cost of producing a ton of nitrogen in countries with whom the United Nations Development Organisation(s) are principally concerned.

In the late 1980's it is your authors' view that coal or atomic energy based technology might provide a technical mechanism for reducing the unit cost of nitrogen in massive plants, but since the object of this paper is to consider ways and means of reducing the capital costs of fertiliser plants - for the short and medium term future, it would be inappropriate to dwell on the long term trends in synthesis gas production using coal or atomic energy developments.

The escalation in capital costs of today's generation of fertiliser plants is without doubt due principally to world wide inflation, and this itself has mainly been stimulated by increases in the world price of crude oil. Balance of payments difficulties, imposed by actual or

threatened crude price increases have resulted in high interest rates being required by commercial banks and general investment uncertainty which has not acted to the best advantages of developing countries be they oil-rich or oil-starved. Significant assistance has been and is being provided during these difficult and uncertain days by the international lending agencies led by the World Bank. IDA's loan policy has done much to minimise the effect on inflating capital costs of fertiliser plants which derive from high interest rates which have developed in Europe, and more particularly the generous grace periods provided in the past by IDA, have given an incentive to progressive developing countries to complete their projects on time or even ahead of the loan agreement critical completion dates.

The market is however influenced by factors much larger than the requirements of fertiliser plants e.g. steel/coal/ship building/refining and pipeline construction. Equipment purchases in 1977 cost less than similar equipment purchased in 1975/76 in spite of 12% general inflation in the West. Because of steel industry problems 1978 could be an excellent time to buy steel products, even though the forecasted general escalation rate in so-called developed countries will be 0.8%/month in 1978 to 0.66%/month in 1980.

Figure I shows representative disbursement curves for two projects identical except that project (a) is a plant built in a developed country while project (b) is for the same plant being built in a developing location. Two conclusions are apparent; firstly that the undiscounted capital cost will be some 30% more in the less developed country; and secondly it will take about one third longer to build, with consequent increased exposure to the effects of any

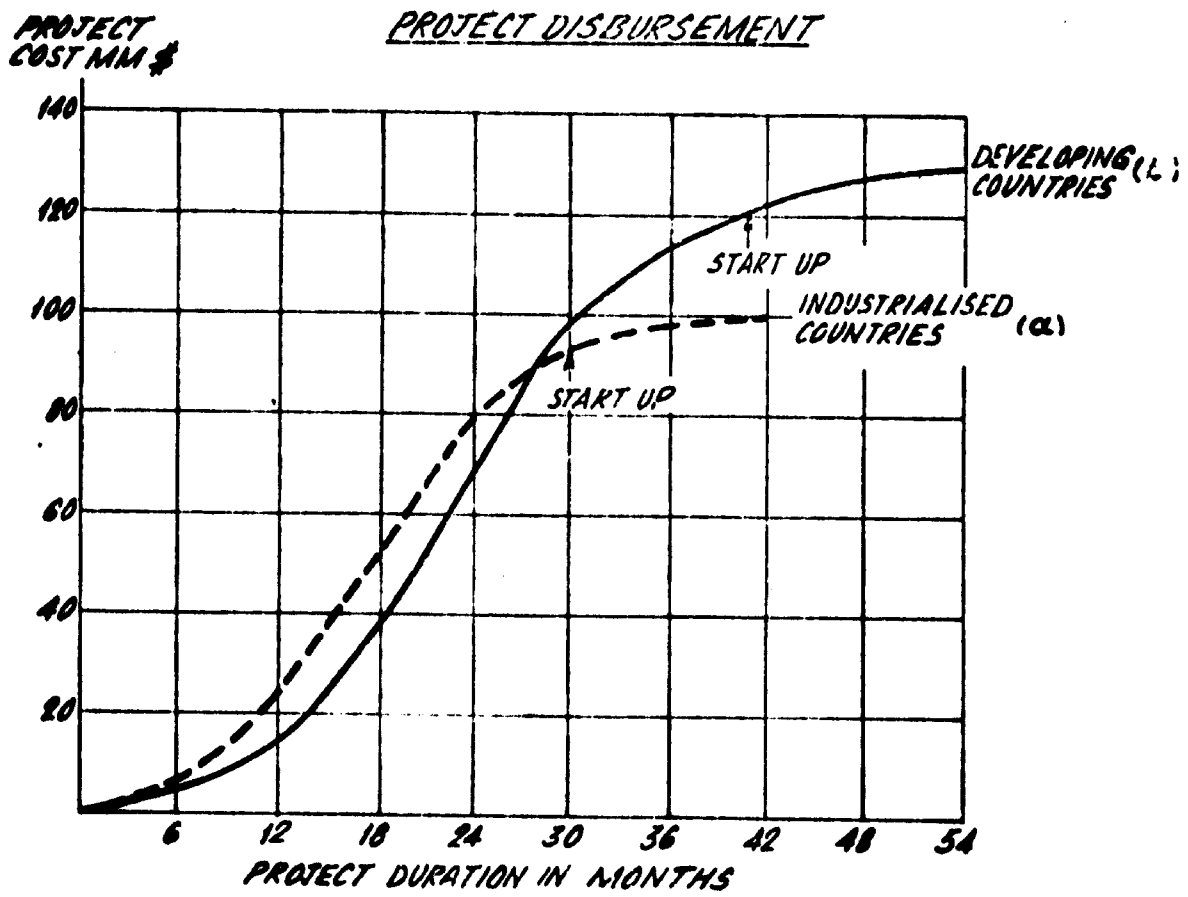


FIG. I.

inflation, apart from increased interest charges during construction (about 85% greater in case (b) than (a) in the example shown). Plants at the latter type of location also require higher inventories of spare parts, catalysts, etc. as well as possibly higher investment of off-sites if local services are of limited reliability.

The effects of poor project management are magnified when encountered on a project in a developing and less developed country. The penalties incurred include the additional direct effects of shipping and construction peculiar to the location, as well as the consequential effects appearing as extra interest charges.

In fact plants at these locations are susceptible to threefold penalties arising from poor management - those two mentioned above plus the effects of the known propensity of these plants to be extremely late in reaching full name-plate capacity.

It appears therefore that all the cards are stacked against building plants at these locations but this is not so. Because feedstock prices are usually much lower, or may be arbitrarily set low by government decree in developing countries, than in developed countries a fair degree of inefficiency can be absorbed but this is obviously wasteful and is really a measure of the potential such countries have.

Table I

Ammonia/Urea Complex

<u>Capital Costs</u>	<u>N. Africa</u>	<u>W. Europe</u>
	<u>\$MM</u>	<u>\$MM</u>
Battery limits process plants	178	126
Offsites	121	86
Spares	<u>11</u>	<u>8</u>
Sub-Total	310	220
Start up costs	15	11
Working capital	13	13
Interest during construction	<u>45</u>	<u>26</u>
Total Capital Employed	<u>483</u>	<u>270</u>

Table I shows the results of a recent study comparing a Western European plant and the same plant in a particularly difficult location (not the same as in Figure I), and attention is drawn to Table II showing the sensitivity of the feasibility of the plant to productivity during the early years of operation at the two locations.

Table II

Estimated Selling Price of Ammonia with Different Start Up Patterns

Start up pattern Year 1/2/3	<u>N. Africa</u> <u>\$/Tonne</u>	<u>W. Europe</u> <u>\$/Tonne</u>
70/85/100	131.34	160.17
30/70/90	150.57	174.68
30/60/75	173.62	

It cannot be stressed too strongly that whilst there is a natural anxiety to get a long term project underway as quickly as possible extra time taken at the beginning to ensure a well founded project is much, much less costly than the same amount of time lost in delays incurred later in the project, sorting out problems that could have been avoided.

Clearly delays interfering with the latter stages of a project are more serious because of the amount of disbursement already incurred, combined with the cost of wasted time of the erection crews and interference with contractors staff and operating personnel.

A US\$200 million plant can easily incur US\$1 million extra for each week of delay, and the only answer is good project management from the outset.

IN SUMMARY

Good project management and control is indeed the single most important facet of a successful investment. Thus the operator must aim for a well conceived project with:

1. An early definition and freezing of project parameters. This requires a firm knowledge of the marketability of the product(s), an even firmer knowledge of availability and continuity of feed-stock particularly and other raw material supplies, and an early identification of the source of funds.

2. A fully definitive Invitation to Bid document produced by the potential operator assisted or not by financial/technical/banking advisors depending on the competence of initial operating group. Such a document will best serve the intentions of the operating group if it is clearly understandable by selected competent contractors. Unless circumstances are exceptional not more than three responsive bids should be solicited, for reasons of economy in the contracting industry generally. If 10 bids are requested for each go-job, the net effect inevitably will be an increase in plant costs because of an increase in contractor overhead, and hence his engineering costs and fee.

The quality of bid responses will generally reflect the quality of the ITB, and after evaluation a reasonable and fair main contract and where necessary reasonable and fair sub-contracts should be written.

3. Only proven technology, using a contractor experienced in that particular technology at that scale, and with experience in developing countries should be considered.

4. The optimum form of contract. Until oil prices stabilise and world inflation moderates, this would appear to be lump sum but it is facile to assume they represent an infallible mechanism for producing the best buy or even for reducing plant capital costs. Customers' and contractors' objectives are opposed in most facets except time, and as to contract price, because of the abortive tendering expense incurred by the contracting industry, little if any saving results: most certainly the time for evaluation of bids of this type of contract is considerably longer.

Most successful projects are achieved by good team work which is itself achieved by minimising stress between participants: contractual arrangements which engender a genuine feeling of partnership between the parties are highly desirable so that each carries those risks that are within his experience and financial strength. Together they should be working toward a common goal with common incentives in the form of rewards shared in proportion to the risk.

If a target-cost type contract (with contractor and customer sharing under- and over-runs in a predetermined manner) can be negotiated then one gets a congruence of interests which is absent from the cost-plus and lump sum types of contract. For overall expediency the target-cost type contract is best commenced as a cost-plus type and converted to target at the definitive estimate stage.

5. **The establishment of an operating organisation - even though initially it might be small - whose members are given adequate levels of authority in both financial and technical terms by borrowing governments to enable correct decisions to be made quickly. The steel-works project at Sidmar in Belgium was initially staffed by three executives all of whom stayed with the project until the complex was successfully completed ten years ago, on time.**

6. **The proper motivation of the rapidly increasing staff of a major project so as to maintain continuity of interest in the project at all levels - from the initial planning stage right through into the profitable operation of a big modern fertiliser complex is also vital. In today's monetary terms such a group will be responsible for the proper operation and maintenance of \$240/250,000,000 of investment creating a gross revenue of \$60/70 million per annum.**

Discontinuity of management and staff during the design and construction stage will put at risk the whole viability of the fertiliser project since delays in project progress must occur, knowledge and experience will not be adequately transferred by the contractor/consultant/advisor etc. and product will not be sold early enough to provide adequate revenue to service the debts which have been undertaken.

7. **During the progress of the work, given continuity of individuals from all parties, attention should be paid to good public relations between all parties. Justice and fair dealings must be seen to be done.**

8. From the beginning of such a project, all parties must understand clearly the restraints and freedoms available to the project implementation group - by the lending agencies. An inadequate understanding of the paperwork required by lenders will result in project delays - shipment of expensive equipment to unusual destinations depends on immaculate bills of lading, letters of intent, payment schedules etc. and ships are not like taxis waiting on every corner.



• 10/11/1961

G-666



78.11.06