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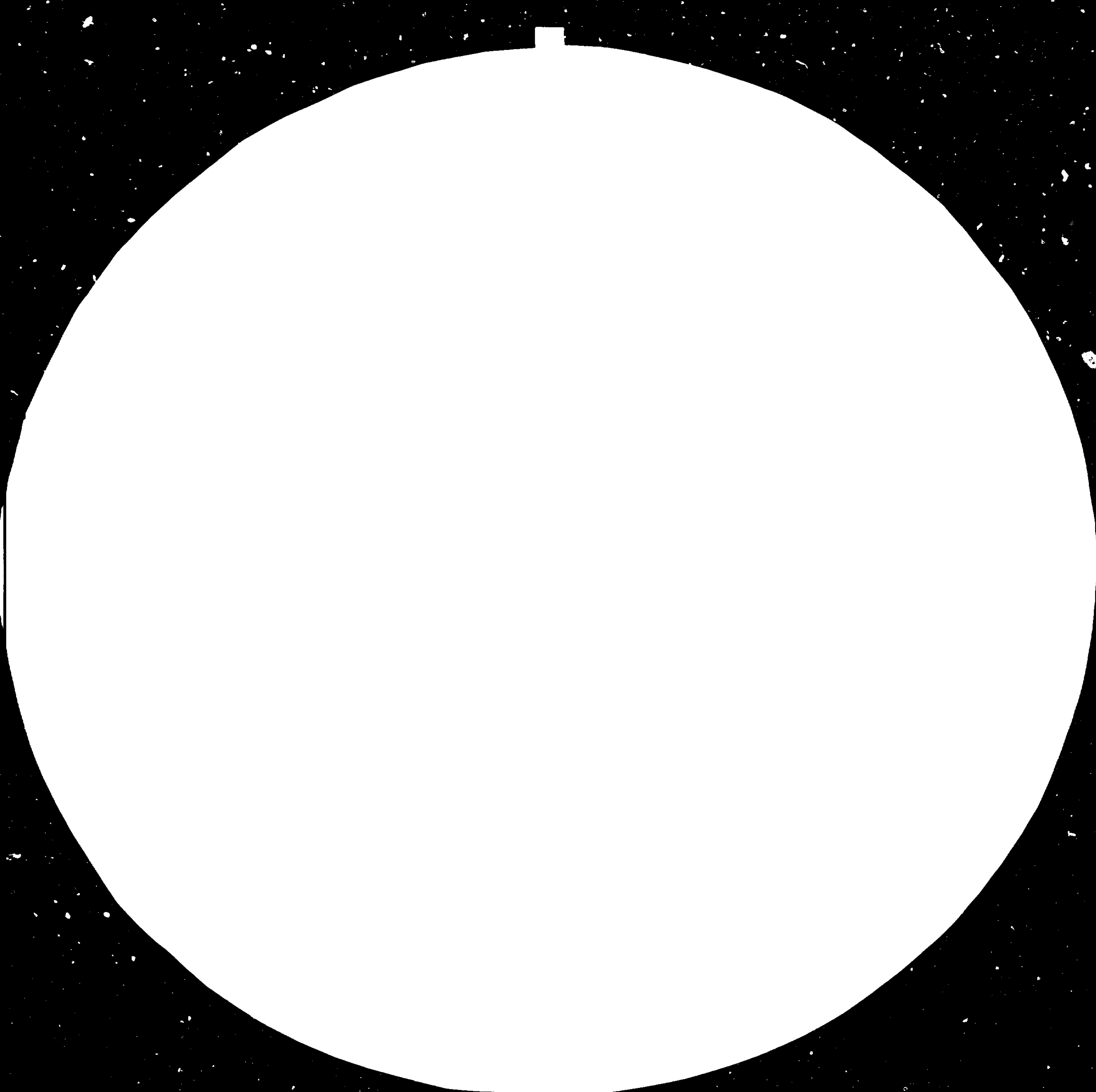

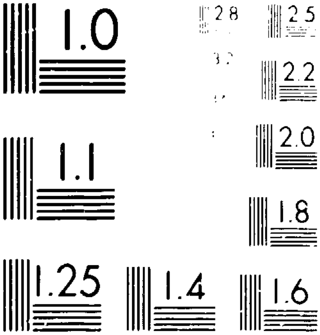
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→ Maria Dietrich

UNIDO-Czechoslovakia Joint Programme
for International Co-operation in the Field of Ceramics,
Building Materials and Non-metallic Minerals Based Industries
Pilsen, Czechoslovakia

Distr.
LIMITED

JP/134/82
November 1982

ORIGINAL: English

In-plant Technical Workshop
on Energy Conservation and Management
in Ceramic Industries

11 - 29 April 1983
Pilsen, Czechoslovakia

INVESTMENT AND PRODUCTION COSTS OF INDUSTRIAL UNITS

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INTRODUCTION

Most participants in technical workshops organized regularly by the UNIDO-Czechoslovakia Joint Programme for International Co-operation in the Field of Ceramics, Building Materials and Non-metallic Minerals Based Industries are engaged in planning, designing and managing these industries in the phases of pre-investment, investment or production. Being technicians they prepare jointly with economists many documents for decision-making in the investment and production processes. These specialists need necessarily to become mutually familiar to a certain extent with the knowledge and vocabulary of their colleagues for better understanding in their collaboration.

This paper is a trial to introduce the participants into the economic sphere in two important components of economic information - the investment and production costs in conjunction with the investment cycle - where the mutual co-operation between economists and technicians is very close and contributes to the selection of efficient production equipment, suitable civil engineering works and creates prerequisites for reasonable production costs.

These two categories of costs are also two of more elements of each feasibility study which is a tool for financial and economic evaluation of industrial projects. In this way, a considerable progress has been made by UNIDO in the standardization of these studies in last years. This paper uses the general nomenclature of investment and production costs as applied in the Manual for the Preparation of Industrial Feasibility Studies published by UNIDO in 1978.

The on-going Technical Workshop is geared to energy conservation in ceramic industries and deals with techno-economic activities and measures aimed at the most effective energy consumption in ceramic industrial units. The principles of energy conservation have to be applied also in project designs of new plants to be established. The impacts of such decisions on investment and production costs are also discussed in this paper.

I. INVESTMENT AND PRODUCTION CYCLE

The investment cycle consists of the pre-investment and investment phases.

There are usually four stages in the pre-investment phase and to each of them a document is elaborated as a basis for further decision-making. The first stage of identification of investment opportunities is backed by opportunity studies. The second stage, concerned with preliminary project formulation, is accompanied by a pre-feasibility study which represents a preliminary technical, commercial and economic project whereas the third stage - the project formulation - is characterized by a feasibility study being of the same structure as the pre-feasibility study but more detailed and based on primary information sources. The final stage of the pre-investment phase deals with project evaluation and is presented by way of an evaluation report.

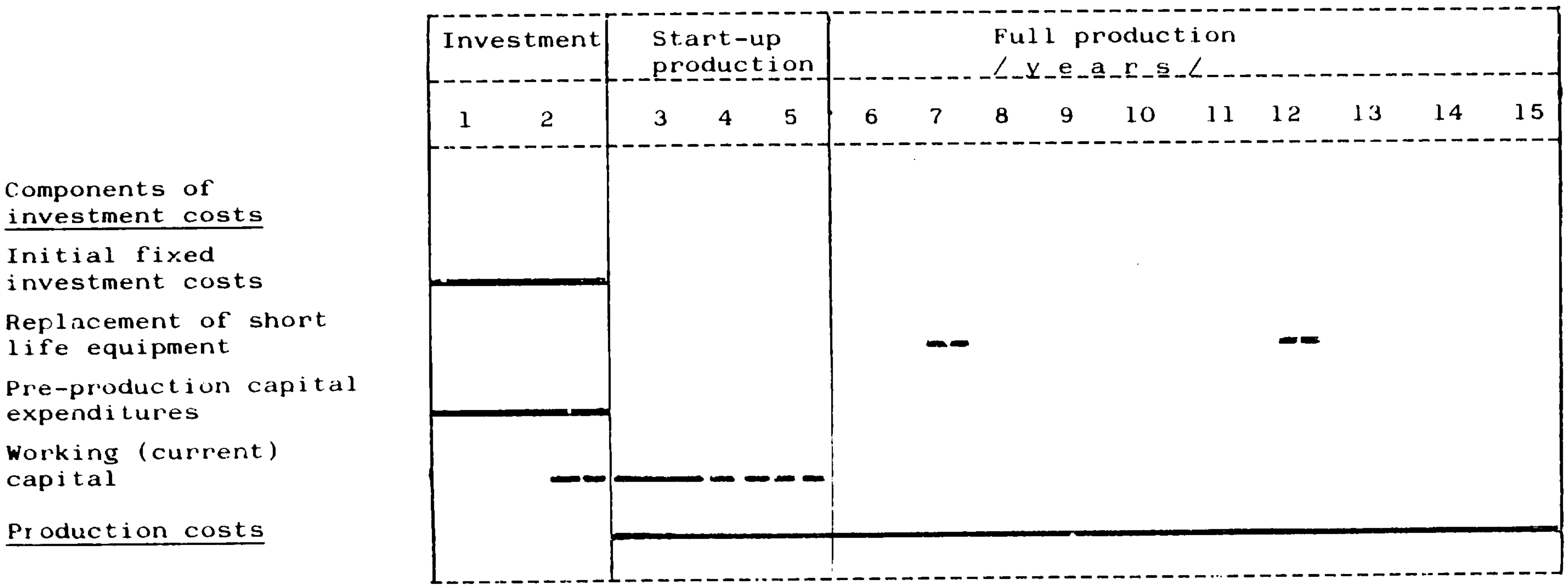
The investment phase comprises project and engineering designs, negotiations and contracting, plant construction, training of labour and staff, testing of equipment and trial production.

The production phase consists of two periods. The start-up production is opened by plant commissioning and continues with the start-up production programme by the end of which full factory output should be reached. Its duration in ceramic industries varies from 1 to 3 years. The full production period continues till the life time of production equipment is over. The whole production phase in ceramic industries makes 10 to 15 years. As the life time of civil engineering works is longer, it is mostly purposeful to exchange the worn out equipment and double in this way the life time of a plant as a whole.

Table 1: Investment and Production Cycle

Phase	Stage	Documentation
Pre-investment	Identification of investment opportunities	Opportunity study
	Preliminary project selection and definition	Pre-feasibility study
	Project formulation	Technical, commercial and economic feasibility study, support and functional studies
	Evaluation and investment decision	Evaluation report
Investment	Project design	Schedules, reports on site probing, plant civil engineering and plant machinery and equipment designs
	Negotiations and contracting	Contracts for civil engineering works construction, for delivery, erection and installement of plant machinery and equipment and for technical assistance
	Construction	Detailed physical designs for construction of civil engineering works and for erection and installation of plant machinery and equipment, detailed time schedules
	Training of personnel	Training programmes
	Testing of equipment and trial production	Programmes of testing particular machines and of production trial
Production	Start-up production	Commissioning and start-up production programme
	Full production	Production programmes

Table 2: Distribution of Investment and Production Costs over the Project Life



II. CHARACTER AND MAIN GROUPS OF INVESTMENT COSTS OF AN INDUSTRIAL PLANT

There are three main groups of investment costs in the establishment of an industrial plant:

- Initial fixed investment costs
- Pre-production capital expenditures
- Working capital

While the initial investment costs incur during the construction stage and the pre-production capital expenditures during the pre-production stages, the costs of working capital are invested predominantly in the first year of start-up production programme and partly in the next years of this stage. /See Table 2/.

<u>The initial fixed investment costs</u> consist of

- costs incurred for acquisition of land and for all expenses and taxes connected herewith,
- costs of site preparation and development,
- costs of civil engineering works as production premises and buildings, special civil engineering works as foundations for all kinds of heavy equipment, chimneys, stacks, ramps, etc., costs of special buildings and structures for auxiliary equipment for water circulation, fuel storage and distribution, power transformation, compressed air generation systems and for service equipment as utility networks and traffic installations,
- costs of technology,
- costs of incorporated fixed assets,
- costs of plant machinery and equipment namely production equipment, auxiliary equipment such as utility supplies, generation of steam, hot water and compressed air, workshop and laboratory equipment, storage and ware house equipment,

and service equipment as office, canteen, plant security and medical service equipment.

The pre-production capital expenditures involve the costs of pre-investment and pre-production activities carried out by the investor, contracted experts, consultants and institutes concerned with lay-out planning and designing such as:

- costs of pre-investment studies,
- costs of preparatory investigations,
- costs of management of project implementation,
- costs of detailed planning and tendering,
- costs of supervision, co-ordination, test run and take over of civil works, equipment and plant,
- costs of built-up of administration, recruitment and training of staff and labour,
- costs of arrangement for supplies,
- costs of arrangements for marketing,
- costs of built-up of connections with athorities,
- costs of preliminary and capital-issue expenditures,
- financial costs during construction.

These costs are accumulated during the years of investment preparation and implementation. With the opening of the production phase these costs are capitalized, i. e. converted into assets.

Working capital

An industrial plant does not need only fixed assets such as land, civil works, machinery and equipment, rendered pre-production services and incurred material pre-production expenditures capitalized as assets to start the production, but also current assets as receivables, inventory items consisting of raw materials, auxiliary materials and spare parts, work-in progress and finished products as well as cash in hand for wages and cash expenses. The sum of these current assets after deduction of current liabilities (accounts payable) represents the working capital required for covering this group of assets.

This may be summarized as follows:

+ raw materials
+ auxiliary materials
+ spare parts
+ work-in progress
+ finished products

inventory total

+ cash in hand
+ acounts receivable

current assets total

- acounts payable

net working capital

III. COMMENTS ON SOME INVESTMENT COSTS

A. Building structures and civil engineering works including site preparation and development

(Annex 1 - I/2,3)

Plant machinery and equipment for ceramic plants is mostly delivered to developing countries from developed countries whereas the building materials for structures and civil engineering works should be preferrably delivered locally. The construction of a plant and the erection and installement of delivered plant machinery and equipment require a close co-operation between the supplier of machinery and the contractor. The machinery supplier presents plans for displacement and accommodation of process, auxiliary and service equipment including requirements regarding the foundations, anchorage, transport routes, height and illumination of particular spaces, carrying capacities of foundations, floors, etc., and takes over the building structures and other civil works when they are prepared for erection and installation of machinery and equipment.

If local contractors are experienced in industrial construction, they have the advantage of being familiar with local building materials suitable for local climatic conditions.

Technological machinery for larger outputs requiring vertical sequence of operations in raw material preparation should be e. g. accommodated in a steel skeleton multi-story structure to be delivered from a developed country and supplemented with local light weight masonry. The construction might be a subdelivery including erection of the steel structure.

These two examples show that there will be different approaches in contracting the construction of building structures and civil works. For decision making the following principles should be taken into account:

- Proved experience of contractor in industrial construction
- Selection of contractors by tender specific-tion
- Selection of the bid with regard to technical solution and price
- Cleared procedure of co-operation between machinery supplier and contractor prior to contracting

The cost estimates embrace the following items including site preparation: factory buildings, stores for raw materials, factory supplies, auxiliary materials and spare parts, ware house for finished products, buildings for laboratories, maintenance shops and administration, outdoor works for utilities. The sum of the investment costs covering the structures and civil works should be considerably lower than that of plant machinery and equipment. Excessive buildings bind excessive capital and decrease its profitability. Therefore they should be purposeful, simple, of cheap building materials, their service time is sufficient if equalling the double life time of plant machinery and equipment (for ceramics).

B Manufacturing technology
(Annex 1 - I/4)

Manufacturing technology is a norm for the manufacture of a certain product. Ceramic technologies, especially the traditional ones, are mostly not licensed. Their price is either included in the lump sum for the delivery of production equipment or quoted as a separate item of the bid. It should be taken into account that also traditional technologies have to be adjusted by the supplier of process equipment to local raw materials and conditions.

The investment cost of technology is usually attached to the cost of production equipment and amortized by the average percentage of the equipment depreciation.

Some new effective ceramic manufacturing technologies based on non-traditional compositions of ceramic blends and characterized by lower firing temperatures bring about a considerable reduction of energy consumption and energy costs. If such a technology is held in secrecy, a licence agreement might be required for its transfer. In this case a preliminary calculation should be made by the investor comparing the lump sum of the licence versus discounted annual savings of energy consumption. In any case the technology should be dovetailed with the production equipment. Consequently, any change in the price of equipment due to the licensed technology should be taken into account in the preliminary computation.

The character of licence will be discussed in the following section.

C <u>Incorporated fixed assets</u>
(Annex 1 - I/5)

Under incorporated fixed assets, industrial property rights called also intellectual property rights, are classified such as patents, patent licences and know-how licences and trade marks. They are useful tools for transfer and development of inventions, know-how information and for protection of trade marks. They will be concisely characterized especially with regard to transfer of technology to developing countries.

The patent system and patent licence

The patent discloses the full information of an invention for public and the state confers on the patent owner through patent law the rights of excluding anybody from making, using and selling the invented product, technique or process in the national territory where the patent has been issued. The patentee can himself exercise the property rights or sell or license them to others. When the patent lapses, its information may be freely used by anybody.

The patent licence is a legal agreement between two parties which stipulates the conditions under which the use of patent rights is transmitted. Patent licences play an important role in developed countries. They eliminate parallel industrial development and accelerate national development. However, in developing countries, the rights obtainable from patent licence, have little relevance with regard to the absence of patent and relevant case laws.

The know-how and know-how licence agreement

The know-how is a technical information characterized by utility, novelty, confidentiality and value. The confidentiality or secrecy emanates from licensor`s statement that at least a part of information has been kept in secrecy which enabled him to maintain a distinguished position in an industrial activity. If he licenses the use of the information to a licensee he requires it to be held secret over a defined period or until such information becomes publicly available. The secrecy clause is fundamental to a know-how licence agreement. The property right and title in confidential know-how is created by making the know-how licence agreement between licensor and licensee which is based predominantly on contract and trade-secret laws.

The know-how agreement has usually four parts:

(a) recitals and legal administrative provisions,

(b) definitions, grant of rights and obligations of each party,

(c) remuneration to the licensor and factors that condition it,

(d) services and matter that may be adjunctive to know-how, such as trade mark rights or patents. However, the licence definition will be worded in different way in developed and developing countries.

In developed countries, prior disclosure of know-how often takes place enabling the client to witness the information or its application. Prior to the disclosure a secrecy agreement is concluded stating that disclosure does not confer on the client any right-of-use of disclosed information. Consequently, the licensee acquainted with the information before entering into the contract, does not require its detailed description in the contract.

In developing countries, skills of evaluation may be lacking and the licensor may not be willing to disclose secret information in advance without being sure that the law of the developing country protects trade secrets. Therefore, the usual clause of defining know-how should be expanded into a description clause because the licensee needs some advance information on the know-how to be transmitted.

Governments in developing countries view with concern the excessive obligations licensees sometimes accept in agreements. It is one of the tasks of government agencies regulating technology transfers to prevent recipients from accepting obligations beyond reasonable protection and use of secret information, or making payments disproportionate to the advantage gained through know-how or contracting for information that is irrelevant to or will be insufficient for the client`s need.

Remuneration should be regarded as licensor`s participation in licensee`s profit. It is paid either in advance in a lump sum or in annual royalties. The value of the lump sum should equal to the sum of expected royalties discounted to the date on which the lump sum is paid.

Trade mark and trade mark agreement

Trade marks are distinctive visual and sometimes aural devices, words or emblems (symbols), or a combinations of them, that a firm applies to its goods or to services it performs to indicate to the public that they are the firm`s goods or services.

The trade mark constitutes a property right and there are statuses in most countries that govern the ownership, registration and use of trade marks. Trade mark can be transferred and mostly the transfer has to be recorded in trade mark registry. The trade mark proprietor has an exclusionary right to sue for unlawful use of a trade name in the territory in which the right of exclusivity applies. There is generally no statutory limitation to the life of a trade mark.

Trade mark licence is a registered user agreement. Transfers to developing countries are performed mostly in a package including also other industrial rights or services. The payment of remuneration follows in way of royalties.

Table 3: Comparison of Industrial Rights

	PATENT	KNOW HOW	TRADE MARK
Definition	Patent is an exclusive right conferred by the state on the patent owner (patentee) for a limited period; this right excludes others from making, using and selling the invented product, technique or process in the national territory where the patent was issued. The patentee has the property rights over the invention which he can himself exercise or sell or licence to others.	Know-how is a useful, novel and valuable information in the possession of the licensor, at least some of which he has held in secrecy. Know-how is not defined by the law. Its nature, content and specifity are established only in the licence agreement.	Trade marks are distinctive visual and sometimes aural devices, words or emblems (symbols) or a combination of them, that a firm applies to the goods it trades in, or to the services it performs to indicate to the public that they are the firm's goods or services.
Licence	Patent licence is a legal agreement between two parties that sets out the privileges exchanged between the parties and the limitations (acceptable under law) placed on them in the exercise of these privileges.	Know-how licence creates property rights and title in know-how. The licensee obtains only the right of use, i.e. a lease to use the licensed information.	Trade mark licence is a registered user agreement. Trade mark can be transferred, but generally the transfer must be recorded in the trade mark registry.
Legal basis	Patent law	Contract and trade-secret laws	Statuses defining the criteria of acceptance for registering trade marks, the exclusionary right of trade mark proprietor and the obligations to keep the registration in force.

Accounting of remuneration of industrial property rights

Total remuneration paid in lump sum on acquiring an industrial property right and the initial fees connected herewith are considered as investment costs. Remuneration paid annually as royalties are classified as production costs.

D Production equipment
(Annex 1 - I/6)

The production equipment for the manufacture of ceramic products is of a double character. Whereas some operations as ceramic raw material and blend crushing, grinding, proportioning, mixing, dewatering and product shaping are of mechanical nature, the operations of ceramic blend and shaped product drying and dry product firing are thermal processes. The quality and suitability of production equipment together with manufacturing technology bear to a great extent on the efficiency of the manufacturing process and on the quality of products. Both the machinery and technology should be tailored to local raw materials and conditions.

Some criteria for the selection of production equipment related to the degree of mechanization

1/ Plant outputs - If high factory outputs are required, highly mechanized mass production is introduced. Only small production units can run with low degree of mechanization under certain conditions (2, 4, 5, 6).

2/ Technology - Some ceramic products require simple manufacturing technology (e.g. red bricks), others need a sophisticated one (e.g. porcelain tableware). High mechanization is imperative for sophisticated manufacture, low degree mechanization is acceptable for simple production process under certain conditions (1, 4, 5, 6).

3/ Raw materials - Apart from quality also the number of raw material components needed for a product influences the degree of mechanization. Some clay includes e.g. quartz, flux and clayey component in favourable relations so that it can be applied as a single raw materials for the manufacture of a certain product. Moreover, if such a clay is of satisfactory grainage and easy to disintegrate, the degree of mechanization can be decreased by eliminating some operations.

4/ Employment opportunities - Most developing countries solve with their industrialization also the problem of unemployment. The unemployment entails high supply of labour versus low demand and consequently low wages, i.e. low cost of labour. Therefore there are trends to plan cheap manual work instead of machines where possible. It is feasible under certain conditions (1, 2, 5, 6).

5/ Level of infrastructure and local industrial development - It is rather risky to start a highly mechanized ceramic plant in a least developed country. It is preferrable to commence with the mechanization of a lower degree under certain conditions (1, 2, 4, 6).

6/ Economic profitability - All these decisions will influence the investment and later the production costs. Only the positive results of calculated economic profitability can endorse the decision to be implemented. A practical example will illustrate the process of selection:

In a least developed country a brick plant is to be erected to cover the need of 3 million bricks per year in a rural district. The plant is to be erected next to the deposit where bricks were manually produced and fired in piles. The clay has all necessary components and gives bricks of good quality if fired to 950°C. It disintegrates during extraction, is homogenous and of required grainage.

Below, there is a review of manufacturing equipment for a brick plant producing 3 million bricks annually. The plant is expected to run 9 months annually and is labour intensive in phases of natural drying and kiln charging and discharging. Further reduction of mechanization and increase of employment could be achieved by replacing the digger-loader by manual work. Also idle toothed rolls and one conveyor might be eliminated with regard to the quality of the above clay. The savings of investment costs (price of digger-loader and the price of the eliminated idle toothed rolls and conveyor if need be) and the comparison of production costs (operation costs of digger-loader versus the cost of labour replacing this machine) would be projected into the calculation of commercial profitability.

Mining and transport of raw material	Pcs
Digger-loader	1
Tractor	1
Trailor	1
Body preparation and moulding	
Box feeder	1
Belt conveyor	1
Idle toothed rolls	1
Belt conveyor	1
Fine roller mill	1
Belt conveyor	1
Two-shaft mixer	1
Auger	1
Column cutter	1
Transport truck	20
Supporting structural platforms	1 set
Chutes and hoppers	1 set
Auxiliary materials	1 set
Coal or wood fired annular kiln	
Moving fire top fired barrel arch kiln of production capacity 2 - 3 million bricks annually	1
Accessories: smoke fan, hot air fan, flue fans, chutes, fittings, piping	1 set
Wheel barrow	5

Automation

Automation penetrates step by step into ceramic processes. Automated presses for ceramic wall tiles, floor tiles and plates increased enourmously outputs in developed countries. Later the press was incorporated in one line with drier, glazing equipment and roller kiln producing automatically floor and wall tiles. Automation will also play the decisive role in energy conservation as it will be mentioned in the following subsection.

There is no doubt that automation will be transferred also to ceramic plants in developing countries in conjunction with the optimization of mechanical and thermal processes in ceramic industries.

Selection of production equipment with view to outputs and energy conservation

Energy is consumed both by mechanical and thermal units. In the first case, electricity is predominantly used for drives and servomotors of process machinery, process conveying and transport and other process machinery and equipment. Especially selected heavy machinery as crushers, mills, mixers and presses should not be overdimensioned and they should be provided with effective motors and control equipment. The guaranteed outputs of main mechanical units, energy consumption related to outputs and prices of erected mechanical units should be taken as comparative parameters.

Thermal units are the biggest energy consumers. They use also electricity for their drives, servomotors, ducting of air and fuels and exhausting combustion products. However, their main consumption is that of fuels. Electricity plays also the role of fuels in electrically heated thermal units.

The investment costs of thermal units, especially those of ceramic kilns, represent the most expensive items of the machinery. The industrial kilns and driers are intensive consumers of high grade fuels (fuel oils fuel gases and expensive electricity). These fuels guarantee a high quality of ceramic products and enable high firing temperature for some technical ceramic products for other industries.

Developing countries which are without high grade fuels and establish ceramic industries such as utility ware, sanitary ware, wall tiles, floor tiles, etc., should seek for cheaper energies locally available such as hydroelectric power, coal, wood and waste materials as rice husks successfully applied in firing red bricks. It should be noted that new effective processes for coal firing have been elaborated in conjunction with energy shortage.

The following main parameters should be taken into account in the selection of thermal units for comparison and decision making:

- Guaranteed output of each kiln related to a definite product mix
- Guaranteed ware quality and maximum acceptable reject percentage
- Guaranteed maximum specific heat consumption (kJ/kg of fired products)
- Price of erected thermal unit with accessories.

E <u>Selection of auxiliary and service equipment</u>
(Annex 1 - I/6)

Similar principles are applied in the selection of auxiliary and service equipment which should be dimensioned adequately to support the operations of production equipment. Auxiliary equipment includes also energy consumers as means of transportation, thermal units as hot water boilers, steam boilers, compressed air plants, gas producers, etc. Outputs, service lifes, energy consumption, energy efficiency and prices are the main parameters applied in the selection.

The selection of production equipment is connected with negotiating the prices of equipment which again will be included into investment costs. Technical solutions should always be assessed with regard to their prices and variants should be evaluated according to economic parameters resulting from commercial profitability calculation.

F <u>Laboratory equipment</u>
(Annex 1 - I/6)

The manufacturing process of ceramic products is very sensitive to changes of homogenity and quality of raw materials. fineness of ground raw materials and mixes, humidity of blends to be pressed, air humidity, drying and firing conditions and other factors. Regular testing of raw materials, semi-finished and finished products enabling immediate intervention in the production process to eliminate or compensate undesirable deviations is the main tool to maintain a steady quality of products and low percentage of rejects. A well functioning laboratory in a ceramic plant is therefore indispensable.

The extent of equipment depends on product mix and plant capacity. Mostly, two possibilities may occur depending on whether a testing institute for non-metallic or silicate raw materials and products is established in the region or country. Such an institute contributes to industry oriented geological prospection and exploration of non-metallic raw materials by testing the samples of the found deposits. Its findings serve concurrantly to the planning of industrial development. Besides, it is expected to assist established plants in the preparation of body composition for their products, to carry out more sophisticated tests of their raw materials, semi-products and finished products and to serve as basis for training local personnel.

In a concrete case, in preparing the establishment of a ceramic plant in a country with an established similar institute as characterized above, the equipment of the plant laboratory may cover only the continuous laboratory routine work for quality control.

In the absence of a similar institute, the laboratory of a ceramic plant would have to be more elaborately furnished or to order more sophisticated tests abroad. In each case, the right selection is a matter of calculation. Therefore, the project design of laboratory equipment should be consulted by a specialist experienced in laboratory testing. This should guarantee the choice of adequate equipment at reasonable cost.

G Support studies
(Annex 1 - II/1)

A support study concerned with the evaluation of raw materials for the establishment of a ceramic plant is indispensable to guarantee the raw material basis of a project. The proposed check-list of the items of such a study may give a picture of its contents:

- Evaluation of findings of geological prospection and exploration of ceramic raw material deposits

- Taking of representative samples from identified deposits

- Product oriented testing in three steps (preliminary, laboratory and industrial testing)

- Evaluation of tests and selection of prospective products from the technical point of view

- Research of optimum body compositions of selected products

- Proposals of manufacturing technologies and outline of main technological equipment

- Findings and recommendations

The aim of the study is to prove that ceramic raw materials of good quality can be extracted from local deposits with sufficient reserves to be locally processed and/or exported.

Such studies can be ordered from local testing institutes if available or qualified research institutes abroad or requested as UNIDO assistance.

H Incorporation of the principles and requirements of energy management into project and engineering designs

(Annex 1 - I/6, II/4)

Project and engineering designs represent the first stage in the investment phase in which a system of drawings and schedules is elaborated in way of detailed instructions for the plant construction. An indispensable part is the project budget of total investment costs.

All important requirements, measures and the ensuing costs have to be projected into this document to be applied in further stages of negotiations, i. e. the contracting and construction, as to influence positively the phase of production. As the present priority task of energy intensive industries including the ceramic industry is the reduction of energy costs, the following principles of energy management should be anchored and implemented in the activities of the investment phase.

- Local raw materials taken into account by the technology should be investigated not only with regard to their applicability for required ceramic products but also with the view to their capability to give ceramic bodies of lower firing temperatures and shorter firing cycles if need be.
- The manufacturing technology should be based on local raw materials, local fuels if available and local conditions (climate, infrastructure, skill, etc.)
- The production equipment including thermal equipment should be in compliance with proposed technology.
- Thermal equipment should be designed and delivered as an interconnected system of thermal units passing on their waste neat to units with deficient or no energy inputs of their own.
- All thermal units should be provided with measuring equipment to enable energy consumption control in the production phase.
- Where high grade fuels have to be used, thermal units should be designed on the basis of optimization of thermal processes in compliance with limiting conditions of dried and fired products expressed by the shortest firing cycles and minimum energy consumption depending also on the setting pattern of products. Further development of conveyor lines including passage driers and roller kilns might be prospective in this way.

- If the application of high grade energies (fuel gases, fuel oils and electricity) is not economically acceptable, local substitutes should be sought for them (coal, wood, waste materials) and corresponding kilns.
- Especially coal should be taken into accout if available with regard to its relatively high heating value and new firing methods developed under the pressure of energy shortage (e. g. firing with powdered coal, rennaissance of of coal gasification in gas producers on a higher technical level).
- Other substitutes of lower heating value such as rice husks and various waste combustibles should be utilized for products fired at lower firing temperatures (bricks, pottery)

Some of these measures may have impact on investment costs. E. g. waste heat utilization will require additional costs for economizers and recupperators, tubing and control equipment. However, the experience of last years proves that just these installations bringing along energy savings in the production phase show a very short return on capital.

I <u>Working capital</u>
(Annex 1 - III)

As said before, the working capital consists of current assets from the total of which current liabilities were deducted. The current assets appear as average account balances of receivables, particular inventories as production materials, work-in-progress, products and spare parts, cash in hand, that must be provided prior to and during starting production and for later increase of production during the start-up period which may take two or three years. The costs incurred for providing current assets are investment costs. Current assets need not be fully covered by capital as the balance of current liabilities, mainly of accounts payable, represents a credit of suppliers of materials and utilities based on the maturity period of invoices. This enables that current assets are partly covered by current liabilities.

The method of working capital calculation is shown in Table 4.

Table 4: Calculation of Working Capital

Items	Annual basis	Adjusted annual basis (AB)	Days of coverage	Coefficient of turnover	Required invest. costs and expected credits
Current Assets					
Accounts receivable (Debitors)	Annual production costs	Annual costs minus depreciation and interest	20	360:20=18	$RIC = \frac{AB}{18}$
Local clays	Annual purchase costs	Annual purchase costs	300	360:300=1.2	$RIC = \frac{AB}{1.2}$
Local clay B	- " -	- " -	150	360:150=2.4	$RIC = \frac{AB}{2.4}$
Local quartz	- " -	- " -	30	360:30= 12	$RIC = \frac{AB}{12}$
Local limestone	- " -	- " -	- " -	- " -	- " -
Imported feldspar	- " -	- " -	100	360:100=3.6	$RIC = \frac{AB}{3.6}$
Imported glazes	- " -	- " -	150	360:150=2.4	$RIC = \frac{AB}{2.4}$
Spare parts	- " -	- " -	180	360:180=2	$RIC = \frac{AB}{2}$
Work in progress	Annual factory costs	Annual factory costs of work in progress	20	360:20=18	$RIC = \frac{AB}{18}$

.. to be continued

Continuation

Finished products	Annual factory costs	Annual factory plus administrative costs	15	360:15=24	$RIC = \frac{AB}{24}$
Cash in hand	Annual production costs	Annual production costs less raw materials, utilities and depreciation	15	360:15=24	$RIC = \frac{AB}{24}$
Current Assets Total					Total
Accounts payable (Creditors)	Annual purchases of materials, supplies and utilities	Annual purchases of materials, supplies and utilities	20	360:20=18	$SC = \frac{AB}{18}$ (minus)
Working Capital					Total

Legend: RIC = required investment costs; SC = suppliers credits over the period between delivery and invoice maturity
AB = adjusted basis

IV. IDENTIFICATION OF INVESTMENT COSTS IN THE FIELD AND IN DEVELOPED COUNTRIES

A Cost of land
(Annex 1 - I/1)

In general, the prices of land in developing countries are lower as compared to developed countries because land is still abundant and the demand is easier to be satisfied. Many developing countries establish industrial estates provided with utility networks where industries can be established and the land hired or bought at reasonable prices. Besides, many territories are state property and land is easy to obtain if the relevant industrial establishment complies with the development programme of the country.

Related payments as taxes, legal expenses, etc. are classified as investment costs if paid in connection with the purchase and as production costs if paid periodically.

Sources of information: Ministry of Finance, Ministry of Lands, City Councils

B Cost of site preparation and development
(Annex 1 - I/2)

The cost will depend on the extent of works. In any case local firms possessing earth moving machinery and local contractors have to be contacted. In the stage of preliminary project selection and definition (pre-feasibility study), price estimates of supposed works for site preparation and development should be investigated, such as of utility networks (per running meter) between building site and points of tie-in to public networks (electric power, water, communication and emmissions /sewage/ disposal); also prices per square meter of roads and of railway sidings per running meter if required. The estimates should be consulted with contractors.

In the stage of project formulation (feasibility study), the extent of works should be cleared and documented with plans, dimensions, required earth quantities to be replaced and distances regarding the networks and dimensions of networks so that a more accurate estimate of costs may be established.

Source of information: Local and foreign contractors

C Cost of structures and civil works
(Annex 1 - I/3)

In the stage of preliminary project selection and definition (pre-feasibility study), the following price estimates should be identified: prices per square metre of built-up area and per cubic metre of enclosed built-up space for different kinds of buildings and structures. Total prices are then calculated after capacities are cleared. Special civil engineering works and buildings for auxiliary and service equipment and outdoor equipment may be priced according to similar implemented projects and with prices adequately updated.

In the stage of project formulation (feasibility study), the plant capacity and arrangement of equipment will be so far cleared that dimensions of production premises and of the other civil engineering works will be identified and the prices quoted with greater precision.

Sources of information: Local contractors, contractors from developed countries experienced in construction in developing countries, similar implemented projects, reviews of industrial profiles.

D Cost of manufacturing technology
(Annex 1 - I/4)

Price of manufacturing technology for traditional ceramic industries is either included in the lump sum of manufacturing equipment or as one item of the bid of such an equipment. Even if the principles of these technologies are known and described in literature they have to be adjusted to local raw materials and climate conditions and the corresponding manufacturing equipment should be recommended. It may be said that the price of this technological research represents the minimum basis for quoting the price of traditional technology.

Source of information: Prices of research undertaken by research institutes, bids of manufacturing equipment that include prices of technologies.

E Costs of incorporated fixed assets
(Annex 1 - I/5)

The costs of these assets are discussed jointly with the characterization of these assets in the section III/B.

F Costs of plant machinery and equipment
(Annex 1 - I/6)

Plant machinery and equipment is mostly delivered from developed countries. The prices are quoted predominantly FOB (free on board) and include the price ex factory and all costs incurred up to the board of a ship in a port from which the equipment will be shipped (e. g. terrestre transport from the factory, insurance, storing, transloading, port dues, etc.) The quoted prices are binding only for a stipulated period with regard to permanent price inflation.

The price may also be quoted CIF (cost, insurance, freight) a port where the delivery is to be landed. This quotation is offered usually on the request of a client who is not familiar with continuously changing sea freight tariffs.

Landed cost in the port of destination includes CIF price plus costs of landing and port dues (unloading, handling, wharfage, etc., and customs duty if applicable). Landed cost based on CIF basis is calculated by the client. However, this term is also used for deliveries assigned to further terrestre transport. E. g. landed cost Lusaka railway station - capital of land-locked Zambia will include CIF price plus all port dues, transport and insurance to Lusaka including unloading from waggons and clearing by customs.

Local transport costs to the building site, storage, handling and erection of the machinery and equipment have to be also included. In this way total costs are obtained amounting from 125 to 150% as compared to 100% corresponding to FOB price the port of shipping.

To reduce the cost of transport to overseas and land-locked countries, it is usually agreed that some materials available in the country of the client will be provided locally. E. g. the bodies of driers and kilns may be built of local red bricks, wooden laths in mechanized brick plant for circulation of green and dried bricks are often also of local origin, some applicable means of technological transport, etc. may be delivered locally in agreement with supplier.

Sources of information: Price lists and offers of suppliers, transport tariffs of forwarding agents who can also intimate port dues, insurance companies, port authorities, customs.

G <u>Costs of pre-investment studies</u>
(Annex 1 - II/1)

Costs of pre-feasibility and feasibility studies are quoted by a percentage of the anticipated cost of project design, costs of opportunity studies and support studies are usually priced on calculation basis.

Sources of information: Lay-out planning and designing institutes, research institutes, consultants.

H <u>Costs of promotional activities</u>
(Annex 1 - II/2)

This are mostly the costs of investor's activities connected with organization of project promotion, provision of credits and partnership if need be.

Source of information: The investor

I Costs incurred in conjunction with project implementation (Annex 1 - II/2 - 11)

Once a decision is taken to implement an industrial project, a management of project implementation is to be set up. This body contracts the project design of the industrial plant, experts for participation in tender specification and evaluation of bids of plant machinery, civil engineering works and experts for supervision, test runs and take-over of civil works equipment and plant. During the construction period all preparations are made for commencing the production phase. Raw and auxiliary materials, supplies and utilities for test runs and start-up production have to be provided , technical, administrative, purchasing sales and marketing staff and labour have to be recruited and trained, legal and financial arrangements connected with the establishment of the industrial plant must be carried out.

Most of the costs incurred under the nomenclature of pre-production capital expenditures (II/3 through II/10) will be priced as production costs (wages, salaries, rents, travel and communication expenses). They will be capitalized as investment costs incurred in pre-production phased. The quotations of these costs may be taken over from those of production costs. Only the price of project design will have to be identified, this being usually quoted as a percentage of total investment costs depending on the extent of the project and the sophistification of production (3 to 8 per cent).

J Costs incurred for the acquisition of current assets (Annex 1 - III)

These costs are also derived from the price level of production costs as they represent the necessary reserves of inventory such as raw materials, auxiliary materials, spare parts, work-in-progress, finished products and of cash in hand for commencing the production and for its increases during the start-up periods. The current asset represented by the average balance of "accounts receivable" is to be covered only partly as the need of coverage is diminished by the average balance of the liability "accounts payable".

The calculation of costs of current assets and working capital is presented in Table 4.

V. CHARACTER AND MAIN GROUPS OF PRODUCTION COSTS

Production costs provide material, manpower and services for the production cycle. The total production costs of an industrial plant may be subdivided as follows:

1. Direct materials
2. Direct manpower
3. Factory overheads

1. - 3. Factory costs

4. Administrative overhead costs
5. Sales and distribution

1.-5. Operating costs

6. Financial costs
7. Depreciation

1. - 7. Total production costs
(Total manufacturing costs)

Direct materials involve the costs of unprocessed and semi-processed raw materials, processed industrial materials, spare parts, auxiliary materials, factory supplies and utilities.

Direct manpower is the cost denomination of direct wages and direct salaries in the factory.

Factory overhead costs include costs of manpower not directly involved in the production and costs of auxiliary materials, office supplies, utilities, repair and maintenance and other costs not directly integrated with the production cycle.

Administrative overhead costs with their manpower, office supplies, overhead materials and utilities, communication and travel bear also some costs of the whole plant as engineering costs, rents and recurring land charges, insurance, royalties and taxes.

Sales and distribution costs comprise their manpower, training and advertising costs, travel expenses, costs of packing, freight and commission.

Financial overhead costs are represented mainly by interests whereas depreciation costs relate to fixed assets and capitalized pre-production expenditures.

VI. IDENTIFICATION OF PRODUCTION COSTS IN THE FIELD AND IN DEVELOPED COUNTRIES

A Costs of direct materials (Annex 2 - 1.1 to 1.5)

Clays, raw kaolins, quartzs, quartzites, quartz sands, limestones, feldspars, laterites and other raw materials are used in ceramic industries in unprocessed or semi-processed condition. Kaolin, however, has to be beneficiated and delivered as washed kaolin for some of ceramic industries (e.g. porcelain, artware). Ceramic industries can be economically established only in countries possessing deposits of ceramic raw materials. The prices of raw materials may be ascertained from local suppliers running their extraction. If deposits have not yet been opened, the prices have to be pre-calculated taking into account investment costs of opening the deposit including mining machinery and production costs of raw material extraction. This applies for the case that the deposit will belong to the ceramic plant. Otherwise, the future price estimate would have to be agreed with the holder of the deposit.

Fritts, glazes and stains are typical processed industrial materials for ceramic industries. They are mostly imported from developed countries. Their price list has to be required from recommended suppliers.

Spare parts are machine components subjected to shorter service time than the other machine parts due to their intensive wear and tear. A set of spare parts for two or three years is usually delivered with plant machinery. The planned spare parts are ordered from supplier of machinery in future years. The prices of spare parts delivered with plant machinery may be taken as basis for the calculation of spare parts costs in later years.

Auxiliary materials and factory supplies - Various chemicals are used in ceramic processes as flocculants, whitening agents and liquefying agents; special laboratory chemicals, laboratory glass and aids; materials for mechanical and electrical workshops; materials for maintenance of machinery such as oils, greases and cleaning materials; materials for repair of kiln cars; building materials for maintenance of civil engineering works. The costs of auxiliary materials and factory supplies are classified partly as direct inputs and partly as overheads - see Annex 2.

The calculation of the cost of auxiliary materials and factory supplies should be based on experience from a similar ceramic plant under operation.

The costs of all the materials of this section /A/ have to be calculated including all costs up to the store of the factory.

B <u>Costs of utilities</u> (Annex 2 - 1.6)

The highest costs are those of electricity and high-grade fuels as ceramic industries are highly energy intensive. Their thermal processes are based on fuel oil, gasoline, fuel gas and/or electricity. As said before in the discussion of investment costs, the choice of fuel is decided with the selection of thermal units. In this connection also the specific consumptions of particular fuels have to be compared. Based on the calculation of MJ/kg of ceramic products, also the costs of particular fuels have to be related to the mass of ceramic products to find the most economic fuel.

Electricity is used in ceramic plants for driving production, auxiliary and service machinery and equipment. Some ceramic industries use electric power for thermal processes in driers and electric kilns. Besides, it is used for lighting. In this case its cost is classified under overheads. The price of deliveries can be obtained from local utilities corporations.

Fuel gas is delivered as town gas or natural gas, the latter being of higher heating value. The fuel gases are used for ceramic driers and kilns. Local utility corporation might be their supplier.

Producer gas was produced earlier by ceramic factories. The gas was of low calorific value and low pressure. It was used for ceramic driers and kilns. At present, attempts are made to revive this method on new principles.

Fuel oils are applied for ceramic driers and kilns. If applied for central heating, their cost is recorded under overheads. The prices will be available with local representatives of main oil and gasoline suppliers.

Gasoline is used for heating spray driers of ceramic slurries. Its price will be obtained as that of fuel oils.

Apart from the above so called high-grade fuels, coal, wood and some waste combustibles gain always more importance with regard to their low prices and energy shortage.

Specific consumption of water for industrial purposes is given by the parameter m^3/kg of ceramic product. This consumption can be reduced if recycling is possible. Drinking water and water for social conveniences is planned and calculated according to the number of employees. Prices of water deliveries should be available with local utilities corporations.

Steam and compressed air are usually produced within the ceramic plant. To obtain their internal prices, the costs of their production are recorded on the accounts of their cost centres.

C Cost of manpower
(Annex 2 - 2.1, 2.2)

The cost of manpower consists of wages and salaries which again are classified as direct costs of technical staff and labour employed directly in the production process and as overhead costs of the other employees who are not directly engaged in this process.

Surcharges on wages and salaries including benefits and social security contributions are calculated for the purpose of feasibility studies.

Tariffs of wages and salaries are determined in some developing countries by their governments and are obtainable from Labour Department. For a ceramic plant, tariffs of wages for unskilled and skilled workers and foremen are needed. Tariffs of salaries for managerial, technical and administrative staff as well as for expatriate specialists are mostly also regulated. Tariffs of wages and salaries are also negotiated between trade unions and employers or the price of labour results from the supply a demand.

D Overheads
(Annex 2 - 3, 4, 6)

Factory overheads are costs that unlike direct costs are not directly involved in the manufacturing process.

This applies to the cost of some auxiliary materials, office supplies, utilities, wages for repair and maintenance, salaries of laboratory staff, communication, travel, etc.

Administrative overheads are those of the plant administration related to the plant as a whole. Apart from the costs of wages of administration personnel and other operational costs of this department, contractual engineering costs, rents, land charges and insurance are accounted. Mostly depreciation and financial costs are also classified as administrative overheads. For the purpose of feasibility studies, these two items are recommended to be followed separately.

Prices reflected in overhead costs are ascertained mostly locally - materials and products from suppliers, salaries and wages by comparison with similar local enterprises and with regard to local tariffs if available, insurance from insurance companies, utilities from utility corporations, taxes from Ministry of Finance, royalties for licences according to the contracts with locensors.

Financial overheads, mainly rates of interest will be indicated by local commercial and development banks. Both the interests on long-term investment loans, short-term loans and current accounts play an important role in the feasibility of a project.

E <u>Sales and distribution costs</u>
(Annex 2 - 5.1 to 5.8)

These costs are related to activities consisting in recovering the incurred costs and obtaining profit by selling the produced goods. The estimates of these costs may be difficult. It is advisable to investigate local sales methods and determine the manning of this section. From these two points, most of the cost items can be derived. The remaining items will be derived as follows - cost of packages and containers from production volume and freight costs from market radius and density.

F Depreciation
(Annex 2 - 7.1 to 7.6)

The depreciation charges express the gradual depreciation of particular objects of fixed assets in dependence on their life times. If e. g. a truck of original value of US $ 15,000 is expected to have a life time of 5 years, the annual depreciation rate is 20% and the annual depreciation cost makes US $ 3,000. This method called straight line method is mostly used. The depreciation methods and rates are determined by local tax authorities /Income Tax Office/.

Average life time of ceramic plant machinery and equipment is 12.5 years which corresponds to the annual depreciation percentage of 8%. The depreciation rates of civil engineering works lie between 2 and 5%.

VII. SIGNIFICANCE OF INVESTMENT AND PRODUCTION COSTS IN THE EVALUATION OF COMMERCIAL PROFITABILITY

As far this paper was dealing with investment and production costs. Before assessing their influence on the profitability of a project, also the roles of financial sources and sales revenues are to be mentioned.

Every industrial project must be backed by financial resources, proper or borrowed, to be feasible. The availability of such resources should be cleared as soon as possible to avoid further useless efforts if this basic condition is not available. If the capital is at hand, it can be applied naturally only on the condition of project`s profitability. Therefore, the second step is to investigate the preliminary feasibility of the project which gives rough outlines of profitability and enables the partners participating in the project to agree on the conception of the feasibility study. Once the feasibility study based on duly verified primary data is accomplished and positively evaluated and the decision on investment is taken, the financial sources have to be made applicable. They are applied as follows:

The fixed assets are usually covered by equity - the proper capital of company holders. Very often a part of equipment is covered by supplier`s credit. Pre-production costs are sometimes also covered by equity or a middle term credit is accepted from development banks. Current assets are credited by short-term credits of commercial banks. As for timing of these operations, the investment costs of fixed assets and pre-production costs incur during construction and pre-production periods respectively, the acquisition and payment of current assets follow mainly during the production start-up period.

Sales revenues start financing the production costs with the start-up of production to continue over the life time of the production phase. They should be high enough to cover the production costs, repay loans and leave sufficient net profits.

The sources of financed investment costs, sales revenues, investment costs and production costs are four elements on which the calculation of the commercial profitability in the framework of pre-feasibility and feasibility studies is based.

Most feasibility studies evaluating commercial profitability of industrial plants to be established start with an annual production programme based on a market study. This annual output assessed with prices is taken to be equal to sales revenues for the purpose of feasibility study. Then suitable plant equipment is sought for and pre-production activities are planned. Financial sources are mobilized to cover investment costs. The composition of financial sources will influence production costs. They will be encumbered with interests on credits and profits will be reduced by repayments of loans. If the plant machinery is too expensive and buildings too luxury, the high cost of investment will increase production costs at least in the item of depreciation. If the manufacturing equipment is not effective enough to conserve energy, the energy costs will be increasing. If production costs increase, profit decreases and may convert even to loss.

This may occur also if the planned quality of products was not achieved because of insufficient training of staff and labour or due to machinery producing lower quality products than anticipated. Lower product quality is reflected in lower sales revenues with the same impact as that of increased production costs.

These few examples have shown the mutual dependence of these categories and the responsibility of project designers, consulting engineers, supervising consultants, managing staff of implementation, training personnel and especially economists.

Failures in the pre-production phases may have serious consequences in the production phase. A balanced project based on reliable data is the only way to successful operation.

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ANNEX 1 NOMENCLATURE OF INVESTMENT COSTS

I. INITIAL FIXED INVESTMENT COSTS

1. Land

Cost of land

Taxes

Legal expenses

Payments to neighbours

Rights of way

2. Site preparation and development

Relocation of existing structure, pipes, cables, powerlines, roads, etc.
Demolition and removal of structures and foundations
Wrecking
Grubbing
Site grading, cutting and filling to establish a general job level
Graining, removal of standing water, reclamation of swamps
Diversion of streams, etc.
Utility connections from site to point of tie-in to public networks
- Electric power (high and low tension)
- Water (use and drinking water)
- Communications (telephone, telex)
- Roads
- Railway sidings
- Other

Other site preparation and development work

3. Structures and civil works

Buildings and structures (construction + installation work) including also:
- Heating and ventilation, air conditioning, plumbing, gas, power current, low current installations

Special civil engineering works:
- Pile foundations
- Slurry trench walls
- Walls
- Soil consolidation

Drainage
Lowering of ground water table
Steel sheet piling
Ramps
Chimneys and stacks
Foundations for all kinds of heavy equipment

Special buildings and structures for auxiliary and service equipment:

Generating plants for steam, hot and cold water, air treatment, high and low tension currents
Emergency power plants
Storage tanks for fuel and gasoline
Filling stations
Central units for telephone, intercommunications, fire fighting, etc.
Compressed air centres
Pneumatic dispatch - tube systems
Booster stations
Elevators
Cranes
Kitchens
Laundries
Laboratories

Outdoor works

Utility supplies and distribution including water, electric power, communications, steam and gas
Emissions handling and treatment including sewage system, oil and grease separators, pumping stations and screw conveyors, waste storage boxes, refuse burning plants
Traffic installations including yards, roads, paths, parking areas; railway tracks, sheds for cars, outdoor lighting
Landscaping including plants, grass, sods
Fencing and supervision including fences

4. Technology

5. Incorporated fixed assets

Patents
Patent licences
Know-how licences
Trade marks

6. Plant machinery and equipment

Production equipment

Plant (process) equipment
Electric equipment

Instrumentation and controls
Process conveying and transport
Other plant machinery and equipment

Auxiliary equipment

Transport : cars, buses, trucks, tank trucks, fork-lifts, railway equipment, water transport, ropeways, etc.
Utility supply: electric power equipment, water supply (pumping stations, etc), gas (booster stations, etc.)
Generating plants for: electricity, steam, hot and cold water, compressed air, etc.
Emergency power: stand-by diesels, batteries, etc.
Workshop equipment: mechanical, electrical, measuring instruments, etc.
Laboratories
Storage and warehouse equipment
Intercommunications: central units for telephone, wireless, telex, etc.
Heating, ventilation, air conditioning
Packaging equipment and durable packaging, mechanical saws, mailing machines, planters, drums, containers, etc.
Sewage disposal and treatment: pumps with drives, screw conveyors, treatment plant
Waste disposal and treatment
Other auxiliary equipment

Service equipment

Office equipment: machines, reproduction equipment, furniture, lockers, etc.
Canteen
Medical service
Plant security: fire protection, supervision, etc.
Plant yard cleaning and service: mechanical brooms, sprinkler cars, etc.
Staff welfare and residential buildings
Other

II. PRE-PRODUCTION CAPITAL EXPENDITURES

1. Pre-investment studies

Opportunity studies
Pre-feasibility studies
Feasibility studies
Support and functional studies

2. Preparatory investigations

Promotional activities

3. Management of project implementation

   Salaries and wages of managerial staff
   Rent and operation of offices, motor cars, living quarters,etc.
   Travel and communication expenses
   Duties and taxes during the implementation period

4. Detailed planning, tendering

   Detailed engineering of equipment
   Detailed engineering of civil works
   Tendering and evaluation of bids

5. Supervision, coordination, test run and takeover of civil works, equipment and plant

   Salaries and wages of site staff
   Costs of foreign experts
   Rents (e.g. living quarters, offices)
   Raw and auxiliary materials, supplies and utilities for test runs and start-up
   Interests during construction (e.g. for term loans and current bank accounts)
   Others

6. Built-up of administration, recruitment and training of staff and labour

   Salaries and wages of administrative staff (including personnel recruitment staff)
   Advertising costs related to recruiting personnel
   Salaries and wages of training staff and/or fees of training experts and/or fees of external training (locally or abroad) including travel and assistance payments
   Training materials
   Salaries and wages of recruited staff and labour from date of recruitment until production start-up
   Rent and operation of offices, training facilities, motor cars, living quarters, etc.

7. Arrangements for supplies

   Salaries and wages of purchasing staff
   Travel and other related expenses
   Communication

8. Arrangements for marketing

   Salaries and wages for sales and marketing staff
   Advertising
   Training of salesmen and merchants
   Travel expenses
   Communication

9. Built-up of connections with authorities

   Cost for necessary approvals of operation and the like

10. Preliminary and capital-issue expenditures

    Registration/incorporation fees
    Printing and incidentals
    Prospectuses and other printing expenses
    Public announcement expenses

11. Financial costs during construction

    Accumulated interests on credits

III. WORKING CAPITAL

1. Current assets

A Accounts receivable	+
B Inventory	
Raw material	+
Auxiliary material	+
Spare parts	+
Work-in-progress	+
Finished products	+
C Cash in hand	+
D Current assets - total	

2. Current liabilities

A Accounts payable	-

3. Working capital

   A Net working capital
   B Increase in working capital

ANNEX 2 NOMENCLATURE OF PRODUCTION COSTS

1. Direct materials and inputs

1.1 Unprocessed and semiprocessed raw materials
1.2 Processed industrial materials
1.3 Components
1.4 Auxiliary materials
1.5 Factory supplies
1.6 Utilities

2. Direct manpower (labour and staff)

2.1 Direct wages
2.2 Direct salaries

3. Factory overhead costs

3.1 Manpower costs not directly involved in production
3.2 Auxiliary material
3.3 Office supplies
3.4 Utilities
3.5 Repair and maintenance (contractual)
3.6 Effluents disposal
3.7 Communication
3.8 Travel

Total I - Factory costs

4. Administrative overhead costs

4.1 Manpower costs
4.2 Office supplies
4.3 Overhead materials and utilities
4.4 Communication and travel
4.5 Engineering costs (contractual)
4.6 Rents and recurring land charges
4.7 Insurances of property
4.8 Royalties for licences
4.9 Taxes

5. Sales and distribution costs

5.1 Manpower costs
5.2 Training of salesmen and merchants
5.3 Advertising
5.4 Travel expenses
5.5 After sales services communication
5.6 Containers and packages
5.7 Freight
5.8 Commissions

Total II (accumulated) = Operating costs

6. Financial overhead costs

6.1 Interests

7. Depreciation

7.1 Buildings and other civil engineering works
7.2 Machinery
7.3 Tools
7.4 Office equipment
7.5 Vehicles
7.6 Capitalized pre-production expenditures

Total III (accumulated) - Production or manufacturing costs