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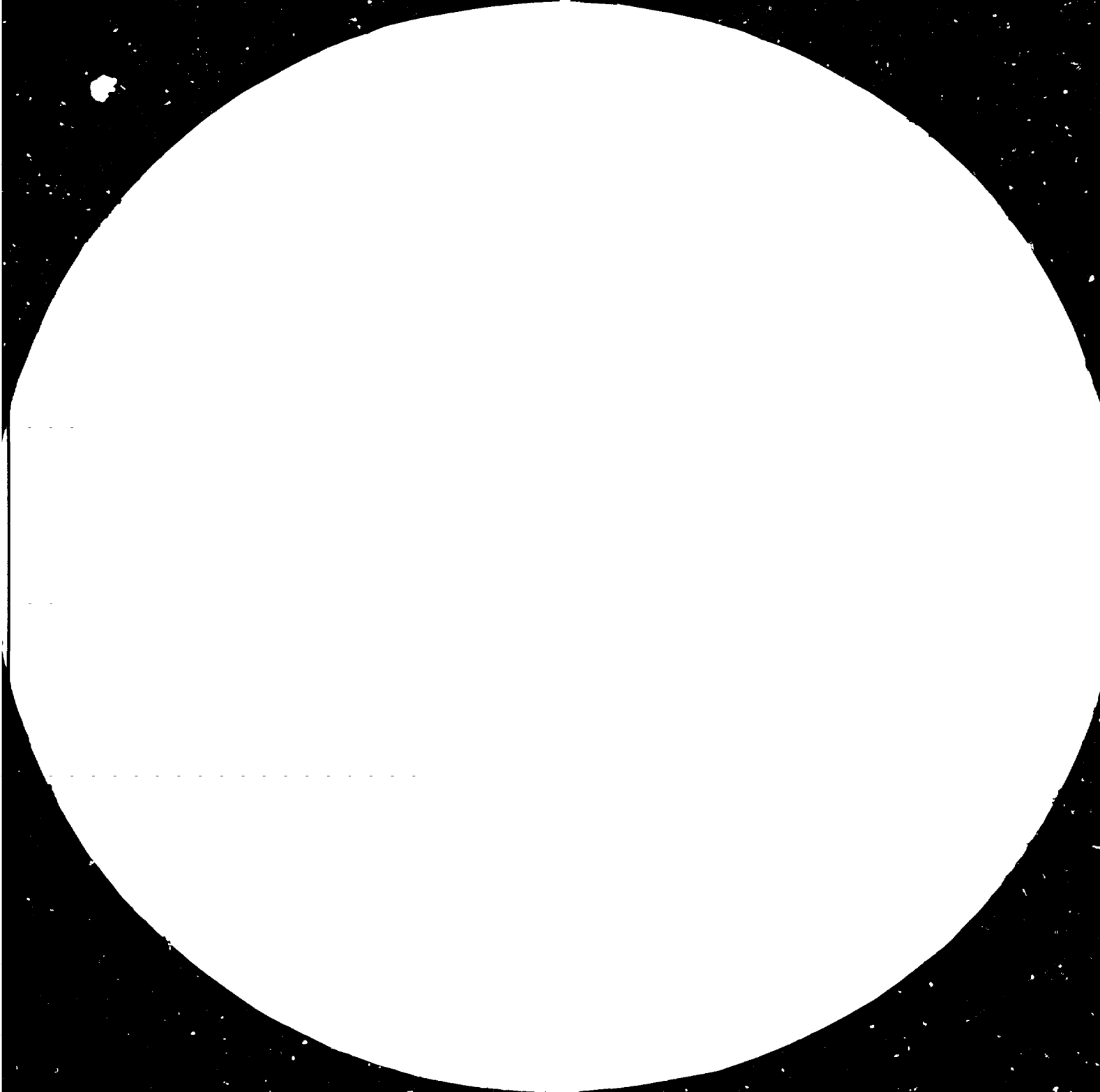

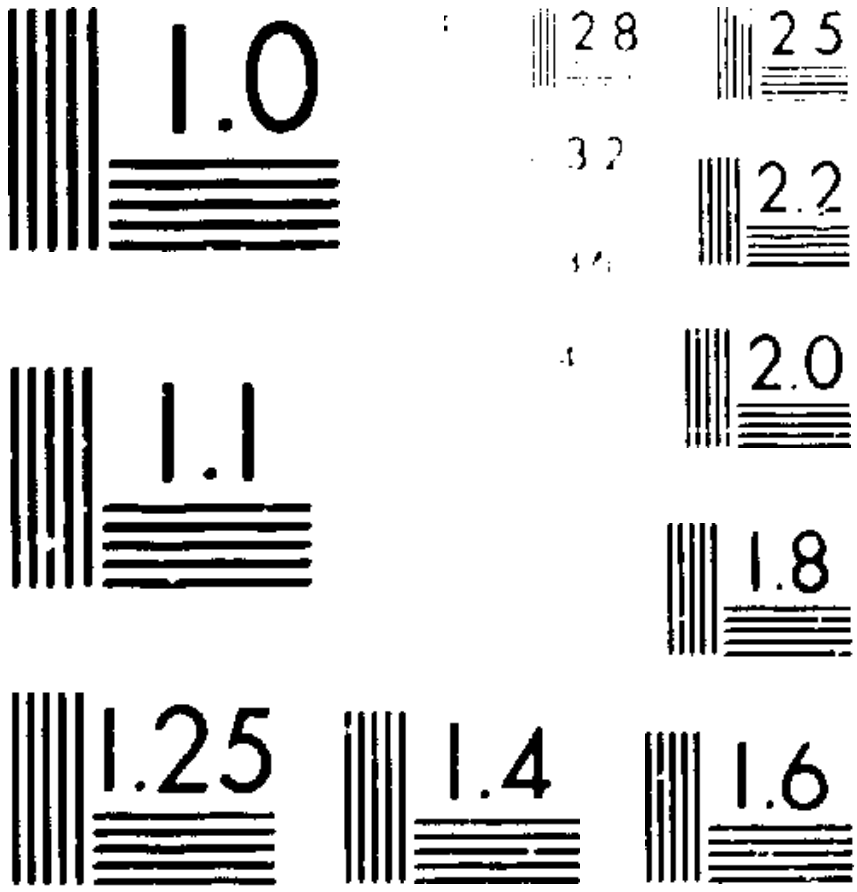

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DP/ID/SER.A/449
22 July 1982
ENGLISH

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Philippines.

ASSISTANCE IN THE SMALL-SCALE MANUFACTURE OF BUILDING CERAMICS AND GLASS

SI/PHI/81/803

PHILIPPINES

Technical report: Development of cottage and medium-size ceramic and glass industries

Prepared for the Government of the Philippines,
by the United Nations Industrial Development Organization
acting as executing agency for the United Nations Development Programme

Based on the work of Jan Dřevo,
expert in small-scale ceramic industries

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United Nations Industrial Development Organization

Vienna

V.82-29032

Explanatory notes

References to dollars ($) are to United States dollars, unless otherwise stated.

The monetary unit in the Philippines is the peso (₱). During the period covered by the report, the value of the peso in relation to the United States dollar was $US1 = ₱ 8.22.

References to "tons" are to metric tons, unless otherwise specified.

The following abbreviations are used in this report:

NACIDA National Cottage Industries Development Authority

CRDC Ceramics Research and Development Centre

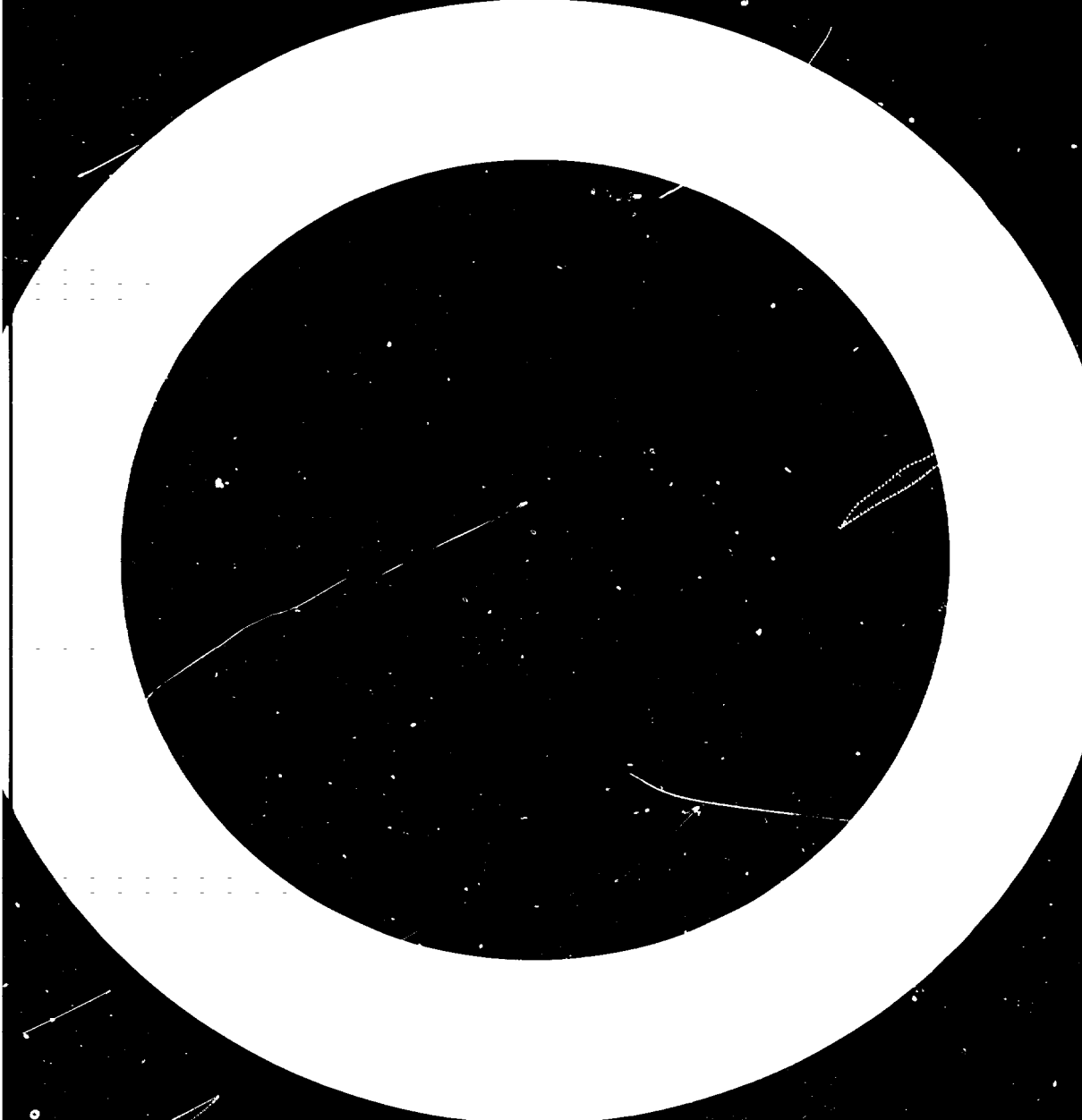
Mention of firm names and commercial products does not imply the endorsement of the United Nations Industrial Development Organization (UNIDO).

ABSTRACT

The project "Development of Cottage and Medium-Size Ceramic and Glass Industries" (SI/PHI/81/803) was a mission of exploratory character. The objective of the mission, which was carried out from 20 February to 19 March 1982, was to identify the main problems of the above industries in the Philippines and to recommend solutions. The main subjects of investigation were the manufacture of glazed flowerpots, artware based on porcelain and earthenware bodies and glass artware.

The improvement of functional parameters of kilns in the above ceramic industries appeared a prerequisite for further technological intervention and the first priority to be solved. The fluctuating composition of powdered ceramic blends supplied to small producers of ceramics causes peeling and crazing of ceramic glazes. Low quality of glass manufactured on the basis of crushed recycled glass only, outdated equipment for glass melting and annealing and consequent enormous fuel consumption for glass processing are the main problems of glass manufacturers.

The recommendations propose work programmes by which functional parameters of ceramic kiln will be upgraded, measures for energy conservation taken, new ceramic blends developed, suitable glazes found and deliveries of standardized blends secured. Defects of ceramic ware will also be removed and higher quality of products achieved. The work programme for glass manufacture deals with the introduction of batch compositions based on glass sand as the main component and proposes adaptations of glass tank furnaces and annealers aimed at higher quality of products and the saving of energy.



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INTRODUCTION

Cottage industries in the Philippines are a billion-peso export industry, second only to the coconut industry as a foreign exchange earner. Embroidery is the leading earner among cottage industries, followed by bamboo and rattan work, woodcraft and needlecraft. It is estimated that cottage industries employ about 2 million workers.

The Governement of the Philippines promotes the development of cottage industries because of their high labour intensity, low-investment requirements, adaptability to Philippine conditions and exploitation of abundant local raw materials - all factors contributing to the stability of the country's economy. The Cottage Industries Development Decree was issued in 1981 by the Government and the National Cottage Industries Development Authority (NACIDA) was established to carry out this development.

The cottage and medium-size ceramic and glass industries, which help to increase the exports of the country, are impeded in their development. In the case of the ceramic industries raw materials and body compositions of fluctuating properties are delivered and products are fired in ceramic kilns without any measuring or recording equipment whatsoever, which is often reflected in defects of final products. The small and medium-size glass industries use recycled glass as main or exclusive input material to the detriment of the quality of the product. Their small tank furnaces and annealers have enormous heat consumption. These energy consuming units are operated without any instrumentation, wall cooling and air pre-heating system, their lifetime being very short and reject percentage very high.

The introduction of technological and energy-saving measures in the above industries aimed at higher quality of products and reduction of production costs is an urgent matter.

A mission was arranged to provide assistance to review the present conditions in this field, identify the main problems and outline a specific programme to raise the level of manufacture and products. The co-operating agency nominated by the Government of the Philippines was NACIDA.

The objective of the mission was the analysis of the main problems in ceramics and glass cottage industries to be solved. The UNIDO expert was expected to:

(a) Review the present conditions of small and medium cottage manufacture in the Philippines;

(b) Identify the main problems, such as selection of raw materials, body and batch compositions, manufacturing technologies, firing and fusing processes, quality of products, energy conservation and production economy;

(c) Outline a specific programme of technical assistance to develop small-scale ceramic and glass industries.

The problems were identified and follow-up work programmes were recommended to improve existing conditions.

RECOMMENDATIONS

The following recommendations give work programmes for the solution of most urgent problems. Recommendations 1 to 6 were assessed as top priorities by the UNIDO expert in agreement with Ernesto Payoyo, Chief Industrial Development Specialist, Ministry of Trade and Industry. The Government of the Philippines is expected to submit a request to UNIDO through UNDP, Manila, for further technical assistance geared to the realization of the proposed programmes.

A. Principal recommendations

1. Upgrading of functional parameters of ceramic kilns and energy savings in ceramic plants

It was found necessary to increase the efficiency of the kilns by the introduction of modern firing methods. Otherwise it would be difficult to implement recommendations 2, 3 and 4. Concurrently the assessment of energy conservation and recommendations of energy savings will take place. The following recommendations are made for a dormant kiln for firing glazed flowerpots at Gatbuca Calumpit at Bulacan:

(a) The firing conditions in the kiln for firing glazed flowerpots should be investigated;

(b) The necessary adaptations of the kiln should be carried out and it should be provided with measuring equipment to follow firing trials;

(c) Firing trials of glazed flowerpots should be conducted and the quality of fired products assessed;

(d) Experience in glaze firing of flowerpots should be transferred to other producers, through demonstrative training activities.

The following recommendations are made for ceramic kilns and other heat consuming units in one pre-selected plant manufacturing artware ceramics based on porcelain body and in one pre-selected plant producing artware ceramics based on earthenware body:

(a) The firing conditions in one kiln of each plant should be investigated and feasible adaptations carried out for kiln temperature control and effective kiln operation;

(b) Energy conservation in the plant should be assessed and measures recommended for energy savings and introduction of improved firing techniques;

(c) The gained experience should be transferred to other producers.

2. Manufacture of glazed flowerpots

In case that the adaptation of the kiln at the PAN Flowerpots Gatbuca Calumpit Bulacan plant, as envisaged in recommendation 1, shows that improved firing conditions do not suffice and that the development of body composition is also necessary, the following recommendations are made:

(a) The quality of raw materials and body composition should be tested and assessed in order to determine the co-efficient of thermal expansion of the body and try corresponding glazes and suitable firing temperatures;

(b) A new body composition based on the used clay as main component should be developed and a corresponding glaze tried out;

(c) Experimental firings should be conducted and the quality of products assessed;

(d) The gained experience should be transferred to other producers.

3. Manufacture of artware ceramics, called by their producers porcelain and soft porcelain

The following recommendations are made for one selected plant to remove the found defects of and to improve the quality of products:

(a) The applied raw materials and body compositions, including thermal co-efficients of bodies and glazes, should be tested and assessed;

(b) Desirable changes of body compositions should be carried out, corresponding glazes and temperatures for biscuit and glaze firings tried out;

(c) Trial manufacture should be conducted and the quality of products assessed;

(d) Experience gained in this rehabilitation should be transferred to other producers;

Extensional advisory facilities should be established to assist the entrepreneurs in setting up new shops or plants.

4. Manufacture of artware ceramics based on earthenware body

The following recommendations are made for one selected plant to remove the found defects of products, i.e. peeling of glazes, and improve their quality:

(a) The delivered powdered blends of Mayon Ceramics and Philippine Ceramics in Manila and thermal co-efficients of bodies and glazes should be tested and assessed;

(b) Suitable body compositions should be developed, corresponding glazes and firing temperatures for biscuits and glazed ware tried out;

(c) Trial manufacture should be conducted and the quality of products assessed;

(d) The gained experience should be transferred to other producers;

Appropriate technology should be decided upon for the manufacture of artware ceramics based on earthenware body taking into consideration the existing local manufacturing capabilities.

Measures should be taken by NACIDA and the Ministry of Trade and Industry to ensure the delivery of powdered ceramic blends of stable quality and composition to the producers:

(a) The total amount of powdered blend used by the small units annually should be determined and a purchasing mechanism should be introduced among producers, possibly through the establishment of an association, encouraging joint bulk purchases;

(b) Negotiations should be entered into with a large ceramic factory to deliver standardized powdered blends once a year.

5. Refractory kiln furniture for cottage and medium-size ceramic industries

A recommendation was made for UNIDO assistance to improve the research capabilities of the recently established Ceramics Research and Development Centre (CRDC) at Manila, specifically in the field of manufacture of kiln furniture. The Centre works in co-operation with NACIDA.

6. Manufacture of artware glass and drinking glasses (handblown)

The following recommendations are made to increase the production, improve the quality of products and reduce energy consumption in one selected plant:

(a) Processing techniques should be introduced utilizing glass sands as the main batch component with acceptable addition of recycled glass (only unsorted crushed glass is available);

(b) Small tank furnaces should be modernized by the application of refractory linings suitable to the melting temperature of the proposed batch composition, by the introduction and use of temperature measuring devices and instalment of economic firing equipment for glass melting;

(c) Simple and effective appliances for cutting off handblown products should be introduced;

(d) Temperature controlled annealers should be introduced to decrease rejects, reduce energy consumption and increase the quality of products;

(e) The suitability and availability of local colouring agents/oxides should be assessed and advice and information provided to the producers on their relevant applications;

(f) Glass decoration methods should be introduced;

(g) The gained experience should be transferred to other producers;

Consultations should be held for investors on manufacturing equipment;

NACIDA should investigate the economic viability and alternative possibilities of the utilization of local or imported glass sands.

B. Implementation of recommendations

Recommendation 1 will be implemented by a specialist in kiln design and operation. Recommendations 2 to 5 will be implemented by ceramic technologists and recommendation 6 by an expert in the manufacture of artware glass. The duration of each of the six implementation programmes will be three months with possible extension.

As agreed with CRDC, the experts will be provided with laboratory testing, workshops and counterparts. The financing of these, however, has not yet been negotiated with the Government of the Philippines.

C. Further recommendations

These recommendations are mostly concerned with the development and planning of cottage and medium-size brick and lime manufacturing industries.

Recommendations by UNIDO expert to NACIDA

7. NACIDA Brick Pilot Plant in Tacloban City

The following provisional solution is recommended for the period until the required power input for the pilot plant becomes available and the manufacturing equipment for raw material and body preparation and brick extrusion can be installed:

(a) The construction of the kiln should be completed;

(b) Manual production of green bricks should be introduced and improved by small mechanism;

(c) Commissioning of the kiln and brick manufacture on a restricted scale should be started.

8. Simple red-brick manufacture in Alang-alang

The manual manufacture of red bricks with improved firing in piles placed in concrete chambers lined with bricks is recommended for rural areas where rice husks are available since fuel and deposits of brick clay are within easy reach. To extend the possibility of application, wood firing trial tests should be undertaken.

9. Lime manufacture

The establishment of quick lime manufacture should be included in future programmes. Since limestone is abundant in the country, replacement cement with other hydraulic binders may prove to be more economical, particularly in rural areas.

Further assistance needed

10. The Government of the Philippines expects that in addition to the assistance rendered through their project and its follow-up, further assistance will be required in the following areas:

(a) Establishment of a training ceramic centre at Bacolod;

(b) Establishment of a glass pilot plant at Marikina;

(c) Training of NACIDA ceramists in small-scale ceramic plants abroad.

FINDINGS

Present state of ceramic and glass industries

Pottery is an ancient art in the Philippines; brick making was introduced by the Spaniards; and during the turn of the nineteenth century the first attempt to produce porcelain was made. In the twentieth century, large-scale production of bricks, wall and floor tiles, sanitary ware, dinnerware and refractories was introduced. Modern ceramic factories have recently been established. Artware and flowerpot making have not been absorbed by large-scale industries and are flourishing as cottage and medium-size industries. The following firms, however, belong to large-scale industries: Mariwasa Tile Manufacturing, Philippine Standard, Era Industries, Fil-Hispano, Refractory Corporation of the Philippines, Apatit Ceramics, Aurea Ceramics, Royal Porcelain and Mayon Ceramics.

The large glass industry encompasses the production of containers and drinking glass while glass artware remains in the sphere of cottage industries. Most of the above industries, regardless of their scale, are competitive in foreign markets and export considerable amounts of their products. But they also have some common problems.

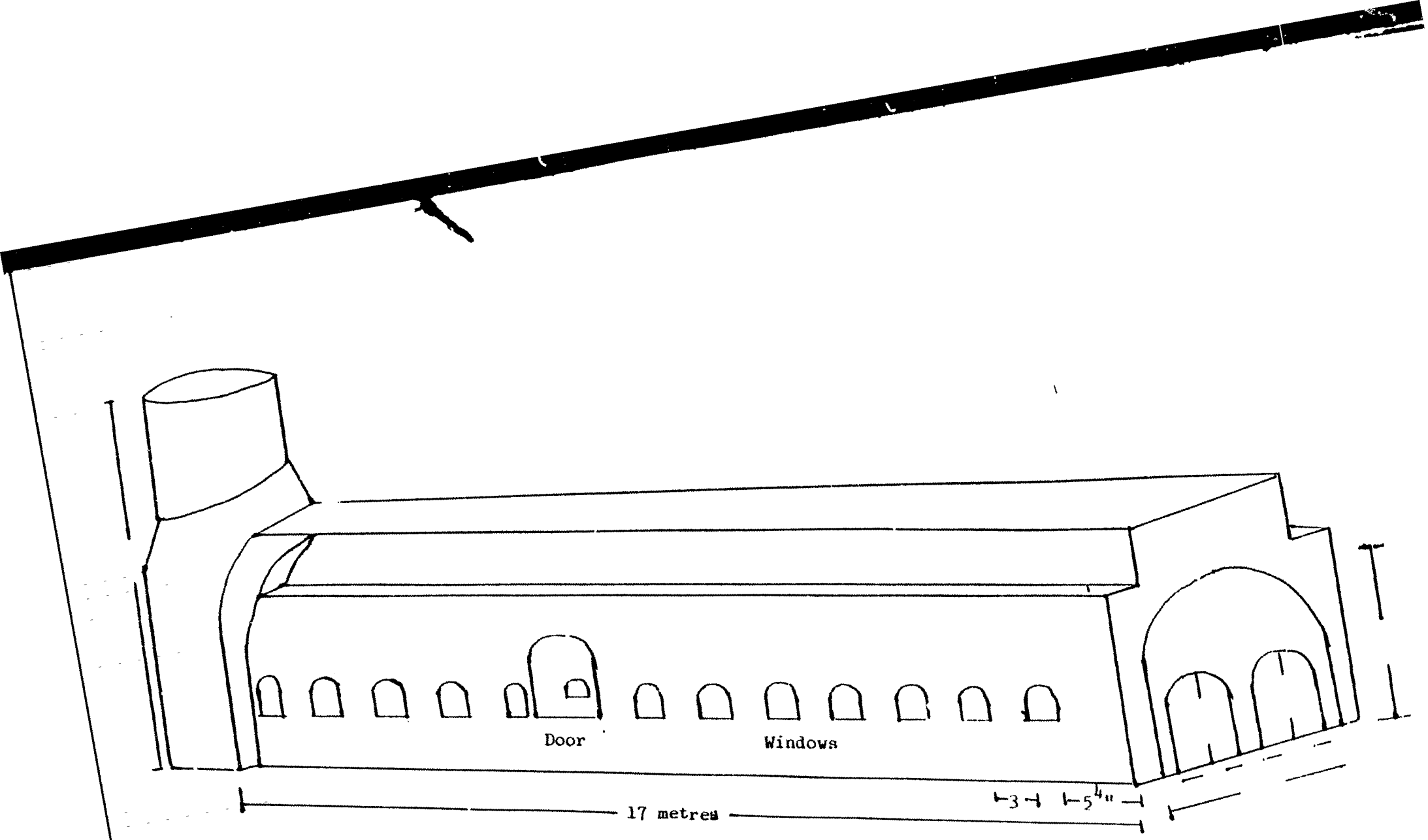
The most encumbering problem, which is detrimental to the national economy, is the insufficient mining output and beneficiation of local raw materials. In the country there are deposits of kaolin, ball clays, quartz, quartz sands, feldspar, refractory clays, magnesite, dolomite, talc, bentonite and limestone but ceramics and glass manufacture are based predominantly on imported raw materials. There is a lack of stable, adequate, homogenous and reasonably priced local raw materials for ceramics industry. Their exploitation is difficult and costly because known deposits of clay, feldspar and silica materials are located mostly in inaccessible areas in various islands of the country. Also there are not enough raw-material processing facilities, i.e. raw material upgrading and beneficiation plants. On the other hand, a complete geological survey of existing ceramic and glass raw material deposits still does not exist.

National Cottage Industries Development Authority (NACIDA)

NACIDA, which has regional offices in 12 regions in the Philippines, is a base for technical and economic support to cottage and medium-size industries. It contributes to the development of ceramic industry by the training facilities at Marikina, by the Ceramic Workshop at Tacloban, and by the Brick Pilot Plant at Tacloban, which is under construction. The establishment of another training centre at Bacolod is being planned. NACIDA provides technical assistance through the local Ceramics Research and Development Centre. It offers economic assistance, which varies and makes the growth of outputs and exports possible. The full range of NACIDA's functions is described in annex I.

Pottery

Pottery has been preserved as flowerpot making. There are villages in the Philippines where flowerpots are made in every cottage. There are no problems with local clays, their processing, moulding and firing. A "home-made" firing kiln is given in figure I, drawn by the entrepreneur of PAN Flowerpots Gatbuca.



17 windows
5^{5}" height inside at the end
5^{2}" height inside at the front
17 Metres long
7^{2}" width inside

Figure I. PAN kiln for firing flowerpots

The problem arose when exporters required flowerpots to be delivered white and glazed. The producer constructed another kiln for glazing pots. (See report on plant visit, annex II.) The firing, however, failed leaving the glaze dull and contaminated with flyashes. A repeated firing in Marikina Ceramic Training Centre in an electric kiln gave glazed surface of good quality. 1/

Firing of glazed products is a delicate operation. With regard to applied fuel, glaze firing is either carried out in kilns provided with muffles or glazed ware to be fired is inserted into protective saggars. Required temperature must be measured and controlled. A dull glaze is partly devitrified by the influence of kiln atmosphere or by firing or cooling near the devitrification point.

The glaze to be applied should be a white opaque glaze. A transparent glaze cannot be used because of the coloured biscuit, fired at 800°C. The firing temperature that can be reached in kiln for glaze firing is 1,000°C.

The adjustment of the kiln for glaze firing and the application of this experience to the kilns of other producers would bring about immediate exports. That is why the Government of the Philippines considers the solution of this problem a priority.

1/ The remaining glaze is deposited in the entrepeneur's plant.

Artware ceramics based on porcelain and soft porcelain bodies

Ceramic artware is produced in the Philippines on two bases, porcelain and earthenware ceramic bodies. The genuine porcelain is vitrified and distinguished by transparent thin walls. The body is composed of clay soils, feldspar and quartz in approximately equal proportions. Earthenware products have a porous body consisting of more than 50 per cent of clays, of 35 to 45 per cent of quartz and of 5 to 10 per cent of feldspar or limestone.

Manufacturers use partly imported raw materials and prepare ceramic bodies. (See reports on plant visits, annexes III and IV.) Problems are fluctuation of quality of local raw materials and consequent defects of finished products.

The defect, occurring in Clayburn Ceramics products but also in other glazed bodies, such as earthenware, is crazing of glaze for which the fluctuating quality of raw materials allegedly accounts. This explanation is acceptable since a changed body composition may cause the decrease of the coefficient of thermal expansion of the body by which the suitable ratio of body/glaze coefficient of thermal expansion is affected.

If crazing occurs a few weeks or months after firing, it may be caused by moisture expansion of the body. In both cases change of body composition is required, which consists mainly in the increasing of the content of quartz.

Artware ceramics based on earthenware body (annexes V and VI)

All manufacturers in this group buy earthenware powdered blends from large factories, such as Mayon Ceramics or Philippine Ceramics. The supply of these is, however, limited and their quality unstable. Products often show peeling of glazes, which is considered to be a consequence of varying quality of delivered mixes.

Unlike the glaze crazing, the peeling is caused by a relatively high coefficient of thermal expansion of body with regard to the coefficient of the applied glaze. If it occurs, the body composition should be changed by decreasing its coefficient, i.e. the content of quartz in the body should be decreased.

Common problems of artware ceramics based on porcelain and earthenware body

In addition to unreliable deliveries of local raw materials and powdered ceramic mixes, all producers complain of high consumption of electric power. They use mostly electric firing kilns, which consume the largest amounts of power compared to the other equipment. The kilns in the visited plants are without measuring and control equipment. Taking into account also the varying qualities of raw materials, varying compositions of body mixes and uncontrolled firing, the firing process is still a matter of continuous experiments. The introduction of controlled firing following the optimum firing curve established for a ceramic body of constant composition would probably bring about considerable energy savings. This does not mean, however, that the energy conservation in these industries does not need a deeper analysis within the framework of the whole manufacturing process.

Many producers feel the necessity to update their technological equipment, e.g. two of the four visited producers of artware want to reconstruct the old or establish a new plant. Their requests for consultations are fully justified since the selection of equipment will determine the output, quality of products and economy of production of the plant in the next ten to thirteen years.

The problems of artware ceramics are: unstable quality of raw materials; unstable compositions of delivered powdered mixes; defects of ware (glaze crazing and peeling); high energy consumption and unsuitable firing techniques; and need for advisory services.

Brick making (annexes VII and VIII)

Brick manufacture in the Philippines was introduced during the Spanish rule for building churches, residencies and fortifications. In the twentieth century, it was outweighed by prefabricated and cast concrete. Nowadays, the advantages of bricks are appreciated again for housing development, especially in the country.

Tacloban Ceramic Workshop of the Eastern Visayas Regional Institute at Tacloban City in the island Leyte is one of the centres fostering the development of brick making. The expert was invited to assess the situation in the brick pilot plant, which is under construction. The production hall is finished, the chamber kiln is nearly finished, the equipment for clay and body preparation has not been ordered because sufficient supply of electric power for expected installed power input is not yet available due to delay in construction of another power plant. Provisional solution is proposed in the recommendations.

Simple kilns fired by rice husks in brickworks in Alang-alang in the island Leyte are given in figure II. The ancient method of firing bricks in piles is improved by permanent concrete walls of chambers provided with brick linings and a roof protecting against rain. The fuel is rammed into gaps between bricks during setting. The bricks are of commercial quality and are sold to local consumers. This manufacture can be recommended for rural areas with clay deposits for local manufacture.

Artware and functional glass

Two glass-making plants were visited. Both were melting recycled glass in oil-fired small tank furnaces without regeneration or recuperaton and without insulated ceiling, so that thermal efficiency must have been very low. There was no measuring equipment. Drinking glasses were handblown into moulds, decorative products, such as flowers were made by free blowing, i.e. without moulds. Hot products were cooled in oil-fired annealers without any temperature-measuring equipment.

The first plant at Dalahican works on the basis of recycled glass only, which is detrimental to the quality of products (annex IX). Its kiln has the lifetime of one year only. Melting and cooling is conducted only by experience, e.g. suitable temperatures in glass melting or annealing are estimated by means of a piece of paper put on fire - the colour of flame indicates whether the temperature is suitable. The reject percentage amounts to 20 per cent, predominantly in the annealer.

The second plant, at Mandaluyong, is better equipped in the phase of glass offcutting and its annealer is constructed on conveyor basis and divided into the annealing and the cooling part (annex X).

Both manufacturers intend to make improvements in technological equipment. They would like to convert to glass-sand basis. They have not yet found reliable source for glass-sand deliveries and lack of know-how for starting production with a new batch composition. They are also interested in consultancy regarding measures for energy conservation, new firing, cooling, measuring and control equipment.

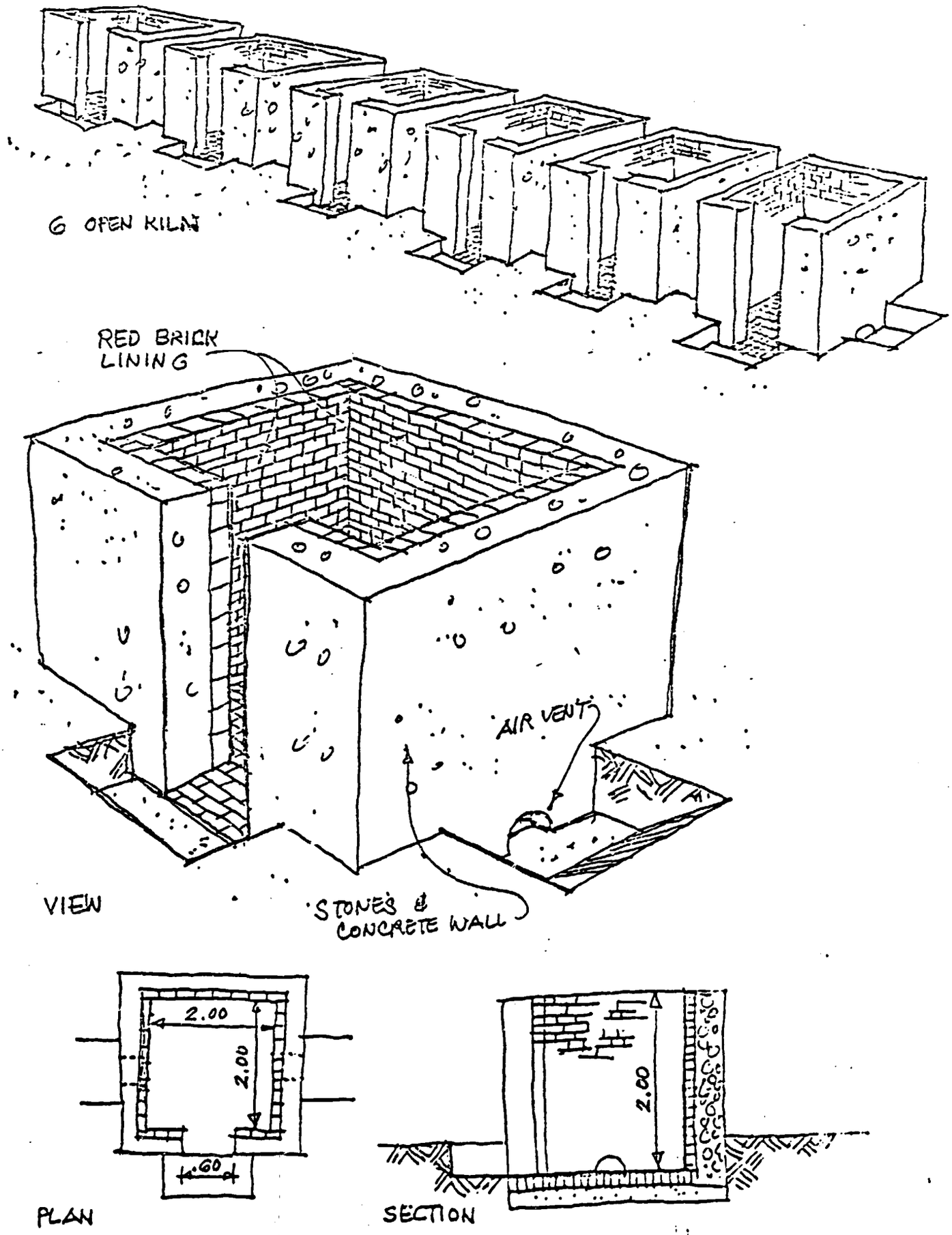


Figure II. Rice haulm open kiln for brick making

Co-operation with the Ceramics Research and Development Centre at Manila (annex XI)

During the first visit the expert became acquainted with organization and equipment of the Centre, which was to be fully completed by July 1982. The well-equipped laboratories, however, have been in operation since 1981. The Centre has about 100 employees, of which approximately half are regular employees and half are contractors. The organizational arrangement and review of testing programme are given in annex XI.

During the second meeting, in which Ernesto Payoyo, Chief Industrial Development Specialist, Ministry of Trade and Industry, also took part, the Director of the Centre, Guillermina C. Manalac, agreed that the Centre could do laboratory tests for UNIDO projects resulting from the recommendations of the closing exploratory mission. The Director also agreed to CRDC's participation in a project dealing with kiln design, kiln operation and energy conservation in small-scale ceramic industries.

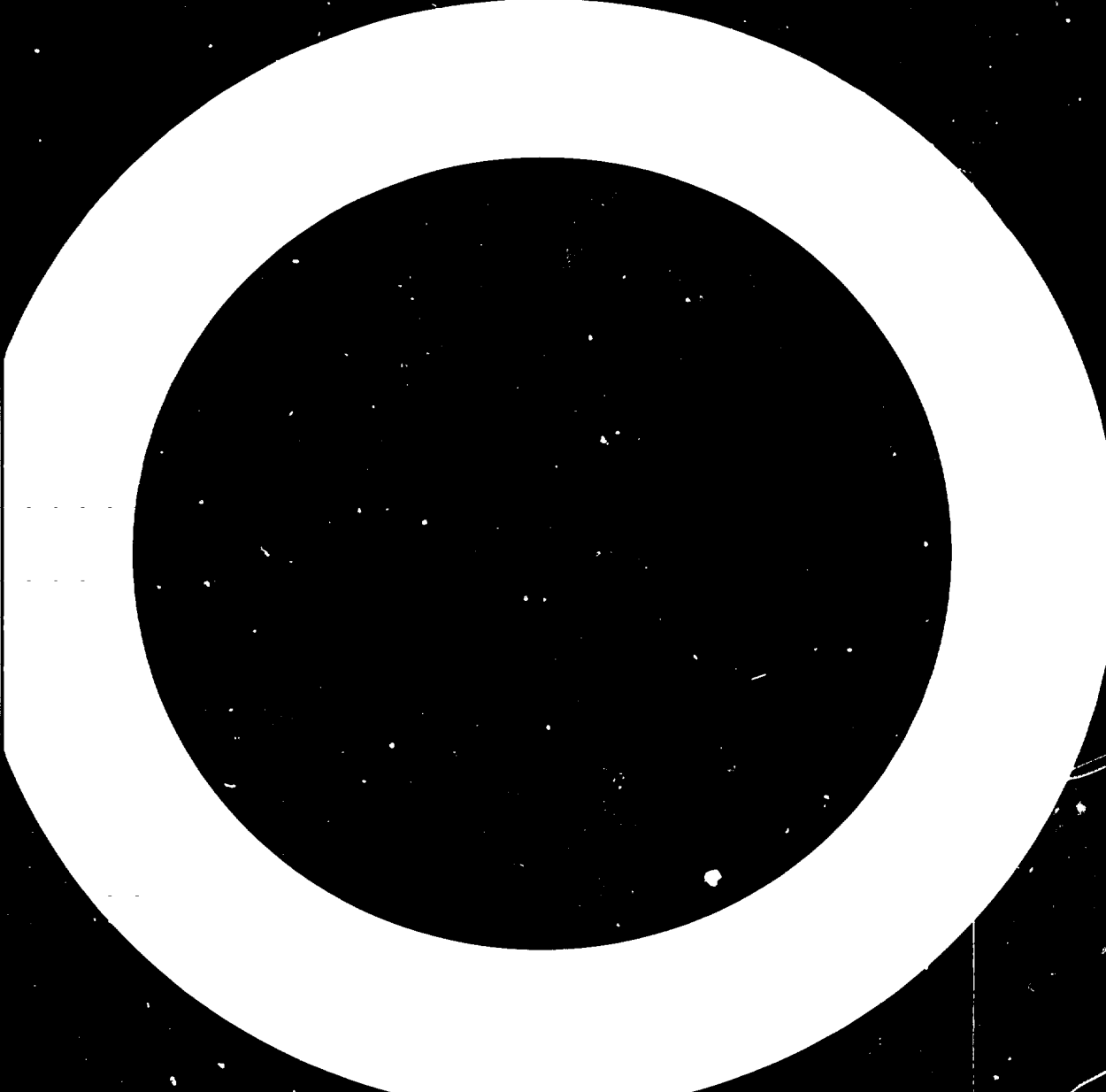
The Director of the Centre made on this occasion the request to UNIDO for technical assistance in the manufacture of refractory furniture and kiln linings for small-scale ceramic industries, if possible with the participation of UNIDO-Czechoslovakia Joint Programme. The introduction of manufacturing capability in the country is expected to reduce high foreign expenditures on such parts, improve the quality of products and the efficiency of the kilns. Ernesto Payoyo fully supported this request, which is expected to be submitted officially to UNIDO by the Government through UNDP.

Training of NACIDA technicians (annex XII)

The training concerning the pre-investment activities was extended on the request of Ernesto Payoyo on 10 and 12 March 1982.

Negotiations with the representative of the Government (annex XIII)

A record of negotiations with the representative of the Government is given in annex XIII.



Annex I

NATIONAL COTTAGE INDUSTRY DEVELOPMENT AUTHORITY (NACIDA)

NACIDA, which was visited by the expert on 26 February 1982, was established in 1981 with the aim to promote the development of cottage industry and to contribute to the rural development in view of the high labour intensity and low investment requirements of cottage industries and of the abundant raw materials and manpower available in the Philippines.

According to the presidental decree, NACIDA should perform the following functions:

(a) Organize, strengthen, encourage and promote the establishment of cottage industries;

(b) Develop financial-assistance programmes and funding mechanisms for the cottage industries;

(c) Undertake a programme of development and expansion of cottage industries nationwide particularly in less developed areas;

(d) Plan, design and formulate viable, resource-based, low-budget, income-generating and market-oriented "training-production" livelihood projects;

(e) Evolve and validate viable special projects, which are employment-generating and income-producing, to be collectively managed and operated by trainee-graduates;

(f) Undertake industrial surveys of different craft skills needed by industry;

(g) Conduct field surveys of indigenous raw materials and equipment;

(h) Initiate, and if necessary procure, certified raw materials needed for production by cottage industries;

(i) Help producers attain competitive footing in the market;

(j) Rationalize different aspects of cottage industry operations;

(k) Establish and develop Cottage Industries Training Centres and undertake research and development;

(l) Promote the quality assurance of cottage industries products;

(m) Extend assistance to cottage industries producers in their problems relating to financing, production and marketing;

(n) Work in close co-ordination with the private sector.

The Minister of Industry or Chairman of the NACIDA Board is the Chief Executive Officer of NACIDA and the Administrator of NACIDA is the Chief Operating Officer responsible directly to the Chairman. NACIDA has established regional offices in each of the 12 regions of the Philippines.

To accelerate the growth and development of cottage industries, the Government may provide to persons, firms or corporations registered with NACIDA incentives and benefits, such as tax privileges, promotion, marketing assistance, production assistance, skills development and technology assistance, skills credit and loans assistance and equipment and raw materials assistance.

Annex II

MANUFACTURE OF POTTERY PRODUCTS AT BULACAN

Plant visited:	1 March 1982
Name and address of the plant:	PAN Flowerpots Gatbuca Calumpit Bulacan
Established:	1978
Total assets:	₱ 30,000
Product assortment:	Flowerpots and water containers
Annual output:	200,000 pieces = 360,000 kg
Annual sales:	₱ 730,000

Main raw materials

Denomination	Characteristics	Origin	Condition	Price
1. Bulacan ricefield clay	Red plastic pottery clay	Local	Raw	₱ 36/m^3
2. Riversand Pampanga	Grog	Local	Raw	-

Manufacturing process

The wetted clay is passed three times between smooth rollers of equal diameter running at the same velocity. It is then put into a mould and turned on a potter's wheel provided with template. Green pots are dried on shelves in the hall where kiln is placed. Drying takes 72 hours in dry season and 144 hours in rainy season. The kiln has a setting capacity of 1,200 pieces of medium size. Two firings a week take place. The firing temperature is over 800°C. The rejects are 10 per cent.

The second kiln has been built for firing glaze biscuit. The experimental firings were conducted by a higher temperature, near 1,000°C (measured by PCE). The result, however, has not been satisfactory. The glaze was mostly dull and contaminated by kiln atmosphere. The kiln has a capacity of 2,400 pieces.

The first kiln is fired by semi-hard wood and hard wood, i.e. waste from local lumber yard, the second kiln is fired by hard wood only.

The firing of glazed pots was repeated by NACIDA in the Marikina Training Centre in an electric kiln. The quality of the fired glazed pots was satisfactory.

Conclusion

Glazed flowerpots, which are required by Philippine exporters, have never been produced by Philippine cottage producers before, except in one case.

Training of pot makers in firing glazed ware and assistance in cottage kiln adjustment for this purpose is recommended. It would contribute to increased exports of cottage industries.

Annex III

MANUFACTURE OF ARTWARE CERAMICS AT MANILA

Plant visited: 1 March 1982

Name and address of the plant: Clayburn Ceramics
150 Blumentritt Street
San Juan
Metro Manila

Established: 1959

Total assets: ₱ 900,000

Annual sales: ₱ 2,000,000 (85% exports)

Main raw materials

Denomination	Characteristics	Origin	Condition	Price
1. Siruma clay	Siliceous clay	Camarines Bicol (local)	stone	₱ 300/ton
2. Ventura feldspar	Flux	Ilocos (local)	stone	₱ 450/ton
3. Iloilo	Black, white and brown plastic clay	Iloilo (local)	powdered	₱ 350-380/ton
4. Talc		Imported	powdered	₱ 3,000/ton
5. Talacag clay		Talacag	powdered	₱ 495/ton
6. Kentucky ball clay		Imported	powdered	₱ 2,500/ton
7. Magpit	China clay	Cola bato (local)		₱ 320/ton
8. Glazes				₱ 15-18/kg

Manufacturing process

Raw materials are delivered mostly in powdered condition and ground in a ball mill in weighed proportions. All products are shaped by casting the fine ground slurry into plaster moulds. Models and plaster moulds are prepared in a separate workshop. Cast products are dried in electric driers and fired to 1,300°C in small electric kilns. The body composition corresponds to soft porcelain. Most products are biscuit fired, glazed and refired. Others undergo only one firing process. Onglaze decorations are refired by the temperature of 700°C. European glazes are used.

The electric driers and kilns, which have a maximum capacity of 2 m^3 are too old and are probably the main reason of the alleged power consumption. The values of energy consumption, however, could not be found.

The glaze on the product has been showing crazing. The entrepreneur sees a potential reason in fluctuating quality of one clay component delivered from the mines.

Request

The entrepreneur requests assistance in energy conservation and a technological consultation.

Annex IV

MANUFACTURE OF CHINAWARE AT MAKATI

Plant visited:	11 March 1982
Name and address of the plant:	Pintar International 8061A Estrella Street Makati Metro Manila Manuel M. Pleno, Managing Director
Established:	1973
Total assets:	P 20,000 (Salvage value)
Product assortment:	Decorative table tags, boxes, supplements
Annual sales:	P 1,000,000
Applied raw materials:	Processed raw materials from United Kingdom and washed kaolin from the United States. Porcelain body composition is used.

Manufacturing process

Raw materials are mixed in a ball mill, casting is by using plaster moulds, drying is at room temperature. Biscuit firing in electric kilns is at 1,250°C, glaze firing is at 900°C. Onglaze decoration is applied.

Requests

The company has a new plant of triple capacity under construction and is interested in technical assistance regarding consultation on new equipment, quality improvement and application of energy saving measures.

Annex V

MANUFACTURE OF CERAMICS MINIATURE DECORATIVE PRODUCTS AT BACOLOD CITY

Plant visited:	4 March 1982
Name and address of the plant:	Anaware Ceramic International 33 Camia Road Capitolville Bacolod City 6001 Negros Occ.
Established:	1972
Total assets:	₱ 1,300,000
Product assortment:	Decorative and functional ware (miniatures)
Annual sales:	₱ 1,400,000
Applied raw materials:	Raw materials are not processed. Earthenware powdered blend is delivered from Manila by Mayon Ceramics. The body composition fluctuates. Price of the powdered body is ₱ 2,500/ton. Annual consumption of the body amounts to 4 tons only.

Manufacturing process

Casting process is used with addition of silicate deflocculants. For simple items press moulding is used. Drying takes one day in dry season and two days in rainy season. Biscuit firing in an electric kiln at firing temperature of 900°C.

The biscuit is hand painted and transparent glaze is applied. The glaze firing takes place again in the electric kiln at the same temperature.

Requests

The entrepreneur's requests are quality improvement by deliveries of ceramic bodies of standardized compositions; assistance in removing peeling glazes; measures for energy conservation and consultations for prepared modernization of plant equipment.

Annex VI

MANUFACTURE OF ARTWARE CERAMICS AT BACOLOD CITY

Plant visited:	5 March 1982
Name and address of the plant:	NLS Ceramics
Owner:	Nannette L. Sanson Mountain View Subdivision Bacolod City
Established:	1977
Total assets:	₱ 1,200,000
Product assortment:	Vases of larger sizes richly decorated with line plastic creations, foliage, flowers etc. Figural ceramics (statuses).
Annual sales:	₱ 1,000,000
Applied raw materials:	Earthenware powdered blend delivered by Philippine Ceramics, Metro Manila. The quality of the body is fluctuating. Raw materials from Iloilo are probably included. The composition is unknown to producers.

Manufacturing process

Product moulding is by casting into plaster moulds, plastic decorations are done by hand from plastic body. Hand decorations are painted on fired biscuits and then glass is applied.

Both the biscuit and glaze firing are conducted in an electric kiln at 1,000°C. If the onglaze decoration is applied (gold decal), third firing proceeds at 800°C.

Requests

Requests are assistance regarding the location of a raw material preparation plant to be established near the clay deposits of Iloilo, which would guarantee the supply of standardized bodies; problem of glaze peeling; and energy conservation.

Annex VII

NACIDA EASTERN VISAYAS REGIONAL INSTITUTE AT TACLOBAN CITY

Tacloban Ceramic Workshop

Tacloban Workshop, which was visited on 3 March 1982, is attached to the NACIDA Regional Institute at Tacloban and is engaged in the development of earthenware, stoneware and brick products. A pilot plant is also under construction. The construction of this brick pilot plant was delayed and the UNIDO expert was requested by NACIDA for the assessment of the present situation. In fact, the production hall has been completed and the construction of the kiln has almost been completed. The clay and body preparation equipment has not been ordered yet, nor has the moulding equipment (brick extruder). Even if the plant had the machinery, it could not start operating since the local power input to be installed is not available yet, i.e. there is a delay in the construction of a power plant based on geothermal energy.

The kiln itself has been designed by Aguido Basa, according to a type of a Chinese kiln being in satisfactory operation in Manila. Under these conditions, the simplest solution seems to be finishing the kiln and make it ready for commissioning. The clay and body preparation as well as brick moulding should be made manually in the meantime according to the method applied by the National Food Authority in Alang- alang. The delivery of remaining machinery should not take place unless sufficient electric input is in sight.

Annex VIII

SIMPLE BRICK MAKING DEVELOPED BY NATIONAL FOOD INDUSTRY AT ALANG-ALANG

The manufacturing in brickworks in Alang-alang, which was visited on 3 March 1982, is based on manual work only. Local brick clay is wetted and rammed to be homogenized. It is pressed into wooden moulds, the green pressed bricks being dried under sheds. Their body consists of clay, river sand and ash (100 plus 30 plus 30 parts respectively). Brick firing takes place in chambers constructed of concrete and lined with red fired bricks. The ceiling is left open. The front wall consists of two parts leaving sufficient entrance for brick setting and firing. A simple setting pattern is applied. Concurrently with setting bricks, rice husks are thrown in as fuel. Above the setting a 30-cm-thick layer of rice husks is put and maintained during firing.

Bricks of 50 by 100 by 200 mm were fired. Firing takes four days and cooling three days. Tacloban Ceramics Centre took two bricks to be tested on compressive strength. The price of bricks is P 1.10 per piece.

Conclusion

The kiln firing seems to be on substantially higher level than firing in piles. The firing should also be tried and tested with larger formats. These kilns could be recommended for villages possessing brick clays for local brick manufacture. They would help to solve the housing problem in the country.

Annex IX

MANUFACTURE OF DECORATIVE GLASS PRODUCTS AND DRINKING GLASSES AT DALAHICAN, CAVITY CITY

Plant visited:	2 March 1982
Name and address of the plant:	Weinstein Trading Corporation 980 Manila Cavity Road, Dalahican Cavity City
Established:	1971
Total assets:	₱ 2,100,000
Product assortment:	Decorative glass products and drinking glasses
Annual output:	443 tons
Annual sales:	₱ 3,443,000 (30% exports)
Applied raw materials:	The only used material is recycled unsorted crushed glass delivered at the price of ₱ 0.25/kg. The crushed glass is thoroughly washed and delivered to the furnace.

Manufacturing process

The melting takes place in a small tank furnace. The lining of the furnace is made of refractories of unknown quality. It has a lifetime of one year. The other kiln serves as standby.

The forming of product shape is made by free blowing, without mould, the drinking glasses are blown in moulds. The manufacture of drinking glasses has been discontinued because of obsolete moulding equipment.

The annealing is carried out in nine annealers, which are oil-fired. The annealers are heated eight hours and then the ware is held inside for sixteen hours to cool.

The total reject amounts to 20 per cent. Bunker Crude Oil is used both for melting and annealing, the consumption being 1,500 l/24 hours. The price is ₱ 2.15/l. The daily consumption of electricity is 65 kWh at the price of ₱ 0.75/kWh.

Requests

Requests are introduction of batch composition involving also glass sand and other usual components with possibly high proportion of cullet; consultation on how to modernize existing furnaces and annealers to reduce the high energy consumption; proposal for application of a new glass cutting machine (drinking glasses); and consultation on deliveries of colouring agents of local origin.

Annex X

MANUFACTURE OF DRINKING, HANDBLOWN AND DECORATIVE GLASS AT MANDALUYONG

Plant visited:	11 March 1982
Name and address of the plant:	San Jose Glass Corporation 461 J. Rizal Street Mandaluyong Metro Manila 3119
Established:	1979
Total assets:	₱ 500,000
Product assortment:	Pitchers, tumblers, decorative products, flowers
Output:	1,000 kg glassware daily
Annual sales:	₱ 400,000
Applied raw materials:	Recycled cullet, borax, soda ash, salt cake, feldspar, limestone, kaolin. No glass sands are applied.

Manufacturing process

Raw materials are received in powdered condition and proportioned volumetrically. The melting takes place in a glass tank furnace at the temperature of 1,800°F. The furnace has only one heavy oil-fired burner, the flame is ducted in U shape. The furnace has no energy-saving system and energy consumption is very high.

Most products are hand blown into moulds. Some decorative ware and flowers are made by free hand. Glass cutting off is done by gas burner.

Glass products are cooled in a lehr without any measuring equipment. The lehr, however, is constructed on conveyor basis with glassware travelling on metal plates pulled by chain. It is heated by one heavy oil-fired burner placed at the entrance of the lehr. The hot gases are ducted through the lehr and exhausted to chimney at the end of the heated zone.

Rejects are 20 per cent in cold weather and 10 per cent in hot weather.

Requests

Requests are technical assistance regarding quality improvement (conversion to glass sand basis) and consultation regarding measures for energy saving.

Annex XI

CERAMICS RESEARCH AND DEVELOPMENT CENTRE (CRDC)

Visit to the Centre on 2 March 1982

The Director of the Ceramics Research and Development Centre, Guillermina C. Manalac, who participated in UNIDO Training Workshop on Refractories in Pilsen in 1974, gave the expert a short review of the activities of the Centre. The possibilities of potential mutual co-operation between the Centre and the UNIDO-Czechoslovakia Joint Programme during the planned assistance in the Philippines were discussed.

The establishment of the Ceramics Research and Development Centre was brought about by a joint project negotiated in 1974 by the National Institute of Science and Technology with Japan International Co-operation Agency (JICA). Implementation started in 1976 and was to be completed in July 1982. A fully equipped laboratory has, however, been in operation since 1981 as well as the pottery plant and the brick plant. The Centre has about 100 employees, of which approximately one half are regular employees and the other half contractors.

The Ceramics Research and Development Centre has three departments, research and development, programme and co-ordination and technical guidance. The laboratory tests performed are mineralogical, physical and chemical analyses.

Visit to the Centre on 15 March 1982

Attendance:

Gillermina C. Manalac, Director of the Ceramics Research and Development Centre in Manila

Ernesto Payoyo, Chief Industrial Development Specialist, Ministry of Trade and Industry

Jesus Reyes, Head CITC Projects

Aurelia Mabalay, Chief, Ceramic Workshop, CITC

Jan Dřevo, UNIDO Expert

NACIDA initiated this meeting with the aim to discuss CRDC participation in the possible projects of technical assistance in the fields of ceramic technology improvement and ceramic kiln design. A technical assistance request is to be forwarded to UNIDO through UNDP at Manila.

It was agreed that CRDC would carry out all the required tests of raw materials, body compositions, biscuits and glazed products for the expected projects geared to the production and technology of ceramic artware, decorative and functional products based on pottery, earthenware and porcelain bodies.

It was agreed that CRDC would participate and provide its facilities for the project concerned with kiln design, kiln operation and energy conservation in small-scale ceramic industries.

The CRDC requested technical assistance from UNIDO in the manufacture of refractory furniture and linings for ceramic kilns in the field of ceramic small-scale industries.

Introduction of this manufacture is one of the prerequisites for upgrading the level of these industries. Ernesto Payoyo supported this request, which is to be officially submitted by the Government of the Philippines through UNDP Resident Representative to UNIDO.

Annex XII

TRAINING OF NACIDA TECHNICIANS

The expert was requested to extend a training on the procedures for pre-investment activities and aimed at the forthcoming assignments of the NACIDA Training Centre in small-scale manufacture of ceramics and glass.

Training extended:

10 March 1982
12 March 1982

The trainees:

Jesus M. Reyes, Head, CITC Projects

Aurelia Mabalay, Chief, Ceramic Workshop, CITC

Leonor Balnes, Officer in Charge of Regional Support Service

Annex XIII

NEGOTIATIONS WITH THE REPRESENTATIVE OF THE GOVERNMENT

Ernesto Payoyo, Chief Industrial Development Specialist, Ministry of Trade and Industry, as main counterpart to the expert, was authorized to organize the implementation of the expert's programme in the country, to discuss findings and to express the Government's reaction to the findings and recommendations for the draft terminal report. He participated in official opening and final negotiations with Ivan E. Pluhar, UNIDO Senior Industrial Development Field Adviser, and with Syvelyn J. Tan, Special Assistant to the Minister, Ministry of Trade and Industry. He also nominated accompanying counterparts for plant visits.

The discussions were held mostly in the NACIDA Training Centre at Marikina.

The following problems were discussed:

(a) Local raw materials for ceramics in general (long-term problem);

(b) Local body compositions for NACIDA ceramic producers (alternatives);

(c) Local glass sands;

(d) Planned NACIDA facilities for support of ceramic and glass industries: Ceramic Training Centre at Bacolod, Glass Pilot Plant at Marikina (Assistance of the Joint Programme considered);

(e) Interest in placing NACIDA ceramists for training to small-scale ceramic plants in Czechoslovakia;

(f) Possibility of delivering manufacturing equipment (phase of raw material and body preparation and brick extrusion) for brick pilot plant at Tacloban;

(g) Agreement on recommendations and findings in the draft terminal report.