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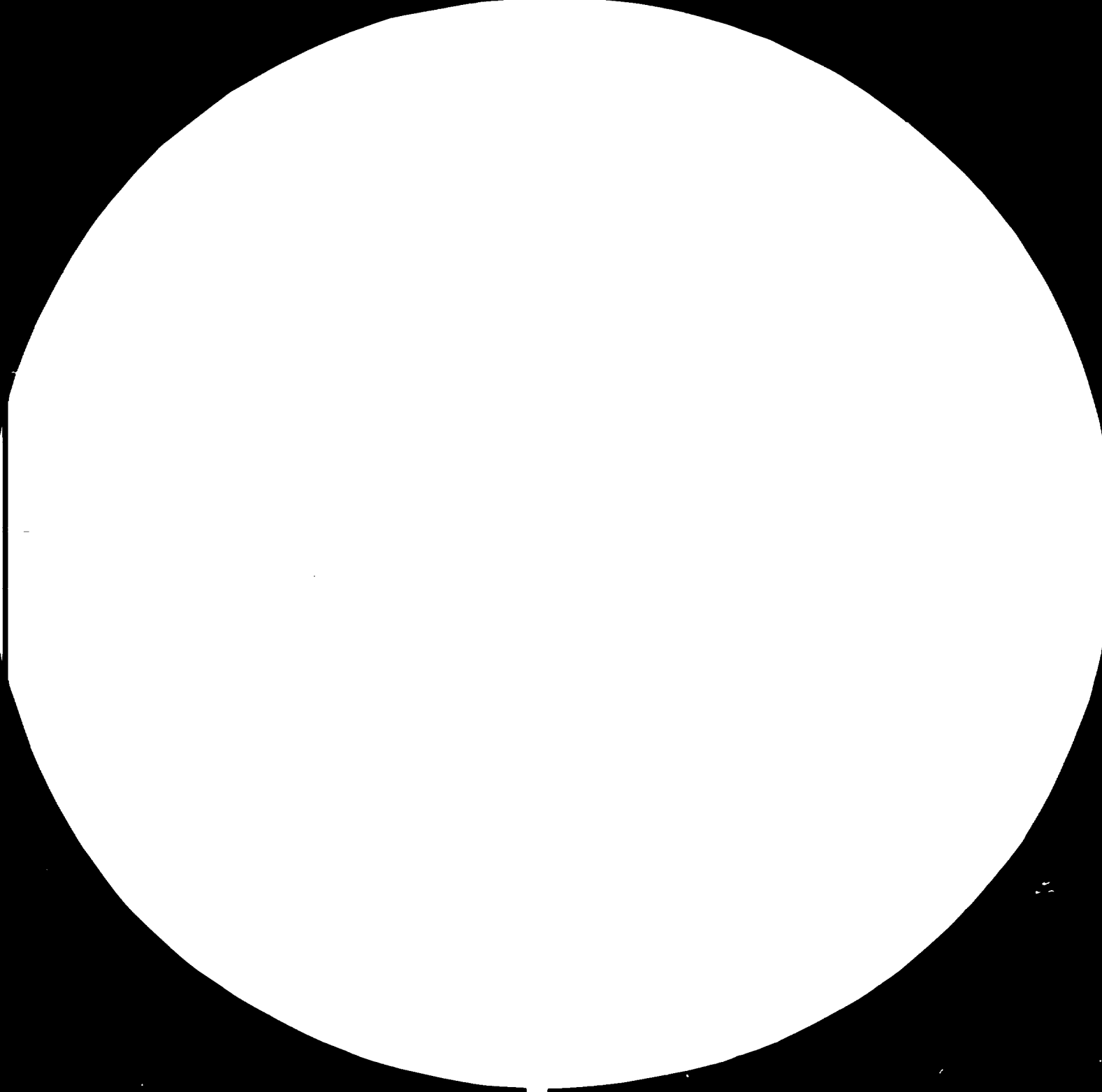

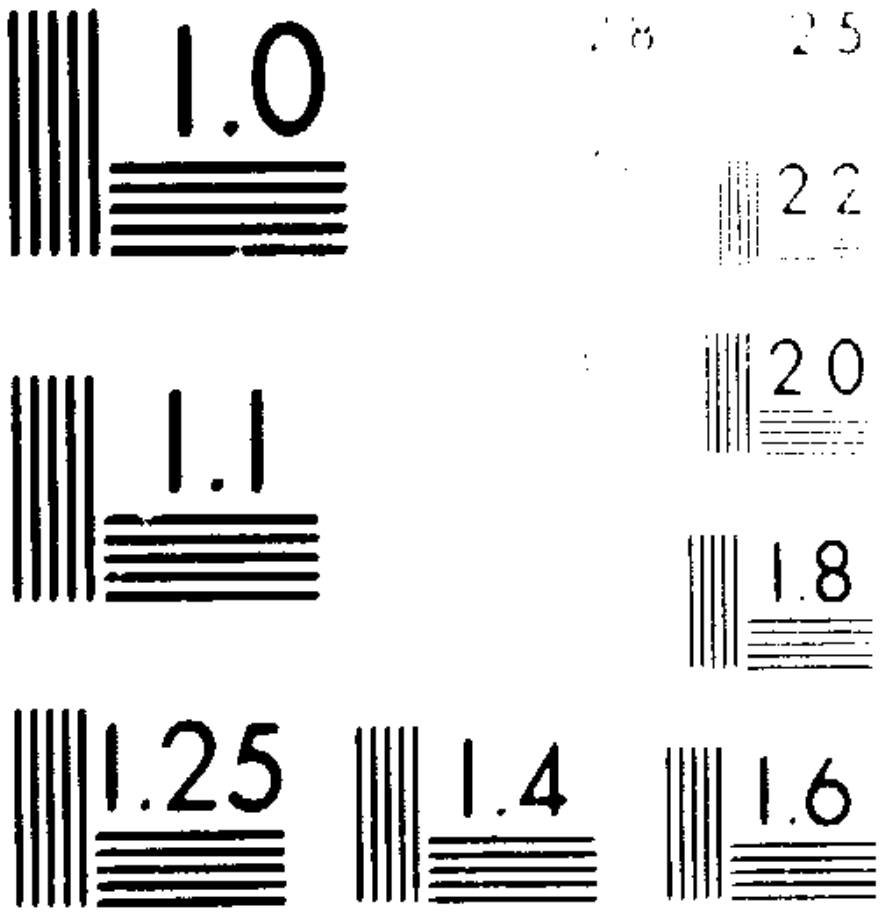
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RESTRICTED
20 July 1982
English

[THAILAND : Plastics production.]
(DP/THA/74/024)

Project Findings and Recommendations

Terminal Report Prepared For

The Government of Thailand

by

George Abbott (Plastics Production Technician)
Expert of the United Nations Industrial Development Organisation,
Acting as Executing Agency for
The United Nations Development Programme

Reporting Period

5/8/81 - 30/7/82

003012

This report has not been cleared with the United Nations Industrial Development Organisation which does not, therefore, necessarily share the views presented.

I. Contents

Note: No Interim 6 Monthly Progress Report was submitted, as the submission date coincided with the expert's admission to hospital.

Acknowledgements

Thanks are due to Khun Kamthon Sathirakul (Chairman Ong Karn Kha Kurusapha) for his support throughout the assignment, and his consideration during my convalescence after hospitalisation.

Thanks are also due to all the staff with whom I worked at the School Science Equipment factory of Ong Karn Kha, for their help during, and after, this period, and their willingness to assist always in all matters, project and personal. In particular to Khun Payong Padanupong, Head of School Science Equipment, with whom good relations were maintained throughout; and to Khun Siriporn Puntavanun, secretary, S3E, for help in project matters, and personal assistance during a difficult period.

Thanks also to the UNDP staff, Bangkok, for excellent support, and to Assistant Regional Representative, Mr. A. Frismark, and SIDFA, Mr. W. Millager in particular for advice and assistance when needed.

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III. Introduction

1. Project Background.

The School Science Equipment section of the Ong Karn Kha Kurusapha manufactures educational, demonstration, and teaching equipment for the educational establishments in Thailand, (mainly secondary), in conjunction with the Institute for the Promotion of Science and Technology (IPST), which is the primary designer of the equipment.

A UNIDO expert was responsible for advice and assistance for the initiation and operation of all manufacturing processes, including the production of plastic moulded components. (See expert's terminal report dated 30/9/80: Leonhard.)

After the departure of this expert, additional aid was requested in the form of a 'Plastics Production Technician' (Project Revision, Budget Code I, dated 30/10/80), it having been decided that this section of production would benefit by a further input of technical expertise.

On the arrival of the Plastics Production Technician, it was found that no mould design facilities were in existence, the toolroom was inadequate in terms of equipment and expertise, and the moulding dept. inefficient due to inexperience and general working arrangements. Contributing in large measure to the inefficiency of the moulding dept. was the poor design and condition of the existing moulding tools, some of which were manufactured in house and some by outside sources.

2. Summary of official arrangements.

28/3/75. Original project document signed.
Project Revision - Amendment to the project document calling further (Budget Code I.d.d. 30/10/80) technical assistance for the plastics section.

Project Site: The manufacturing sections of the works were not ideal in layout, due to lack of space and general working environmental arrangements. The assembly section was good. A number of machines necessary for toolmaking were situated in another factory some distance away and were used for general machining and maintenance work.

On January 26th 1982, the expert was hospitalised, and was absent from the project until March 29th, during which period the entire project was re-sited in a different area. Whilst the assembly dept. was still good, the general arrangement of the machining depts. was still considered inadequate due to layout and general lack of space; the toolroom being large enough to house only one machine.

Government Inputs: (from 5/8/81-30/7/82)	Equipment:	1 Granulating m/c - ฿38,000 ($1652)
	Manpower:	Nine personnel (Toolroom & Moulding Dept.)
	Counterparts:	No counterpart provided.

UNDP/UNIDO: 1 Plastics Prod. expert 12 m/m
(from 5/8/81-30/7/82)

Plastics Prod. Tech. Expert: Arrival date: 5/8/81.
Plastics " " " : Departure date: 30/7/82.

Short Term Objectives. To improve the quality and competetiveness of plastic moulded components through improved mould design, toolmaking methods, and moulding techniques, and help towards achieving self sufficiency in these skills.

Long Term Objectives. To contribute materially to the manufacture of school science equipment, thus upgrading the quality and standard of teaching and education in the Kingdom, in addition to creating employment and saving foreign currency.

IV. Findings. Action Taken.

1. Main activities of the Plastics Section.

These consist of the design, manufacture, and operation of moulding tools, to produce plastic components which form integral parts of scientific and educational items for use in the educational system of Thailand.

The activities necessitate the availability of knowledge and experience in the field of mould design; personnel experienced and skilled in mould toolmaking, and equipment of sufficient quality and variety to enable this function to be performed; experienced moulding machine operators and moulding machines of sufficiently high standard and capacity to manufacture the required quantities of mouldings. Plus adequate premises; and necessary items of ancillary equipment for efficient operation of all three departments.

2. General

(i) There were no adequate design facilities and personnel to form the basis of a self contained plastics unit. Designing was performed sketchily by toolroom personnel and revealed a lack of expertise and experience; there was no organisation for recording design data.

Strenuous efforts were made to introduce practical design knowledge and a system which would continue after the expert's departure, with little success due to no personnel with the necessary background, qualifications and experience being made available. (Appendix 4. Para 2 (i) Design Section.) Subsequent to the general summary of the situation dated 30th November 1981, (Appendix 4. Para 2 (i) Design Section) the works draughtsman has been engaged for a considerable period planning the move to new premises.

After the move, he was the general factotum in repair, renovation, ~~in repair, renovation,~~ alteration, removal and siting operations. This meant that he was unable to work with the expert in detailing moulds and standard mould bolsters, and the expert took over this operation, sometimes fully, but usually only in such a way that would enable the toolroom to proceed - this being a time consuming operation. This, however, led to a decrease in the estimated number of designs completed.

(ii) The range of toolroom equipment was, and still is, inadequate for making the required range of moulding tools to an acceptable standard, this in turn placing limitations on design methods. A further consideration is that, with the exception of one machine, all equipment is now situated in the general machining area (after factory re-site), including fitting benches; in some cases it is situated in a different factory, and is used for general machining and maintenance work. The area designated as "Toolroom" houses one machine only. This lack of suitable equipment was discussed with project management in the early stages, and recommendations made. (Appendix 5)

(iii) There are approximately 55 moulding tools in existence. Of these 20 were manufactured in house, the rest by outside contractors. Due to faulty design, 13 of these have never worked at all. 25-30 moulds have been examined as they commenced production runs, and without exception these were found to be badly designed; and in poor condition owing to cheap and unsuitable materials being used, this causing undue damage, and wear and tear.

Due mainly to these faults, moulding cycles are excessively protracted. Possible re-design, part re-make, and renovation were suggested in many cases and discussed with management, but the inevitable decision was that the expense could not be justified.

Instruction was given, on a job to job basis, to try and improve the product quality by experimenting with moulding conditions (pressures, times, temperatures). In some cases, small improvements were achieved, but the design and condition of the moulds generally prevented a desirable moulding standard being achieved, and often the curing of one fault led to the manifestation of others.

(iv) At no stage is there any quality control check on moulded product. This results in faults being discovered, in some cases, after the assembly process. It has been suggested to management that application of quality control at the post moulding stage could improve the product by highlighting faults, and remedial action initiated at this stage. (Appendix 4. Para 3 (iv))

(v) There is uncertainty regarding positive data on the quantity of components required from a mould. In what appears to be a "play safe" attitude, it is assumed that numbers will be small in relation to generally accepted quantities produced by the injection moulding process. An expensive mould cannot, therefore, be justified for economic reasons.

After the initial order is completed, repeat orders are received, and the mould eventually makes more product than originally intended with resultant breakdown, undue wear and tear and general diminishing of condition.

This problem has been discussed, partial solutions suggested, and action initiated. (Appendix 6, Standard Bolsters: Appendix 8, Small Semi-automatic moulding machine.)

(vi) The equipment in the moulding department consists of two expensive, high production injection machines, one small inexpensive one, and a vacuum thermoforming machine. It is probable that this equipment requirement was overestimated in the planning stage in terms of types of machine in relation to component volume requirement.

Even allowing for repeat orders, this volume requirement could have been fulfilled by smaller and less expensive machines, possibly of a semi-automatic type, these requiring less sophisticated tooling . (Appendix 8. Manumold machine) In the initial stages, the physically larger components, or any high volume order, could have been contracted out.

In a 6 month period from 1/8/81 to 30/1/82 the following production figures were analysed:-

1 oz Engel m/c

Total Nº of mouldings produced = 65,350 from 20 moulds. This averages 3,292 per production run. It was noted that 32,650 mouldings were produced from 1 mould, making the average production run for the remaining 19 moulds 1,747.

3 oz Engel m/c

Total Nº of mouldings produced = 50,800 from 12 moulds
Average production run = 4,233

M-800 Terforme.

Total Nº of mouldings produced = 52,715 from 8 moulds.
Average production run = 6,589

20,000 mouldings were produced from 1 mould making the average for the remaining 7 moulds 4,673.

(vii) At the time of writing, the vacuum forming machine has produced only a very small number of components since it was acquired in 1979.

(viii) Large quantities of plastic scrap (sprues, runners, rejects) were being stored in unsuitable conditions. It was suggested that a granulating machine to re-grind scrap material (and, therefore, re-use) be purchased. Such a machine was obtained locally in November 1981.

(ix) Mould costs can be evaluated in terms of material (steel etc;) and labour only, as reliable overhead figures have proved difficult to obtain. In industrialised or developed countries, material costs represent approx. 15% of the total (this being an average figure); due to generally lower labour cost in Thailand, it is estimated that material costs could be as high as circa 45% of the total, if normal good quality imported mould materials were used. Therefore cheaper unsuitable local material is generally used to keep costs down.

Moulded component costs (piece price) are again evaluated only in ~~material and~~ labour terms. Due to faulty design causing excessively long moulding cycles, poor mould condition in some cases necessitating the use of extra labour in trimming operations, and inefficient working arrangements, the labour content of the piece price is

far higher than it would be given good moulds and efficient working arrangements. In one case (Abacus Counter mould, 48 Imps.) the cost is estimated at almost 7 times that which could be obtained, the labour content of the trimming cost alone being higher than the labour content of the actual moulding operation. (Figures appended)

Abacus Counter (48 Imp. Mould)

1. Estimated labour cost achieved by normal working.

48 impressions working on 45 second cycle.

= 3,840 per hour.

= 3,840 x 8 hours = 30,720 per day: = 153,600 per week of 5 days.

Assume operator's wages at 1,000 ₿ per week.

Then piece price (labour) = $\frac{1,000}{153,600}$ = .0065 ₿

2. Labour cost in S.S.E.

40 Impressions working on 90 second cycle. (8 Imps. not used due to insufficient machine capacity)

= 1,600 per hour

= 1,600 x 6 hours = 9,600 per day = 48,000 per week. (machines work approx. 6 hours/day)

Assume operator's wages at 1,000 ₿ per week.

Then piece price (moulding labour) = $\frac{1,000}{48,000}$ = .0208 ₿

Plus Labour cost for trimming. (Student : 62 ₿ per day)

360 pieces per hour (10 sec. average) = 2,520 per day. (7 hour day)

$\frac{62}{2,520}$ = .0246 ₿ per piece

Total Cost = (.0208 + .0246) ₿ = .0454 ₿

This is equal to 6.98 x Normal Cost.

(x) General Comments (Plastics Section)

1. Instances occured when work was carried out on moulds in the toolroom about which the expert was not consulted, the ensuing results not being encouraging. Similarly, there were occasions when advice and instruction had no lasting effect, this latter applying both to toolroom and moulding operations.

   This communications problem persisted throughout.

2. Moulding projects insufficiently researched caused time wastage when requirements were changed, or the project cancelled, after long periods of time had been spent on them. This was prevalent during the first 6 months of the assignment.

3. Working arrangements are not ideal. Because of start up and closing down times in the morning, at midday, and in the evening, it is estimated that average machine usage is 6 hours per day, whilst operators are paid for 8 hours. It has been suggested to management that arrangements could be made to have the machines ready for work at the factory starting time, and an operator overlap created at midday. This would reduce lost production time to approx. 15 mins. per day.

3. Training

(i) Lectures and tuition in mould design to the plastics section head and the senior toolmaker were commenced on January 25th 1982, but a total of 5½ hours only (up to the time of writing) was given, as the expert suffered a cardiac arrest on January 26th, and was hospitalised.

Since returning to the project on March 29th, on the same day that the factory re-site was completed, these personnel have not been available for formal tuition due to pressure of work.

Instruction was given, on a job by job basis, in mould design, toolroom operations and techniques, and moulding techniques, to the personnel involved in these operations. Discussions have been held with management (Head of SSE.) and advice given.

Copies of lectures were made and distributed to appropriate personnel, and on one occasion two complete volumes dealing with mould design and toolroom techniques were photostated. (These volumes now being out of print.)

Charts for analysing and correcting faults in injection moulded products were issued. Standard type moulding condition sheets were also issued for recording data applicable to specific moulds when optimum moulding conditions were achieved.

No counterpart was provided during the assignment, or anyone who could be given working instruction in mould design, this being the primary requirement; it is hoped that the examples of mould design completed by the expert

will be used as guidelines in the future. (Although principles, or methods, of moulding vary greatly, most can be obtained from mould design manuals; whether a mould is successful in operation relies to a large extent on constructional engineering detail, and use of suitable materials.)

(ii) Included in the project budget are funds for a fellowship award to a candidate already selected, the chosen venue being the Central Institute of Plastics Engineering and Tools (CIPET) in Madras, S. India. Copies of all relevant correspondence are attached (Appendix 7). The fellowship has not been taken up as of this date, and copies of correspondence have now been passed to Fellowships Unit, UNDP, Bangkok.

V. Recommendations

1. In view of the uncertainty relating to any potential development and expansion, or no development taking place, recommendations encompassing both situation are made.

(i) Recommendations if there is to be future expansion of the plastics section.

(a) The entire plastics section - designs, toolmaking, and moulding departments, to be an autonomous section under direct control of one qualified individual, who would be responsible only to the head of the School Science Equipment organisation.

(b) Designs Department : To be expanded on an organised basis requiring the input of knowledge and techniques from outside sources. The head of this department could well be the one to be in charge of the entire section. In addition to supervising mould design, mould manufacture and moulding production, and being responsible for organisation, this individual would be responsible for estimating and technical correspondence; and all quality control activities (applying to mouldings and moulds) would be under his supervision. Suitable premises should be provided.

(c) Toolroom: Equipment should be aquired, using the list contained in Appendix 5 for guidance, and premises extended to contain all equipment and necessary sub. office space, storerooms, steel stocks, separately to other manufacturing sections of the organisation. Key personnel to be trained by outside sources, and foreman to be accountable to head of entire section.

Further recommended that T.R. machines not be used for general works machining and maintenance purposes.

(d) Moulding Department : Existing equipment to be retained, one/two further small semi-automatic injection machines aquired (Appendix 8) along with smaller ancillary pieces of equipment. The department should be isolated from other manufacturing sections to lessen possibility of material contamination. One key operator should be trained from outside sources, or possibly an experienced local operator obtained, who would be in charge of the department.

Dependent on the scope of expansion, the department may wish to aquire a machine of larger shot capacity eventually.

(ii) Outside Assistance.

Two experts should be requested, as follows:-

(a) One qualified and experienced in mould design, toolmaking, and moulding techniques, also having organising experience, both generally and in detail, and estimating (moulds and mouldings.) (The provision of a full time counterpart would be essential.)

(b) One specialist mouldmaking expert, with experience of all toolmaking techniques, toolroom equipment. Also having organising experience. (Counterpart to be provided.)

(c) If expansion is planned as a definite go ahead policy, as opposed to piecemeal expansion, Expert (a) should be installed at the inception, for planning,

obtaining equipment, personnel etc; This should be a 36 month assignment. Expert (b) should be in post 9-12 months after (a), and this should be a 24 month assignment. A total, therefore, of 60 man months is envisaged initially for outside expert assistance. If expanded on a piecemeal basis, the necessary outside assistance and supervision situation would become complicated, and impossible except on an ad hoc basis, unless someone with experience as generally outlined in (a) is recruited locally, on a full time basis; this is unlikely. In this case, the eventual efficiency of the department would depend largely on the rate and level at which T.R. personnel could gain knowledge and experience by self teaching, using empirical methods.

(d) It is envisaged at present that only two situations requiring a definite policy expansion of the plastics section could arise:-

1) A legistative decision at government ministerial level to provide all primary educational establishments with the same facilities and equipment given to the secondary sector. This would substantially increase the requirements for educational equipment (and moulded components).

2) An organisational decision to move into and compete in trade or custom toolmaking and moulding. This is considered unlikely.

2. Recommendations if there is to be no further expansion in the plastics section.

(i) A maintenance engineers department should be created to perform maintenance work and work of a general nature now undertaken by the head of the plastics section. This would enable the section head to devote his time to the plastics section.

(ii) A quality control check on plastic moulded products should be instituted permanently and continuously, and be the responsibility of the plastics section head. (If an overall quality control department existed this function could alternatively be under it's aegis).

(iii) A 3 oz (84 gm) "MANUMOLD" semi-automatic moulding machine requiring less sophisticated tooling should be purchased, this machine being particularly suitable for short production runs. (Appendix 8)

(iv) A "Jones and Shipman" universal cylindrical grinding machine should be purchased (model 1300 EIT. 10" x 27") to widen the scope of machining operations in the toolroom. (Appendix 5) (Quotations obtained)

(v) A "Deckel" GK 21 die sinking machine should be purchased to widen the scope of machining operations in the toolroom. (Appendix 5)(Quotations obtained)

(vi) Moulds and Standard Mould Bolsters designed (and some detailed, or part detailed) by the expert should be used as possible models for subsequent mould design. This refers to constructional and engineering aspects, rather than the method or principle of moulding.

A manual dealing with the general aspects of mould design should be purchased. (Name, author, cost and publisher provided)

(vii) Regardless of whether expansion takes place, or status quo maintained, the UNIDO fellowship for the selected individual (Head of Plastics Section) should be taken up as soon as possible.

Appendix 1

UNITED NATIONS

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO 19 December 1980

PROJECT IN THE KINGDOM OF THAILAND

INTERNAL

JOB DESCRIPTION

DP/THA/74/024/11-03/31.9.Z

Post title Plastics Production Technician/Engineer

Duration Twelve months, with possibility of extension

Date required As soon as possible

Duty station Bangkok

Purpose of project To assist the Government to design moulds and to produce thermoplastics injection moulding machines for the manufacture of science equipment for schools

Duties The expert will work in close co-operation with the industrial designer and the counterpart personnel and will specifically be expected to:

1. Supervise the production of plastic items;
2. Scrutinise existing injection moulds and make possible improvements;
3. Design new injection and vacuum thermoforming moulds;
4. Set the variables on the plastics production machines to optimal performance;
5. Give advice on how to handle plastics;
6. Give advice on purchasing accessories which may be required, for plastics production machines and mouldmaking machines;
7. Train local personnel.

..../..

Appendix 2

From: G. Abbott : Plastics Production Technician
[illegible]

To:- A. Delos, Acting Head
Engineering Industries Section
Division of Industrial Operations
UNIDO, Vienna

cc. Resident Representative : UNDP, [illegible]
cc. SIDFA : UNIDO, [illegible]

Date [illegible]

Subject: Initial Work Programme.

1. The work programme will follow the requirements of the [illegible] as specified in the job description. These are:-

(i) To supervise the production of plastic items.

(ii) Scrutinise existing injection moulds [illegible] improvements. In this connection, the assistance of the industrial designer will be associated in [illegible] obsolete moulds of no further use.

(iii) Design new injection and vacuum thermoforming moulds.

(iv) Set the variables in the plastics production machines to optimal performance.

(v) Give advice on how to handle plastics.

(vi) Give advice on purchasing accessories which [illegible] required for plastics production machines and mould making machines.

(vii) Train local personnel.

2. (i) With regard to 1. (vii) it is intended to reorganise the existing design structure as far as is possible within existing parameters. This will concern specifically two men (toolroom foreman and senior toolmaker) and will consist of in plant training and ad hoc lectures on specifics, in addition to more general instruction. As both men have other duties to perform, it cannot be accurately estimated how effective this will be in terms of the student potential in a specific period of time. An assessment of this will be made at a later date.

(ii) It has been [illegible] that lectures [illegible] be [illegible] and given to all the [illegible] personnel in the establishment [illegible] from a more generalised [illegible] design and toolmaking techniques; also [illegible] materials, and the uses [illegible] types of materials, etc. These lectures will commence as soon as possible.

3. (i) The work programme will be [illegible] of the whole factory to a new site in [illegible]. The estimated loss of time [illegible] at present being to complete the move by [illegible].

Signed : [illegible]
United Nations Industrial
Development Organization

Appendix 3

From. S. Abbott : Plastics Production Technician
DP/BRA/74/024/11-02/31.9.E.

To: M. Delos, Actia; Head
Engineering Industries Section
Division of Industrial Operations
UNIDO : Vienna

cc. Resident Representative, UNDP, Bangkok
cc. SIDFA : UNIDO, Bangkok

Date: 3 September 1981

Subject: Preliminary Report.

1. General

(i) The expert arrived at the duty station on Wednesday, 5/3/81 at 15.20 pm.

(ii) On the morning of 6/3/81, UNDP was visited and the Assistant Regional Director contacted. Contact was also made with Mr. Kurt Hofmann, Industrial Design expert with the project. Briefings were received from the Assistant Regional Director, and Mr. Hofmann.

(iii) On 7/3/81, the expert was introduced to the Managing Director of the project (Khun Kanthan, M.D. Ong Karn Kha.) and Khun Payong Pudanupong, Production Manager, School Science Equipment, Ong Karn Kha.

(iv) On arrival at the project site, the expert was shown around and introduced to the project personnel with whom he would be working. A familiarisation period followed; inspections were made of the existing mould design, toolmaking, and moulding facilities and equipment, and moulded products examined.

2. Findings (applying solely to the production of plastic mouldings)

(i) Design Facilities

Non existent at present. The only work of this nature is performed by the Toolroom Foreman on writing and size paper and can only be described as "dimensional sketches" lacking in necessary detail.

[illegible] to the [illegible] of [illegible] parts, were located and scrapped [illegible]. (Under the previous arrangement, [illegible] would have been made and passed to draughtsman for detailing. This does not apply at present.)

However, on examination of various moulds and existing drawings it was found that in some cases a problem had been created by the moulded area being too large for the machine capacity; in at least one other case the mould component was too long to be extracted from the mould after moulding. There are basic design faults.

In addition, the construction of moulds lacked knowledge of design detail, and were poorly constructed from a mechanical engineering standpoint. This has resulted in a minimal breakdowns and interruption of production. Most of the troubles were caused by not incorporating conventional standard mould design techniques.

A considerable number of moulds will need to be redesigned, modified, and/or produced new if production rate of (comparatively small at present) is reasonably increased.

(ii) Toolroom

A very small unit consisting of three machines, viz:-
One Universal Milling & Boring Machine.
One small Lathe.
One small Lathe.
An assortment of accessories, small hand tools, and measuring equipment.

With the exception of the universal milling machine, the machines are not adequate enough for toolroom work. One section also has access to a small shaping machine, (on site), a surface grinding machine, a radial arm drill, a [illegible] lathe capacity. All the latter are within the [illegible] organisation, but sited some miles away, in the main machine department of the printing factory.

A range of good quality imported alloy steel is available from a local supplier, also mild steel, and an inferior quality carbon steel (which is of local manufacture). The imported steels, being more expensive, tend to be used sparingly, this also being detrimental to good quality. Outside facilities, or companies, are used for the heat treatment of steel mould parts, where necessary.

Moulds are also made for the Yarn Shop by master tools here in Langho, these also being very cheap and not of good quality.

Five men are employed in the section, consisting of the foreman (who is also in charge of the moulding section), one senior toolsetter, and three toolsetters. The foreman is engaged on design work, quote, [illegible], and administrative

duties, the senior tools[illegible] relatively speaking, and the other three are [illegible] a standard.

The toolroom location is at the end of the [illegible] department, is separated from this by glass [illegible], and is air conditioned.

(iii) Moulding Department

Consists of four machines, viz:-

1 - 3 oz. injection machine with 30 ton locking pressure (Lux)
1 - 1 oz. injection machine (with 12 ton locking)
1 - 1 oz. vertical injection machine
1 - Vacuum thermoforming machine

The first two were supplied, [illegible] of moulds, and are of good quality, although servicing and maintenance [illegible] has been neglected. Certain control items are missing from the control panels of both machines, rendering them [illegible]. The absence of these items means that the machines cannot be put to optimum use. (Up until the service [illegible] were being operated in an unsatisfactory manner, with [illegible] moulding of poor quality. This situation has now been rectified as far as possible, and arrangements are being made to try and obtain the missing items.)

The machines are intended for [illegible] basis, capable of working 3 shifts, ie. 24 hrs/day, at present working approx. 23-30% capacity due to work not being planned to the maximum use by arrangements.

The vertical injection machine is [illegible] German origin, and of basic design only, with no refinements. It can [illegible] classed as a production machine, but is, nevertheless, used frequently for smaller moulds.

The vacuum forming machine is of good quality, but has had little use and is in almost "as new" condition. [illegible] material is bought locally from agents for the large chemical companies.

Personnel employed in the moulding dept consist of the technician, who sets the moulds and machines for operational use, and four operators. As already stated, the toolroom foreman is also in charge of this department.

3. Conclusions.

(i) The situation at present is not good but can be improved considerably, even in its present status, by the injection of knowledge and organisation.

(ii) However, the forward situation depends upon a number of things, not the least of which is how far it is wished to make the plastics section efficient, and particularly even in certain areas.

This, in turn, depends on:-

(a) Whether or not [illegible] wish to enter the [illegible] market [illegible] and [illegible] commercially [illegible], and possibly, moulding establishment.

(b) A decision by the Ministry of Education to bring primary schools into the [illegible] of being supplied with the kind of school equipment which is currently being supplied only to secondary schools. This would greatly increase the demand for products made by [illegible], including [illegible].

The second alternative would appear the [illegible], and the decision has been pending for some time.

(iii) (a) If it is decided eventually to incorporate [illegible], and the demand is increased, [illegible] may feel justified in expanding in certain areas, the first of which would appear to be the design section and the toolroom, as a greater input of knowledge, [illegible], and capital expenditure would be required here.

(b) If it is decided not to incorporate the primary [illegible], or no decision is reached, it is likely that the [illegible] status of the plastics section will remain the same. (N.B. please note that this is [illegible] opinion based upon economic logic and facts as they are at this time, the take off in plastic mouldings [illegible] relatively small.) In this case the comments in 3 (i) would apply, and [illegible] would [illegible] to improve the [illegible] as far as ever possible with the existing facilities and [illegible].

Signed : [illegible]
United Nations Industrial
Development Organization

Appendix 4

SCHOOL SCIENCE EQUIPMENT
ONG KARN KHA KURUSAPHA 52 Ladprao rd. Bangkok 10, Thailand
แผนก ผลิตอุปกรณ์วิทยาศาสตร์ องค์การค้าของคุรุสภา 52 ถ. ลาดพร้าว อ. บางกะปิ กรุงเทพฯ 10 โทร. 3777481

To: Khun Payong Padanupong: School Science Equipment
Ong Karn Kha

From: G. Abbott

Subject: Plastics Section

Date: 30 November 1981

1) (i) After working with this organisation for some months, the situation regarding the plastics section should be reviewed. In this appraisal, an attempt will be made to identify what I regard as problem areas. Some of the problems would be costly and difficult to eradicate, others relatively simple and cheap, but large or small, all have a direct bearing on the efficiency of the section. Recommendations are made here and have been made in previous documents dated 3/11/81 and 5/11/81, some of which would have to be decided by future OKK policy and strategy, but all are open to discussion, should any action be considered.

Firstly, a summary of the general situation is appended below.

(ii) Summary

As a company, Ong Karn Kha is faced with the problem that the small production requirements for any particular moulding, as estimated initially, do not justify the expense of building an expensive mould. Estimated average quantities range from 2,000 to 10,000, the lower figure taking the mould out of the prototype category, whilst the higher figure still does not justify an expensive mould.

Economics, therefore, based on the situation as it is at present, are dictating, to a large extent, the level of efficiency of the three main departments, design, toolmaking, and moulding; this applies to both personnel and equipment. The situation can be described as difficult is terms of attaining the desired standards, in that,

(a) to set up an organisation capable of efficient production in design, toolmaking and moulding would be expensive and difficult to justify under present conditions, particularly regarding equipment, and

(b) Without the organisation (applying mainly to personnel), and equipment, efficient production of designs, moulds, and mouldings is unlikely.

2) This paragraph attempts to identify the problems inrespect of the three main departments.

(i) Design Section

Until the advent of myself, design facilities were minimal. Sketches were made by the head of the plastics section, (this man being responsible for the toolroom and moulding machines) on small pieces of paper, these being used by toolroom personnel for machining and manufacturing purposes; the sketches reveal a lack of basic design principle knowledge, and constructional detail knowledge. (It should be noted that some of the unorthodox constructional methods used are necessary to accomodate the lack of manufacturing equipment, and the desireability of keeping costs as low as possible. Allowing for this, the lack of design experience is still obvious.)

No attempt was made to have the basic sketches expanded into working, numbered drawings from which records could be made and retained.

An attempt was made by myself to obtain the services of either the head of plastics section (Charoen) or the senior toolmaker (Pirawat) to be trained for full time designing, under constant instruction and supervision, as it was reasoned that during the period of assignment, enough knowledge could be imparted to enable continuity to be maintained, both men having the necessary foreknowledge and background. This would have meant probable organisational changes but in my opinion, the position created and the knowledge gained would, in the long term, have more than compensated for any temporary difficuties. As head of section, Charoen would have been particularly suitable, but displayed no interest. Pirawat was then assigned, but in a period of three weeks spent only two days with me, and indicated this was the probable pattern. Obviously, this was unsatifactory and the arrangement was cancelled. Other than these two, there is no one else of the required calibre available.

The present arrangement is that the basic designs are drawn by myself in general arrangement form, giving all details, measurements in scale, and this is then taken over by the office draughtsman (Thanee), who expands it into a series of numbered working drawings under my supervision from which prints can be made, and issued. Progress is now being made in the production of working drawings. However, as Thanee does not have the necessary background experience to be considered as a potential mould designer, capable of carrying on when my 12 months assignment is complete, it must be assumed that, under this present arrangement, the situation will revert to it's original form, with subsequent deterioration.

(ii) Toolroom

The quality of moulding tools produced in this department is low, compared to normal standards which apply in similar establishments in developed countries.

In my opinion, this is due to:-

(a) Lack of suitable mould making equipment.

(b) Incorrect mould design.

(c) Use of cheaper steels, and lack of heat treatment on mould components.

(d) Lack of supervision, resulting in faulty work and inaccuracy.

Discussing:-

(a) This has already been discussed in some detail in my communication to you of 5th November 81. To summarise - the range of equipment is insufficient for the correct and efficient manufacture of plastic moulding tools. The limited collective scope of machining operations which the equipment offers imposes limitations on mould design methods, methods of manufacture, and accuracy. (The 5th November communication presents a list of toolroom equipment which, in my opinion, is the minimum required.)

(b) This subject has also been discussed, in this communication, Para. 2) (i)

(c) In normal toolrooms producing plastic moulds, cost of material is approximately 15% of total cost. (This is, of course, an average figure.) Using cheaper materials reduces the figure to 8% - 10%. It is obvious that for large production type moulds it more economical to use better materials, and thereby reduce the production downtime caused by mould repairs and renovations. It is also more efficient - and essential - for some mould component pieces to be heat treated, to minimise wear and damage.

Since the initial production estimates in OKK are for between 2,000 and 10,000 (10,000 being on the high side) the moulds tend to be made from cheaper materials, and mould parts which should be heat treated are not. On even short production runs, there is mould damage caused by moving parts "seizing up", preventing operation of the mould; and wear damage which is manifested as "flash" on the mouldings, which should be unacceptable to the production assembly departments.

(Flash also occurs by reason of incorrect mould design and moulding techniques, thereby illustrating the interelationship between design, manufacture, and moulding.)

(d) One individual is officially in charge of the toolroom and moulding department (the plastics section). In addition to these responsibilities he is also involved in mould design (see para 2 (i)); designing (and manufacturing) equipment for use in the production shop, repairs to production machines, and works transport, prototype and development work for the production department, etc; In short, he either involves himself, or is put in the position of doing a number of jobs, for some of which the responsibility should be elsewhere.

This being the case, he cannot devote the necessary time to control mould making activities in the toolroom, and the moulding operation, resulting in errors and inaccuracies in mould manufacture going undetected, and production of poor quality mouldings. (The production of poor mouldings is encouraged by the fact that the production assembly departments accept anything produced by the moulding machines, poor quality, incorrect, or otherwise.)

(iii) Moulding Department

This is run by a foreman subordinate to the man in charge of the plastics section. It can be said that this department is, to some extent, a victim of what has happened previously in design and toolmaking, in that it's efficiency, and the quality of product is dependent, partially, on these two previous operations.

Making allowance for the faults caused by mould design and manufacture, however, again inadequate control of the department is evident; instructions are followed as long as I myself am in attendance, then disregarded, and mould settings and moulding conditions set are subsequently altered during production.

Instruction has been given to the machine setters and operators, moulding faults pointed out, experimentation to ascertain optimum possible moulding conditions carried out and remedies suggested. Fault finding charts have been issued, and printed sheets for recording moulding conditions supplied. At the time of writing only two of these sheets, half completed in a sketchy fashion, could be found.

The combination of faults caused by mould design and manufacture, and faulty mould settings and moulding conditions produce poor mouldings, the majority of which should be rejected.

3) Conclusions and Recommendations

(i) The purchase of mould making equipment is a policy matter to be decided by the management and prinapals of Ong Karn Kha, according to the importance which is placed on the section, both in the situation as it is now, and that in which it develops in the future.

(ii) It is recommended that a person with a suitable technical background be engaged to understudy myself in mould design, to provide continuity in this field. This position should be controlled directly by head of the School Science Equipment works, and not be responsible in any way to the head of the plastics section (toolroom and moulding machines).

(iii) To enable the man in charge of the "plastics section" (toolroom and moulding machines) to control and supervise adequately, and organise satisfactorily, these two departments, it is suggested that his time occupied by other duties - design, production work, development work, and general repair work, should be kept to a minimum, ideally abolished altogether.

With regard to the three latter categories, he should be involved only insofar as machining operations necessitating the use of specialist toolroom machines (eg. the Deckel FP1) are required, which should be infrequently.

(iv) It is recommended that a quality control department or section be created answerable directly to the works head, to inspect and check production from the moulding machines, working by criteria and standards established by management. If standards were correctly set, and adhered to, rather than the preseat attitude of "anything will do" being applied, there would be an immediate beneficial effect on the efficiency of the moulding department and toolroom, resulting in better quality work and product.

(v) Finally, it is pointed out that recommendations (ii)(iii) and (iv) could be implemented in the situation presently pertaining, at a comparatively low cost.

George Abbott
UNIDO-T.A. Expert

c.c. Khun Kamthon Sathirakul, Director of Cng Karn Kha

Appendix 5

SCHOOL SCIENCE EQUIPMENT
ONG KARN KHA KURUSAPHA 52 Ladprao rd. Bangkok 10. Thailand
แผนก อุปกรณ์วิทยาศาสตร์ องค์การค้าของคุรุสภา 52 ถ. ลาดพร้าว อ.บางกะปิ กรุงเทพฯ 10 โทร. 3777481

To: Khun Payong Padanupong

From: G. Abbott, UNIDO T.A. Expert

Subject: Toolroom

Date: 5 November 1981

At present there are 4 machines in the Toolroom, viz:-

1 small universal milling machine
1 small lathe
1 small/medium sized lathe
1 small pillar drill
Sundry hand tools and measuring instruments.

There are no heat treatment facilities.

In my opinion, the above range of equipment is insufficient for the correct and efficient manufacture of plastic moulding tools. The limited collective scope of machining operations which the equipment offers imposes limitations on mould design methods, methods of manufacture, and accuracy. In order to overcome these built in faults, the moulds are often operated under less than optimum conditions, resulting in poor quality mouldings.

I append, therefore, a list of equipment and machines which I consider to be a minimum for the manufacture of good quality plastic moulding tools. To understand the choice of machines would necessitate a knowledge of design and manufacturing techniques not usually possessed by non-technical personnel, therefore, a simple explanation is given for each choice.

TOOLROOM EQUIPMENT

1) To machine mould plates to external sizes and approximate thickness requires either a horizontal or universal milling machine, or a shaping machine.

   Of these, a universal milling machine is considered more suitable for two reasons:-

   (a) If fitted with a suitable cutting tool, the rate of metal removal is faster than that of a shaping machine, therefore, cheaper.

   (b) A machine of this type and size is required for many other milling operations in a toolroom, besides mould plate machining.

   ie. this is a versatile machine, a necessity in a toolroom, as opposed to a shaping machine which is limited to one type of operation only.

Therefore a Universal Milling machine, size approximately 10"/12" x 36" is recommended.

2) The accuracy of plate thickness measurements in a mould is important, with regard to obtaining both the required dimension, and the parallelism of the plate. A surface grinding machine, of a size large enough to process mould plates approximately 10" x 15" (in plan view) is required, and a machine of size approximately 12" x 36" is recommended.

N.B. Most surface grinding machines have a long, narrow machining capacity; in the manufacture of mould plates then, the width is fully utilised, whilst the length is not. Machines having a more square working area, (which are obtainable) ie. approx. 25" x 40", are more suited for mould work. However, machines of this type are usually very large and a little more expensive.

3) In addition to 2), a smaller surface grinding machine, size 6" x 18" is recommended. This is used for processing smaller pieces such as mould inserts, (pieces from which the moulding cavity and core are assembled in many cases.) which are, on occasions, of a very small size, for which 2) would be unsuitable.

4) Of the more important operations in mould manufacture, an ability to fit hardened cylindrical components into the mould with absolute diametrically dimensional accuracy is essential. This applies to guide bushes and guide pillars, which have to ensure the correct location of one half of the mould to the other, the fitting of cylindrical inserts into the mould bolster, and often the fitting of cylindrical smaller inserts into the main mould inserts. All these components require to be heat treated (hardened) to ensure minimum wear and low susceptibility to damage, and the heat treatment processes usually produce slight dimensional changes in the component. When in the hardened condition they cannot be machined by ordinary high speed cutting tools, and have to be processed by cylindrical grinding. A universal cylindrical grinding machine, size 6" x 18" or 6" x 27" is regarded as an essential piece of equipment. This will perform internal and external operations and taper grinding when fitted with a swivelling table and backslide.

5) In the amount of components in a moulding tool, there are usually a large number of small diameter items, such as guide pillars and bushes, ejector pins, return pins, small moulding pins (ie., forming circular recesses and holes in the moulded component) etc.,

To manufacture these efficiently, a small S.S. & S.C. lathe is required, size approximately 4" - 4½" centre height, and of good quality (toolroom standard).

6) To enable larger turning operations to be carried out ie. larger type circular inserts, mould locating rings, boring out cavity plates, core plates, back plates, and similar, larger lathe capacity is needed. Ideally, this larger lathe should have a "gap bed"; that is, part of the lathe bed upon which the lathe saddle travels, is cut away at the

headstock end, to enable mould plates to be mounted off centre on the lathe faceplate, without fouling the machine when rotating.

It is suggested that a heavy duty, robust machine of approximately 7½" centre height would be suitable.

7) A variable speed pillar drill is required with a capacity of approximately 25 mm. This is used for drilling operations of a general nature-clearance holes, counterbores for fastening screws, etc;

8) In addition to 6) a small fast variable speed drill is required, capacity up to approximately 8 mm. This again is used for general drilling operations of a smaller diameter than 6).

Note: All the foregoing equipment is capable of what are termed "conventional machining operations". However, in a toolroom which produces moulds for plastic components, it is necessary to have one or two specialist machines, as the shape of the moulding itself often-very often-requires mould cavities and cores (which form the actual moulding shape) of shapes which are not producable by conventional machining.

There are two types of machines of this sort, each working on different principles:-

(a) Spark Erosion Machines (Electrical Discharge Machining or E.D.M.)

These are machines which can form complicated shapes in steel from a master which is the reverse of the shape required. The master is made from conductive material, and is set vertically in close proximity to the workpiece. A current is then passed between the two, the master being one electrode and the workpiece the other. As the current passes, steel is eroded from the workpiece in an exact reverse shape to that of the master.

This process can be performed on annealed (soft) steel, or steel which is in the heat treated (hardened) condition.

(b) Die Sinking Machines

These are machines which can operate on steel in the annealed condition only. The principle is that of a stylus following a master shape, whilst a cutting tool operating on the workpiece simultaneously reproduces the movement of the stylus, and thus generates in the workpiece the shape of the master.

9) It is recommended that a Die Sinking Machine be acquired as the ability to reproduce non geometrical, awkward shapes in a cavity block, or on core pieces, is regarded as essential to the successful operation of a toolroom.

The Die Sinking Machine is preferred, at this stage, to the E.D.M. machine on the grounds of keeping capital outlay as low as possible, E.D.M. machines usually being very costly.

The machine envisaged can also be used as a light vertical milling machine and a specialist engraving machine.

10) Along with 9) a small specialist cutter grinder would be required to produce cutting tools of the required shapes and sizes for the die sinking machine. These are manufactured by the companies making the die sinkers, particularly for those machines. It can also be used for making form cutters for use in lathes, and in the conventional milling machines.

11) A tapered double ended fast spindle, used for holding polishing mops would be required (this to reproduce the correct type of surface on the parts of the mould which form the moulded component). Also a quantity of polishing soaps and materials (classed as consummable items).

In addition to the machines recommended, wooden benches would have to be made for the toolmakers to work on, and a range of small hand tools, and cutting tools provided files, polishing equipment, small hammers, centre punches, toolmakers vices, measuring equipment, surface plates, etc;.

Small Universal Milling Machine

To supplement the range of milling operations performed by 1), a smaller machine, of the same general type is required. This should be capable of accurate working in smaller dimensions, and should be as versatile as possible. Such a machine is already installed in the C.K.K. toolroom-good quality, versatile, and in good condition:- and would be a considerable asset in any toolroom.

However, being a small, light machine, it is not meant to be used for heavier milling operations necessitating large stock removal (this type of operation should be performed by 1)) and will deteriorate if used consistently for heavy work.

Heat Treatment

To any medium or large sized toolroom ie. 25 - 50 personnel, a heat treatment dept/is considered essential. However, this is a very small unit, and as long as heat treatment facilities for moulds and mould parts can be obtained from commercial organisations outside the C.K.K. the expense of installing a dept. can not be justified.

A consideration which has to be taken into account, however, is that outside heat treatment services are usually expensive compared to in house ones. If, in the event that the unit ever expands to reasonable size, current costings should be examined, and the possibility of creating such a department looked into.

Costs:

A rough estimate of cost is appended for each item of equipment in the foregoing list.

As quotations have not been obtained (except for two items), and prices vary considerably depending on quality and sometimes country of origin, it is emphasised that these prices can be only approximate. They are, however, sufficiently accurate to form a basis for discussion, should this be considered necessary.

	Baht
1) Medium sized Universal Milling Machine	1,200,000
2) Medium sized Surface Grinding Machine	800,000
3) Small Surface Grinding Machine	500,000
4) Universal Cyl. Grinding Machine	800,000
5) Small lathe	300,000
6) Medium Sized lathe	600,000
7) Pillar Drilling Machine	120,000
8) Bench Drilling Machine	75,000
9) Die Sinking Machine, plus	
10) Die Sinking Grinder	500,000
11) Polishing Spindle	Installed
12) Small Universal Milling Machine	Installed
Total	4,895,000
Extra Equipment (est. 20%)	1,000,000
	5,895,000
Small Tools, Measuring Instruments	200,000
	6,095,000

Comment

In the event that it is decided to create an efficient toolroom in O.K.K. some machines already in the possession of the organisation may be suitable for incorporating in the department.

These include (a) the larger lathes installed in the printing plant at Lad Phrao, (b) the surface grinding machine in the same place. (c) the small shaping machine installed at Soi Sailom. (d) the lathes now in the toolroom at Soi Sailom, and (e) a small pillar drill at Soi Sailom.

However, there are two considerations:-

(a) the condition of the machines - toolroom work is, or should be, of a highly precise nature.

(b) Size requirements - the size of machine should be examined as to it's suitability for performing the operations required.

It may be possible to incorporate some, or all, of these in the initial stages, but if found to be unsuitable for either of the above reasons, should be regarded as only as a temporary measure, and the attached list of equipment should again be consulted.

Appendix 6

SCHOOL SCIENCE EQUIPMENT
ONG KARN KHA KURUSAPHA 52 Ladprao rd. Bangkok 10, Thailand
แผนก ผลิตอุปกรณ์วิทยาศาสตร์ องค์การค้าของคุรุสภา 52 ถ. ลาดพร้าว อ.บางกะปิ กรุงเทพฯ 10 โทร. 3777481

To: Khun Payong Padanupong

From: G. Abbott, UNIDO. T.A. Expert

Subject: Stand Mould Bolsters

Dates: 3/11/1981

As we discussed, the manufacture of comparatively costly good quality moulds, correctly designed and well made, up to accepted normal standards, is not economically viable, considering the small amount of production required from any particular mould.

It is proposed therefore, to design, detail & manufacture a series of standard bolsters for each of the two Engel moulding machines.

These bolsters will be made from good quality materials, heat treated where necessary, and possible, and it is expected that each will accomodate six to eight sets of inserts, each set moulding a different item.

There are three advantages:-

1) The cost of each bolster will be amortised between all the sets of inserts which it accomodates.
2) The delivery time for the production of new items will be reduced, as only a set of inserts will be required.
3) The quality of mouldings should improve, and the moulding operation should be facilitated by the use of good quality moulds.

It is planned that the following standard bolsters be designed and manufactured:-

1) For the 83 gm. Engel

(a) 2 Plate Bolster (Rectangular inserts)
(b) 3 Plate Bolster (" " ")
(c) 2 Plate Stripper Plate Bolster (Rectangular inserts)
(d) 2 Plate " " " (Circular inserts)
(e) 3 Plate " " " (Circular inserts)

This range may be extended later if desirable to include:-
(a) 2 Plate Bolster (Circular inserts)
(b) 3 Plate Bolster (Circular inserts)
(c) 3 Plate Stripper Plate Bolster (Rectangular inserts)

2) For the 23 gm. Engel

Exactly as range for 83 gm. Engel.

Will you please approve the above proposal, and/or discuss further, if necessary.

George Abbott

Appendix 7

SCHOOL SCIENCE EQUIPMENT
ONG KARN KHA KURUSAPHA 52 Ladprao rd. Bangkok 10. Thailand
แผนก ผลิตอุปกรณ์วิทยาศาสตร์ องค์การค้าของคุรุสภา 52 ถ.ลาดพร้าว อ.บางกะปิ กรุงเทพฯ 10 โทร. 3777481

28 October 1981

The Director
Central Institute of Plastics Engineering & Tools
Guindy
Madras
S. India

Dear Sir:

I write on behalf of the management of this company to enquire whether you would be willing to participate in our training programme by accepting a man for 3 months training in your institute, mainly in the toolroom department.

The man is a Thai national, graduate industrial engineer, English speaking, and has experience with machine tools, shaping and milling machines, lathes, small tools, etc., and making moulds for plastic products.

This is a fellowship sponsored by the United Nations Development Programme (U.N.D.P.) and administered by the United Nations Industrial Development Organisation, (U.N.I.D.O.). The person concerned would be self supporting, and you would not be involved in any costs.

Please inform us:-

(a) Whether you would be willing to accept him.

(b) If there are any periods which would be either suitable or unsuitable for you.

(c) Whether there would be any charges for the training.

Your early reply would be appreciated.

Yours faithfully,

George Abbott
U.N.I.D.O. T.A. Expert

George Abbott
U.N.I.D.O. T.A. Expert
School Science Equipment
38 Soi Sailom, Paholyothin 8
Bangkok 4, THAILAND

CIPET

CENTRAL INSTITUTE OF PLASTICS ENGINEERING & TOOLS
GUINDY, MADRAS-600 032.

Grams : CIPET, MADRAS
Phone : 432371 / - 2 - 3 - 4

Ref. No : Trg/81

Date : 30/11/1981

Mr George Abbott
U.N.I.D.O. TA Expert
School Science Equipment
Ong Karn Kha Kurusapha
52 Ladprao rd.
Bangkok 10
Thailand

Dear Sir,

We write to acknowledge with thanks the receipt of your letter of 28th October 1981 wherein you had requestedus to provide training to a Thai Nationals in our Institute for a period of three ~~yr~~ months.

CIPET will be happy to provide training to this individual in the tool room department. In fact, CIPET is presently training two batches of Bangla Desh Nationals and one UNIDO fellow from Trinidad. UNIDO is bearing the tuition fee of Rs 2700/- per month as well as meeting Boarding & lodging expenses apart from paying directly to the fellows out of pocket expenses. We shall be providing training programme as at present arranged for the other UNDP fellows sponsored by UNIDO. It would facilitate clearance from the Government of India if this training is also sponsored through the UNIDO.

Incidentally, we propose to train two UNIDO fellows commencing from the first week in January 1982 and if this individual could also join them, it will be easier forus to tailor a programme for all the three candidates.

Thanking you,

Yours faithfully,

APKrishnan

A.P.Krishnan
Director

SCHOOL SCIENCE EQUIPMENT
ONG KARN KHA KURUSAPHA 52 Ladprao rd. Bangkok 10, Thailand
แผนก อุปกรณ์วิทยาศาสตร์ องค์การค้าของคุรุสภา 52 ถ. ลาดพร้าว อ.บางกะปิ กรุงเทพฯ 10 โทร. 3777481

Sri A. P. Krishnan
Director
Central Institute of Plastics Engineering & Tools
Guindy
Madras 600032
S. India

Bangkok, 14 December 1981

Dear Sir,

RE. TRAINING FELLOWSHIP

We acknowledge with thanks your letter of 30/11/81, in reply to our query.

We are grateful for your acceptance of this fellow for toolroom training. Unfortunately, it will not be possible to obtain clearance from the appropriate department in the Thai government, and secure the necessary documents, etc; from UNIDO in Vienna, in time to take advantage of your programme beginning the first week in January 1982.

We would enquire, therefore, if it is possible for you to accept him to commence training sometime around mid-1982, the date to be decided by your goodselves to suit your convenience.

We would enquire also if hostel facilities are still available in the CIPET.

Thanking you,

George Abbott
Plastics Production Technician
Project THA/74/024

UNDP/ UNIDO PROJECT THA / 74 / 024
PRODUCTION OF SCHOOL SCIENCE EQUIPMENT
THAILAND

Ref: Training Fellowship

Date: 7 April 1982

Subject:

Mr. A. P. Krishnan
Director
Central Institute of Plastics Engineering and Tools
Guindy
Madras 600-032
S. India

Dear Sir,

We beg to draw your attention to our letter dated 14.12.81 regarding the training fellowship awarded to a technician in our employ.

You agreed to accept this individual in your institute for training (your letter dated 30/11/81).

May we now further enquire when it would be possible for him commence his training with you, bearing in mind that we should require approximately 4 months notice to initiate and complete the necessary formalities and documentation.

Yours faithfully,

George Abbott
Plastics Production Technitian
UNIDO Project THA/74/024

UNDP/ UNIDO PROJECT THA / 74 / 024
PRODUCTION OF SCHOOL SCIENCE EQUIPMENT
THAILAND

Ref: Date:

Subject:

To: Pajong Palamupong, Head S.I.E. DKI

From: G. Abbott, UNIDO P.I.

Subject: Charoen Grisiri - Fellowship

Date: 2 June 1982

Would you please request Khun Charoen to submit Charoen's file to D.I.E.T. for a language test. If he is successful, the necessary application forms can then be issued and action initiated through UNIDO Vienna.

G. Abbott
Plastics Production Technician

UNDP/UNIDO PROJECT THA/74/024
PRODUCTION OF SCHOOL SCIENCE EQUIPMENT
THAILAND

Ref:

Date: 4 June 1982

Subject:

To: Fellowship Unit
UNDP Ratchadamnoen Ave.
Bangkok

From: George Abbott, UNIDO T.A. Expert
School Science Equipment Factory, Ong Karn Kha Kurusapha
Bangkok

Subject: Charoon Sriairi, Engineering Fellowship Candidate

I enclose copies of all correspondence which has taken place up to now regarding this fellowship.

Following your advice, I have sent a request for a language test for this man, by DTEC, to the Head of the SSE factory, upon which satisfactory result the nomination forms can be initiated.

It is likely that I will have to leave the matter in your hands for completion as I will be leaving Bangkok at the end of July.

George Abbott
UNIDO T.A. Expert

Appendix 8

SCHOOL SCIENCE EQUIPMENT
ONG KARN KHA KURUSAPHA 52 Ladprao rd. Bangkok 10. Thailand
แผนก ผลิตอุปกรณ์วิทยาศาสตร์ องค์การค้าของคุรุสภา 52 ถ. ลาดพร้าว อ.บางกะปิ กรุงเทพฯ 10 โทร. 3777481

To: P. Padanupong, Manager School Science Equipment

From: G. Abbott, Plastics Production Technician, UNIDO

Date: 14th April 1982

It would be advantageous for you to study the range of small "MANUMOLD" moulding machines for possible future reference.

These range up to 3 oz. (84 gm.) shot capacity, are semi-automatic, and use less sophisticated (therefore cheaper) moulds than our present Engel machines, which are high production types requiring expensive moulds.

The "Manumold" machines occupy approximately the same space as an office desk, and, in my opinion, would produce a large percentage of our type of production more efficiently and cheaply than our present equipment.

I have, therefore, drafted a letter to Florin Ltd. (Manumold Div.) for your signature.

George Abbott
Plastics Production Technician

SCHOOL SCIENCE EQUIPMENT
ONG KARN KHA KURUSAPHA 52 Ladprao rd. Bangkok 10, Thailand
แผนก อุปกรณ์วิทยาศาสตร์ องค์การค้าของคุรุสภา 52 ถ. ลาดพร้าว อ.บางกะปิ กรุงเทพฯ 10 โทร. 3777481

FLORIN LTD. (MANUMOLD DIVISION)
457/463 CALEDONIAN RD.
LONDON N7 9BB
ENGLAND

Dear Sirs,

We would be grateful if you would send us descriptive literature showing your range of machines.

At this point we do not require formal quotations but it would be appreciated if you gave approximate ruling F.O.B. prices with each model.

Yours faithfully,

P. Padanupong

Payong Padanupong
Manager School Science Equipment

Payong Padanupong
Manager School Science Equipment
Ong Karn Kha Kurusapha Prasumaine
5 Prasumaine Road
Pranakorn, Bangkok 2
THAILAND

Appendix 9. Number and type of moulds Designed

Standard Bolsters.

SB 1. 2 Plate Bolster. 3 oz Engel (Rectangular Inserts)
SB 2. 2 Plate Bolster. 1 oz Engel (Rectangular Inserts)
SB 3. 3 Plate Bolster. 1 oz Engel (Rectangular Inserts)
SB 4. 2 Plate Stripper Plate Bolster. 3 oz Engel (Rectangular Inserts)
SB 5. 2 Plate Stripper Plate Bolster. 1 oz Engel (Rectangular Inserts)
SB 7. 3 Plate Stripper Plate Bolster. 1 oz Engel (Circular Inserts)
SB 8. 3 Plate Bolster. 3 oz Engel. (Rectangular Inserts)

Moulds.

Mould Nº 1001	1 Impression Electrical Cover.	3 oz Engel
Mould Nº 1002	4 Impression Spherical Lens.	1 oz Engel
Mould Nº 1003	Length Comparator Blocks. (10 type composite mould)	3 oz Engel
Mould Nº	8 Impression Spherical Lens. (Subsequently advised not needed)	1 oz Engel
Mould Nº 1004	4 Impression Magnet Holder (Inserts fitting S.3. 5)	1 oz Engel

Appendix 10

Quality Control of products manufactured by the School Science Equipment factory (S.S.E) of the Ong Karn Kha Kurusapha (O.K.K) organisation, in conjunction with the Institute for the Promotion of Science and Technology (I.P.S.T)

Prepared for UNDP/UNIDO by J. Abbott: C. Eng: M.I. Mech E:
UNIDO T.A. (Plastics) 18/6/82

This report was prepared at the request of Mr. W. Millaner (SIDFA, UNDP/UNIDO: Bangkok) and attempts to expand comments and recommendations in the Industrial Design Expert's (Mr. K. Hofmann) terminal report.

1. Quality Control (Q.C.) operation at S.S.E.

(i) The position of quality controller/inspector in the S.S.E. factory does officially exist, in the form of one individual. This man has little or no experience in Q.C., and is responsible to the Production Controller, who, in turn is responsible to the Head of Production at S.S.E.

The Production Controller is, or appears to be, second in command to the Head of Production, and completed a 3 month study tour of Q.C. methods in Japan. (Aug.-Oct. 1978)

(ii) In itself, the fact that Q.C. is responsible to Production Control in the chain of organisation is wrong. It should be directly responsible to the Head of S.S.E. Production Control having a possible vested interest in some situations.

(iii) The Q.C. man is employed for the majority of his time in job preparation, not Q.C.: Estimated at 90%+.

(iv) The quality and correctness of assemblies, and of individual components making up the assemblies lies, therefore, mainly in the hands of the heads of the various manufacturing departments and their staff. Past experience indicates that this system is extremely fallible. Occasionally one of the team of industrial designers will pick out an item or assembly ready for despatch, and check it.

2. As it is presently organised then, the system has three disadvantages:-

(i) Q.C. is responsible to Production Control, and can be overruled by them. This can encourage the manufacture of faulty product in order to maintain delivery schedules.

(ii) There is no check or inspection of bought out items coming into the factory. This can result, and has resulted, in items being assembled with faulty components; especially electrical components.

(iii) The system relies heavily on the competence and concientiousness on the heads of manufacturing and assembly departments and their staff, and on their continuing prescience at the scene of operations.

(i) and (iii) are the more important, although in the case of (ii) routine percentage checks should be instituted.

3. <u>I.P.S.T. participation in Q.C. of items produced by S.S.E.</u>

(i) It has in the past been suggested that, since I.P.S.T. is the original designer, it should share responsibility for Q.C. This suggestion is given a qualified endorsement, as the main responsibility should lie with S.S.E., as manufacturers. In it's own interest however, after approval of samples produced by standard manufacturing methods, I.P.S.T. should institute random back up checks and inspections whilst the items are in production, (O.K.K. being in the position of manufacturing and selling agents for I.P.S.T. designed product, and faulty product could reflect on the reputation of I.P.S.T.). If checks were made at irregular, frequent

intervals, it would provide I.P.S.T. with first hand information of the manufacturing standard being achieved before distribution to the user; and help to maintain the efficiency of S.S.E. Q.C. operations.

If a permanent position were established, it could also be used to visit the educational establishments supplied, to obtain and evaluate user reaction.

(ii) A meeting took place between Dr. Nida (Director, I.P.S.T.), three I.P.S.T. senior staff, and the writer on 14th June 1982.

In the meeting, Dr. Nida stated that the standard of items manufactured by S.S.E. was unsatisfactory, almost always due to faulty workmanship. (Example quoted), and this situation had existed for a number of years. In the monthly co-ordinating committee meetings, in which I.P.S.T., O.K.K. S.S.E. and the Ministry of Education are represented, the question of Q.C. had repeatedly arisen, and been discussed, with no apparent resultant action.

It was also Dr. Nida's opinion that the main responsibility should be with S.S.E.

Repeated complaints were received by I.P.S.T. regarding equipment failure when in use. (It is noted that O.K.K./ S.S.E. supply approximately 40% of equipment, other contractors supplying the rest.)

The I.P.S.T. members were then appraised of the current Q.C. organisation and working arrangements, and expressed the hope that an improvement could be accomplished: they also pointed out that there had been many meetings in the past between UN experts, and IPST and O.K.K. representatives regarding standards and Q.C., in addition to the monthly co-ordinating committee meetings, with no resultant action or improvement in standards.

An organisation chart, already prepared in rough by the writer, showing the theoretically correct sequence of events involving IPST and S.S.E., after the original IPST product design, was outlined to the meeting, this being based on what has become an accepted procedure in industry.

In referring to the chart, Dr. Nida said that IPST had no budget for a Q.C. post, and the back up check as already outlined by the writer would have to be undertaken by a member of her staff. It was stated that this suggestion had been made and agreed by IPST and O.K.K./S.S.E. in the May co-ordinating committee meeting. (This presumably after studying Mr. Hofmann's report.)

There followed a short discussion on Production Forecasts, the relevance being that quantity of product required can affect design, and methods of production; including Q.C. equipment and methods.

Dr. Nida stated that all they were required to do was to recommended the number of product units per class, and the actual quantity was not decided by IPST.

4. Product Specification

(i) Complete specifications for all existing products, equipment, and component parts thereof manufactured by S.S.E. are in existence, these being prepared prior to production, and after IPST approval is obtained.

5. Conclusions and Recommendations.

(i) From statements by IPST, and from the writer's personal experience, there is a need for a Quality Control unit in the S.S.E. As in all companies, it will be necessary to tailor the unit, in terms of manpower and equipment, to the range and volume of product, and although the range is diversified not all items are in production at the same time. There is, however, the inspection of inward goods to consider.

As complete product specifications exist, it is recommended that one person with Q.C. experience and qualifications be recruited initially, rather than use one with product knowledge but no Q.C. experience and it would be desireable for this individual to have some experience of the standards required in the production of plastic mouldings. This man, using his experience would found the unit and develop it as necessary to encompass the range and volume of S.S.E. production, and it is a probability that it would need expanding to take in another inspector when fully operational, and assuming the production range and volume existing at present.

Future product range and volume expansion would dictate future Q.C. requirements, in common with all other departments.

(ii) If it is considered that the private sector would provide the best background for Q.C. personnel, difficulty may arise in recruiting from it. Unless this problem can be overcome, and if a suitable alternative cannot be found, it is recommended that UNDP assistance be requested in setting up the unit and training personnel. In this case a 12 month period for installation and personnel training should be considered.

(iii) The S.S.E. Q.C. unit should be responsible only to the Head of S.S.E.

(iv) In view of Dr. Hida's remarks (para. 3) it would appear that IPST have agreed in principle to share, to some extent, in Q.C. operations. To what extent the suggested method (ie. that an IPST staff member visit the S.S.E. factory at intervals) will be successful has yet to be ascertained. Two potential drawbacks can be foreseen:-

(a) In time, the visits may become less frequent, due to pressure of work on IPST staff.

(b) It would be natural for the person involved to concentrate largely on the functioning of the equipment, rather than the mechanical construction; and unless checks were made on this, he would be relying on-information given to him by Q.C. in S.S.E.

It is recommended, therefore, that in spite of financial constraints on IPST mentioned earlier, someone with Q.C. experience be used by them.

Preferred System