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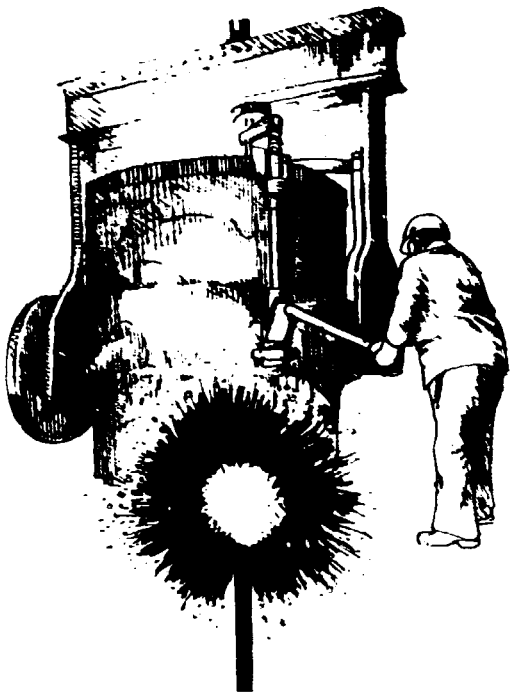

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MODERNISATION OF FOUNDRY INDUSTRY
REPUBLIC OF INDONESIA
DP/INS/88/019

PREPARATORY ASSISTANCE STUDY
UNIDO CONTRACT NO 88/106

MAY 1989

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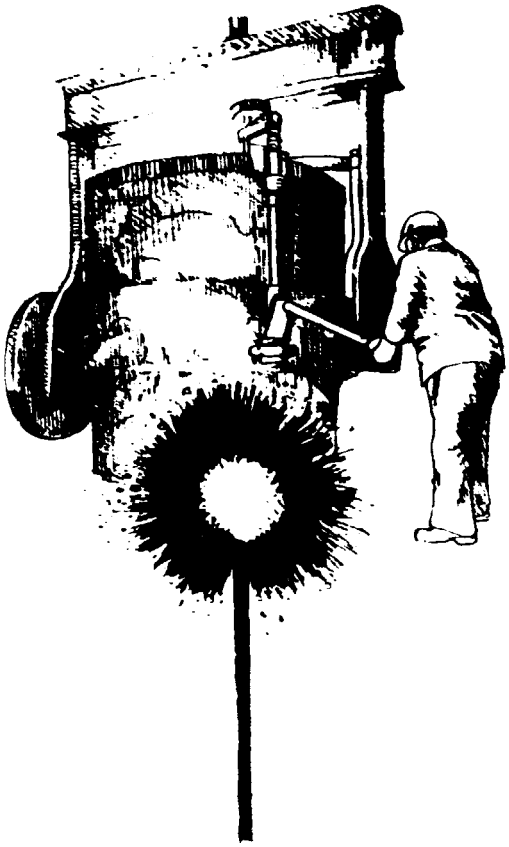

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PREPARATORY ASSISTANCE STUDY

MODERNIZATION OF FOUNDRY INDUSTRY
INDONESIA

INS/88/019

FINAL REPORT

BY

PETER LAMB
DEREK WATSON
JAMES WELSH

FOUNDRY & MANAGEMENT EXPERTS

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION

EXECUTIVE SUMMARY

The Government of Indonesia has laid great emphasis on industrialisation in the country and the engineering sector has been given high priority for development both in the public and private sectors. Priority has been given to the promotion of local manufacture of industrial machinery. Most of this equipment incorporates foundry products and therefore the foundry industry is an essential infrastructural component for the development of the engineering sector. Its existance permits this sector to operate with a great flexibility in the response to design changes and the introduction and development of products. The absence of a proper foundry industry will therefore clearly inhibit the growth of this sector.

There are approximately 130 foundries within Indonesian of varying sizes with a licenced capacity of 98,000 tonnes per year. Current output is approximately 50,000 tonnes per year of which 92% is produced by the private sector. It is estimated that this production is only a third of the country's casting requirement and that the locally made castings are of low complexity and poor quality with 75% of indeterminate specification.

There has been considerable investment in modern equipment but many installations are unbalanced and the skills and technical knowledge to use this plant, equipment and processors is poorly understood. Furthermore, the lack of good financial and general management practices leaves the industry in a precarious position. Poor quality and limited reverse engineering skills have greatly restricted the penetration of a growing casting market.

Lack of market information on which to properly assesscapital investment has often resulted in inappropriate installation of equipment which in turn has restricted the increase in output and the development of higher quality castings.

A major effort is required to produce an urgent solution to these problems in order to begin to answer the requirements of the consumers of cast products.

The necessity to obtain a rapid and enduring solution and the nature of the problem, require that assistance be given directly to the foundries by providing 'hands-on' technical and management expertise. The private sector (the major casting producer) has been chosen as the immediate beneficiary of this assistance. The two major centres of Jakarta and Surabaya, which account for some 65% of casting production, have been selected and within each region those foundries which offer the best combination of installed capacity and technical and management ability have been chosen to participate in the project.

At each centre a lead foundry has been selected which will have a resident team of three experts covering the disciplines of foundry and methods engineering, metallurgy and patternmaking.

Two additional experts will be provided, a Chief Technical Adviser for overall coordination, casting market development and the planning of an institutional framework to aid the ongoing improvement of the foundry industry and a Financial and Management Expert to review and install new financial, cost and management systems.

It is proposed that at the end of the two year project, some 8 to 12 foundries, which are estimated to provide 40% of the present castings production will have been brought into line with modern, internationally accepted operations. These plants will be manufacturing more technically demanding products and will have the ability to develop further and to widen their activity in the market.

ACKNOWLEDGEMENT

The Study Team wish to express their appreciation to all interviewed parties for their help and assistance given during the field work in Indonesia.

In particular to Mr S Prawiroadiredjo (Director General), Ir. H. Mohammad Toyib (Director of Basic Metals and Machinery) and the staff members of the Ministry of Industry for their close interest and instructive support.

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1. INTRODUCTION

The Government of Indonesia has accorded high priority to the development of the engineering industry with a targetted annual growth rate of 17%. Priority is given to the promotion of local manufacture of machinery and equipment much of which uses foundry products. Recent reports have shown that both casting quality and limited product range are a major constraint on this development. It is generally accepted that there is an urgent need to improve technology and upgrade skills in the foundry industry to assist penetration of a largely unsatisfied local market. Bilateral agreements have been already planned to assist the state-owned sector of the industry but most of the foundries are in the private sector and it is here that development assistance is most needed.

It has been proposed that a project of technical assistance to help the modernisation of the sector concentrates on a selected group of enterprises which are considered most promising both from the view of managerial abilities and interest as well as the existance of minimum technological equipment to ensure satisfactory results.

The study team, comprising of experts disciplined in foundry technology, marketing, financial and general management were charged with carrying out an audit of the existing levels of technology, operational skills, management practices, maintenance practices, and product assortments. A selected number of foundries were chosen in the Jakarta and Surabaya industrial areas of Java in order to indentify the most promising companies for the proposed direct technical assistance. One foundry in each location has been selected as a lead enterprise and will be the initial beneficiary of the assistance.

These companies are required to cooperate in the retraining of skilled personnel and management from other nominated foundries who will progressively through the project programme also receive similar direct technical and management assistance.

This is a report covering this modernisation programme and includes a work programme and draft project document prepared with the assistance of the Ministry of Industry (Directorate General of Machinery and Basic Metals), the Foundry Association and UNDP/UNIDO staff members.

The terms of reference for this Preparatory Assistance Study are contained in Appendix 1 of the report.

2. SELECTION OF FOUNDRIES

On arrival in Jakarta a meeting was arranged by the Ministry of Industry and the Foundry Association at the offices of the Ministry of Industry to discuss the team's schedule of visits.

This meeting was attended by the Directorate General, Mr Soeparno Prawiroadiredjo and the Director, Mr. Toyib, along with Mr. Narasimhan SIDFA-UNIDO and approximately 30 representatives of foundries all being Association members. At this meeting a general programme of visits was discussed and outlined, with the Ministry and the Association recommending the foundries to be visited. This information and schedule to be confirmed and finalised the following day at a meeting with the Foundry Association.

A meeting was held at the Association chaired by Mr M. Bachtiar current Association Chairman. The Ministry of Industry were represented and approximately twenty people representing Association Members.

At the meeting the list of Foudries to be visited was completed and a timetable of these visits was drawn up. The visits originally were to be only in two locations that of Jakarta and Surabaya but the Director of the Ministry of Industry and the Foundry Association recommended that visits be made to other areas to see a broader range of foundries and to give all of the Association Members an opportunity to have their individual foundries visited by the study team.

The team agreed and these visits were included in the schedule. The extra locations agreed were Jogyakarta, Semarang, Tegal and Bandung. Further visits were later scheduled to the Bandung Institute of Technology, the Metal Industries Development Centre and the Politeknik Mekanik Swiss.

The visits were confirmed by the tne Association and the Ministry, however the Team requested that if possible it would like to visit additional Foundries while in the Surabaya Area. This eventually added four further Foundries to the schedule.

The Team were given, by the Ministry of Industry, a copy of a draft report dated January 1989 containing basic foundry data collected by a team from the Technical Co-Operation-Federal Republik of Germany and this report was used to cross check that the visits scheduled covered an acceptable percentage and range of the foundries in Java. From this report and subsequent visits, the team estimated that the foundries visited accounted for approximately 60% of the casting output of Indonesia.

Additional visits by the team included machine shops either as part of a foundry or independent, to view the range of machining facilities and review the quality of castings after machining

A complete list of organisations and companies visited is contained in Appendix 2.

3. CURRENT FOUNDRY STATUS

The foundries visited ranged from state owned enterprises, joint-venture companies with a foreign interest, private Indonesian companies and cottage-type units. Facilities ranged from high pressure moulding lines to simple hand moulding jobbing shops. This wide spectrum of foundry types gave the study team a full insight into both the structure and performance of the foundry industry in Java.

All major foundry operations were included and their combined production accounted for more than 60% of the total casting manufacture.

Although in a few instances modern technology was being applied, in general the level of technical expertise was low with many foundries still employing techniques long since abandoned in the developed countries. This has lead inevitably to the production of poor quality castings of relatively simple complexity and with high rejection rates.

This quality of casting is unsuitable for processing by modern machine tools and when combined with low grade cast iron severely limits any application in todays design of consumer appliances or capital plant.

In the larger output foundries, mechanised machine moulding systems were producing products of good visual quality. However poor quality control, limited metallurgical knowledge and foundry technology were often resulting in high rejection rates. These factors were hindering the commercial success of the operations and also limiting the penetration of potential casting markets.

Labour intensive systems of production were observed which had been introduced from neighbouring countries and were being sucessfully applied but the very nature of this high human involvement results in lack of manufacturing control which is unacceptable to modern international quality assurance systems.

The technically most advanced operations were found to be those where either ongoing technical input was through an overseas joint venture partner or where "in-plant know-how" had been introduced from overseas in the early operation of the unit. Unfortunately it was apparant that little indigenous foundry development had occured in the past ten years to successfully upgrade the product range and casting market penetration within the country.

The individual process operations of the foundries will now be considered with regard to the applied technology level. It must be emphasised that the practices and controls varied widely and the following observations are made in general and do not necessarily apply to every unit visited. Furthermore it is felt that it would be inappropriate here to discuss the performance and conditions of individual foundries. The expert team were always concious of the importance of confidentiality since foundries are required to operate in a commercially competative environment and disclosure of certain working practices and product information could be of benefit to other companies.

A summary of the facilities and operating information of the foundries visited is given in Appendix 3.

3.1. Technology Level

3.1.1. Patternmaking

The art and skill of patternmaking has always been of major importance in the industry, but with the development of modern sand practices, the quality, accuracy and design of patterns is now of paramount importance.

High pressure moulding systems for repetition small casting production by the green sand process and the introduction of self hardening chemically bonded sand systems such as furan have made the precise dimensional accurancy and strong material construction of patterns essential for successful operation of the processes and equipment. Similarly modern coremaking machinery and gas harderning sand systems demand high quality coreboxes.

Apart from the newly equiped state owned foundries little wood processing machinery existed to aid good patternmaking construction. The level of construction and pattern design was poor and even the availability of suitable hand tools scarce. The necessary dimensional accurancy was in doubt as was the application of correct pattern tapers and contraction rates. Wood processing machines such as planers, thicknessers, millers and sanders are now essential to meet the dimensional requirements of patterns for high grade components.

Little use was made of epoxy resin patterns as a cheap intermediate between wood and metal. The use of this material is of particular interest due to the frequent demand for relativily short runs of components by the local manufacturing and assembly industry. Since expensive and sopnisticated machine tools for the manufacture of metal patterns are not extensively available, the introduction of epoxy pattern making techniques would be of major benefit.

Frequently the only suitable pattern equipment seen in the foundries had been imported. Only at Metal Industries Development Centre were acceptable techniques being applied but even there it was evident that accuracy was a continuing problem.

The skills and know-how for pattern manufacture must be upgraded. Failure to do this will inevitably restrict any modernisation of the industry into advanced practices. Training of new operatives as well as retraining of existing patternmakers must be given priority status.

A new patternmaking training facility has recently been established at the Politeknik Mekanik Swiss in Bandung and will produce ten people per year. This will not be sufficient for the future needs of the industry and systematic retraining must be established at foundry level along with a machinery installation programme.

3.1.2. Moulding and Coremaking

The most frequently used moulding sand system was the clay-bonded or green sand process. This process was used, as is usual, for the mechanised machine moulding of small repetitive components. However it was also used extensively for the floor moulding of both small and medium sized parts.

The larger foundries with outputs in the range 1500 to 3000 tonnes per annum employed modern high pressure flaskless and jolt squeeze moulding lines. Some products exhibited surface appearances acceptable to international standards but in achieving this reject rates of up to 18% were reported. Larger components in grey iron were manufactured in the cement-sand process with mollasses as an accelarator.

In the case of steel castings the CO_2-process was employed. Furan type self-setting sand systems which are now most widely used for jobbing production in the developed countries, were used only on a small scale for coremaking.

Two completely integrated furan moulding systems with reclamation of the sand were observed in the state owned foundries but these were still only in the early stages of development or commissioning and current production was insignificant.

Shell coremaking was extensively used for repetition type castings. The specialist producers of pipe fittings were equiped with hot box coremaking machines and the jobbing foundries produced shell sand cores by hand with crudely heated core boxes. Locally manufactured resin coated sands were available and the producers, usually foundries, were seen to employ no testing equipment and doubts must be made as to resin quality and coating efficiency. Indonesia does have a major potential advantage in that good quality foundry sands are readily available.

The importance of close control of all moulding and coremaking sand mixtures was obvoiusly not understood and frequently foundries did not even observe the basic requirement of measuring the volumes of sand and additives to the mixers. The small foundries did not even have mechanical sand mixers.

Although sand testing equipment existed in some larger units, little evidence was observed of its use for systematic sand control.

Matchplate snap flask moulding was effectively used and was particularly sucessful when the flasks had been imported. However when moulding equipment had been made locally, usually with crude location arrangements, high levels of defects and rejects occured.

No specialist manufacturer of foundry equipment exists in Indonesia and the foundries themselves, frequently produce inferior copies of proprietory machines. Superficial copying using inferior materials and sometimes a lack of understanding of the basic essentials of design, does not produce efficient equipment and licensed production from well established equipment builders is a more effective solution.

3.1.3. Melting

Grey cast iron was extensively produced from simple cold blast cupolas. The design and operation of these furnaces produced in most cases, very low grade metal.

In the smaller foundries, no understanding of the basic metallurgy existed and no metal testing of any description was carried out. Besides the frequent gas and inclusion defects found in castings, the very low strength and inconsistant nature of the iron confined its use to only rudimentory components. It has been estimated that 75% of the grey iron castings produced are indeterminate in quality or grade of material.

The inefficient design of most cupolas leads to high coke and energy usage and low tapping temperatures frequently result in wastage of metal and defective castings. This efficiency is further reduced by the need to remelt rejected castings which in some instances were found to be in excess of 35%.

More encouraging was the recent general move by the larger foundries to electric induction furnaces for iron and steel. Numerous units were seen and these will form the basis for future advances in foundry technology and casting quality.

The induction furnace can provide frequent batches of molten metal at controlled temperatures and of accurate composition. However to accomplish this, other essential control equipment is needed. Immersion pyrometers and carbon equivalent meters are a minimum requirement for grey iron production and a direct reading spectrometer is necessary for the more demanding materials such as steel and its alloys. Too many foundries were without this equipment, for example, foundries were producing steel castings without any analytical control or apparent metallurgical knowledge. Observation of these operations would indicate that the components produced would not perform in a manner approaching that of imported material. There was an almost complete lack of know-how in the production of steel castings. This applies to metal melting and treatment, ladle and pouring practice as well as methods engineering and heat treatment.

Generally, orderliness and cleanliness of the operating areas of the melting furnaces was unsatisfactory. In particular storage and segregation of scrap and additives was poorly managed. Clean and uncontaminated charge materials for this type of furnace are essential since the final quality and composition of the metal is largely governed by the input quality of materials.

Attention to cleaning and maintenance of ladles would significantly effect the occurance of dross and inclusion defects.

To make advances into the higher performance casting market, the industry must adopt techniques for sucessfully and consistantly producing higher grade and nodular cast irons. Only in exceptional instances were the necessary controls being applied to guarantee the end user performance. Safety critical components will demand a level of testing higher than that now applied, for example, testi g one sample per month is totally unaceptable.

3.1.4. Finishing

Adequate finishing of castings is an essential part of the process to produce acceptable components. The basic equipment for removal of sand and scale from the casting surface such as shot blasting, was not often present. This leads to poor inspection of the components since visual examination is impossible if there is sand or scale on the surface.

Frequently castings were being machined without sand removal resulting in excessive machine tool wear, poor surface finish and more important, rejects during and after machining. This regular abortive machining situation would normally be totally uncceptable to an efficient machine shop facility.

Heat treatment is another finishing operation which is required for steel and malleable iron castings. Dubious temperature control and poorly designed furnaces were seen which must frequently result in incorrect metallurgical structures. Essential metallurgical knowledge appeared to be lacking even in foundries producing high grade materials. Almost all heat treatment furnaces seen were crudely manufactured and well below the levels of engineering design required to allow reasonably efficient and accurate temperature control of the castings.

3.1.5. Quality Control

At no foundry visited was a complete and integrated quality control system in operation. Systematic control of all processes and materials within the modern foundry is essential both to minimise rejects and therefore production costs and to assure consistant quality to the user.

Such systems are now fully accepted and applied by foundries in the developed countries. They are regularly subjected to audit by monitoring or third party inspection authorities and are increasingly becoming a prerequisite for admission to even the bidders lists of many international engineering and manufacturing companies. The International Standards Organisation (ISO) and many individual countries publish standards which these systems must satisfy.

Inspection of the delivered castings or batch of castings is not in itself able to fully prove that the components meet the specified standard. To do this would usually mean destruction of the casting, therefore "in process" control and stage inspection is necessary to assure the user of the casting's integrity. The basis for such a systematic approach to quality assurance does not exist in the Indonesian foundry industry nor is it apparantly demanded by local users.

The essential elements can be briefly summarised as follows:

Casting Standards
Written work procedures
Records and analysis of quality data
Equipment for measurement and control
Inspection procedures
Independent quality management responsibility
Certification of products
Customer liason
Systems audit

With the exception of some measuring and control equipment, most other elements of a quality system were found not to exist or even the need identified. With the increasing legislation, world-wide, relating to product liability and consumer protection any company considering entering directly into the export market or supplying the Indonesian based international casting users must install and maintain an acceptable quality system.

3.2. Operational Skills

There undoubtedly exists within Indonesia a good level of skill and enthusiastic commitment by manual operatives. With correct training and incentive payment systems these attributes have been observed, on occasions, to be successfully harnessed and therefore must be considered as a major asset which could be developed by the Industry. However due to lack of training, technology and frequently poor management techniques this is inefficiently used. The problem is very evident in the case of patternmaking, where good wood working skills can be observed but due to lack of equipment and poor training the pattern quality is frequently below standard. This situation applies to most manually skilled operators.

This must be accepted as a major problem and mainly attributed to the system of management operating in many companies. This will be dealt with later in section 3.3 of the report. Skills have also not developed due to the insular nature of companies and there is little evidence of any cross movement of technology between companies by interchange of staff or technical communication. This has created a stagnant level of technical skill within individual foundries and also in the country as a whole. The mould of this can be broken by intensive introduction of modern expert assistance, but cooperation between foundries in the industry must be attained for any ongoing long term advancement to be sustained.

3.3. Management Practices

3.3.1. General Management

Visits were made to thirty foundries which involved seeing a wide range of businesses with different types of ownership. They included private limited companies (PT), family companies (CV), public state owned companies and private joint venture companies. The activities of the companies visited also varied considerably as some were pure foundries supplying only to the domestic market, some were part of a group or larger organisation supplying totally in house, others supplied in house and to the domestic market and a limited number were involved in exporting.

Most companies visited had the basis of a similar type of organisation with a President Director in control and a number of operational managers. The public sector companies had many more managers than the average private sector company and the small private sector companies were mainly run by the owner with working foremen rather than managers.

At all establishments visited there was little evidence of a positive foundry management structure and only in a few instances was there a specific person with relavent experience at a senior level responsible for the foundry operation. None of the foundries visited had the professional technical management required to improve quality, manufacture a wider range of castings, reduce rejects, and increase productivity. They were also unable to use new technology for the development of new products to reduce imports or enter the export market. Most companies were run on an autocratic basis rather than with a structured management organisation, the result being an ineffective and weak management system.

The system of management in many cases is based on a "Top man" who is expected to know everything and have all the answers. This situation is unrealistic and does not allow for the development of good foundry and business practices or management participation, development and success. Although this form of management was common in many of the foundries visited, future development and in some cases survival, is dependent on adopting new management practices. Further, it should be stressed that any senior manager that believes "he knows it all" is himself a poor manager, as a main principle of management, is to delegate authority and responsibility thoughout the company's managers, using their individual expertise. A new approach is required in order that management has an open mind with a positive approach to business control and future developments.

Companies were often reluctant to hold people, designated as senior managers, financially responsible, since this means giving more information regarding the companies financial affairs to middle and senior management. Also it means having to actually control costs and performance and record, relevant information for overall control and measurement. The procedures were lacking in many of the companies visited.

Formal organisation and allocation of responsibility to management at all levels is essential to any companies success and future development. Management at all levels should be held accountable for the costs and performance of their designated area of responsibility. Each area of cost and performance should be controlled to establish which sectors are profitable and which are not, to enable "Management" decisions to be made as to what actions are necessary to correct and improve the performance. This control would also help managers develop management skills at all levels, to enable the company to be managed and controlled and move forward in an organised and positive manner.

Current organisation leaves a major gap in the development of middle management, an area crucial to any company's success.

Each company regardless of size requires a formal management structure, job descriptions and allocation of responsibility for all levels of management. This should not involve smaller companies in any complicated systems as it can be done on a simplistic basis. However the larger the organisation the greater the necessity for more detailed control and management organisation.

It was noted that in several of the companies visited some form of computer equipment existed while others had no yet progressed to the use of computers. Of the companies with computers without exception these computers were used only for administration and basic financial records. No integrated system was seen and the general feeling was that management had not yet come to terms with using computers or were having problems. With the range of software packages available, to be used on various computers, including personal computers, covering subjects such as cost and financial control, cash forecasting, budgetary control, methods, planning, quality assurance, management needs to take a more positive view to developing the use of these facilities.

A further concerning factor was the apparent lack of management awareness to consolidate practical knowledge and experience. Many foundries diversified into other products and materials without having resolved their current production and quality problems, for example :

Iron foundries deciding to produce steel castings with all the relevant changes in melting, moulding, sand preparation, finishing and quality practices and in most cases with total lack of technical know how. Current basic problems must be solved securing a strong basis on which the foundry can build before venturing into other unknown areas.

Wages and conditions of employment varied considerably between the public and private sectors and the larger group companies and small private companies.

(1) Many smaller companies paid considerably less than the public sector with less benefits.

(2) Some of the more profitable companies paid lower basic rates than the public sector but good workers could earn greatly in excess of their basic wages.

(3) Very few companies had a bonus system that related to good production and therefore reject rates of up to 35% will continue to be a problem.

Many companies operated complicated wage structures based on a combination of education level, grade in the company, length of service plus production and or profit bonus. However most of the wages schemes did not operate on a basis of good production or profit as it was found that the companies paid out their annual bonus regardlees of level of production or whether they made a profit or loss.

Wage rates varied considerably with some unskilled on basic earnings of 30,000 RPH per month to semi skilled and skilled in some cases earning 120,000 to 150,000 RPH per month. Managers wage scales were less well defined and said to be, in most companies, by negotiation.

Ranges indicated were from 200,000 to 500,000 RPH per month (1 $US = 1750 RPH, April 1989).

There was no evidence that payments or wages to trainees, at shop floor or management level, were made on any incentive basis to encourage the trainees to develop and stay with the company.

3.3.2. Financial and Cost Control

In the foundries visited there was very little evidence that the companies were controlled in an effective financial and cost concious manner.

Very few figures where available to show annual performance of the company let alone weekly and monthly financial and management information. In the cases where the foundry was part of a group or part of a larger organisation individual figures for the foundry were often not available as in many cases the foundry was classed as a service to the whole operation. No daily, weekly, monthly analysis of the various items of cost or usages of direct materials, electricity, wages, rejection rates, yield percentages etc were available. Management seemed unaware that even if the company was profitable then it could become more profitable if controlled properly. Many of the managers were unaware of rejection rates, tonnes poured, yield, numbers employed, wages costs and appeared to estimate figures because of the lack of factual information. Again the situation arose where many of the managers were not privy to certain financial and cost information as it was not deemed to be their business.

Very few managers were aware of their foundries maximum output capacity in both poured and finished casting weight. They were also unaware in many cases as to which operation in the foundry was the limiting factor and how this could be modified to increase overall capacity.

Another area of concern was the extremely high cost of development of new castings. All these castings are made on a trial and error basis with high rejection rates and with consequently high cost (loss) implications. Technology needs to be greatly improved to reduce development costs, also all such costs should be detailed and controlled to enable development expenditure to be kept to a minimum.

Management should be totally cost conscious and responsible, unlike the current situation where in the main there is a lack of management concern regarding reject castings and the relevant cost consequences. It is almost certain taking into account the high scrap rates and then rejections at the machining stage, that many foundries produce some, if not all castings, at a loss. It should be noted that the current high level of reject castings would be much higher if customers insisted on meeting quality standards applied in developed countries. At this time sub standard castings are acceptable for one of two reasons. Either the customer does not have an alternative supply or is unaware of the true specification requirement.

It is essential, if companies are to be successfull, that all persons at supervisory or management level be aware of, and have the responsibility for, control over costs that come under their remit. The overall manager should be held accountable for all costs and incomes and in turn should analyse and break down these costs into the various departments i.e. pattern making, moulding, sand preparation, melting, finishing, heat treatment and shotblasting. This is to ensure that middle managers and supervisors are aware of the information that affects them and for which they are responsible. The responsibility and the amount of information becomes greater the higher the level of the manager, eventually arriving at the management team running the foundry with full information and so able to make the relevant decisions.

It is essential for control that certain information, is made available on a daily, weekly, monthly and cumulative basis. This information should be compared against budgets and targets already established. Changes or deviations from the budgets, if known at an early date, will allow corrective decisions to be made at the earliest opportunity. This allows the revision of plans and budgets for the following months, or years, based on factual information.

Development of managers must include training in financial understanding and cost control to enable them to understand the effect and consequences of their actions on the company. The lack of understanding of the necessity for good cost and financial control was very evident, and some companies are unlikely to survive if they continue with current management practices.

As markets change, material prices increase, wage costs rise, sales prices possibly reduce due to competition, management needs to be able to re-act quickly, making decisions based on financial fact and backed by a strong senior and middle management, none of which is available today.

All companies visited would benefit from financial cost and business management training and also from the introduction of basic essential cost and financial control systems. Failure to implement these controls could, and in some cases certainly will, mean any other investment in technology and capital equipment will be wasted as the companies will not survive.

Management must become more financially aware, be able to analyse the cost of products specifically, and not on a global or group basis, to ensure optimum output at the minimum of cost to maximise on the investment made in the company.

3.3.3. Cash Management

In most of the companies visited the management with whom the organisation was discussed, all effectively at senior levels, had very little if any involvement in cash control. All believed it was the responsibility of someone else, i.e. another manager, head office, shareholders.

It was evident even with some of the very senior people that cash control was not excercised or included in their daily running of the business. Also many companies were reluctant to give senior managers such information. This has resulted in management not being financially aware and cash conscious leading in same cases to lack of control of stocks of raw materials and finished goods, work in progress and in some cases of outstanding debts.

Some of the best companies for cash control were the smaller private companies where the owner was conscious of their bank borrowings and the requirement for cash to pay wages and other bills. However this was done more on a simplistic income and expenditure basis, than by cash forecasting and planning.

Many companies visited had a shortage of funds for development both for capital investment and working capital requirements. All privately owned companies emphasised that the current interest rate of 20 - 22% for bank borrowings was very high.

Many companies giving credit to their customers were finding customers taking extended credit and so in some cases creating additional financial pressure. A limited number of companies were more fortunate as they received payment on delivery. This mainly applied to companies supplying castings to the free market.

Many Companies expressed interest in exporting. The knowledgeable companies were motivated by the preferential (subsidised) interest rates some 10% cheaper and also as a way to improve cash flow as payment by letter credit was usually on shipment. Unfortunately only a handfull of companies were exporting and only one company in any volume. Although many companies wanted to export, the majority were not conscious of the cash implications and the quality requirements.

Some companies were borrowing substantial sums of money both from the banks and the capital market. In the case of the capital market, interest rates as high as 40% were being charged. Companies borrowing substantial amounts at such high interest rates with low productivity and low gross margins could not afford to finance the interest and unless totally refinanced with interest free funds i.e. share capital or owner loans they have very little chance of survival.

3.3.4 Forward Planning and Capital Investment

On investigating the basis of forward planning and capital investment appraisal it was found that in most cases, companies had not prepared any forward plan to indicate where they were going, which market they were serving, what they were trying to achieve and the cash and capital requirements needed. Some companies had drawn up forward plans but in all cases these were for the purpose of borrowing money from the bank. Many of these plans were not formulated on known facts or for company control. Often these plans were based on what the Senior Director thought, someone had seen overseas or what other foundries were doing. This often lead to a misunderstanding of the equipment and technical skills required. The approach is almost niave as without the completion of a market analysis and sales plan it is not possible to determine the correct plant and equipment to install. Examples were found of multi million dollar investments in new modern equipment in excellent foundry facilities but with the foundries often working at less than 40% capacity. In one case, after a recent very major investment, the foundry had no work load at all and is now looking for a market.

Without investigating fully the market the management are deciding to invest in equipment some of which will be greatly under-utilized, some which will be operated inefficiently and some which will never be used.

Many people believed that bigger is better and that they need a least one of everything. It is very concerning that funds are available but that investments are being made often on the wrong advice or lack of technical and market knowledge. These investments therefore can easily become a burden rather than an asset. While not being able to fully utilise the equipment purchased they have wasted the opportunity of spending the funds to the foundry's maximum advantage.

Also it has to be stated that although there was a great deal of investment taking place in capital equipment very little investment was being made into technology and training. Many of the problems that foundries now face are greater because of higher bank borrowings for capital equipment while not being able to improve output, quality or range of products because of total lack of technology.

With the willingness of the people particularly in the private sector to work and the basic need to increase personal knowledge, develop and improve quality, it is essential that professional senior management personnel are employed capable of understanding technology and appreciate the necessity to analyse all investments. This is essential to maximise on the return on these investments both in equipment and people. As matter of good practice companies should have a continuous three year plan taking the following factors into account, marketing, technology requirement, cost and financial appraisal, capital investment analysis, cash flow requirements, projected profit and loss accounts and balance sheets.

Finally, current management is not assessing the true capital requirements of their foundries and in some cases money is being made available too easily. It is essential that all management, involved in capital expenditure, are fully aware of the use and operation of the equipment they are purchasing, the technology required, (the most important element) and that they are held responsible for the proper use and return on investment.

3.3.5 Technical Management

As described already all too often the management and staff of the foundry industry were found to have very limited knowledge of modern techniques of production. Few developments have occurred within the individual foundries since the initial installation of equipment and technology. The majority of "technical" personnel had no knowledge of processes other than those currently employed and the management structure made any development totally dependent on the knowledge and motivation of the owner or president director of the company. In many instances no recognisable technical person existed within the company and there was a scarcity of trained metallurgists and foundry engineers.

The industry survives, technically, on the low quality product types, ignorance of the buyers of castings and the lack of strict standards for casting supply.

A major reason for the slow penetration and development of the casting market must be attributed to the inexperienced and poorly trained technical support personnel to the Sales Management. Reverse engineering skills, on the part of foundries, are lacking and must be developed to meet the government expansion plans for the engineering industry.

Operationally, at plant level, quality problems remain unsolved and often render the attempts to introduce quality control systems abortive. Basic principles of foundry practice were frequently not understood.

It is essential that the technical management of the industry is built up with well educated and trained people. Working conditions and salary levels must be improved to become competitive with other more environmentally acceptable industries in order to attract the right people.

Whilst the main thrust to modernise the industry must be to improve the technology level of individual companies by 'hands-on' expert assistance, in the longer term the industry as a whole must address this problem possibly through an extension of the scope of operation and interests of the current association. More participation of the staff of the industry within a technically orientated semi-professional body will encourage the desemination of knowledge throughout the foundries and improve liaison with the educational establishments.

3.4. Equipment and Maintenance

During the limited period of foundry visits, time did not permit any detailed examination of individual pieces of foundry equipment. Therefore only general comments are possible with regard to the observed situation.

Only a few foundries claimed to have any form of planned or preventive maintenance systems. As would be expected these occurred in the more mechanised foundries. The condition of equipment varied considerally from poorly maintained to well organized and planned systems. The latter was particularly noticable in a joint venture foundry where a systematic approach had been organised.

However, many pieces of equipment were out of production. This was felt to be due to poor organisation and discipline or sometimes financial restraints rather than the ability of the maintenance personnel.

Many pieces of equipment were literally worn out apparantly due to lack of spare or replacement parts. In the more complex automatic plants it is not practically feasible to locally manufacturer certain spares, these must be imported and management must allocated funding for this purpose.

Similarly many attempts were witnessed of locally manufactured copies of moulding and finishing equipment. Without exception, these were inferior in performance to the original machines. It was unfortunately apparent that most of the engineering and technical management effort in some foundries was being expended on equipment copying instead of improving productivity with existing plant and solving foundry operational problems.

The latter should be the primary function of these managers. This may be a reflexion of the qualification of most technical/supervising personnel who have a background of mechanical engineering rather than the management and metallurgical training necessary to operate foundries.

3.5. Product Assortments

The Indonesian foundry industry can be divided into five broad sources of supply:

- Supply of very simple items such as cooking and artisan products for local use and often produced by "cottage type" units.

- Supply to the "free market", usually through traders who sell at prices cheaper than the Original Equipment Manufacturer (OEM) but not of the same quality. Castings (such as automotive brakedrums) are purchased from an OEM and copied by reverse engineering techniques.

- Supply direct to OEM of either original or spare parts which may be subject to some form of performance guarantee. Engineering drawings and specification may be supplied by the OEM. Spare parts for maintenance purposes in the manufacturing industry may also be supplied under this section.

- Plant and equipment manufacturers who have their own foundry attached to an engineering workshop for "in house" supply. A limited quantity of castings for other users may also be manufactured in these units.

- Because of the low technology of the industry there are very few export opportunities. The two successful exporters have acquired the necessary ability and know-how to export in one case from a foreign joint venture partner and in the other case from the owner's detailed personal knowledge of the recipient country through residence.

THE FOLLOWING CASTINGS WERE WITNESSED AS HAVING BEEN LOCALLY MANUFACTURED DURING THE TEAMS FOUNDRY VISITS

INDUSTRY	PRODUCT DESCRIPTION	MATERIAL		WEIGHT
Automotive	Brake drums, brake discs clutch pressure plates, fly wheels, exhaust manifolds, motor cycle cylinder heads, barrels and liners, body press dies	grey iron		1 kg 5000 kg
Agriculture	Rice, processing machines, irrigation pumps, diesel, engine cylinder heads, diesel cylinder blocks (under development) diesel engine water tanks water pumps.	grey iron aluminium		1 kg 40 kg
	Tapioca machine parts	aluminium	up to	50 kg
	Sugar milling plants - rolls, pinions, scrapers coupling, knife holder, bearings	grey iron and carbon steel		2000 kg
	Main bearings, feed screens	brass	up to	750 kg
Oil and Chemicals	Gear box parts, counter weights, tees, elbows Multi stage pumps, centrifugal pumps	grey iron	up to	2000 kg
Mining and Construction	Digger teeth	alloy steel		1-20 kg
	Hammer bars, track pads	manganese steel		1-70 kg
	Jaws plates	carbon steel		2500 kg
	Jawstocks	carbon steel	up to	2000 kg
	Slewing ring, gear ring	carbon steel		100-1000 kg
	Slurry pumps, water gates	manganese steel		100-500 kg
	Gyratory crusher parts	carbon steel		20 kg
	Gears and pinions			
	Warwicks	carbon steel		2 kg

Contd....

INDUSTRY	PRODUCT DESCRIPTION	MATERIAL		WEIGHT
Manufacturing Industry	Textile machine spares	grey iron		0.25-10 kg
	Cement spares-liners, grinding balls (under development)	alloy irons		0.5-60 kg
	Woodworking machine parts	grey iron	up to	4000 kg
	Sewing machine parts	grey iron	up to	15 kg
	Tile and pharmaceutical parts	grey iron	up to	30 kg
	Paper mill parts, electric motor casings	grey iron	up to	100 kg
	Flanges	carbon steel		5 to 20 kg
	Computer frame parts, filters (precision castings)	stainless steel		2 kg
Transport	Anchorage casting	grey iron		20 kg
	Fork lift balance weights	grey iron	up to	4000 kg
	Road roller parts			
	Railway parts-coupler assemblies	carbon steel		50-200 kg
	Bolster side frames			300 kg
	Axles boxes	steel/iron	up to	20 kg
	Pandrels	ductile iron	up to	5 kg
Public Utilities	Pipe fittings	malleable	up to	5 kg
	Values and fittings	copper base	up to	10 kg
	Water meters, gas burners	copper base	up to	10 kg
	Cooking pots, fire hydrants	grey iron		5-20 kg
	Street furniture	grey iron	up to	100 kg
Steel Plants	Ingot moulds and bottom plates	grey iron	up to	1500 kg
	Steel mill guides	carbon steel	up to	5000 kg
Ship Building	Bollards	carbon steel		200 kg

3.6. Training

No formal training was practiced for skilled or semi skilled workers. Few instances were found where a systematic approach had either been made with regard to training of supervisors or managers. This varied from none to occasional ad hoc seminars or overseas visits.

Skilled personel were promoted from helper grade and received total 'on-the-job' training. No apprenticeship system operates nor has vocational training in foundry sciences been readily available. Whilst 'on-the-job' training is in the short term cost effective it does limit itself to the practices of a particular company which in the long term restricts technical innovation or advancement from individuals. It is generally prefered that an increment of off-the-job instruction is now incorporated into the training programme of skilled and technical workers to broaden the scope of their knowledge and allow them to both appreciate their place in the foundry production cycle, and also develop their potential long term skills.

Although a limited number of foundries sent staff on external courses in most cases there was management reluctance to do this. The main reasons given being that it was very expensive and management feared that people once trained would leave and work for a competitor for better terms. Management must accept this is always a risk but this could be partly resolved by a simple contract of employment whereby the employee agrees to stay with the company for a specified number of years after training, providing the person reaches an acceptable level of competance. Management also needs to accept in the long term that it is inevitable that the more capable people will change companies in order to increase their remuneration and for career development. This is necessary for the Indonesian foundry industry to develop.

Financial incentives must be combined with any training and linked to educational qualifications, ability and practical experience, plus career opportunities for advancement. It must be stressed, however, that not only theoritical knowledge is needed. This should be the basis, but without practical experience, the foundry industry can not develop. Along with the necessity for this practical experience must come status for shop floor foremen, supervisors and managers to prevent all the people with ability wanting to work in the office, the place that is deemed to be the start of advancement.

Formal training at all levels in the company including senior managment is a prequisite to advancement, development and eventual success.

Mechanical engineering courses are available at a number of institutions throughout Java and metallurgical specialisation is possible within these courses but there is no specific foundry technology training currently available.

In part to correct this situation, a new facility is being created at the Politeknik Mekanik Swiss in Bandung where a patternmaking and training foundry is being completed this year. Up to thirty trainees per year will receive tuition in foundry technology and short term seminars are planned on specific subjects.

Instructors are at present receiving training overseas. If a qualified and experienced staff can be established this facility will prove an asset to the Indonesian foundry industry.

For purely training purposes the foundry is considered to be over equiped but it is understood that the operation will be largely financially self sustaining mainly by sales of castings produced by the trainees.

The study team were sceptical of success in this respect and suggest that such a large scale operation will always require government subsidies or assistance from overseas funding agencies.

The first ten trained patternmakers will graduate next year which in the long term will be of help to the industry provided the individual recruiting companies provide the necessary equipment for these people to practise their skills.

There is currently a major deficiency within the industry of good patternmaking skills and, more importantly, of modern pattern design and casting manufacturing methods. This latter problem will only be resolved in the short/medium term by intensive retraining of existing patternmakers and foundry methods engineers by technical personnel with "hands-on" experience working in advanced foundries.

4. MARKET REVIEW

4.1 General Approach

The scope of the preparatory assistance study does not include a detailed analysis of the Indonesian casting market but calls for a review only. This review was carried out by visiting foundries and assessing other market survey reports carried out in recent years.

Thirty foundries were visited during the course of the overall project and each interviewed regarding to their market penetration, marketing organisation, and methods of approach.

Three reports have been assessed which are:

- Renovation of Jakarta Foundry Centre conducted by Japan International Cooperation Agency in 1985.

- Market and Marketing Study on the foundry sector in Indonesia by Klingenstein in 1987.

- Supply Capability of and Development Pattern for the Indonesian Ferrous and Non Ferrous Foundry Industry by GTZ, Technical Cooperation Federal Republic of Germany, January 1989.

4.2 Recent Growth of The Indonesian Economy

From 1960 to 1965 GNP progressed at an average rate of 1.7% which barely equaled the population growth. However from 1968 onwards there was a steady improvement and from 1970 - 1980 7.8% was attained. The first five year plan (REPELITA I) was set in 1969. Priority in this plan was given to agriculture particularly rice growing which resulted in an annual increase in crops of 5.6%.

REPELITA II (1974 - 1978) followed up the results gained with REPELITA I by consolidating on the supply and quality of food, housing, social welfare. For the industry/mining sector, support was given to private enterprise to foster industrialisation.

REPELITA III (1979-1984) maintained the principal of giving free rein to private enterprise, but priority was moved toward encouragement of domestic medium/small enterprises and towards the promotion of export orientated industries. During the second half of the period, a drop in oil prices and the prolonged economic recession affecting the industrialised countries, caused a reduction in export of primary products.

REPELITA IV (1985-1989) was drawn up to constitute the initial phase of a long term scheme to culminate with REPELITA VI in the latter 1990's. The plan again gave high priority to the engineering sector in particular the following sub sectors - industrial and factory equipment, mechanical equipment, agricultural machinery and equipment, electrical equipment, motor vehicles, railroad equipment, aircraft, shipbuilding and basic metal industries. With regard to future growth the World Bank forecast 3.4% p.a. for 1988/1990 and 4% p.a for 1990/1995 with construction and manufacturing as the fastest growing sector. (Table 1)

TABLE 1

GROWTH RATES AND COMPOSITION OF GDP

SECTOR	GROWTH RATES (% p.a.) 1988/1990	1990/1995
Agriculture	2.7	3.0
Mining & Quarrying	1.8	1.1
Manufacturing	5.4	5.8
- Natural Gas	(5.3)	(1.0)
- Other (incl. oil refinery)	(5.5)	(7.7)
Construction	5.5	7.0
Others	3.5	5.3
GROSS DOMESTIC PRODUCT	3.4	4.0

Source: World Bank

TABLE 2

Producing	No	Companies 1987 Licensed tonnes	Production tonnes	Utilisation %	Turnover mio. Rph	Value Rph/kg
Ferrous	49	66120	31342	47.4	40668	1296
Non-Ferrous	36	12440	6620	53.2	18638	2815
Fe & NFe	34	17390	10641	61.2	14909	1400
A l l	119	97990	48603	49.6	74215	1527
Other	5		no production			

4.3. Structure and Capacity of the Industry

The industry comprises of four main types of companies:

a) Public Sector government owned.

b) Private Sector nationaly owned.

c) Private Sector - Foreign joint ventures.

d) Private Sector cottage type units.

In a survey carried out in 1988 GTZ reported a total of 124 foundries registered, 5 of which were major state owned enterprises. In addition to the registered foundries, there were an unknown number of unregistered cottage type industries.

Table 2 shows that a capacity of 97,990 tons per annum was installed. However this figure must be viewed with some caution as the basis of calculating capacity is unclear and ongoing changes are taking place in the various foundries. Of this installed capacity approximately 15% was in Government owned foundries.

Capacity utilisation of the registered foundries was 49.6% yielding an annual production of 48.603 tonns. Total production from the cottage industries was unknown but estimated to be relatively small.

The state owned sector accounted for 8% of total casting production.

Turnover of the registered foundries was Rp 74,215 million at an average selling price of Rp 1527 per kg. (1,750 Rp = $ 1.US April 1989).

Technical Capability

Foundries in Indonesia can generally be classified as jobbing or semi mechanised. Casting weights vary from less than a kilogram to approximately 10 tonnes in a range of material specifications including grey, ductile and malleable iron, carbon and manganese steels plus copper base and aluminium alloys.

The foundries are located through out the country and serve a wide range of industries and products. Typical industries include agriculture, textiles, municipal, automotive, general engineering, steel mills, machine tools, sugar and rice milling, mining and quarrying.

Although many foundries have the plant and equipment necessary to produce castings for the above industries, most of them have limited, or are totally without quality control equipment and systems. Technology, as yet has not caught up with that of the developed countries and in many cases there is total lack of knowledge of foundry technology, processes and management skills.

Consequently, the foundry industry has now reached a stage where it can satisfy only certain parts of the domestic requirements. An outline of their markets and products is given in Section 3.5.

Types of foundries range from cottage type who are rudimentary in operation, to the private sector medium/large foundries who are reasonably well equipped but lack technology, management expertise and in some cases balancing equipment. The public sector foundries are well equipped but with very low utilisation. The technical capability of the main foundries are described in Section 3 of this report. Their facilities and production statistics are listed in Appendix 3.

4.4. Market Assessment

4.4.1. Local Production

Reliable data on the castings produced by foundries in Indonesia does not exist. Estimates range from 11532 tons per year in 1969 (UNIDO, Ministry of Industry) to 74320 tons per year in 1982 (Ministry of Industry). In 1985 (JICA) produced a detailed report which estimated 35,000 - 40,000 tons per year.

The two most recent estimations have been made by KLINGENSTEIN in 1987 of 35.000 tons per year and G T Z in 1988 of 48603 tons per year. Klingenstein's estimate is based on 70 medium to large foundries, whereas G T Z base their estimates on 124 foundries and estimate the split to be 40665 tons of ferrous castings and 7938 of non-ferrous castings. Of this tonnage the public sector government owned foundries accounted for only 8% (4000 tonnes).

Based on the above information it can be reasonably assumed that approximately 50,000 tons per annum is the current local production.

Table 3 shows the breakdown of casting users and degree of complexity for the production in 1987.

The table shows that 8581 tons representing 18% of total production were simple consumer products such as cooking pots and artisan products. Pipes and pipe fittings accounting for 10420 tons representing 21% of total production are for the general country infrastructure and not industrial engineering.

The remaining 29602 tons representing 61% of total production were directly or indirectly supplied to engineering industries. However only 4630 tons representing 10% of total production have any relevance to the industries identified for development under REPELITA IV.

Table 3 also shows that the castings range in complexity from "most simple" to "medium" and averaging at "simple". Other categories not attained by the industry are "difficult" and "complex". Typical types of castings classified under each complexity level are shown in Table 4.

The following Table 5, compares Indonesian local production with that of its neighbouring countries and shows how Indonesian production has fallen behind.

TABLE 3

MAJOR CASTING USERS AND DEGREE OF COMPLEXITY

PARAMETERS MAJOR USER SECTORS	NUMBER OF ESTABLISHMENTS	TOTAL (ts)	AVERAGE DEGREE OF COMPLEXITY	FERROUS (ts)	AVERAGE DEGREE OF COMPLEXITY	NON-FERROUS (ts)	AVERAGE DEGREE OF COMPLEXITY
Simple Consumer Goods	24	8,581	Most Simple To Simple	5,353	Most Simple To Simple	3,228	Most Simple
Durable Consumer Goods 1)	14	10,628	Simple To Medium	8,620	Simple	2,008	Simple To Medium
Pipe and Pipe Fittings	14	10,420	Simple; Sometimes Most Simple Or Medium	9,967	Simple; Sometimes Most Simple Or Medium	453	Simple To Most Simple
Engineering Industries 2) (Priority Sub-Sectors)	14	4,630	Simple: Sometimes Most simple Or Medium	4,155	Simple; Sometimes Most Simple Or Medium	475	Simple To Most Simple
Other Engineering Industries	58	14,344	Simple; Sometimes Most Simple Or Medium	12,570	Simple; Sometimes Most Simple Or Medium	1,774	Simple
TOTAL	124	48,603	Mostly Simple	40,665	Mostly Simple	7,938	Mostly Simple

NOTES: 1) Comprising : automobile industry, engine parts (gasoline and diesel) and motorbike industry.
2) Comprising machine tools, agricultural machinery and equipment, heavy and earth moving machinery and equipment, electrical machinery (motors and generators), electronics industry, ships, harbour and off-shore machinery and equipment, railcar and railway equipment.

SOURCE G T Z Report

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TABLE 4

DEGREE OF COMPLEXITY	TYPICAL CASTING TYPES
Complex	High pressure turbine housings Engine blocks Helical Housings Turbine Rotors Narrow Ducted Impellers Cylinder Jackets Giant Ship Propellers etc.
Difficult	Turbine Housings Complicated Gear Boxes Cylinder Heads, Exhaust Manifolds Cam Shafts, Crank Shafts Giant Machine Beds, Stands, Heads Big & Complicated face plates Heavy Duty Pistons etc.
Medium	Machine Beds, Stands, Heads, Slides Heavy Duty Grinding Balls Brake Drums, Discs, Saddles Suspension Parts Steering Housings, Gear Boxes Pistons, Pump Housings etc
Simple	Plates, Bars, Flanges, Wheels Wearing Parts for Earthmoving Machines Bearings Bushes Covers Griding Balls etc.
Most Simple	Decorative Parts Pots Fence Parts Artisan products Dump - bell weights Other Simple Consumer Goods etc.

TABLE 5

FERROUS AND NON FERROUS BASED CASTING PRODUCTION IN INDONESIA KOREA, THE PHILIPPINES AND THAILAND

COUNTRY	PARAMETER	TOTAL NUMBER OF FERROUS AND NON FERROUS FOUNDRIES	TOTAL PRODUCTION (IN : ts)
The Republic of Indonesia (Base Year 1987)		124	48603
The Republic of Korea (Base Year 1978)		300	657000
Philippines (Base Year 1976)		260	99250
Kingdom of Thailand (Base Year 1981)		250	89000

Source - GTZ Report

4.4.2 Present Domestic Consumption

Domestic consumption is made up from local production and imported castings.

- Local production

  Details of this section are assessed in 4.4.1 at approximately to 50,000 tons per year.

- Imported castings

  Imported castings are brought into the country either as a single castings to be used as such and unattached to any other piece of equipment, or as integral parts of equipment or machinery.

  Klingenstein have estimated from official statistics, that 105,000 tonnes of castings were imported in 1987 as shown in Table 6. The estimates have been taken from SITC division numbers:

  69 - Manufactures of Metal
  71 - Machinery other than electrical
  72 - Electrical machinery, apparatus + appliences
  73 - Transport equipment

On average, import of these products amounted to about 750,000 tons per annum between 1984-1986. An estimate of the share of castings in the total weight of these imports is 10% which results in imports of attached castings of about 75,000 tonnes. It is possible that not all imports are included in the above division numbers therefore imports may be higher.

TABLE 6

ASSESSMENT OF IMPORTED CASTINGS (TONNES)

	IRON	STEEL	TOTAL
Attached	65,000	10,000	75,000
Unattached	25,000	5,000	30,000
			105,000

Total present approximate domestic consumption can be summarised as follows:

Local production	50,000 tonnes per annum
Imported castings	105,000 tonnes per annum
TOTAL	155,000 tonnes per annum

Typical industries which are currently importing castings and would yield parts suitable for local manufacture have been identified by the project team and are listed below:

- Cement industry
- Sugar industry
- Railways
- Machinery and metal working industries
- Shipbuilding and repair
- Automotive industry
- Mining
- Oil and gas industry
- Petrochemical industry
  - agrochemical industry
  - Other basic chemicals
- Irrigation and water supply
- Pulp and paper industry
- Rubber industry
- Plastic industry
- Steel industry

It is important to note however that considerable technical and managerial assistance is required before many of the castings from the above industries can be made.

As already stated in para 4.4, the majority of castings which are currently being manufactured locally are generally of simple to medium complexity (Tables 3 and 4) whereas most of the castings required in the above industries, that are currently being imported, are of a much higher degree of complexity. Deficiences preventing the manufacture of more complex castings are described in chapter 3 of this report.

Where castings are imported and are incorporated into other pieces of equipment, sub-station will require facilities such as design, engineering, machining assembly and testing as well as improved casting production methods for both the individual castings as well as the parts of the assemblies.

The expansion of the total market for this range of castings will be largely dependent on the development of the engineering workshop facilities within the country to manufacture these assemblies.

4.4.3. Future Growth and Projections

Although there are no official forecasts for the growth of the foundry industry sector, forecasts are made for the manufacturing sector. A growth rate of 5.8% p.a between 1990 and 1995 is made by the World Bank for the sector as opposed to an overall growth rate for the country of 4% p.a.

Klingenstein estimate an increase in casting production of 8.5% p.a. to 1995 which with the current level of technology seems rather high.

However GTZ in their recent report recommend as a practical target an average growth rate for cast products of 6% p.a up to the year 2000. Table 7 shows this growth split down into material types. Although cast iron forms the largest share of the market, its forecast growth is one of the lowest at 4.5% mainly due to the current level of manufacture. The two main growth areas are the nodular iron group at 13.5% and the cast steel group at 13.0%. It is important to note that a comprehensive development programme is necessary in order to achieve such targets.

TABLE 7

FORECAST INCREASE IN PRODUCTION 1987 - 2000

CAST MATERIALS	ABSOLUTE PRODUCTION TONS	SHARE IN TOTAL PRODUCTION %	ABSOLUTE PRODUCTION (APPROXIMATION) Tons	SHARE IN TOTAL PRODUCTION %	AVERAGE REQUIRED ANNUAL GROWTH RATE	AVERAGE ANNUAL PRODUCTION INCREASE OVER THE PERIOD TONS
Cast Iron Lamellar Unalloyed & Alloyed	31,359	64.5	55,000	55.0	4.5%	1,860
Nodular Malleable Unalloyed & Alloyed	2,431	5.0	12,000	12.0	13.5%	780
Black Malleable Iron	5,268	10.8	10,000	10.0	5.0%	360
Cast Steel: Plain Carbon High Strength + Stainless	1,607	3.3	8.000	8.0	13.0%	480
Ferrous Sub-Total	40,665	83.6	85,000	85.0	5.5% - 6.5%	3,490
Aluminium Alloys	5,825	12.0	12,000	12.0	6.0%	510
Heavy Metals	2,115	4.4	3,000	3.0	3.0%	80
Non-Ferrous Sub-Totals	7,940	16.4	15,000	15.0	5.0% - 5.5%	580
TOTAL	48,605	200.0	100,000	200.0	5.5% - 6.5%	4,070

SOURCE : G T Z

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4.4.4. Export Opportunities

The prerequisite for entering an export market is an established and satified home market with respect to prices, quality and delivery.

The limited number of foundries who are exporting, either directly or indirectly, are aware of these requirements and also the proceedures for marketing, selling and distribution of what are generally low integrity products. However the laws with regard to supplier liability in developed countries do not appear to be fully understood.

Other foundries are generally interested in exporting but are in many cases unable to meet the quality, price and delivery requirements and unable to create customer confidence.

4.5. Present Marketing Methods

Most of the foundries visited during the survey advised that they had a formal marketing policy and actively persued new sales. However with the some exceptions, it is felt that this is not the case.

The team believed that because of a lack of technical product knowledge very few market assessments had been undertaken to help penetrate new markets. The present lack of marketing skills is compounded by poor performance in the foundry. Having identified a market and won orders the foundry fail to deliver on time or produce the correct quality. Unless assistance is provided the problem will continue. A similar problem also exists due to the lack of financial and cost control where it is impossible to accurately calculate product manufacturing costs. This eliminates an important factor for consideration when carrying out comprehensive market surveys.

The small number of the foundries that do understand the need for marketing are now able to approach specific product markets and in some cases are exporting. Although the products are of relatively low integrity suitable markets have been found and satisfied.

In contrast to the above situation, foundries have been built without conducting market surveys or even investigating the complicated process of casting manufacture.

There are many industries, such as automotive, sugar and cement where opportunies exist for further penetration. This is assisted by the Governments deletion programme. However to succeed foundries must improve quality price and delivery, and create customer confidence. When considering new markets and products it is essential to carry out detailed market analysis. The survey should establish the size of the market and the existing supply capability, to avoid entering markets that are already saturated or investing in plant equipment and technology to service small demand markets. In order to make an assessment the initial requirement is to consider the specific market to be addressed by either individual products, whether defined by metal type, weight or production method or by consumer industry. The latter is felt to be the better method as current and future demands can be assessed and the necessary facilities and technology can be acquired to meet the demand. However the overall pattern can only be defined when all consumer industries are surveyed. Assessments should include full details of types of castings, price levels, specifications, technical, quality and delivery requirements, annual volumes, batch sizes, piece weight, pattern types and costs.

The market survey must include full analysis of attached and unattached castings and the capabilities and intentions of the engineering industry to develop the manufacture of plant and machinery that will utilize castings and therefore increase the demand for cast products.

5. SELECTION OF METHOD OF MODERNISATION

Firstly it must be explained that the skills and technology required to successfully operate a modern foundry are of a diverse nature. Besides the craft skills of patternmaking and moulding, there must exist many other operational and technical skills such as casting design, methods engineering, sand technology and testing, metallurgical expertise (to cover melting, laboratory analysis, non-destructive and physical testing, heat treatment and weld rectification procedures), computers systems, work study and planning as well as general administration and financial management. All are dependent on a successful, knowledgeable and active sales and marketing team. No individual person can possess all of these abilities or skills. Only in the simplest of operations with a very narrow range of products is it possible to operate without a balanced team of management. Therefore when approaching the problems of the Indonesian Foundry Industry it must be realised that each foundry will require help and training from a number of individual experts to build up a satisfactory and successful operation.

The team, having visited and studied the current practices operated in the foundries, discovered and discussed the lack of technology and training. The team reviewed the various methods and options of transferring technology to the Indonesian foundry industry while developing a system for the retraining of the existing workforce.

Several options became obvious and these have all been given careful consideration.

5.1 Individual Expert Assistance

This would be to provide expert help to say twenty foundries spread throughout Java in the six locations visited. This would require the appointment, in the team's opinion, of at least twenty expatriate experts.

Although this was a possible option the team believed that to find 20 such experts would be difficult. Also if the project was spread over a wide geographical area it would be difficult to control and co-ordinate, and resources would be spread too thinly. The main failing in this method was that the expert allocated to any particular foundry would have only specific experience and skills and therefore although this would resolve some of the problems it would not resolve all the deficiencies and so would leave the foundry with continuing problems that would restrict increased production and quality improvement.

It was considered that the experts could move to various foundries passing on their particular skill but with the spread of foundries, production methods, plant and equipment, products and geographical area the team believed less would be achieved and more time wasted.

The allocation of experts was also considered as operating only in two locations i.e. Jakarta and Surabaya. However the team believed that, although this would improve control, it would not improve the passing of technology and the resolution of many of the foundries problems and so would not give the best method of modernisation.

5.2 Specific Foundry Requirements

The team considered the option to assess each foundry's specific requirements for technical assistance and then to allocate various experts to the individual foundries on a basis of the estimated man months required.

This was felt to be a reasonable method. To achieve this the team believed that it was a much longer term project with many more experts involved and a much larger budget requirement. A full time co-ordinating office would be required and as well as an in depth analysis of every foundry that was expecting to participate in the scheme.

The team believed that with the remit given and the estimated budget allocation for this project that this option was not suitable.

5.3 M.I.D.C

Consideration was given to supplying all the expert help to the M.I.D.C. (Metal Industries Development Centre) Bandung and for them to operate as an advisory and training service to the industry. The team felt that the M.I.D.C. had participated a great deal in assisting foundries particularly with patternmaking and casting development using Belgium experts.

However, after the eighteen years that the M.I.D.C. has been operational, it is still only scratching the surface of the problems that exists mainly due to the limited know-how of the present staff in modern technology and their lack of practical expertise and motivation in a commercial environment.

The team, therefore, felt the approach must be "hands on" at shop floor practical level and that rather than have the project based around M.I.D.C., that the M.I.D.C. should participate in the scheme at foundry level and indeed re-train its personal in the process.

5.4 Overseas Training

Overseas training is an important option and in the future companies must give full consideration and be prepared to invest in sending their key technical people for overseas training to broaden their base of knowledge and understandi _ _ a developed environment. It should be stressed, that carefull c nsideration must be given to the selection of the country involved and an in depth investigation into the training required is essential to ensure that training overseas is of benefit to the individual, the company and the Indonesian Foundry Industry. This assessment is not currently being undertaken by foundries sending people abroad.

The team, although believing overseas training at a certain level was a major advantage, did not feel that it was the method to assist the technical development in the short to medium term but rather as an additional benefit to any local retraining that could be effected.

5.5 Lead Foundry System

The team conclude that the only method was "hands on" practical foundry assistance and to this degree considered the method with the most impact was the lead foundry system.

Indonesian industry shows a great interest in copying whether it be of individual machines or successful manufacturing operations. It is strongly felt, and this is supported by the Ministry of Industry, that once successful foundry operations are established, the interest and desire to modernise will be nucleated within other less advanced foundries to emulate their performance. This will be particularly noticeable in the private sector where a great interest was apparent during the teams' visits. Many years of assistance to the state owned sector have unfortunately nto brought about any significant improvements in productivity, quality or output. With the full agreement of the Ministry of Industry, the study team recommend that any direct assistance should be directed at the private sector. However this would be channeled through and controlled by a project management team within the Ministry of Industry assisted by MIDC and the Foundry Association.

A lead foundry would be selected in each of the two main areas visited (Jakarta and Surabaya). These foundries will have a minimum of basic equipment, management and potential markets. Within the geographical area of each of the lead foundries a further group of foundries be selected as associated foundries.

These foundries will also be suitable for development and acceptance of modernisation. Also in each of these two areas, other foundries can benefit to a lesser degree by patternmaker retraining, attending seminars and help with specific problems.

At each lead foundry a fully equipped pattern shop will be provided by the company and selected under the guidance of the expert team. A team of three experts will be located at each lead foundry and include (a patternmaker) a foundry technical engineer, a metallurgist and if the former two will have a broad basis of knowledge on foundry operations.

The participating foundries would send patternmakers for re-training to the lead foundry on a schedule to be agreed depending on the numbers involved and the level of skill already achieved.

It is envisaged that the time cycle of the project would be two years and that for the first six months the teams would concentrate on the lead foundry assistance (with the exception of patternmaking) and during this period organise seminars on specific topics for all the schemes associated and other foundries to attend. It is important that the initial six months is concentrated on the lead foundries for three reasons. Firstly to provide a technically sound basis to use for training and demonstrations, secondly to provide a strong basis for the lead foundries to take full advantage of the technical assistance over the remaining eighteen months of the project to build up strength and technical know-how. Thirdly it will encourage the associated foundries to fully participate when they see some of the benefits being achieved at the lead foundries. After the initial six months the next six months would be allocated 50% to the lead foundries and 50% to the other associated foundries and the final twelve months equally between the lead and associated foundries.

In addition to the three experts based at each of the lead foundries, two additional experts are proposed. Firstly a team leader to co-ordinate the operation of the technical assistance, carry out marketing assessments and give the foundries marketing assistance.

Also to develop the relationship with the Ministry of Industry, M.I.D.C. and the Foundry Association to enable the formulation of an infrastructure/institutional framework for ongoing modernisation of the industry to continue after the termination of the project. The role of MIDC in the field of reverse engineering will be particularly important in the casting market development.

Secondly, a financial and management expert will be provided to introduce essential cost and financial control systems, assist with training of financial and commercial staff to produce business plans, cash forecasting and capital investment appraisals. Also to advise on commercial and managerial problems to enable the foundries to become more cost concious, excercise better control and have more business awareness.

The latter two experts would be based in Jakarta travelling between the two project areas and other locations as required.

A fundamental part of this project is for each expert to have local counterparts, fluent in English with a suitable level of education, training and experience. This is essential to enable the counterparts to learn and retrain as quickly as possible, to maximise on the project time available, gain as much knowledge and benefit from the programme and be able to continue to develop after the termination of the project.

6. LEAD FOUNDRY SELECTION

The team visited thirty foundries to assess their individual capabilities and to develop the basis for the technical assistance programme. Certain basic criteria were necessary before a foundry could be considered for a lead foundry role.

A major prerequisite being a reasonable foundry facility with ample floor area, basic plant and equipment covering, electric melting, hand and mechanised machine moulding and, shotblasting and mechanical finishing equipment. The adoption of this criteria automatically ruled out certain of the foundries visited as they could not meet these basic requirements.

A further major consideration was the ability, with expert help and investment to develop the lead foundries to gain maximum benefit during the project period and with a basic management capability and willingness to continue their own development after the termination of the project.

It is essential that a lead foundry has a sound financial base and that it is prepared to invest in the equipment thought necessary by the team to enable the development to take place. This financial criteria ruled out a number of foundries who advised the team they were either non profitable, or had restrictions on further investment and funding being made available, or in some cases a combination of both.

Technically and financially the foundry needed to have a basis of management that could be retrained and developed while being prepared to recruit managers and/or supervisors to meet the project requirements for counterpart staff.

Finally, a most important factor in the selection of lead foundries was the willingness of the companies involved to be prepared to provide office and secretarial facilities for the experts along with conference facilities for use by the experts for seminars and instruction to the lead and associated foundries staff.

The further willingness to be prepared to allow training to take place at their foundry and be fully co-operative with the expert team, Ministry of Industry, MIDC, Foundry Association and the associated or nominated foundries. These criteria are essential for the success of the project and the continuity of development and training at the end of the technical assistance project. These particular requirements caused great concern to the team as the majority of the foundries visited were reluctant to allow training in their foundry or be prepared to discuss problems or foundry matters with other foundries.

After carefull assessment and revisiting a limited number of foundries and subject to receiving assurances from the foundries selected to meet the teams lead foundry criteria, the two lead foundries chosen are :

(1) P.T. BAKRI TOSANJAYA or (Jakarta Area)
P.T. INDO BANGNA PRIMA

(2) P.T. AGRINDO (Surabaya Area)

The nominated associate foundries have been chosen.

Jakarta	Surabaya
P.T. Bakrie Tosanjaya or P.T. Indo Bangna Prima	P.T. Madju Warna Steel
and	
P.T. Dendrit	P.T. Jatan Taman Steel
P.T. Bina Usaha Mandiri	CV Bumi Brakedrum Co

Other foundries withir these geographical areas who will also benefit from expert assistance have been identified :

P T Roda Prima Lancer
P T Indo Machine
P T Metinea Prima
P T Pakarti Riken
P T Barundo Angyun Industry

Detailed memoranda of agreement have been prepared for signiture by both the Ministry of Industry and the lead foundries listing all responsibilities and provisions of equipment necessary for supply by the lead foundries. These are attached to the draft project document in Appendix 4.

7. CONTINUITY OF DEVELOPMENT

The foundry industry is a subsector within the responsibility of the Ministry of Industry (Directorate General of Machinery and Basic Metals).

The subsector is a mix of privately and state owned companies. However the 5 state owned foundries currently only produce 8% of the total foundry output of castings. Major investment has taken place in these units but due to a combination of lack of technology and poor motivation this is being inefficiently utilised.

The major part of the foundry production, therefore, comes from the many privately owned units. These have also invested in new equipment but although more successfull they still only operate at about 50% of their licenced capacity. The government policy is to seek assistance to help this section of the industry. Any ongoing technical development must accomodate this dominance of the private sector.

The Indonesian Foundry Association is a body, established to promote dialogue between the government and the foundries. It has twenty eight member companies who aapointa president from within the industry. There are no permanent operating staff. Discussions with members indicate that it has a very limited influence or practical advantage to the companies participating. No interchange or developments in technology are effectively promoted by the Association and the mode of operation will require major change of emphasis for this to occur.

Currently, the only institutional mechanism for supporting development of the industry is the Metals Industry Development Centre (MIDC) in Bandung. This is a product orientated research and development operation designed to assist the small and medium scale industries to acquire "know-how" for the manufacture of metal products in the Indonesian environment. Reverse engineering of products takes place generally in line with the government's import delection programme.

A modern patternmaking facility is established along with a small foundry for prototype manufacture in this product development process.

The national staff are supported by a patternmaking and a foundry technical expert from Belgium. Training courses are offered to the industry and direct assistance is provided through manufacture of patterns. The capacity of the unit is small and although it has been in operation for some 18 years, the industry appears largely sceptical of its usefulness. This is due mainly to a non urgent approach and also somewhat dated technology, plant and process design. Assistance is given but examples witnessed by the team indicated that this is targetted to improve the rudimentary cottage type operations rather than the more sophisticated high production orientated foundries.

In this situation, the national staff have no practical experience to offer assistance. However, the necessary skills and experience could be enhanced, if the MIDC staff are actively involved as counterparts to the expert teams at the lead foundries throughout the proposed duration of the project.

It is considered more important that a new institution is established, semi professional in structure and on a national basis, primarily designed to promote technical expertise in foundry operations and which will have open membership to the managers and operating staff of the individual foundries. Many such institutions exist in countries with successful foundry industries and on going development of this industry can only be sustained by adopting this approach through participation of the work fc ce of the industry.

At the present time the commercial constraints within the existing association are restricting any national exchange of information and the framework of the institution must be changed to allow technical exchange outside of this company dominance.

It is recommended that as part of the project programme, the various options for establishment of this type of member motivated institution are investigated and that after discussions and agreement between interested parties, practical assistance is given to the initial operation of the body.

8. PROPOSED PROJECT PROGRAMME

A draft project document has been prepared and is included in this report as Appendix 4.

This has been develop'd in accordance with UNDP/UNIDO rules and includes:

- Preliminary Work Plan
- Training Programme
- International Expert and National Counterparts
- Job Descriptions
- Memoranda of Agreement for lead foundries.

9. CONCLUSIONS

(1) Approximately 50.000 tonnes per annum of castings are produced in Indonesia of which 92% are produced by the private sector. The castings are of simple complexity mainly in low grade iron of casting with 75% being of indeterminate specification. The tonnage produced is estimated to be less than a third of the total casting requirement.

(2) Major capital investment particularly in the state sector has not yielded any significant change in the supply pattern. Lack of technology and good management practices has restricted the development of production of more complex and higher quality products to satisfy the demands of the engineering sector or aid the government deletion programme.

(3) Technology and management techniques must be radically improved to up-grade quality and volume of casting production, to meet the increasing demands of the machinery manufacturing and spare part requirements of the engineering and consumer industries.

(4) Little market information, on the use of castings is available restricting the accurate assessement of the overall requirements and therefore formulation of a future foundry development strategy.

(5) Private sector foundries require assistance at enterprise level in training, technology and management practises to improve performance.

(6) No planned systematic training is taking place in the industry nationally at either shop floor or management levels.

(7) Very little quality control is undertaken restricting the development of better quality, higher grade castings and the creation of customer confidence.

(8) Insular company attitudes and insufficient institutional support or framework have lead to poor interchange of technology, commercial information or training.

(9) Poor financial and general management control, coupled with absence of capital investment appraisal has led to inefficient company operations with limited return on capital investment.

RECOMMENDATION

The technical and management assistance to foundries in the private sector as detailed in the draft project document (Annex V) is implemented on an urgent basis. The overall policy and direction of the project will be under the control of a management team at the Ministry of Industry, Directorate of Machinery and Basic Metals.

1. Expert teams covering the disciplines of foundry engineering, metallurgy, patternmaking, marketing and financial, cost and management control are established at lead foundries in Jakarta and Surabaya.

2. Direct hands on technology transfer and training be given intially to the lead foundries and progressively over the 2 year project period to nominated associated foundries in the two geographical areas. Other foundries in Java to also have access to the technology and skill training through attendance on training courses and seminars carried out at the lead foundry by the experts.

3. MIDC to be invited to participate by providing technical back up facilities such as reverse engineering to assist market penetration and also to take full advantage of the practical training by the experts for its own foundry department staff.

4. Marketing assessment to be carried out to determine the "real" casting requirements to enable the establishement of foundry and government forward planning for the foundry industry.

5. Improved financial, cost and management systems be introduced to enable the foundry industry to go forward in a controlled and organised manner to become commercially aware and competative.

6. To facilitate the ongoing development of the foundry industry, an institutional framework be established which will promote the technical and commercial exchange of information throughout the foundry industry.

APPENDIX 1

TERMS OF REFERENCE FOR SUBCONTRACT

Title: Preparatory Assistance DP/INS/88/019 - Modernization of the Foundry Industry

(a) GENERAL BACKGROUND INFORMATION:

The Government of Indonesia has accorded high priority to the development of the engineering industries and an annual growth of 17 percent is targetted for the machinery and basic metal processing branches in Repelita IV. Among the priority machinery and equipment branches selected for promotion of local manufacturing during Repelita IV are industrial machinery and equipment for palm oil, sugar, rubber, tea, wood processing, food processing, basic chemicals and metal processing and textiles; machine tools; agricultural equipment including tractors and tillers; construction equipment including bulldozers and the like; electrical equipment; railroad rolling stock; automotive components for greater integration into the existing assembly sector; shipbuilding and offshore structures; and electronic equipment including for office automation. Most of the above equipment incorporate foundry products in a considerable degree. Particularly important from the point of view of the input of foundry products are industries manufacturing diesel engines, agricultural equipment including tractors and tillers, bulldozers and other construction equipment, machine tools, passenger and commercial vehicles, sugar mill equipment, palm oil equipment, rice milling equipment and various items of processing equipment particularly for mining and downstream processing of ore. The foundry industry may therefore be regarded as a major infrastructural industry for development of the engineering sector and in particular for the development of local manufacturing in the priority industry branches described above.

At present there are about 100 foundry units in Indonesia with an approximate estimated total capacity of 70,000 tons per year. Production capacity is largely for grey cast iron (80 percent); capacity for steel is severely limited (around 5 percent); ductile iron castings particularly for valves and pipe fittings are also produced. The range of foundry products currently produced include castings for components including spare parts for agricultural and mining machinery as well as for rubber, rice and sugar processing equipment, textile equipment, sewing machines, tile presses, pumps, pipe fittings and household utensils.

It is now widely recognized and has also been documented in various studies that the weakness of this sector is a major constraint for the accelerated development of the engineering industry in Indonesia. Most of these studies which have been carried out in the context of renovation programmes aimed at individual units have pointed out the following weaknesses namely, inadequate technical shopfloor skills, lack of pattern making and design knowledge, poor finishing particularly heat treatment and fettling of castings, improper melting and pouring techniques, lack of quality management leading to high percentage rejects and

in many cases need for additions of balancing equipment to improve casting techniques. Overall, labour productivity is very poor approximating on an average 10 percent of the values in industrialized countries. Reject percentages are similarly in the region of 10-15 percent and cases have been mentioned of percentages as high as over 70 percent compared to an acceptable range of 1-2 percent in many industrialized countries. The standards of equipment maintenance have been reported to be extremely poor leading to high levels of equipment outages. A market oriented management strategy is normally not adopted in many enterprises and the assortment of products is limited to low value items. In-company standards are generally absent and quality control management is weak. As a result, prices of castings are both variable and high. Only less than half of current domestic demand is met by local foundries and that too at the lower end of the technological scale; out of around 100,000 tons estimated annual demand, local production is reported to be 35,000 tons only. At the same time and particularly in the context of current Government concerns for enlarging non oil and gas exports, may be mentioned the potential export market for castings provided prices and quality are competitive.

In recent years, some foundries, particularly those producing parts and components for automotive engine makers, have upgraded their facilities in order to be able to supply products of acceptable quality. Even here, indications are that reject rates are high and equipment utilization levels can be significantly improved.

At the same time, a number of more recently established foundries including those which are in the public sector have installed modern equipment: use of induction furnaces is common and machine molding is also used. On the other hand, the older foundries and including a large number of the smaller foundries in the private sector use cupolas and the green sand molding system. Sand treatment and sand control are grossly inadequate leading to foundry defects such as dimensional deviations, blow holes, sand and slag inclusions etc.

There is therefore urgent need to improve the technology as well as to upgrade the skills in the foundry sector. Considering however, that most of the foundries are private sector enterprises, any strategy for sustained development of the sector must concentrate on improving the ability of the individual units to continue to modernize by themselves, i.e. to be started on a course of autogenous development.

It is therefore proposed that the project of technical assistance to help in the modernization of the foundry industry in Indonesia concentrates on a selected group of individual enterprises which are considered most promising both from the point of

view of managerial abilities and interest as well as the existence of the minimum technological level of equipment to ensure results. Modernization of these units is expected to lead to visible and demonstrable gains of productivity and profit which can act as major stimulus for other enterprises elsewhere to emulate. Furthermore, the successful direct beneficiaries of the project can act as referral points for others in the industry who can, with suitable adaptations, improve the methods and procedures both at management and shopfloor levels that would have been evaluated and implemented in the beneficiary group. Two project locations are recommended, set within the context of the conglomeration of existing foundry capacity in the country, namely Jakarta and Surabaya.

As far as implementation arrangements are concerned, the following schema is envisaged.

The Government Implementing Agency will be the Ministry of Industry (Directorate General of Machinery and Basic Metals) acting in co-operation with the Association of Foundry Industry in Indonesia. At each of the two project locations namely Jakarta and Surabaya, a number of foundries (tentatively estimated at 10 enterprises at each location) are selected for direct modernization assistance. The selected enterprises are those most promising of success and will after modernization act as "demonstration enterprises" or referral points for the Association. At each location, one of the group is to be selected as a lead enterprise. Tentatively P.T. Bakrie Tosanjaya and P.T. Maju Warna Steel have been selected as lead enterprises for Jakarta and Surabaya respectively. These lead enterprises, which have a fair level of technical capability in terms of manpower and equipment, will act on behalf of the Association in providing counterpart facilities namely, counterpart personnel, office and support facilities, training facilities for personnel from the other direct beneficiaries at that location etc. It is also envisaged that the Metal Industries Development Centre, Bandung will also associate with the project through detail of counterparts particularly for the training and in-company standard preparation aspects of the project. The accent of the project will be direct support to the beneficiary enterprises so that they can continue further modernization on their own after project termination.

The following enterprises have been tentatively selected for the two locations. However, one of the main objectives of the preparatory assistance is to evaluate this tentative listing as well as to enlarge it if appropriate.

Jakarta	Surabaya
1. PT Barata Indonesia (Pulogadung)	1. PT B.B.I.
2. PT Bakrie Tosanjaya	2. PT Kumala Ceni
3. PT Dendrit	3. PT Pinda Tonana
4. PT Bina Usaha Mandiri	4. PT Grumo Nasional
	5. CV Logam
	6. PT Waru Jaya
	7. Maju Warna Steel
	8. PT Pakarti Riken Indonesia
	9. PT Jatim Tanan Steel

(b) AIM OF THE CONTRACT:

The basic purpose of the contract (preparatory assistance) is to conduct an audit of the existing levels of technology, operational skills, management practices, maintenance practices and product assortments of the foundries listed above and approximately ten additional foundries each at Jakarta and Surabaya, selected on basis of information available with Ministry of Industry in order to identify enterprises which are the most promising to be included as direct beneficiaries of the proposed technical assistance.

The preparatory assistance is also expected to determine and examine alternative project implementation strategies and validate the proposed implementation modality. In this context, the subcontracts should identify the lead foundries in each location and their specific roles and functions in the context of the technical assistance, including also the organizational and other arrangements considered necessary. The exact manner in which the Association of Foundry Industry in Indonesia can provide continuing counterpart assistance and help in sustaining the modernization effort should also be investigated and elaborated upon.

The subcontractor will prepare a draft report, detailing the findings, their analysis and discussions together with recommendations, which will be discussed in the field with UNDP, National Authorities and UNIDO, and following upon this, the subcontractor, SIDFA and the National Counterpart, will prepare the first draft of project document.

Note: The extent to which software and design facilities are required in particular for ensuring efficient pattern design including gating and risering should be evaluated as also the type and extent of testing facilities required.

(c) SCOPE OF THE CONTRACTING SERVICES:

The subcontractor's team will visit the foundries noted under 'General Background Information' in order to fully assess their present status.

The market conditions will be assessed by the subcontractor using information supplied by the Counterpart and supplemented by the team.

The level of training and experience of staff will be investigated at all levels, and requirements (and modalities) for improvement will be noted.

The subcontractor will prepare the draft report which will cover the modernisation programme, and which will contain a draft work programme in which will be found, amongst others, the coordination development of production, market penetration investment and training. The report will include a draft detailed project document prepared according to UNDP rules.

Note: 1. The subcontractor, together with the counterparts examine the salary scale, with a view to ensuring a low turnover of trainees.

2. A training foundry is to be set up within Indonesia, this may be taken into account.

Following upon the termination of the draft report, the team will be joined in Jakarta by a UNIDO staff member, who will participate in the discussions and work leading to the approved final report, and to the final version of the project document.

(d) GENERAL TIME SCHEDULE (Tentative)

	Time: months after award of contract	Duration: weeks
Briefing in Vienna	1	
Arrival in project area	2	
Activities in project area:		
1. Discussion with the Ministry of Industry, Industry Association, Manufactures, Consumers, and other related bodies	2	1
2. Visits to the companies and workshops	3	4
3. Formulation of analysis, conclusions, and recommendations	3.5	2
4. Discussion of the above formulations		1
5. Drafting of project document		2
6. Concluding discussion and finalization of draft project document (leave project area)	5	2
		(12 Total)
Submission of draft final report	6	
Note: The team will be debriefed in the project area by UNIDO.		
UNIDO will supply comments	6.5	
Presentation of final report	7.5	

(e) PERSONNEL IN THE FIELD;

Total man/months is estimated at 12.

A team of four experts in the following specializations:

a) Foundry experts, marketing and general organization (Team Leader)
b) Production aspects of foundry including molding, melting, pouring fettling
c) Quality control
d) Financial management and cost control

Note: UNIDO will examine the C.Vs of the subcontractor's personnel with great care in the search for maximum relevance to the work to be performed.

(f) LANGUAGE: English

(g) REPORTS:

a) Draft final report: 5 copies
b) Final report: 15 copies

APPENDIX 2

NAMES AND ADDRESSES OF PLACES VISITED

No.	NAMES	ADDRESS
1.	UNDP	United Nations Development Programme
	M. MASRI, Resident Representative	Jalan M H Thamrin 14
	M.A. SELVANATHAN, Deputy Resident Representative	P O Box 2338 Jakarta
		Telephone 321305
	UNIDO	Telex 011.44178
	G.L. NARASIMHAN SIDFA	
	D. Andersen, Assistant to SIDFA	
2.	Ministry of Industry and Basic Metals	Ministry of Industry and Basic Metals
	Mr S. [illegible] - Director General	Departemen Perindustrian,
	Ir M Mohamad Yovit - Director for Basic Metal Industry	10th Floor
		Jalan Gatot Subroto
	Ir H A Hutagalung - Planning Directorate	Kav 52-53, Jakarta Selatan
	Syahtendi - Staff Member	Telephone 512185
	Ir Martin - Staff Member	Telex 44447
	Hardiprakwt - Staff Member	
	Sis Mulyono - Staff Member	
	Ruddyati - Staff Member	
	Sinta - Staff Member	
3.	Indonesian Foundry Industry Association	Indonesian Foundry Industry Association
	M. Sentler	Case Building 4th Floor
		Jalan Gatot Subroto Kav 12
		Jakarta Selatan 12930
		Telephone 510097
		Telex 46729
4.	Barata Indonesia P.T. (Persero)	Barata Indonesia P.T. (Persero)
	Ir. R A P Sudarsono - Chief of Technical Co-operation Bureau	Jakarta Foundry Centre
		Jl Rawa Bali No 23
	Ir. Toto Prasetyo (Metallurgist) - Branch Manager	Pulo Gadung, Jakarta Timur
	Ir Putu Renes - Foundry Manager	Telephone 4894628
		Telex 47316
		Fax 021-7992600
5.	PIMSF	P.T. PIMSF Pulogadung
	Ir W Koerad - Technical Staff	Jl Pulogadung 12
		Jakarta Timur
		(Kawasan Industri Pulogadung)
		Telephone 4892450-4893960
		Fax 4893467

NAMES AND ADDRESSES OF PLACES VISITED

No.	NAMES	ADDRESS
16.	P.T. Bakrie - Tosanjaya	P.T. Bakrie - Tosanjaya
	Thoeas Hanan Thoya - President Director	Jl Raya Bekasi Km 27
	Turnudhy - Plant Manager	Cakung - Jakarta
	Ferryanto S BBA - Business Relations Superintendant	Telephone 4891953
17.	P.T. Bakrie and Brothers	P.T. Bakrie and Brothers
	Ir Santoso M Rasalan MBA - Senior General Manager	Wisma Bakrie 6th Floor
	M Bachtiar - Sales Manager	Jl H R Rasuna Said Kav B-1
		Jakarta - 12920
		Telephone 510192
		Telex 62359
18.	P.T. Dendrit	P.T. Dendrit (Office)
	Raharjo Soekarnen - General Manager	Jl Siaset Riyadi No 7
	Haerpel Isa - Director	Jakarta Timur
		Telephone 883515 - 884584
		Telex 45225
		Plant Address
		Jl Tiger Kampung Sera
		Telephone 4896447
19.	P.T. Metinca	PT Metinca Prima
	Ir Amad Umar - Director	Industrial Works
	Sebastian Dharmawan - Director	Jl Rawa Sumur Barat No 6
		Jakarta Industrial Estate
		Pulogadung, P O Box 6/JKT
		Jakarta Timur
		Telephone 021-4703152-5
		Telex 61205
		Fax 021-4703153
20.	PT Roda Prima Lancar	PT Roda Prima Lancar
	Mr Haryanto	Jl Raya Serang Km 4
		(Kompleks Lucky Indah
		Keramik)
		Desa Kroncong Jatiuwung
		Tangerang
		Telephone 082-122858
21.	PT Bina Usaha Mandiri (BUM)	Office
	Mr Budi Setiadi - President Director	PT Bina Usaha Mandiri
	Dipl Ing Ridwan Setiadi - Production Manager	Jl Tanah Abang 11/23
	Elman Sunarlie	Jakarta - 10160
		Telephone 372878
		Telex 44049
		Factory
		Ds Sentor - Kp Cayang
		Kecamatan Jatiuwung

NAMES AND ADDRESSES OF PLACES VISITED

No.	NAMES	ADDRESS
		Tangerang
12.	PT Indo Bangna Prima	PT Indo Bangna Prima
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	Ir Miharto - Engineer	Tangerang
		Phone 021-610950-610185
		Telex 47396
		Fax 021-5790343
13.	PT Indoemachine	PT Indoemachine
	M.A.D Sunggu - Manager	Jl Daan Mogot Km 14
		Cengkareng, Jakarta-11730
		Telephone 611990
14.	PT Pakanti Riken Indonesia	PT Pakanti Riken Indonesia
	S Yokoyama - Vice President	Jl Kebon Sirih 96
	R Tranggono - Director	Jakarta 10110
	Ir Adi Yanuli - Director	Telephone 371409 - 373969
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15.	PT Barata Indonesia	PT Barata Indonesia
	Noor Widjojadi - President Director	(Persero)
	Drs Er Wynand Pelte - Director of Finance and Personnel	Jl Agagel 109
		Surabaya 60241
	Drs Harrie Soeng Patata - Chief of Technical Co-operation Bureau	Telephone 69075
		Telex 34321 : Fax 69079
		Fax 69079
16.	P.T. Madju Warna Steel	P.T. Madju Warna Steel
	P.H. Sede Haradjaja - Director	Rungkut Industrie III/45
		Surabaya
		Telephone 031-812795-812874
		Telex 33239
17.	P.T. Barindo Anggun Industry	P.T. Barindo Anggun Industr
	Tjondro Prayogo - President Director	Jl Sier Pomahan 149-150
	Gie Tjie Nan - Director	Surabaya
		Telephone 031-470848-472120
		Fax 031-516007
18.	P.T. Agrindo	P.T. Agrindo
	E.B. Santosa - Director	Jl Slompretan 16-18
	Cuk Sutoyo HS - Production Planning	Surabaya 60161
	E.A. Kahmadji - General Manager Production	Telephone 270191
	Fx.H. Subroto - Foundry Manager	Telex 31497
	Ir Harry Gunardi P - Plant Manager, Machine Shop	Fax 031-24828
	Nas Elly	
19.	PT Jatim Taman Steel Manufacturing	PT Jatim Taman Steel
	Wanjono S - Production Manager	Manufacturing

NAMES AND ADDRESSES OF PLACES VISITED

No.	NAMES	ADDRESS
	IV. Kuppen - Expert Melting and Casting	Jl Raya Taman Sidoarjo Surabaya Telephone 031-814674-812513
20.	Hadi Yananto Ir. Hadi Yananto	Hadi Yananto Jl Halmahera No 74 Malang Telephone 27111
21.	VC Bumi Brakedrum Harijono - Director	VC Bumi Brakedrum Mangliawan (Wendit) Kec. Pakis, Malang Telephone 0341-41526
22.	PT Bosa-Bissa-Indra (BBI) Amanda Soejoso - Plant Manager Ir Hudha Djalil - Sales Manager Ir B.W.Sidharta - Foundry Engineering Sukprabowo - Foundry Manager	PT Bosa-Bissa-Indra (BBI) Jl Imam Bonjol No 19 Pasuruan Telephone 0343-21063 Telex 31746 Fax 0343-41499
23.	CV Karya Hidup Sentosa Drs Hendro Wijayanto - president Director Drs FX. Purwoko - Branch Sales Manager Mr Lukman - General Manager	CV Karya Hidup Sentosa Jl Magelang No 144 Yogyakarta Telephone 021-6292044 & 6293429 Telex 41497
24.	Co-operative Industry Satur Jaya Ahad Yusuf Mahmudi Zainal Arifin	Koperasi Industri "Satur Jaya" Batu Deper, Klaten Yogyakarta Telephone 0272-21146
25.	PT Tri Sinar Purnasa Foundry Hidayat Purnasa - Director Tjahjadi S Purnasa - Director	PT Tri Sinar Purnasa Desa Kedung Pari Jl Raya Jurusan Boja Semarang Telephone 021-675639
26.	PT Nimaru Jaya Heru Soebekti - Director Ali Yunus - Production Manager	PT Nimaru Jaya Jl Raya Kaligawe 225 Genuk Semarang Telephone 22489
27.	Matahari SS Co Ltd H Hisyar Adnan - President	Matahari SS Co Ltd Foundry and Machinery Factory Jl Cepaka Nr 19 Tegal 52124

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		Telephone 0283-21976-21507
28.	PT Daika (Gunamusa Group)	PT Daika
	Ir Abdel D. Poerbo - Executive Director	Jl Kolonel Soediarto No 14
		Tegal
		Telephone 21098
29.	PT Kerta Laksana	PT Kerta Laksana
	Ir H Soercjo Mignjodipoero - President Director	508 Jl Jend Sudirman
	Ir H Prayoga - Director	Bandung
	Dipl Ir Dedan Muliadi - Marketing Director	Telephone 611093 - 614833
30.	CV Teha	CV Teha
	Stewart Turangan - Plant Manager	Jl Arjuna 29
		Bandung 40182
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31.	PT Yanmar Agricultural Machinery	PT Yanmar Agricultural
	Manufacturing Indonesia (PT Yamindo)	Machinery Manufacturing
	Fuji Ariyoshi - Technical Adviser	Industry (PT Yamindo)
	Ir S. Putra - Planning Sector	Pondaan, Kabupaten Pasuruan
	Sudaryadji - Sales Engineer	Jawa Timur
	Nasrun Effendi - Sales Supervisor	Telephone 0343-91789
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32.	Ministry of Industry - Metal Industries	Metals Industry Development
	Development Centre (MIDC)	Centre (MIDC)
	Wibisono Setiadjat - Head of Industrial	Jl Sangkuriang No 12
	Development Sector	P.O.Box 113
	Poerwo - Staff Member	Bandung 40135
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	S Djatmiko S D - Staff Member	
33.	Bandung Institute of Technology	Metallurgical Engineering
	Prof Ir Tata Surdia	Laboratory
	Dr Ing. Ir Suparno Adi Dwiwanto	Mechanical Engineering
		Department
		Bandung Institute of
		Technology
		Jl Ganesha 10
		Bandung 40132
		Telephone 84258
34.	Politeknik Mekanik Swiss	Institute of Technology
	Enik A Hidayat - Production Manager	Bandung
	M. Schultz - Adviser	Politeknik Mekanik Swiss
		Jl Ir H Juanda
		(Kpl Kanayakan)
		Tromol Pos 70
		Bandung 40132

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No.	NAMES	ADDRESS
		Telephone 022-82087-84314
		Fax 022-84314
		Telex 28675
35.	German Technical Advisory Group	German Technical Advisory
	Dipl. Ing. M. Berger - Team Leader	Group
	K. Schnieder - Engineer	Department of Industry
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		Jl Gatot Subroto Kav 54
		P O Box 643
		Jakarta 12001
		Telephone 5200733
		Telex 45959

FACILITIES OF FOUNDRIES VISITED

	FOUNDRY NAME	CLASSIFICATION			TYPES OF METAL POURED							
		PMA	BVMN	PMDN	GREY IRON	DUCTILE	MALLEABLE	CARBON STEEL	MANG. STEEL	ALLOY STEEL	COPPER BASE	ALUMINIUM
Jakarta	PT Barata Indonesia		X		X	X		X				X
	PT Bakrie Tosanjaya			X	X	X						
	PT Dendrit			X	X			X	X	X		
	PT Metinca			X				X		X		X
	PT Roda Prima Lancar			X				X				
	PT Bina Usaha Mandiri			X	X	X						
	PT Indo Bangna Prima			X	X	X		X	X	X	X	X
	PT Indo Machine			X	X							
	PT PIMSF			X	X							
Surabaya	PT Pakarti Riken Indonesia	X			X	X	X					
	PT Barata Indonesia (Gresik)		X		X	X		X	X	X		
	PT Barata Indonesia (Cabang)		X		X						X	
	PT Maju Warna Steel			X	X	X		X	X	X		
	PT Barindo Anggun Ind.			X	X						X	
	PT Agrindo			X	X							
	PT Jatim Taman Steel			X	X			X	X	X		
	Hadi Yonanto				X							
	CV Bimi Brakedrum			X	X							
	PT Boma Bisma Indra (BBI)		X		X							
Jogyakarta	CV Karya Hidup Sentosa (KHS)			X	X						X	
	Batur Jaya	Co-operative with 125 members rudimentary operation										
Semarang	PT Tri Sinar Purnamar			X	X		X					
	PT Nimaru Jaya			X	X		X					
Tegal	PT Matahari SS			X	X						X	
	PT Dwika			X	X						X	
Bandung	PT Kerta Laksana			X	X							
	CV Teha			X	X					X	X	

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FACILITIES OF FOUNDRIES VISITED

	FOUNDRY NAME	PRODUCTION TPA CURRENT	PRODUCTION TPA LICENCED	MARKETS OWN USE	MARKETS DOMESTIC	% EXPORT	NUMBERS EMPLOYED TOTAL
Jakarta	PT Barata Indonesia	1620	4000	20	80		162
	PT Bakrie Tosanjaya	2850	5400		100		368
	PT Dendrit	1800	3000		100		190
	PT Metinca				40	60	101
	PT Roda Prima Lancar	480			100		25
	PT Bina Usaha Mandiri	1920	4000	20	80		250
	PT Indo Bangna Prima	1800	1200	30	60	10	112
	PT Indo Machine	840	3600	100			51
	PT PIMSF	60	100				16
Surabaya	PT Pakarti Riken Indonesia	2400	4000		70	30	495
	PT Barata Indonesia (Gresik)	1000	6000	30	70		229
	PT Barata Indonesia (Cabang)	1200		1	99		66
	PT Maju Warna Steel	800			100		170
	PT Barindo Anggun Ind.	2400	540		20	80	470
	PT Agrindo	720	1000	100			70
	PT Jatim Taman Steel	1500	2400	20	80		70
	Hadi Yonanto	240			100		25
	CV Bimi Brakedrum	1200	1800		100		48
	PT Boma Bisma Indra (BBI)	1300	2000		100		37
Jogyakarta	CV Karya Hidup Sentosa (KHS)	960	1275	75	25		101
	Batur Jaya	Co-operative with 125 members rudimentary operation					
Semarang	PT Tri Sinar Purnamar	2100	2700		100		400
	PT Nimaru Jaya	720	1950		100		400
Tegal	PT Matahari SS	360	580	90	10		30
	PT Dwika	178	100	20	80		98
Bandung	PT Kerta Laksana	240		20	80		28
	CV Teha	190	180				12

FACILITIES OF FOUNDRIES VISITED

		PATTERNSHOP					MELTING			
		WOOD	EPOXY	METAL	POLY STYRENE	RATING 1-10	ELECTRIC	CUPOLA	CRUCIBLE	OTHER
Jakarta	PT Barata Indonesia	X			X	5	X		X	
	PT Bakrie Tosanjaya	X	X	X		3	X	X		
	PT Dendrit	X				2	X			
	PT Metinca	X		X		-	X			
	PT Roda Prima Lancar					-	X			
	PT Bina Usaha Mandiri	X			X	5	X			
	PT Indo Bangna Prima	X			X	3	X	X		
	PT Indo Machine			X		3		X		
	PT PIMSF	X				-		X		
Surabaya	PT Pakarti Riken Indonesia	X		X		-	X			
	PT Barata Indonesia (Gresik)	X			X	5	X			
	PT Barata Indonesia (Cabang)	X			X	-		X	X	X
	PT Maju Warna Steel	X				4	X			
	PT Barindo Anggun Ind.			X	X	5			X	
	PT Agrindo	X	X	X		2	X	X		
	PT Jatim Taman Steel	X				3	X			
	Hadi Yonanto	X				-		X		
	CV Bimi Brakedrum	X				-	X			
	PT Boma Bisma Indra (BBI)	X				6	X	X		
Jogyakarta	CV Karya Hidup Sentosa (KHS)	X		X		4	X		X	
	Batur Jaya	Co-operative with 125 members rudimentary operation								
Semarang	PT Tri Sinar Purnamar	X	X			6		X		
	PT Nimasu Jaya					-		X		
Tegal	PT Matahari SS	X				2			X	
	PT Dwika	X				2		X	X	X
Bandung	PT Kerta Laksana	X				1		X	X	
	CV Teha	X				-				X

FACILITIES OF FOUNDRIES VISITED

		MOULDING			SAND TYPES					
		HAND	SIMPLE MACHINE	MECHANISED MACHINE	GREEN SAND	CO2	FURAN	RECLAMATION	CEMENT	OTHERS
Jakarta	PT Barata Indonesia	X		X	X	X	X	X	X	
	PT Bakrie Tosanjaya	X		X	X				X	
	PT Dendrit	X		X	X		X			
	PT Metinca	Precision								
	PT Roda Prima Lancar	X	X		X					
	PT Bina Usaha Mandiri	X		X	X	X				
	PT Indo Bangna Prima	X		X	X	X				
	PT Indo Machine	X			X					
	PT PIMSF	X			X					
Surabaya	PT Pakarti Riken Indonesia	X		X	X	X	X			
	PT Barata Indonesia (Gresik)	X		X	X	X	X			
	PT Barata Indonesia (Cabang)	X				X			X	
	PT Maju Warna Steel	X	X		X	X				
	PT Barindo Anggun Ind.	X	X		X					
	PT Agrindo	X		X	X	X	X			
	PT Jatim Taman Steel	X			X	X				
	Hadi Yonanto	X			X					
	CV Bimi BrakedrumX	X			X					
	PT Boma Bisma Indra (BBI)	X	X				X	X		
Jogyakarta	CV Karya Hidup Sentosa (KHS)	X		X	X	X	X			
	Batur Jaya	Co-operative with 125 members rudimentary operation								
Semarang	PT Tri Sinar Purnamar	X			X					
	PT Nimaru Jaya	X	X		X				X	
Tegal	PT Matahari SS	X	X		X				X	
	PT Dwika	X	X		X				X	
Bandung	PT Kerta Laksana	X	X		X					
	CV Teha	X							X	

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FACILITIES OF FOUNDRIES VISITED

		CORE MAKING					SAND PROCESSING		
		SHELL	CO2	COLD BOX	HAND	MACHINE	SAND PLANT	SAND MIXER	HAND MIXER
Jakarta	PT Barata Indonesia	X	X	X	X	X	X	X	
	PT Bakrie Tosanjaya	X		X	X	X	X		
	PT Dendrit	X		X	X	X	X	X	
	PT Metinca								
	PT Roda Prima Lancar	X				X		X	
	PT Bina Usaha Mandiri	X	X		X		X	X	X
	PT Indo Bangna Prima	X	X		X		X	X	X
	PT Indo Machine								X
	PT PIMSF				X				X
Surabaya	PT Pakarti Riken Indonesia	X		X	X	X	X	X	
	PT Barata Indonesia (Grasik)	X	X	X	X	X	X	X	
	PT Barata Indonesia (Cabang)			X		X		X	
	PT Maju Warna Steel	X	X		X	X		X	X
	PT Barindo Anggun Ind.	X				X			X
	PT Agrindo	X	X		X	X	X	X	
	PT Jatim Taman Steel		X	X	X			X	
	Hadi Yonanto		X						X
	CV Bimi Brakedrum	X							X
	PT Boma disma Indra (BBI)			X	X		X	X	
Jogyakarta	CV Karya Hidup Sentosa (KHS)	X	X	X	X	X	X	X	
	Batur Jaya	Co-operative with 125 members rudimentary operation							
Semarang	PT Tri Sinar Purnamar	X			X				X
	PT Nimaru Jaya			X				X	X
Tegal	PT Matahari SS			X					X
	PT Dwika	X		X	X	X		X	
Bandung	PT Kerta Laksana	X			X			X	X
	CW Teha			X	X			X	

FACILITIES OF FOUNDRIES VISITED

		FINISHING		QUALITY CONTROL					
		SHOT BLASTING	HEAT TREATMENT	SPEC-TROMETER	CE METER	CHEMICAL LAB.	SAND TESTING	MECHANICAL TESTING	OUTSIDE AGENCY
Jakarta	PT Barata Indonesia	X	X	X	X	X	X	X	
	PT Bakrie Tosanjaya	X	X		X	X	X		X
	PT Dendrit	X	X	X			X		
	PT Metinca	X	X					N.D.T.	
	PT Roda Prima Lancar				X	X	X		X
	PT Bina Usaha Mandiri	X				X	X		X
	PT Indo Bangna Prima	X	X	X					X
	PT Indo Machine								
	PT PIMSF								
Surabaya	PT Pakarti Riken Indonesia	X	X	X	X	X	X	X	X
	PT Barata Indonesia (Gresik)	X	X	X			X	X	
	PT Barata Indonesia (Cabang)		X			X	X		
	PT Maju Warna Steel	X	X		X				X
	PT Barindo Anggun Ind.	X							X
	PT Agrindo	X			X				X
	PT Jatim Taman Steel		X	X					X
	Hadi Yonanto								
	CV Bimi Brakedrum	X							
	PT Boma Bisma Indra (BBI)	X		X	X	X	X	X	X
Jogyakarta	CV Karya Hidup Sentosa (KHS)	X			X	X	X		X
	Batur Jaya	Co-operative with 125 members rudimentary operation							
Semarang	PT Tri Sinar Purnamar	X	X						
	PT Nimaru Jaya								
Tegal	PT Matahari SS								X
	PT Dwika	X							X
Bandung	PT Kerta Laksana								X
	CV Teha				X				X

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UNITED NATIONS DEVELOPMENT PROGRAMME
Project of the Government of
INDONESIA

PROJECT DOCUMENT

Number and Title : DP/INS/88/019 - Modernization of selected foundries to supply an improved quality and quantity of cast components to the engineering sector.

Duration : 2 Years

Project Site : Jakarta and Surabaya

ACC/UNDP Sector & Subsector :	UNDP and cost-sharing financing
Government Sector and Subsector :	UNDP
Host Country Implementing Agency :	IPF $ 2,372,850
Executing Agency : UNIDO	
Co-operation or associated agency (if applicable) :	Govt. or third-party cost sharing in kind
Estimated starting date : January 1990	
Government inputs : (local currency)	
(in kind)	
(in cash)	

Brief description :

The project will assist selected small and medium scale foundries in the private sectors by improving their market penetration, quality and range of products produced and also their economic utilisation of plant and equipment by the introduction of new and relevant technology by hands on training and the upgrading of skills at the enterprise level. In addition the introduction of new and improved financial, cost and management practices will assist the development of a competitive foundry industry.

The project will be developed through the counterpart organisation, Director General of Machinery and Basic Metal Industry (DGMBMI) of the Ministry of Industry which will work through the Metals Industry Development Centre (MIDCO and the Foundry Association.

On behalf of	Signature	Date	Name/title (please type)
The Government			
Executive Agency			
UNDP			

United Nations Official exchange rate
at date of last signature of project document : $1.00 =

CONTENTS

A. CONTEXT

1. Description of Foundry Subsector

The Government of Indonesia has laid great emphasis on industrialization in the country and the engineering sector has been given high priority for development both in the public and private sectors. Priority has been given to the promotion of local manufacture of industrial machinery such as equipment for palm oil, sugar, rubber, tea, wood processing, textiles and also machine tools, agricultural equipment including earth moving vehicles, electrical equipment, railway stock, automotive components, shipbuilding and offshore structures. Most of this equipment incorporates foundry products.

The foundry industry is an essential infrastructural component for development of the engineering sector. It's existance permit the engineering sector to operate with a great flexibility in the response to design changes and the introduction and development of products. The absence of a proper foundry industry will therefore clearly inhibit the growth of this sector.

There are approximately 130 licenced foundries within Indonesia ranging in size from rudimentary cottage-type units employing less than 10 people through to medium scale private and state-owned operations with up to 400 workers. The licenced capacity of the industry is 98,000 tonnes per year, this figure must be viewed with some caution as there is no clear definition of the basis for calculation of capacity. The current output is approximately 50,000 tonnes per year (80% iron and steel, 20% copper and aluminium based) which is estimated as only one third of the country's casting usage.

Locally produced castings are supplied to equipment manufacturers or directly to infrastructural development projects as well as replacement spare parts for consumer products such as passenger and commercial vehicles.

There are five state owned foundries and a limited number of joint venture operations with a foreign interest but the majority of the industry is private domestically owned of small and medium scale. The state owned foundries represent 15% of the total installed capacity and of the tonnage produced approximately 8% (4,000 tonnes) comes from public sector foundries and 92% from the private sector. Of all castings produced 75% is of indeterminate specification and of simple complexity.

The report prepared by GTZ (January 1989) indicates that 14 foundries produce the 9.5% of the total foundry production which is directed at the engineering industries, targeted by

the Government for development. The report prepared under the preparatory assistance indicates that some 15-18 foundries possess an amount of machinery and equipment, such as to allow their expansion to a technology acceptable level of operation with a not unreasonable investment in plant and technology.

2. Host Country Strategy

Within the engineering sector the government gives high priority to an expansion of local manufacture of machinery and components and assists this with an agreed schedule of import deletions.

This policy requires the foundry industry to expand production and improve competitiveness by upgrading both quality and productivity as well as diversification into the more complex products now demanded by the sector.

The Government also gives priority to the development and growth of the small and medium scale industries (SMI). It emphasizes the need for SMI such as foundries to be technically competent and to have linkages with the supply of products to large scale industry, to have a large share of the replacement market in engineering items to create additional product added value and to enhance the export of engineering goods.

3. Prior Ongoing Assistance

The Metal Industry Development Centre (MIDC) in Bandung is supported by the Government of Belgium and contains a small foundry product development facility.

The Politeknik Mekanik Swiss (PMS) is building a training centre for patternmakers and foundry technicians and is supported by the government of Switzerland and a World Bank loan. The objective is to train students and shop floor work force, and not to be involved in the training of supervisory and management personnel.

MIDC is expected to be involved in the project as a technical support centre principally in order that it may enhance its technical capacity to assist the foundry subsector in general. Also in order that selected staff may obtain more industrial experience and MIDC develop closer contacts with the foundries.

4. Institutional Framework for the Foundry Subsector

The foundry industry is a subsector within the responsibility

of the Ministry of Industry (Directorate General of Machinery and Basic Metals).

Currently the only institutional mechanism for supporting the development of the industry is the Metals Industry Development Centre (MIDC) Bandung. This is a product oriented development operation designed to assist the small to medium scale industry to acquire know-how for the manufacture of metal products in the Indonesian environment.

Within MIDC a foundry advisory and training service exists for use of both the private and public sector companies, this includes a patternshop and small foundry for the manufacture of prototype castings. Limited direct technical and training assistance is offered.

The project is directed at a group of foundries selected for their ability to absorb technology and to finance necessary improvements, the technical counterpart organisation will be MIDC which will be directly under the the counterpart organisation which is the Ministry of Industry, Directorate General of Machinery and Basic Metals-(DGMBMI). The Foundry Association will be the counterpart organization for the administrative and management aspects of the project.

B.PROJECT JUSTIFICATION

1. Problem to be Addressed, the Present Situation

The problems to be addressed by the project briefly are -

1.1 At "Macro" Level

The development of the production of equipment and machinery within the country, and the supply of specialical spare parts for industry depends upon the existance of a technologically flexible foundry industry. The foundry industry is clearly expected to service the engineering subsector through the supply of castings. This is not happening in Indonesia, and the Ministry of Industry has recoqnised that the deficiencies existing within the Foundry Industry are causing service problems, for the progress of the Engineering Industry.

At present the foundry industry is currently estimated to be successfully supplying only one third of the castings required by the country. The remainder are being imported with for example the sugar industry still

importing 80% of foundry produced spares. Despite extensive investment in the state owned foundries, little penetration of the potential casting market has been achieved in recent years.

The installed capacity of the foundry industry is divided between the private sector - some 85% and the state sector with some 15%. The private sector capacity is utilized at roughly 50%, the state enterprises at less than 30%.

Poor economic competitiveness and slow product and process development has in some instances delayed the implementation of the Government'sImport Deletion Programme.

It is widely recognised and documented in various studies that the weakness of the industry is a major constraint for the accelerated development of the engineering sector. These reports include :

- Renovation of Jakarta Foundry Centre by Japan International Co-operation Agency 1985.
- Market and Marketing Study on the foundry sector in Indonesia by Kleingenstein 1987.
- Supply capability of and development pattern forthe Indonesian ferrous and new ferrous foundry industry by GTZ Technical Co-operation Federal Republic of Germany 1989

The problems be addressed are thus the low capacity utilization and the limited market penetration.

1.2 At "Micro" Level.

1.2.1 Product

The quantity and range of component types produced by the foundry industry is low with up to 75% being of indeterminate material specification and most of simple complexity. There is a lack of knowledge of the market and a very limited ability to assess and develop the manufacture of castings required by the market.

1.2.2 Operational Technique

Lack of skills and technology in patternmaking, (which is a basic essential input) production techniques, modern foundry processes and metallurgy are restricting the expansion and diversification of the industry into more complex products.

1.2.3 Plant Management and Operation

Poor quality management systems and absence of laboratory testing and process control equipment results in either low standard components or high reject rates within the foundry.

1.2.4 Investment and Maintenance

Inappropriate choice of equipment, frequently of inferior local manufacture, and poor maintenance practices also leads to delivery delays and high prices.

1.2.5 Management and Development

Insular management attitudes and an absence of an effective institutional framework for both commercial and technical development, severely restricts any general modernisation of the industry from within.
Non delegation of responsibility to subordinates within the management structure, absence of cost systems and wage incentives or work measurement results in both low productivity and profitability.

The problems to be addressed involve all the activities which together make an industry. Given their range and complexity, and the urgency which Government assigns to their solution, it has been decided to approach these problems at an industry rather than an institutional level. An institutional approach would, it is believed, result in a serious delay in obtaining the necessary required improvements.

It is intended that this project will modernise the foundry industry in the two centres of Jakarta and Surabaya by the introduction of technology, specific training and market development assistance. The production of castings in these two areas accounted for 65% of the total foundry output. It is therefore considered that by concentrating the project activities in these two centres a rapid and useful result will be obtained.

1.3 The Present Situation and Expected End of Project Situation

The Present Situation has been described in a general form under 1.2, Micro level. The following table presents this situation in a fully broken down form, under the specific industrial activity title, and each is accompanied by the corresponding Post Project Situation. It is clear from the table that a thorough restructuring of the selected foundries will take place, bringing these activities into line with proper procedures at all levels.

The Post Project Situation has not been analysed in terms of total production increase. This is became some

foundries will concentrate on producing more complex higher value castings, with a lesser emphasis on volume, whilst others will expand into new product areas, many of which are yet to be defined by a market survey. There is a large market available and the market information will be used to guide the project.

PRE PROJECT	POST PROJECT
Pattern Making	
Few skilled patternmakers and trainees	A minimum of 40 retrained patternmakers
Standard of construction and design is poor	Adequately designed and manufactured wooden patterns
A very limited availability of of suitable machinery and hand tools	Two lead foundry financed, fully equiped, production and training patternshops
No technology for producing epoxy resin patterns	Fully trained patternmakers in the use of epoxy resin
Melting	
Poor understanding of metallurgical procedures	Trained work force in metallurgical procedures
Limited range of simple metal types produced	Production of a wider range of high performance alloys
Inadequate metal testing techniquesfacilities in use	Full metal testing facilities
Poor raw material selection storage, charge measurement and controlfurnace additions	Systematic control of raw materials and measurement of
Lack of understanding of	Trained work force in correct ladle and pouringcorrect ladle and pouring practicespractices
Moulding and Coremaking	
Limited sand processing control	Introduction of systematic sand testing and control
Rudimentary hand moulding techniques in clay bondedand	Operation of improved hand moulding techniques using

cement sand processes only	chemically bonded sand systems with improved control and productivity.
Poor quality machine moulds due to pattern quality and machine operational ability due to lack of maintenance	Improved machine moulding patterns and casting quality along with better performance of equipment by installed planned maintenance scheduling.
Limited use of sand types and techniques for coremaking	Complete range of sand processes and technology available
Manufacture of simple type casting	Production of a wider range of more complex castings
Finishing	
Lack of shotblasting giving high reject rates during machining operations due to failure of inspection to detect defects due to the lack of applying correct finishing techniques	Castings properly shotblasted to enable identification of defects by full inspection prior to machining improvement of casting quality by application of correct finishing techniques.
Lack of full understanding and control of heat treatment processes	Trained personnel in the use and control of heat treatment processes
Quality and Process Control	
No comprehensive quality or process control systems in operation	Quality and process control systems covering, casting standards, written work procedures, recording and analysis of quality data, installation and calibration of control equipment. Quality management structure, product certification, customer liason and quality systems audit
High casting reject rates	Measured and reduced casting reject rates
Lack of detailed understanding of casting specifications	Trained personnel in the production of high grade

resulting in the production indeterminate specification low grade castings	alloys and a wider range of of more complex castings to accepted specifications.
No technical counterpart with adequate 'in plant' experience.	MIDC will have obtained experience permitting it to extend its services to the subsector.

Management Practices

Inappropriate management structure for the foundry operation	Efficient, formalised foundry management team.
Lack of Delegation of Line Authority and Responsibility	Delegation of line Authority and Responsiblity.
Absence of cost, financial, and management control systems	Installed cost, financial and management control systems

Institutional Framework

No co-ordinated institutional framework exists for the general collection, development and disemination of data on new technology and marketing throughout the foundry industry	Existance of an institutional framework capable of absorbing and disseminating technical and marketing data to the foundry industry in general.
	It is anticipated that this will consist of a core staff of upgraded trainers at MIDC, and also a semi professional body representing the personnel and management of the foundry industry.
No administrative counterpart with adequate experience of the subsector.	The Foundry Association will, through working with the experts, have acquired experience to further assist the subsector.

3. Target beneficiaries

3.1. The Main Beneficiaries

These will be the machinery and component manufacturers within the engineering sector who will have available a foundry industry capable of producing an expanded range of cast components at specified quality levels, in a wide range of metal compositions, delivered to agreed schedules and at competative prices.

3.2 The Immediate Beneficiaries

3.2.1 Foundry Institutions

The requirement to obtain a rapid and enduring solution to the problems described, and the nature of the problems require that the project be addressed directly to the foundries. However, the project activities to be

developed are such that only a limited number of foundry plants can be covered by the project personnel and only plants within a limited geographical area can be covered. Thus the regions of Jakarta and Surabaya, which account for some 65% of the total castings production were selected, and within each region, those foundries which offer the best conbination of installed capacity and technical and management ability were chosen to participate in the project.

The direct recipients will raise the technological level and supply capability within the foundry industry and by their example and success act as a stimulus for other enterprises to emulate.

The ongoing provision of training facilities and expanding complement of experienced personnel in the industry working within an appropriate institutional framework will provide the impetus for continuing modernisation of the foundry industry.

	JAKARTA	SURABAYA
Lead Foundries	PT Indo Bangna Prima	PT Agrindo
Associate Foundries	PT Dendrit	PT Madju Warna Steel
	PT Bina Usaha Mandiri	PT Jatim Taman Steel
		CV Bumi Brakedrum Co.
Other Foundries	PT Roda Prima Lancar	PT Pakarti Riken
	PT Indo Machine	PT Barindo Anggun Industry
	PT Metinca	

The following foundries, although not in the project areas and will not be visited by the expert team will benefit from sending at their own cost patternmakers to the lead foundries for retraining, personnel to attend seminars and ad hoc assistance from the expert team with technical and production problems.

YOGYAKARTA
- CV Karya Hidup Sentosa
- Batur Jaya (Co-operative)

SEMARANG
- PT Tri Sinar Purnama Foundry
- PT Nimaru Jaya

TEGAL
- Matahari SS Co.Ltd
- PT Dwika

BANDUNG
- PT Kerta Laksana
- PT Teha

3.2.2. Institutions

It is proposed that MIDC and the Foundry Association be fully involved in the project, in the areas of technology, and management/administration respectively, under the guidance of DGMBMI.

4.Project Strategy and Institutional Arrangement

4.1. Project Strategy

During the preparatory phase of the project, the requirements of the Ministry of Industry, were considered. These include a rapid increase in the supply of cast machine components and spare parts to the engineering industries and to industries which operate machinery. It was decided to offer direct assistance to selected foundries with DGMBMI as the executive, coordinating counterpart, and with MIDC and the Foundry Association (FA) as Technical and Management/Administrative counterparts respectively. MIDC and the FA will supply staff who will accompany those experts whose activities conform to the interests of each institution, and will thus allow them to consolidate their knowledge, obtain experience and develop the necessary degree of co-operation between MIDC and FA. They will be expected to continue to assist the foundry sub-sector after UNDP/UNIDO involvement is at an end.

The foundry plants proposed to be assisted by the project were selected on the basis of :

i. The interest in participating in the project

ii. The existing installed capacity which permits a useful increase of production

iii. The ability to make additional capital investment, where required for the progress of the plant.

iv. The ability to absorb technology

v. The existence of a sufficient and relevant managerial capability.

MIDC will offer a permanent technical support to the industry by providing indispensible 'reverse engineering' and product development assistance. The Centre will supply specifications for castings, in coordination with the consumer of these products and may assist in providing quality assurance where required. During the course of the project, MIDC will select specific areas which it considers can be included into its permanent support and development activities, in order to continue to offer these services on a permanent basis, following upon the termination of the project.

Two locations have been chosen which are the major

regional centres for the industry in Java i.e Jakarta and Surabaya. At each centre a lead foundry has been chosen which will have a resident team of three experts covering the disciplines of patternmaking, foundry and methods engineering and metallurgy.

The teams, for the first six months of the programme, (with the exception of pattern making which will be continuous retraining of lead, associate and other foundry pattern makers for the duration of the project), will concentrate their activities in modernising the lead foundry's operation. For the second six month period the lead foundry will receive 50% of the teams time and the associate foundries the other 50% and for the remaining twelve months the time will be shared approximately 25% to the lead foundries and 25% to each of the associate foundries. During the project other foundries both in the geographical and other areas will send pattern makers for retraining, have selected personnel attend seminars and have ad hoc assistance from the expert team on specific production or technical problems.

To cater for the chronic deficiency in patternmaking skills the lead foundries have agreed to establish and have ready for operation a fully equiped patternshop, for the manufacture of wood and resin patterns,prior to the project commencement capable of both standard production and also retraining of patternmakers. This facility will be freely available to assist in training personnel from other foundries. Both lead, and associate and other foundry personnel will be given intensive instruction in good techniques whilst manufacturing their own patterns. Seminars covering specific topics will be held at the lead foundries for attendance by local foundries.

The metallurgistsand foundry engineerswill be responsible for training counterpart personnel from the lead, associate and other foundries by the following :

- Intensive theoretical and practical "on-the-job" training in pattern design, methods engineering, moulding and coremaking techniques, sand control, furnace practice and laboratory control of melting operations, heat treatment, shotblasting and finishing.

-Establishment of comprehensive quality control systems

-Technical training and support in sales and marketing

-Development into more complex castings in a wider range of high performance alloys

-Advice on suitable equipment and foundry layout and processing procedures

Two additional experts will be provided, resident in Jakarta but with operational and training duties at both locations. These will consists of :

A chief Technical Adviser who will be responsible for administration and coordination of the two teams of experts and their work programmes.

Advice on marketing strategy for the industry to assist substitution and the import deletion programme. Carry out specific market studies in conjuction with counterparts from the Ministry of Industry and Foundry Association. Also advise on the options for and the creation of a coordinated institutional framework, the adoption of which will best facilitate the ongoing development and modernisation of the industry.

A financial and management expert who will be responsible for reviewing the current management structures and practices, evaluating current financial, cost and management reporting systems with a view to installing new computerised systems and up dating existing systems where practical in order to give greater cost, financial and management control of the lead and nominated associate foundries. This position also involves the training of financial staff in cash flow techniques, capital investment appraisal and the management teams in company forward planning.

4.2. Institutional Arrangement

The project will be attached to the Ministry of Industry (Directorate General of Machinery and Basic Metals) acting in co-operation with MIDC and the Foundry Association who will jointly undertake all the co-ordination work with other direct recipients involved in the project.

The Foundry association and the Metal Industries Development Centre, will detail counterpart staff for training and up grading in technology and foundry processes and procedures, and in management and administration.

The lead foundries have agreed to provide counterpart facilities including office accomodation, office secretarial, communication, transportation and other services and also training facilities for personnel

from other direct beneficiaries for the duration of the project.

It is also essential that there will be direct contact between the project international staff and the direct recipients.

The obligation of the lead foundries to allow access and provide the facilities will cease at the termination of the project. However if they should wish to continue this can be arrange by discussion with the Ministry of Industry and the various interested parties.

5. Reasons for assistance from UNDP/Executing Agency

The modernisation of the foundry industry has priority in the engineering sector development plans of the Government of Indonesia. UNIDO has a thorough knowledge of foundries in developing countries through a successful record of assistance in this field by direct technical support. The Ministry of Industry has requested UNIDO be the executing agency.

6. Special Considerations

The major part of the foundry industry is in the private sector of the economy and consists of small to medium sized units which are labour intensive. The content and activities of the project have been designed to directly assist selected units in both expansion and quality upgrading. No negative impact from the project is foreseen.

7. Coordination Arrangement

A number of bilateral aid projects have some common interest in the foundry industry development.

(a) Metals Industry Development Centre-Bandung.
This institution is a research and development facility controlled by the Ministry of Industry supported by the Government of Belgium. Specific metal based products are developed for Indonesian manufacture. It contains a small foundry unit and patternshop which is used for prototype production. Technical assistance is offered to the small scale industries by a advisory and training service. The capacity of the foundry section is limited and is in the main product orientated. Counterparts from MIDC will participate in the training and technology transfer operations of this project to upgrade their knowledge and it is expected that MIDC will select specific areas of expertise during the life

of the project, and will include these in its programmes of assistance upon termination of the project.

(b) Politeknik Mekanik Swiss - Bandung
A foundry technician training operation is being established as part of this skill training centre, which is supported by the Government of Switzerland. The equipment is funded by a World Bank Loan and it is intended that both prototype and production castings will be manufactured.

Skill training at appentice level in patternmaking and foundry practices will be given to school leavers prior to employment in industry. Coordination of the operation into the future institutional framework of the industry will be considered during the project implimentation.

(c) Advisory Group, Technical Cooperation, Federal Republic of Germany.
A series of studies have been carried out into the operational activities, status and development perspectives of the basic engineering industries. As part of this a profile of the foundry industry has been compiled and recommendations made for the upgrading of the industry to meet future planning objectives. The activities within this project do not conflict with the recommendations and no duplication of assistance is anticipated.
Direct technical assistance to the foundry industry is not included in the current assistance programme of the Federal Republic of Germany.

8. Counterpart Support Capacity

Counterpart staff for the project will be provided by both the private sector foundries and the Foundry Association, the Ministry of Industry and
the Metals Industry Development Centre, and qualified staff is available within the M.O.I and MIDC. Written assurances have been recieved, endorsed by the M.O.I, from the major foundry counterparts from the private sector. A memorandum of agreement has been signed by the Ministry of Industry and the two lead foundries (Annex).

MIDC will provide three counterparts in the disciplines, of patternmaking, foundry engineering and metallurgy respectively.

It is essential for the project success that fluent English speaking, technically qualified personnel are available and this must be confirmed by the UNIDO CTA before commencement of the field activities of the project.

C. THE DEVELOPMENT OBJECTIVE

The development objective of the project is to improve the quality, productivity and widen the range of products manufactured in the foundry industry, to enable the implementation of the Government's expansion, diversification and deletion policies, for the engineering industry.

D. IMMEDIATE OBJECTIVE

The overall project objective is to assist a group of selected small and medium scale foundry industries to achieve quality, diversification and economic production through direct technical and management assistance at the private sector enterprise level, and to prepare MIDC and the Foundry Association to continue the work upon finalization of the project.

1 IMMEDIATE OBJECTIVE NO 1

The modernisation of two lead foundries based in Jakarta and Surabaya respectively so that they will act as demonstration units by the introduction of new technology, training and upgrading of skills to improve their market penetration, quality, range of products and economic utilisation of their plant and equipment.

1.1. Output

Increased volume and improved quality of the existing foundry production to meet the demands of the expanding engineering industry.

Activities

1.1.1 Activity I

Produce high quality patterns by utilising the fully equiped lead foundry patternshops for normal production and the retraining of lead foundry patternmakers.

1.1.2 Activity 2

Review the existing quality procedures and establish new improved and fully comprehensive systems.

1.1.3 Activity 3

Introduction of production control systems and planned maintenance scheduling to increase productivity, efficiency and utilisation of plant and equipment.

1.1.4 Activity 4

Recommend improvements in processing procedures and then where required advise on modifications to foundry equipment and layout.

1.2. OutPut 2

Increased production of a wider range of complex castings in higher performances alloys to meet the requirements of the expanding engineering industry.

Activities

1.2.1 Activity 1

Assist in the market assessment to identify new potential products for manufacture and help in the attainment of orders for these new products by expert technical sales support.

1.2.2 Activity 2

Introduce new production methods and materials to enable the manufacture of the new products and train foundry management and operatives in their use.

1.2.3 Activity 3

Introduce quality control and testing techniques to meet the quality requirements of the new products.

1.3 OutPut 3

Established cost, financial and management control systems to create effective management, improved profitability and market competativeness.

Activities

1.3.1 Activity 1

Review and where appropriate establish a revised general management structure with financial awareness, and assist with the preparation of a three year business plan.

1.3.2 Activity 2

Establish computerised financial, cost control and management reporting systems.

1.3.3 Activity 3

Establish monitoring and review procedures to fully utilise the information and data generated from the new systems.

2. Immediate Objective No 2

The modernisation of six nominated associate foundries three in each of the project locations (Jakarta and Surabaya) by the introduction of new technology, training and upgrading of skills to improve their market penetration, quality, range of products and economic utilisation of their plant and equipment.

2.1 OutPut 1

Increased volume and improved quality of the existing foundry production to meet the demands of the expanding engineering industry.

Activities

2.1.1 Activity 1

Produce high quality patterns by the retraining of associate foundry patternmakers at the lead foundry patternshops.

2.1.2 Activity 2

Review the existing quality procedures and establish new, improved and fully comprehensive systems.

2.1.3 Activity 3

Introduction of production control systems and planned maintenance of plant and equipment.

2.1.4 Activity 4

Recommended improvements in Processing Procedures and then when required advise on modifications to foundry equipment and layout.

2.2 OutPut 2

Increased production of a wider range of complex castings in higher performance alloys to meet the requirements of the expanding engineering industry.

Activities

2.2.1 Activity 1

Assist in the market assessment to identify new potential products for manufacture and help in the attainment of orders for these new products by expert technical sales support.

2.2.2 Activity 2

Introduce new production methods and materials to enable the manufacture of the new products and train foundry management and operatives in their use.

2.2.3 Activity 3

Introduce quality control and testing techniques to meet the quality requirements of the new products.

2.3 OutPut 3

Established cost, financial and management control systems to create effective management, improve profitability and market competiveness.

Activities

2.3.1 Activity 1

Review and where appropriate establish a revised general management structure with financial awareness.

2.3.2 Activity 2

Establish computerised financial, cost control and management reporting systems.

2.3.3 Activity 3

Establish monitoring and review procedures to fully utilise the information and data generated from the new systems.

3. Immediate Objective No 3

The technical upgrading of other interested foundries in the two project locations of Jakarta and Surabaya by the introduction of technical expert assistance on specific problems

3.1 Output 1

Increased volume and improved quality of existing foundry production to meet the demands of the expanding engineering industry.

Activities

3.1.1 Activity 1

Produce high quality patterns by the retraining of other foundry patternmakers at the lead foundry patternshops.

3.1.2 Activity 2

Solve specific technical and production problems to improve quality, productivity and utilisation of plant and equipment.

3.1.3 Activity 3

Assist in diversification of product range.

4. Immediate Objective No.4

Training of counterpart personnel from the recipient foundries and MIDC in new and relevant foundry technology and management practices by practical demonstration and seminars.

4.1. Output 1

Trained personnel from lead associate and other foundries in relevant foundry technology.

Activities

4.1.1. Activity 1

Formulate and conduct training programmes as detailed in Annex III.

4.2. Output 2

Trained personnel from MIDC in relevant foundry technology.

Activities

4.2.1. Activity 1

Formulate and conduct training programmes as detailed in Annex III.

5. Immediate Objective No.5

To establish an ongoing modernisation of the foundry industry by the creation of an institutional framework which will promote the technical and commercial exchange of information throughout the foundry industry and other associated interested parties.

5.1. Output 1

An action plan for the development of the foundry association or institute.

Activities

5.1.1 Activity 1

Discussion with action groups comprised of representatives from the Ministry of Industry and Senior personnel from the lead, associate and other interested foundries regarding the development and establishment of a suitable institutional framework for the advancement both technically and commercially of the foundry industry.

5.1.2 Activity 2

Report to the action groups on detailed actions required and the necessary budget for implementation and operation.

5.1.3 Activity 3

Provide advisory assistance in the installation of systems and assist senior functionaries during the initial operation.

5.1.4. Activity 4

Personnel for the Association will accompany the experts in administration where agreed and will develop the skills for later transmission to the Association members, not included in the direct assistance programme.

5.2 Output 2

A much improved techno/practical level in the foundry activities within MIDC for later transmission to the sub-sector.

Activities

5.2.1 Activity 1

Selected staff from MIDC will accompany the project expatriate technical experts during the course of the entire project.

6. Immediate Objective No.6

To assist the development and to increase the usage of foundry products in the engineering sector, by training and advising two nominated counterparts from two designated national consultancy organisations in the conduct of market surveys related to casting usage.

6.1 OutPut 1

Produce reports on the market potential for cast products in two major sectors of the engineering industry as a model for future market assessments by the national counterparts.

Activities

6.1.1 Activity 1

Hold discussion with the Ministry of Industry and the Foundry Association and agree the sector industries for investigation.

6.1.2 Activity 2

Instruct consultants on the selection of user industries and associated parties for the collection of statistical data for the compilation of the market assesment report.

6.1.3 Activity 3

Discussion on the reports with the Ministry of Industry, Foundry Association and other interested parties, and the preparation of strategies for the implementation of the recommended actions of the reports.

E INPUTS

1. Government and other Counterpart Inputs

a) National Staff

As the success of the project will depend considerably upon the counterpart staff, the expert team will assist the counterpart organisations in their selection.

The following is an outline of the require ments

- A national counterpart supplied by the Ministry of Industry responsible for the co-ordination of the project, fully conversant with the Indonesian foundry industry to advise on and ensure the adherance to government policy particularly in relation to the legal and other requirements regarding the institutional development aspect.

-A minimum of three national counterparts supplied by the Metal Institute Development Centre Bandung (MIDC)

qualified in metallurgy, foundry engineering and patternmaking respectively, responsible for maximising on the benefit to the institute, from the technology transfer and training from the expert team.

-Two national counterparts supplied by national consultancy organisations with marketing experience for duties related to the market surveys.

-two drivers for UNIDO provided vehicles (additional to the vehicles and drivers provided by the lead foundries).

-Nominated Associate foundries to provide at least one suitable national counterpart for each international expert in accordance with the agreed scheduled assistance as produced by the expert team.

-The two lead foundries each to supply one bi-lingual secretary Indonesian Bahasa - English.

-The two lead foundries each to provide at least five fluent English Speaking Counterparts for the duration of the project, one for each expert, with relavent education and foundry experience willing to accept and able to absorb instruction in new technology and management systems.

b) Other National Inputs

-The two lead foundries confirm that they are financially sound with available funds for investment in accordance with the plant and equipment requirement as detailed by the UNIDO expert team in Annex VI.

-The Ministry of Industry (Directorate General of Machinery and Basic Metals) confirms that the lead foundries are acceptable and financially sound for the purpose of the project and are able to continue development after the termination of the project.

Lead Foundries Equipment and Installations

-The two lead foundries to fully equip patternshops for the manufacture of wood and resin patterns, as detailed by the UNIDO expert team (Annex VI) for retraining their own, associate and other foundry patternmakers as scheduled by the UNIDO expert team at the commencement of the project.

-The two lead foundries to purchase and install quality and sand testing equipment as detailed by the UNIDO expert team (Annex VI) for the purpose of improving their own quality and training their own, associate and other foundry personnel a scheduled by

the UNIDO expert team at the commencement of the project.

-The two lead foundries to purchase, install, repair and upgrade other plant and equipment as detailed by the UNIDO expert team (Annex VI).

-The two lead foundries each to provide working facilities for five international experts and national experts where appropriate including office accommodation, furniture, stationery, secretarial, telephone, facsimile and other services necessary for the efficient conduct of the project works.

-The two lead foundries to provide training facilities for the use by the international experts to accomodate up to thirty people, including rooms for seminars with suitable furniture and facilities for carrying out such programmes efficiently.

-The two lead foundries each to provide one car and one driver for the use of the resident expert team.

-The two lead foundries to confirm they have or will have prior to the project commencement a minimum level of equipment installed in operational order necessary for the production of good quality castings as per the following :

(1) Electric Melting
(2) Facilities for hand moulding with no bake or furan type sand process
(3) Machine moulding with mechanical handling and sand processing
(4) Shot blasting
(5) Basic mechanical grinding and finishing tools
(6) Quality control equipment for

Metal Melting
Chemical Analysis
Sand Testing
Physical Testing and Metalographic Examination
Casting Inspection

Computer Facilities

-To provide computer facilities to take advantage of standard software packages for :

(1) Accounting
(2) Cost Control
(3) Cash forecasting
(4) Production Control
(5) Quality Control
(6) Methods Engineering

Access to Lead Foundries for Trainees

-To allow access into the foundry and seminar facilities of personnel from associate and other foundries for training and demonstration purposes in accordance with a programme as scheduled by the UNIDO team at the commencement and during the project. This to include the following :

(1) Pattern Making - Continuous access for a minimum of five associate or other foundry patternmakers.

(2) Melting - Periodic demonstrations of specific melting procedures.

(3) Laboratories - Specific instruction on equipment operation

(4) Hand and Machine Moulding - Periodic demonstration of techniques.

(5) Core Making - Periodic demonstration of techniques

(6) Sand Processing - Periodic demonstrations

(7) Finishing - Periodic demonstration of specific techniques

(8) Financial and Management - Access for office based seminars only.

-Equipment, named counterpart staff, office and seminar facilities and services will be installed and operational prior to the arrival of the expert team.

General

-The Ministry of Industry will ensure access to the various enterprises identified for assistance and to the lead foundries for the purpose of training and demonstration programmes as scheduled by the international expert team. Access to the various institutes such as MIDC and Politeknik Mekanik Swiss engaged in work related to the project also to be ensured.

-All salaries, allowance and travel costs of counterparts in connection with the project, will be provided by their employee organisation of company.

-Operation and maintenance costs of project vehicles will be covered by the lead foundries with the

exception of those supplied by UNDP whose costs will be covered by the Ministry of Industry.

c)Budgetary Provision

Necessary budgetary provisions have been made. The government budget for inputs in kind is attached.

2. UNDP/UNIDO Inputs

a) BL 11-50 Consultants $ 54,150

Six months of short term specialist consultant services are to cater for specific un forseen requirements for expertise which may arise during the course of the project.

b)BL 15.00 Project Travel $ 1000

c)BL 16.00 UNIDO Staff

Preparatory Phase	$ 4,500
Main Project	$ 15,000

Provision for UNIDO Staff Member attendance

d)BL 17.00 National Experts $ 6,000

Provision for contracting local consultants to assist in market survey work 6 M/M.

e)BL 21.00 Subcontract

(1) Preparatory phase (March-May 89)	$ 110,700
(2) Main Subcontract	$1,962,000

Provision of international expertise by UNIDO and training arrangements for the execution of this technical assistance project will be effected through subcontract to an Organisation which has a proven record of successfully implementing and operating the transfer of technology and management techniques in the foundry industry. This is considered essential because of the imperative requirement to :

- ensure fielding of experts all of whom have long and successful hands on experience in the disciplines and techniques recommended for the project.
- ensure that the team have effective back stopping for their field work from their company, and that the CTA has full managerial authority.
- Obtain a team of experts who are well known to one another, and thus ensure a true team operation. This will ensure a flexible operation of the project.
- Allow the subcontractor to change experts during the

course of the project, in order to respond to changed or additional requirements.

Selection of the subcontractor will be carried out by UNIDO in accordance with established guidelines and procedures. Detailed terms of reference will be elaborated by UNIDO based on scope and context of work as per ANNEX I (work plan).

The subcontractor, to ensure smooth implementation of the project, will provide computer software packages and training aids and will also include for air and rail travel within the island of Java.

The subcontract will provide the full range of services as per the terms of reference to be elaborated by UNIDO, amounting to a total of 196 man months in the field estimated to be made up as follows :

General Foundry Technologist and Team Leader	26
Foundry Financial and Management Expert	24
2 Pattern Maker Specialist	48
2 Foundry Metallurgy Specialists	48
2 Foundry Engineering/Methods Specialists	48
Total M/M	194

f)Training

No fellowships are forseen and no study tours are proposed.

g)Equipment and Supplies

1.BL 41.00 Expendable Equipment $ 10,000

This will include various technical publications on international standards, foundry management, foundry practices, general management, financial and cost control and other publications that will be useful during and after termination of the project.

2. BL 42.00 Non - Expendable Equipment $ 191,000

The equipment proposed consists of two sets of audio-visual equipment for use in the training programmes.

Two Personal Computers with hard disc storage for use in the training programmes.

Two vehicles one based a Jakarta and one at Surabaya, for use during the project duration. This is necessary as the project activities will involve considerable travel. (This is in addition to the cars provided by the Counterparts)

BL 53.000 Miscellaneous	$	18,500
Project Total		$2,372,850

F Risks

(A) Outset of Project	Risk
(1) Non availability of equipment	Low
(2) Non availability of suitable counterparts	Middle
(3) Lead foundry refusal of access to nominated associate foundries for training and demonstration purposes	Low
(4) Non interest of associate foundries	Low
(5) Non availability of suitable experts	Low

(B) During Project Operation	
(1) Lead foundry ceasing to allow access to nominated associate foundries for training and demonstration purposes	Low
(2) Lack of continuity of suitable counterparts	Middle
(3) Lack of continuing interest by the lead foundries	Low
(4) Lack of continuing interest by the associate foundries	Low
(5) Lack of financial stability of lead foundries	Low

These potential risk areas have been specifically discussed with the lead foundries and commitments and assurances obtained.

G Prior Obligations and Prerequisites

(1) The lead foundries purchase and installation of the plant and equipment recommended by UNIDO team and agreed to by the lead foundries, prior to arrival of the expert team. (see memorandum of agreement ANNEX VI).

(2)The lead foundries designation of suitable named counterparts, to be selected from existing staff or recruited, by name and ensuring that they will be available full time, where applicable, for the project activities for the length of the project period.

(3)The nominated associate foundries designation of suitable named counterparts who will be available as required by the project schedule.

(4)The lead foundries arrangement for furnished office accomodation,seminar facilities and other associated facilities for the international and national staff.

(5)Making arrangementswith the selected enterprisesto ensure that international and national experts will be allowed access to their foundires and given information required to achieve the project objectives and to confirm the full commitment of the selectedenterprises to the activities of the project as related to them.

(6)The designation by the Ministry of Industry and the Metal Industries Delopment Centre Bandung (MIDC) of named counterparts available an agreed programme for the duration of the project.

(7)The project document will be signed by UNDP and UNDP assistance will be provided, subject to UNDP receiving satisfaction that the prerequisites and prior obligations listed above have been fulfilled or likely to be fulfilled. When anticipated fulfillment of one or more of the prerequisites and prior obligations fail to materialise the UNDP may, at its discretion, either suspend or terminate its assistance.

H Project Review Reporting and Evaluation

The project review, reporting and evaluation is covered in Annex II.

ILEGAL CONTEXT

This project document shall be the instrument envisaged in the Supplemental Provisions of the Project Document, attached hereto. The host country implementing agency shall, for the purpose of the Supplemental Provisions to the Project Document, refer to the government co-operating agency described in the Supplemental Provisions.

The following types of revisions may be made to this project document with the signature of the UNDP resident representative only, provided he or she is assured that the

other signatories of the project document have no objections to the proposed changes.

(a) Revisions in, or addition of, any of the annexes of the project document with the exception of the Standard Legal Text, the agreement to which is a pre-condition for UNDP assistance.

(b) Revisions which do not involve significant changes in the immediate objectives, outputs or activities of a project, but are caused by the rearrangement of inputs already agreed to or by cost increases due to inflation; and

(c) Mandatory annual revisions which rephase the delivery of agreed project inputs or increased expert or other costs due to inflation or take into account agency expenditure flexibility.

J BUDJET

The project budget is given on the next page.

[redacted] VS[redacted]/01 [redacted] Mod[redacted]iz[redacted]on [redacted]gr[redacted]e f[redacted]th[redacted]un[redacted] [redacted]tr[redacted]

	TOTAL m/m	TOTAL $	1989 m/m	1989 $	1990 m/m	1990 $	1991 m/m	1991 $	1992 m/m	1992 $
International experts										
11-01										
11-02										
11-03										
11-04										
11-05										
11-06										
11-07										
11-08										
11-09										
11-10										
11-11										
11-12										
11-13										
11-14										
11-15										
11-50 Short term consult.	6	54150			3	26400	3	27750		
11-99 Sub-total experts	6	54150			3	26400	3	27750		
15-00 Project travel		1000				500		500		
16-00 Mission cost		19500		4500		5000		5000		5000
17-01 Market Study	3	3000			3	3000				
17-02 Market Study	3	3000			3	3000				
18-00 Surr.prior oblig.										
19-99 TOTAL PERS COST	12	80650		4500	9	37900	3	33250		5000
Subcontracts										
21-01		2072700	9	110700	66	1012000	96	650000	32	300000
21-02										
21-03										
21-04										
21-05										
28-00 Surr.prior oblig.										
29-00 TOTAL SUB-CONTRACT		2072700		110700		1012000		650000		300000

	TOTAL		1989		1990		1991		1992	
	m/m	$	m/m	$	m/m	$	m/m	$	m/m	$
Training										
31-01										
31-02										
31-03										
31-04										
31-05										
31-99 Sub-tot ind.fellows										
32-01										
32-02										
32-03										
32-99 Sub-tot st.tours										
38-00 Surr.prior oblig.										
39-99 TOTAL TRNG COMPONENT										
Equipment										
41-00 Expendable equipm.		10000				10000				
42-00 Non-exp. equipm.		191000				191000				
48-00 Surr.prior oblig.										
49-99 TOTAL EQPM COMPONENT		201000				201000				
Miscellaneous										
51-00 Sundries		18500		500		8000		8000		2000
58-00 Surr.prior oblig.										
59-99 TOTAL MISC COMPONENT		18500		500		8000		8000		2000
99-99 PROJECT TOTAL	12	2372850		115700	9	1258900	3	691250		307000

ANNEX I

PRELIMINARY WORK PLAN

		International Experts Involved	YEAR 1 QUARTER 1	2	3	4	YEAR 2 QUARTER 1	2	3	4	YEAR 3 QUARTER 1	2
1.1.1	Production of high quality patterns	3 - 4										
1.1.2	Review of existing quality procedures and establishment of new systems	7 - 8										
1.1.3	Introduce production control systems and planned maintenance scheduling	5 - 6										
1.1.4	Recommend improvements in processing	5 - 6										
1.2.1	Market assessment for new products	1 + 5 6 7 8										
1.2.2	Introduce new production methods	5 - 6										
1.2.3	Introduce quality control and testing	7 - 8										
1.3.1	Review and establish management structure	2										
1.3.2	Establish computer management systems	2										
1.3.3	Establish monitoring and review procedures	2										
2.1.1	Production of high quality patterns	3 - 4										
2.1.2	Review of existing quality procedures and establishment of new systems	7 - 8										
2.1.3	Introduce production control systems and planned maintenance scheduling	5 - 6										
2.1.4	Recommend improvements in processing	5 - 6										
2.2.1	Market assessment for new products	1 + 5 6 7 8										
2.2.2	Introduce new production methods	5 - 6										
2.2.3	Introduce quality control and testing	7 - 8										
2.3.1	Review establish management structure	2										
2.3.2	Establish computer management systems	2										
2.3.3	Establish monitoring and review procedures	2										

		International Experts Involved	YEAR 1 QUARTER 1	2	3	4	YEAR 2 QUARTER 1	2	3	4	YEAR 3 Quarter 1	2
3.1.1	Production of high quality patterns	3 - 4										
3.1.2	Assistance with specific technical problems	1 2 3 4 5 6 7 8										
4.1.1	Formulate and conduct training for foundries	1 2 3 4 5 6 7 8										
4.1.2	Formulate and conduct training for NIDC	1 3 4 5										
5.1.1	Discussion on Institutional Arrangement	1 - 2										
5.1.2	Report on action required	1 - 2										
5.1.3	Advisory Assistance on institutional set up	1 - 2										
6.1.1	Meeting MJI - Association to determine market sector for assessment	1										
6.1.2	Instruct ~~market assessment report~~ national consultants	1										
6.1.3	Discuss market assessment report	1										

PROJECT REVIEW REPORTING AND EVALUATION

(a) The project will be subject to tripartite review (joint review by representatives of the government, executing agency and UNDP) at least once every 12 months, the first such meeting to be held at the beginning of the twelve month after full implementation. The subcontractor shall prepare and submit to each tripartite review meeting a Project Performance Evaluation Report (PPER) additionally an inception report will be require after 3 months and progress reports after 6 and 18 months from full implementation.

(b) A project terminal report will be prepared for consideration at the terminal tripartite review meeting. It shall be prepared in draft sufficiently in advance to allow review and technical clearance by the executing agency at least four months prior to the terminal tripartite review.

(c) The project shall be subject to evaluation 18 months after full implementation. The organisation, terms of reference and timing will be decided after consultation between the parties to the project document, plus any associated United Nations Agency.

TRAINING PROGRAMME

The programme of training will be formulated and confirmed by the CTA and the financial management consultant after detailed analyses of field, associate and other foundry staff requirement and discussions with the Ministry of Industry, Foundry Association and MIDC, at the commencement of the project.

This programme will provisionally cover the following subjects and will be attended as a minimum by the counterpart staff from the interested foundries, the Ministry of Industry and MIDC. The training will be by direct instruction and demonstration as well as by seminar.

1. Patternmaker retraining (Minimum 40 patternmakers).
2. Methods engineering and pattern design.
3. Moulding and core making techniques for hand and machine production.
4. Melting and metal treatment.
5. Finishing Operations
6. Quality Control Systems
7. Sand Testing
8. Metallurgical Analysis and Testing.
9. Foundry Process and Equipment Layouts.
10. Production Control and Scheduling.
11. Financial and Cost Control.
12. Management Practices.

ANNEX IV

JOB DESCRIPTION

1. Post Title : **Patternmaking Expert (2 required)**

2. Duration :

3. Date required :

4. Duty Station : One in Jakarta and one in Surabaya with travel within the country.

5. Purpose of Project : To assist the small/medium scale foundry industry by improving their market penetration, quality, range of products and economic utilization of plant and equipment by the introduction of new technology, training and upgrading of skills.

6. Duties :

The Expert will be required to :

6.1 Provide "hands on" assistance by retraining management and local artisans in the production of high quality wood, polystyrene and epoxy resin patterns by

- Improving skills in the construction of wooden and polystyrene patterns particularly with regard to accuracy, methods of construction, tapers, contraction, machining allowance, surface finish and interpretation of drawings.

- Introduction technology and developing the production of epoxy resin patterns from wooden masters.

- Instruction on the safe and correct use of wood processing machines and hand tools.

6.2 Instruct the above skills for patterns used in the production of iron, steel and non ferrous castings for a wide range of industries but particularly automotive, engineering, agriculture and construction.

6.3 Assist the Chief Technical Adviser in establishing and monitoring the training programmes.

6.4 Prepare a final report setting out progress made and recommendations for future action.

7. Qualifications : Apprentice trained technically qualified with a minimum of 10 years experience and having held a position of responsibility in manufacturing industry or a training establishment having gained experience in an advanced market economy and preferably with experience of working in a developing country.

8. Languages : English

JOB DESCRIPTION

1. Post Title : **Chief Technical Adviser**

2. Duration : 2 years

3. Date required :

4. Duty Station : Jakarta with travel within the country.

5. Purpose of Project : To assist the small/medium scale foundry industry by improving their market penetration, quality, range of products and economic utilization of plant and equipment by the introduction of new technology, training and upgrading of skills.

6. Duties :

The Chief Technical Adviser will be required to :

6.1 Be responsible for the overall technical and management outputs of the expert teams.

6.2 Have executive responsibility for the administration, management and choice of experts within the project.

6.3 Assist in the selection of all counterpart staff

6.4 Assisted by the Financial and Management Consultant formulate a training programme for counterpart personnel from the recipient foundries and MIDC in new and relevant foundry technology and management practices by practical demonstration and seminars.

6.5 Visit the lead foundries in advance of the expert teams in order to establish that essential equipment is installed and commissioned.

6.6 Present specilist seminars where appropriate.

6.7 Discuss with all interested parties and prepare a report

and budget for the establishment of a suitable institutional framework for the sustained advancement both technically & commercially of the foundry industry. Also provide assistance during the initial phase of the operation.

6.8 Assist in the development and market penetration of foundry products in the engineering sector by training counterparts in conducting market surveys.

6.9 Prepare and present a report at the tripartite meeting. Also prepare other reports as required by project.

6.10 Prepare a final report in accordance with UNIDO/UNDP requirements.

7. Qualifications : University Degree in metallurgy with a minimum of 20 years foundry experience in both technical and sales support management having gained experience in an advanced market economy, and preferably having worked in a developing country.

8. Languages : English

JOB DESCRIPTION

1. Post Title : Foundry Methods Engineer (2 required)

2. Duration : 2 years

3. Date required :

4. Duty Station : One in Jakarta and one in Surabaya with travel within the country.

5. Purpose of Project : To assist the small-/medium scale foundry industry by improving their market penetration, quality, range of products and economic utilization of plant and equipment by the introduction of new technology, training and upgrading of skills.

6. Duties :

The Foundry Methods Engineer will be required to :

6.1 Provide "hands on" training and technical assistance to both management and local astisans with the object of improving casting quality, reducing rejection rates, increasing production and improving utilisation of plant and equipment by :

- Improving rudimentary hand moulding and core making techniques and sand systems by introducing chemically bonded sand systems with improved control and productivity.

- Improve machine moulding techniques

- Improving shell core making practice and core box design

- Instructing in the principles of pattern design and foundry methods engineering and introducing computer controlled systems.

- Introduce computerised production control and

scheduling systems.

- Introducing machine maintenance scheduling
- Identifying casting defects and instruct in corrective action
- Liasing with customers on quality problems
- Recommending improvements in processing procedures and where required advise on modifications to foundry equipment and layout.

Experience is preferably requird in all of the above subjects in both iron and steel casting production particularly for the automotive, engineering, agriculture and construction industries.

6.2 Present a number of seminars on the above disciplines as agreed with the Chief Technical Adviser (CTA).

6.3 Assist the Chief Technical Adviser in establishment and monitoring of the training programmes.

6.4 Prepare a final report setting out progress made and recommendations for future action.

7. Qualifications : University Degree or Diploma in Foundry Technology with at least 10 years foundry experience in an advanced market economy and preferably having worked in developing countries.

8. Languages : English

JOB DESCRIPTION

1. Post Title : **Financial and Management Consultant**

2. Duration : 2 years

3. Date required :

4. Duty Station : Jakarta with travel within the country.

5. Purpose of Project : To assist the small/medium scale foundry industry by improving their market penetration, quality, range of products and economic utilization of plant and equipment, by the introduction of new technology, training and upgrading of skills.
   Also the introduction of new and improved financial, cost and management practices to assist the development of a commercially aware, competative foundry industry.

6. Duties :

The Financial Consultant will be required to :

6.1 Review and where appropriate establish a revised general management structure with financial awareness.

6.2 Review existing procedures and where appropriate establish computerised financial, cost control management reporting systems.

6.3 Establish monitoring and review procedures to fully utilize the information and data generated from the new systems.

6.4 Assist in the preparation of a 3 year business plan for the two lead foundries, including capital investment appraisal, cash forecasts, projected profit and loss accounts and balance sheets.

6.5 Present a number of seminars on the above subject as agreed with the Chief Technical Adviser.

6.6 Assist the Chief Technical Adviser in formulating a training programm for counterpart personnel from the recipient foundries and MIDC in new and relevant foundry technology and management practices by practical demonstration and seminars.

6.7 Prepare a final report setting out progress made and recommendations for future action.

7. Qualifications : A fully qualified accountant with a minimum of 10 years experience in the following subjects .having foundry experience in an advanced market economy, and preferably having worked in a developing country.
- Financial and Management Accounting
- Cost Accounting and Systems Control
- Systems Implementation
- Computer Systems Operation
- Cash Forecasting
- Business Plan Preparations
- Capital Appraisal Assessment
- Commercial Experience
- General Management Experience

8. Languages : English

JOB DESCRIPTION

1. Post Title : **Foundry Metallurgist** (2 required)

2. Duration : 2 years

3. Date required :

4. Duty Station : One in Jakarta and one in Surabaya with travel within the country.

5. Purpose of Project : To assist the small/medium scale foundry industry by improving their market penetration, quality, range of products and economic utilization of plant and equipment by the introduction of new technology, training and upgrading of skills.

6. Duties :

The Metallurgist will be required to :

6.1 Provide "hands on" training and technical assistance to both management and local astisans with the object of improving casting quality, reducing rejection rates, increasing production and improving utilisation of plant and equipment by :

- Reviewing existing quality procedures and establishing a written fully comprehensive system suitable for computer recording and monitoring.

- Improving raw material selection and testing.

- Training of work force in metallurgical procedures and introduction of high grade alloys and more complex castings to internationally accepted specifications.

- Instruct in use of metallographic techniques

- Measuring casting reject rates and causes and introduce computerised recording system.

- Liasing with customers on quality problems
- Improving electric induction and cupola melting techniques.
- Introducting systematic sand control and testing
- Improving metal pouring and ladle practices
- Improving casting finishing techniques and procedures
- Training in the use and control of heat treatment processes.

Experience is preferably requird in all of the above subjects in both iron and steel casting production particularly for the automotive, engineering, agriculture and construction industries.

6.2 Present a number of seminars on the above disciplines as agreed with the Chief Technical Adviser (CTA).

6.3 Assist the Chief Technical Adviser in establishment and monitoring of the training programmes.

6.4 Prepare a final report setting out progress made and recommendations for future action.

7. Qualifications : University Degree or equivalent in Metallurgy or Material Science with a minimum of 10 years foundry experience in an advanced market economy and preferably having worked in developing countries.

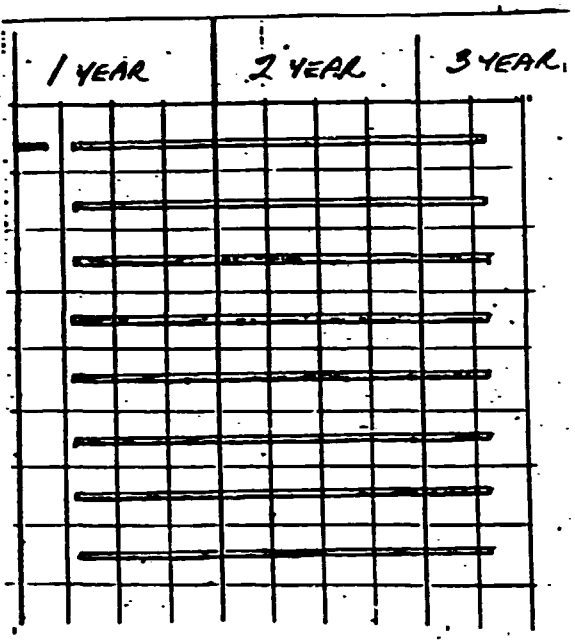
8. Languages : English

ANNEX V

INTERNATIONAL EXPERT AND NATIONAL COUNTERPART REQUIREMENTS

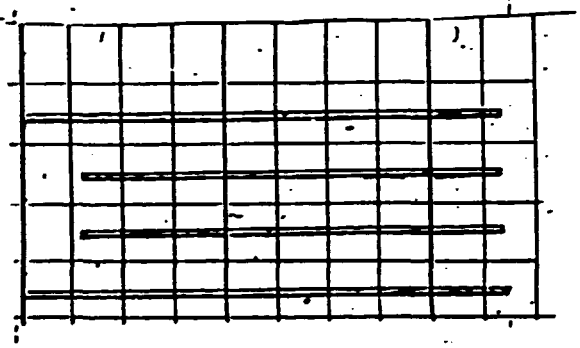
INTERNATIONAL EXPERTS

	M/M	1 YEAR	2 YEAR	3 YEAR
1. Chief Technical Adviser	26			
2. Financial and Management Consultant	24			
3. Foundry Engineer - Jakarta based	24			
4. Foundry Engineer - Surabaya based	24			
5. Metallurgist - Jakarta based	24			
6. Metallurgist - Surabaya based	24			
7. Patternmaker - Jakarta based	24			
8. Patternmaker - Surabaya based	24			

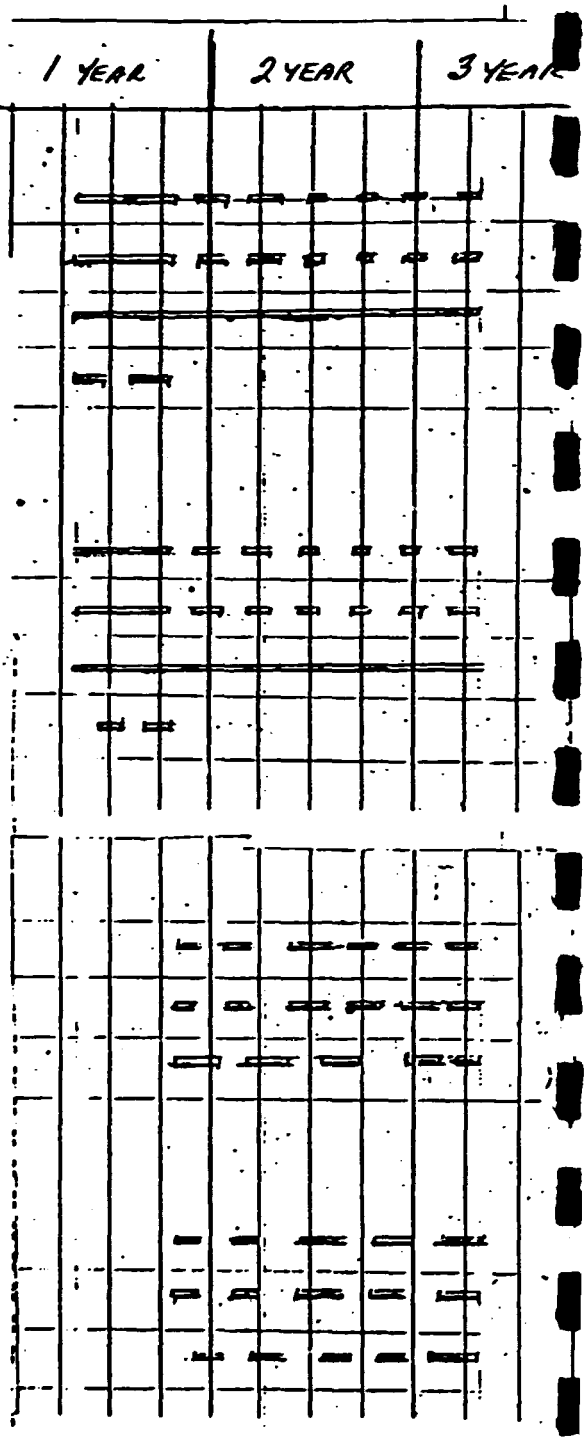


NATIONAL COUNTERPARTS

Counterparts for Chief Technical Adviser		
1. Ministry of Industry	26	
2. MIDC	24	
3. Foundry Association	24	
4. Lead Foundries	26	



	M/M	1 YEAR	2 YEAR	3 YEAR
LEAD FOUNDRIES				
a. Jakarta				
Foundry Engineer	12			
Metallurgist	12			
Patternmaker	24			
Financial + Management	3			
b. Surabaya				
Foundry Engineer	12			
Metallurgist	12			
Patternmaker	24			
Financial + Management	3			
ASSOCIATION FOUNDRIES				
a. Jakarta (3 foundries)				
Foundry Engineer	12			
Metallurgist	12			
Financial and Management	9			
b. Surabaya (3 foundries)				
Foundry Engineer	12			
Metallurgist	12			
Financial + Management	9			



FOUNDRY MODERNISATION PROGRAMME

Memorandum of Agreement

PT Agrindo has been selected as a lead foundry in the Surabaya Area to be one of the two main beneficients from expert technical and financial management assistance over a period of two years financed by UNDP.

To qualify for this assistance the company agrees to the following terms and conditions.

1) The company confirms that they are financially sound with available funds for investment in accordance with the plant and equipment requirements as detailed by the UNIDO expert team in Annex A.

2) The Ministry of Industry (Directorate General of Machinery-Basic Metals) confirm that the company is acceptable and financially sound for the purpose of the project particularly in relation to continuity of development after the termination of the project.

3) To purchase and install a fully equipped patternshop for the manufacture of wood and resin patterns as detailed by the UNIDO expert team, (Annex A) for training their own, associate and other foundry patternmakers as scheduled by the UNIDO expert team at the commencement of the project.

4) To purchase and install quality and sand testing equipment as detailed by the UNIDO expert team (Annex A) for the purpose of improving their own quality and training their own, associate and other foundry personnel as scheduled by the UNIDO expert team at commencement of the project.

5) To purchase, install, repair and upgrade other plant and equipment as detailed by the UNIDO expert team (Annex A).

6) To provide working facilities for five international experts and national experts where appropriate including office accomodation, furniture, stationery, secretarial, telephone, facsimile and other services necessary for the efficient conduct of the project work.

7) To supply one bi-lingual secretary Indonesian Bahasa - English.

8) To provide training facilities for the use by the international experts to accomodate up to thirty people including rooms for seminars with suitable furniture and facilities for carrying out such programmes efficiently.

9) To provide one car and one driver for the use of the resident expert team.

10) To provide at least five fluent English speaking conterparts for the duration of the project, one for each expert, with relavent education and foundry experience willing to accept and able to absorb instruction in new technology and management systems.

11) The company confirms they have or will have prior to the project commencement a minimum level of equipment installed in operational order necessary for the production of good quality castings as per the following.

(1) Electric Melting
(2) Facilities for hand moulding with no bake or furan type sand process
(3) Machine moulding with mechanical handling and sand processing
(4) Shot blasting
(5) Basic mechanical grinding and finishing tools
(6) Quality control equipment for
    Metal Melting
    Sand Testing
    Physical Testing
    Casting Inspection

12) To provide computer facilities to take advantage of standard software packages for :
    1) Accounting
    2) Cost Control
    3) Cash forecasting
    4) Production Control
    5) Quality Control
    6) Methods Engineering

13) To allow access into the foundry and seminar facilities for personnel from associate and other foundries for training and demonstration purposes in accordance with the programme as scheduled by the UNIDO team at the commencement and during the project. This includes the following :

(1)	Pattern Making	-	Continuous access for a minimum of five associate or other foundry patternmakers
(2)	Melting	-	Periodic demonstrations of specific melting procedures
(3)	Laboratories	-	Specific instruction on equipment operation
(4)	Hand and Machine Moulding	-	Periodic demonstration of techniques
(5)	Core Making	-	Periodic demonstration of techniques

(6) Sand Processing - Periodic demonstrations

(7) Finishing - Periodic demonstration of specific techniques

(8) Financial and Management - Access for office based seminars only

14) Equipment, named counterpart staff, office and seminar facilities and services will be installed and operational prior to the arrival of the expert team.

P.T. AGRINDO	MINISTRY OF INDUSTRY (DIRECTORATE GENERAL OF MACHINERY AND BASIC METALS)

P.T. AGRINDO

EQUIPMENT REQUIREMENTS (NON EXPENDABLE)

The following list shows the minimum additional equipment that is necessary in order for you to comply with the project requirements, the equipment will be purchased by yourselves from your own resources.

All of the equipment should be installed and commissioned before arrival of the expert team.

1. Patternshop

Item	Description
Planer Thicknesser	Heavy duty planing and thicknesing machine with a table size of approximately 500 mm wide x 2,800 mm table long. Complete with electric motor drive, stop start controls and isolator switch, necessary safety devices and guards and dust extraction system with take off duct
Disc Sander	One sided 600 mm disc sander with tilting and adjustable table. Complete with internal dust extraction duct and take off spigot. Complete with electric motor drive and stop/start controls and isolator switch.
Vertical Profile Belt Sander	Swivelling table of approximately 400 x 400 mm with interchangeble profile bars ranging from 15 to 40 mm wide. Complete with dust extraction take off and stop/start, controls, starter and isolator switch.
Band Saw, Sharpener and Welder	Size of work table to be approximately 765 mm x 400 mm with maximum workpiece height of 530 mm and band pulley diameter of 800 mm. Complete with tilting table, band tensioning device, 4 Kw electric motor drive, stop/start controls, starter, isolator switch and dust extractic · take off duct.

	Also with machine an automotice Bandsaw grinder complete with grinding wheel which will facilitate band saws up to 40 mm wide and a Bandsaw Butt Welder for welding band saws from 10 to 40 mm wide.
Circular Saw	Table type circular saw approximately 650 mm diameter with a table size of 1090 x 860 mm, distance of saw to rip fence 500 mm, and rise and fall of saw 127 mm. Including canting fence, crown guard and riving knife, hand operated brake, crosscutting and mitering fence. Powered by a 7.5 Kw motor complete with stop start controls, isolating switches, safety devices and take off spigot for dust extraction.
Lathe	Centre turning lathe of 1500 mm length and turning diameter above slide of 640 mm and maximum turning diameter of 1000 mm. Manualy operated main slide including manual cross and top slide, tail stock compound, slide tool rest suitable for machining wood, wood laminates, resinoid/plastic materials and metalic materials. Complete with electric motor drive, stop start controls, starter and isolator switch and one complete set of turning tools.
High Speed Pattern Router	Table size approximately 900 x 770 mm Spindle speeds 10.000 and 20.000 revs/minute with hand feed.
Tool Grinders	Bench type double sided wheelstand grinder with tool slides, sliding guide, rotary tool holder with grinding range for cutting lengths 80mm to 140mm, maximum disc cutter 180 mm, grinding wheel sizes 150 mm x 32 mm and 20 mm wide. Suitable for sharping a full range of wood and metal cutting patternmaking tools. Complete with stop start controls, starter and isolator switch.

One grinder suitable for grinding planing tools up to 660 mm long and capable of sharpening saw blades up to 914mm diameter.

5 Sets Hand Tools

Each set comprising the following

1 - No 7C Jointer/Try Plane
1 - No 5 Jack Plane
1 - No 4 1/2 Smoothing Plane
1 - No 51 Flat Bottomed Spoke Shave
1 - No 51 Round Bottomed spoke Shave
1 - 75 mm Spring Dividers with Solid Nut
1 - 150 mm Spring Dividers with Solid Nut
1 - 75 mm Spring Inside Calipers with Solid Nut
1 - 100 mm Spring Inside Calipers with Solid Nut
1 - 75 mm Spring Outside Calipers with Solid Nut
1 - 150 mm Spring Calipers with Solid Nut
1 - Set Trammel Heads
1 - Combination Set with Metric/Inch Rule. Square Head, centre Head and Protractor
1 - B2 Contraction Rule 300 mm
1 - B2 Contraction Rule 500 mm
1 - B3 Contraction Rule 300 mm
1 - B3 Contraction Rule 500 mm
1 - 'Yankee' Pump Screwdriver complete with 3 Bits
1 - Stead Cabinet Handled Screwdriver 300 mm Blade

1 - Stead Cabinet Handled Screwdriver 200 mm Blade
1 - Rachet Brace 250 mm Inch Sweep
1 - Screwdriver Inserts
1 - Footprint Jennings Pattern Auger Bits, Set No 1031, 6-25 mm in Tool Roll
1 - 650 mm x 5P Rip Saw
1 - 300 mm x 15P Tenon Saw
1 - 7 kg 'Steelmaster', Claw Hammer
1 - Cross Peen Pin Hammer
1 - Push Pin Rp
1 - 3 mm Point diameter Pin Punch
1 - 5 mm Point diameter Pin Punch
1 - 6 mm Paring Chisel, Beech handle
1 - 10 mm Paring Chisel, Beech Handle
1 - 12 mm Paring Chisel, Beech Handle
1 - 16 mm Paring Chisel, Beech Handle
1 - 19 mm Paring Chisel, beech Handle
1 - 25 mm Paring Chisel, Beech Handle
1 - 38 mm Paring Chisel, beech Handle
1 - 6 mm Radius Straight Gouge
1 - 12 mm Radius Straight Gouge
1 - 19 mm Radius Straight Gouge
1 - 25 mm Radius Straight Gouge
1 - 12 mm Wide Blade Turning Chisel Round Nose
1 - 12 mm Wide Blade Turning Chisel Round Nose
1 - Coarse Sharpening Stone 25 x 50 x 200mm
1 - Fine Sharpening Stone 25 x 50 x 300 mm
1 - Medium Square Slip Stone 12 mm Square x 100 mm Long.
1 - Handy Scriber
1 Set Wood Turning Chisels
1 Set Wood Twist Bits

Wood Dust and Chip Extraction System

Wood Sanding dust is potentialy explosive and must be collected in a separate fabric filter to that of wood chips.

a) System for Bandsaw, Planer thicknesser, circular saw and sweep up chutes constructed from galvanite sheet with 3 best quality cotton twill filter sleeves for the separation of chips and air. On the underside of the unit 3 large capacity plastic bags for the collection of extracted refuse. Driven by

its own 5.5 KW totaly enclosed fan cooled motor. All bends to be double radius and sweep up chutes with air tight covers located adjacent to the lathe and router.

b) System for disc and profile sander constructed from best quality galvanite sheet with 3 best quality cotton twill filter sleeves for the separation of the dust and extracted air. Sleeves to be enclosed on 4 sides by heavy gauge galvanised cladding with the top left open for any explosion relief requirements. On the underside there will bins for dust collection. Driven by its own 5.5 Kw totally enclosed fan cooled motor.

In addition to the above equipment the following items will have to be manufactured or purchased locally.

- Installation and commissioning of above equipment
- Purchase/manufacture of 10 working benches
- Mixing machine for plastic pattern material
- Weigh Scales for plastic pattern material
- All comsumables including timber, glue, screws, plastic pattern making material etc.

The pattern shop will require a well lit floor space of approximately 450 square metres and would include space for an office, timber storage and some pattern storage.

2. Sand Laboratory

Equipment description is not necessary because the item name describes the equipment use and providing it is bought from an accredited supplier performance is guaranteed.

Laboratory Sand Mixer
Universal Sand Strength Tester
Ramming Accessories
High Strength Accessories
Shell Moulding Accessories
Sieve Analysis
Mould Hardness Tester
Permeability Tester
Shatter Index
Sand Rammer and Block
Sliding Weight Scales
Speedy Moisture Tester and 100 Tins of

absorbant Material
Moisture Tester and Balance
Rapid Sand Washer
Balance
Compactability Tester

In addition to above it is necessary to provide a suitable laboratory complete with working benches etc.

3. Melting

It is necessary to purchase localy a set of scales for the melting furnaces and hanging scales for the metal ladles. Both scales must be suitable for foundry use and be dust proof, the hanging scales must also be heat proof.

4. Quality

If it is your intention to produce ductile iron each melt must be checked for metal analyisis. Spectrometers give instant analysis but are very expensive. However in the short term a wet chemical analysis laboratory will suffice. It is assumed that such items as chemicals, glassware, measuring equipment can be purchased localy. The laboratory should be located within reasonable walking distance of the foundry and should be equiped with suitabl_ benches, tiled work tops and fume cupboards.

In order to manufacture ductile iron it will also be necessary to purchase equipment for the examination of metal structures consisting of a metallurgical miscroscope with magnification up to x 500, sample grinding/polishing and mounting facilities.
Also an ultrasonic testing machine for the determination of nodularity in iron castings.

5. Moulding Systems

It is planned within the project to cater for hand and machine moulding.

- Hand Moulding
  This will take the form of a "Pattern Flow Unit" (PFU) and the equipment requirements will be :

  - Continuous mixer suitable for use with self setting binders such as furan or CO2.

  - Sand feed system for the mixer, consisting basicaly of an overhead hopper complete with sand feed system, such as belt, screw, bucket or pneumatic conveyors complete

with control equipment.

- A roller track loop for conveying mounted patterns and moulds.

- An overhead crane gantry with a 5 tonne capacity electric powered hoist suitable for handling ladles of molten metal and complete moulds.

  For development and demonstration purposes used sand from the PFU will be discarded, but for your future plans it will be necessary to consider the economic advantages of installing a sand reclamation system.

- Machine Moulding

  The installed machines are of a suitable type however it is necessary to improve the sand preparation plant and moulding box design.

Although basic layout drawings and equipment specifications are provided as part of this project before the commencement date, it is recommended that in view of the extensive uprating of your foundry expert assistance be sought in order to detail your outline plans.

ANNEX VI

FOUNDRY MODERNISATION PROGRAMME

Memorandum of Agreement

PT Indo Bangna Prima has been selected as a lead foundry in the Jakarta Area to be one of the two main beneficients from expert technical and financial management assistance over a period of two years financed by UNDP.

To qualify for this assistance the company agrees to the following terms and conditions.

1) The company confirms that they are financially sound with available funds for investment in accordance with the plant and equipment requirements as detailed by the UNIDO expert team in Annex A.

2) The Ministry of Industry (Directorate General of Machinery-Basic Metals) confirm that the company is acceptable and financially sound for the purpose of the project particularly in relation to continuity of development after the termination of the project.

3) To purchase and install a fully equipped patternshop for the manufacture of wood and resin patterns as detailed by the UNIDO expert team, (Annex A) for training their own, associate and other foundry patternmakers as scheduled by the UNIDO expert team at the commencement of the project.

4) To purchase and install quality and sand testing equipment as detailed by the UNIDO expert team (Annex A) for the purpose of improving their own quality and training their own, associate and other foundry personnel as scheduled by the UNIDO expert team at commencement of the project.

5) To purchase, install, repair and upgrade other plant and equipment as detailed by the UNIDO expert team (Annex A).

6) To provide working facilities for five international experts and national experts where appropriate including office accomodation, furniture, stationery, secretarial, telephone, facsimile and other services necessary for the efficient conduct of the project work.

7) To supply one bi-lingual secretary Indonesian Bahasa - English.

8) To provide training facilities for the use by the international experts to accomodate up to thirty people including rooms for seminars with suitable furniture and facilities for carrying out such programmes efficiently.

9) To provide one car and one driver for the use of the resident expert team.

10) To provide at least five fluent English speaking conterparts for the duration of the project, one for each expert, with relavent education and foundry experience willing to accept and able to absorb instruction in new technology and management systems.

11) The company confirms they have or will have prior to the project commencement a minimum level of equipment installed in operational order necessary for the production of good quality castings as per the following.

(1) Electric Melting
(2) Facilities for hand moulding with no bake or furan type sand process
(3) Machine moulding with mechanical handling and sand processing
(4) Shot blasting
(5) Basic mechanical grinding and finishing tools
(6) Quality control equipment for
    Metal Melting
    Sand Testing
    Physical Testing
    Casting Inspection

12) To provide computer facilities to take advantage of standard software packages for :
    1) Accounting
    2) Cost Control
    3) Cash forecasting
    4) Production Control
    5) Quality Control
    6) Methods Engineering

13) To allow access into the foundry and seminar facilities for personnel from associate and other foundries for training and demonstration purposes in accordance with the programme as scheduled by the UNIDO team at the commencement and during the project. This includes the following :

(1)	Pattern Making	-	Continuous access for a minimum of five associate or other foundry patternmakers
(2)	Melting	-	Periodic demonstrations of specific melting procedures
(3)	Laboratories	-	Specific instruction on equipment operation
(4)	Hand and Machine Moulding	-	Periodic demonstration of techniques
(5)	Core Making	-	Periodic demonstration of techniques

(6) Sand Processing - Periodic demonstrations

(7) Finishing - Periodic demonstration of specific techniques

(8) Financial and Management - Access for office based seminars only

14) Equipment, named counterpart staff, office and seminar facilities and services will be installed and operational prior to the arrival of the expert team.

P.T. INDO BANGNA PRIMA

MINISTRY OF INDUSTRY
(DIRECTORATE GENERAL OF
MACHINERY AND BASIC METALS)

P.T. INDO BANGNA PRIMA

EQUIPMENT REQUIREMENTS (NON EXPENDABLE)

The following list shows the minimum additional equipment that is necessary in order for you to comply with the project requirements, the equipment will be purchased by yourselves from your own resources. It was noted during the teams visit to your works that you already have several pieces of the listed equipment, providing they are accurate and in good working order replacement is not necessary.

All of the equipment should be installed and commissioned before arrival of the expert team.

1. Patternshop

Item	Description
Planer Thicknesser	Heavy duty planing and thicknesing machine with a table size of approximately 500 mm wide x 2,800 mm table long. Complete with electric motor drive, stop start controls and

	isolator switch, necessary safety devices and guards and dust extraction system with take off duct
Disc Sander	One sided 600 mm disc sander with tilting and adjustable table. Complete with internal dust extraction duct and take off spigot. Complete with electric motor drive and stop/start controls and isolator switch.
Vertical Profile Belt Sander	Swivelling table of approximately 400 x 400 mm with interchangeble profile bars ranging from 15 to 40 mm wide. Complete with dust extraction take off and stop/start, controls, starter and isolator switch.
Band Saw, Sharpener and Welder	Size of work table to be approximately 765 mm x 400 mm with maximum workpiece height of 530 mm and band pulley diameter of 800 mm. Complete with tilting table, band tensioning device, 4 Kw electric motor drive, stop/start controls, starter, isolator switch and dust extraction take off duct. Also with machine an automatic

	Bandsaw grinder complete with grinding wheel which will facilitate band saws up to 40 mm wide and a Bandsaw Butt Welder for welding band saws from 10 to 40 mm wide.
Circular Saw	Table type circular saw approximately 650 mm diameter with a table size of 1090 x 860 mm, distance of saw to rip fence 500 mm, and rise and fall of saw 127 mm. Including canting fence, crown guard and riving knife, hand operated brake, crosscutting and mitering fence. Powered by a 7.5 Kw motor complete with stop start controls, isolating switches, safety devices and take off spigot for dust extraction.
Lathe	Centre turning lathe of 1500 mm length and turning diameter above slide of 640 mm and maximum turning diameter of 1000 mm. Manualy operated main slide including manual cross and top slide, tail stock compound, slide tool rest suitable for machining wood, wood laminates, resinoid/plastic materials and

	metalic materials. Complete with electric motor drive, stop start controls, starter and isolator switch and one complete set of turning tools.
High Speed Pattern Router	Table size approximately 900 x 770 mm Spindle speeds 10.000 and 20.000 revs/minute with hand feed.
Tool Grinders	Bench type double sided wheelstand grinder with tool slides, sliding guide, rotary tool holder with grinding range for cutting lengths 80mm to 140mm, maximum disc cutter 180 mm, grinding wheel sizes 150 mm x 32 mm and 20 mm wide. Suitable for sharping a full range of wood and metal cutting patternmaking tools. Complete with stop start controls, starter and isolator switch.
	One grinder suitable for grinding planing tools up to 660 mm long and capable of sharpening saw blades up to 914mm diameter.

5 Sets Hand Tools — Each set comprising the following

1 - No 7C Jointer/Try Plane

1 - No 5 Jack Plane

1 - No 4 1/2 Smoothing Plane

1 - No 51 Flat Bottomed Spoke Shave

1 - No 51 Round Bottomed spoke Shave

1 - 75 mm Spring Dividers with Solid Nut

1 - 150 mm Spring Dividers with Solid Nut

1 - 75 mm Spring Inside Calipers with Solid Nut

1 - 100 mm Spring Inside Calipers with Solid Nut

1 - 75 mm Spring Outside Calipers with Solid Nut

1 - 150 mm Spring Calipers with Solid Nut

1 - Set Trammel Heads

1 - Combination Set with Metric/Inch Rule. Square Head, centre Head and Protractor

1 - B2 Contraction Rule 300 mm

1 - B2 Contraction Rule 500 mm

1 - B3 Contraction Rule 300 mm

1 - B3 Contraction Rule 500 mm

1 - 'Yankee' Pump Screwdriver complete with 3 Bits

1 - Stead Cabinet Handled Screwdriver 300 mm Blade

1 - Stead Cabinet Handled Screwdriver 200 mm Blade

1 - Rachet Brace 250 mm Inch Sweep

1 - Screwdriver Inserts

1 - Footprint Jennings Pattern Auger Bits, Set No 1031, 6-25 mm in Tool Roll

1 - 650 mm x 5P Rip Saw

1 - 300 mm x 15P Tenon Saw

1 - 7 kg 'Steelmaster', Claw Hammer

1 - Cross Peen Pin Hammer

1 - Push Pin Rp

1 - 3 mm Point diameter Pin Punch

1 - 5 mm Point diameter Pin Punch

1 - 6 mm Paring Chisel, Beech handle

1 - 10 mm Paring Chisel, Beech Handle

1 - 12 mm Paring Chisel, Beech Handle

1 - 16 mm Paring Chisel, Beech Handle

1 - 19 mm Paring Chisel, beech Handle

1 - 25 mm Paring Chisel, Beech Handle

1 - 38 mm Paring Chisel, beech Handle

1 - 6 mm Radius Straight Gouge

1 - 12 mm Radius Straight Gouge

1 - 19 mm Radius Straight Gouge

1 - 25 mm Radius Straight Gouge

1 - 12 mm Wide Blade Turning Chisel Round N...

1 - 12 mm Wide Blade Turning Chisel Round Nose

1 - Coarse Sharpening Stone 25 x 50 x 200mm

1 - Fine Sharpening Stone 25 x 50 x 300 mm

1 - Medium Square Slip Stone 12 mm Square x 100 mm Long.

1 - Handy Scriber

1 Set Wood Turning Chisels

1 Set Wood Twist Bits

Wood Dust and Chip Extraction System

Wood Sanding dust is potentialy explosive and must be collected in a separate fabric filter to that of wood chips.

a) System for Bandsaw, Planer thicknesser, circular saw and sweep up chutes constructed from galvanite sheet with 3 best quality cotton twill filter sleeves for the separation of chips and air. On the underside of the unit 3 large capacity plastic bags for the collection of extracted refuse. Driven by its own 5.5 KW totaly enclosed fan cooled motor. All bends to

be double radius and sweep up chutes with air tight covers located adjacent to the lathe and router.

b) System for disc and profile sander constructed from best quality galvanite sheet with 3 best quality cotton twill filter sleeves for the separation of the dust and extracted air. Sleeves to be enclosed on 4 sides by heavy gauge galvanised cladding with the top left open for any explosion relief requirements. On the underside there will bins for dust collection. Driven by its own 5.5 Kw totally enclosed fan cooled motor.

In addition to the above equipment the following items will have to be manufactured or purchased locally.

- Installation and commissioning of above equipment
- Purchase/manufacture of 10 working benches
- Mixing machine for plastic pattern material
- Weigh Scales for plastic pattern material
- All consumables including timber, glue, screws, plastic pattern making material etc.

The pattern shop will require a well lit floor space of approximately 450 square metres and would include space for an office, timber storage and some pattern storage.

2. Sand Laboratory

Equipment description is not necessary because the item name describes the equipment use and providing it is bought from an accredited supplier performance is guaranteed.

Laboratory Sand Mixer

Universal Sand Strength Tester

Ramming Accessories

High Strength Accessories

Shell Moulding Accessories

Sieve Analysis

Mould Hardness Tester

Permeability Tester

Shatter Index

Sand Rammer and Block

Sliding Weight Scales

Speedy Moisture Tester and 100 Tins of absorbant Material

Moisture Tester and Balance

Rapid Sand Washer

Balance

Compactability Tester

3. Melting

It is necessary to purchase locaiy a set of scales for the melting furnaces and hanging scales for the metal ladles. Both scales must be suitable for foundry use and be dust proof, the hanging scales must also be heat proof.

Although you do have bottom stopered ladles for pouring steel it is essential that new stopper slides are made or purchased. The slides must be fully machined, an accurate fit and smooth in operation.

Gas or oil fired ladles heaters are also required particularly for steel castings.

4. Quality

If it is your intention to produce ductile iron it will be necessary to purchase equipment for the examination of metal structures consisting of a metallurgical miscroscope with magnification up to x 500, sample grinding/polishing and mounting facilities.
Also an ultrasonic testing machine for the determination of nodularity in iron castings.

Providing your spectrometer and carbon equivalent meter are operational no other equipment is necessary.

5. Moulding Systems

It is planned within the project to cater for hand and machine moulding.

- Hand Moulding

  This will take the form of a "Pattern Flow Unit" (PFU) and the equipment requirements will be :

  - Continuous mixer suitable for use with self setting binders such as furan or CO2.

  - Sand feed system for the mixer, consisting basicaly of an overhead hopper complete with sand feed system, such as belt, screw, bucket or pneumatic conveyors complete with control equipment.

  - A roller track loop for conveying mounted patterns and moulds.

  - An overhead crane gantry with a 5 tonne capacity electric powered hoist suitable for handling ladles of molten metal and complete moulds.

  For development and demonstration purposes used sand from the PFU will be discarded, but for your future plans it will be necessary to consider the economic advantages of installing a sand reclamation system.

- Basic layout drawings and equipment specifications will be provided as part of the project at a suitable time in advance of the project date.

- Machine Moulding

Providing your moulding machines are in good working order they are satisfactory, however some re furnishment may be required to the green sand processing plant.

6. Finishing

It is necessary to have a suitable heat treatment furnance and quenching tank for manganese steel. The furnace should be capable of reaching 1050 ^{o}C at a controlled rate and the quenching tank must be at least of the same volume as the heat treatment furnace complete with water circulation.

ANNNEX VII

Supplemental Provisions to the Project Document : The Legal Context

GENERAL RESPONSIBILITIES OF THE GOVERNMENT, UNDP AND THE EXECUTING AGENCY

1. All phases and aspects of UNDP assistance to this project shall be governed by and carried out in accordance with the relevant and applicable resolutions and decisions of the competent UN organs and in accordance with UNDP's policies and procedures for such projects, and subject to the requirements of the UNDP Monitoring, Evaluation and Reporting System.

2. The Government shall remain responsible for this UNDP-assisted development project and realization of its objectives as described in this Project Document.

3. Assistance under this Project Document being provided for the benefit of the Government and the people of Indonesia, the Government shall bear all risks of operations in respect of this project.

4. The Government shall provide to the project the national counterpart personnel, training facilities, land, buildings, equipment and other required services and facilities. It shall designate the Government Co-operating Agency named in the cover page of this document (hereinafter referred to as the "Co-operating Agency"), which shall be directly responsible for the implementation of the Government contribution to the project.

5. The UNDP undertakes to complement and supplement the Government participation and will provide through the Executing Agency the required expert services, training, equipment and other services within the funds available to the project.

6. Upon commencement of the project the Executing Agency shall assume primary responsibility for project execution and shall have the status of an independent contractor for this purpose. However, that primary responsibility shall be exercised in consultation with UNDP and in agreement with the Co-operating Agency. Arrangements to this effect shall be stipulated in the Project Document as well as for the transfer of this responsibility to the Government or to an entity designated by the Government during the execution of the project.

7. Part of the Government's participation may take the form of a cash contribution to UNDP. In such cases, the Executing Agency will provide the related services and facilities and will account annually to the UNDP and to the Government for the expenditure incurred.

Participation of the Government

8. The Government shall provide to the project the services, equipment and facilities in the quantities and at the time specified in the Project Document. Budgetary provision - either in kind or in cash - for the Government's participation so specified shall be set forth in the Project Budgets.

9. The Co-operating Agency shall, as appropriate and in consultation with the Executing Agency, assign a director for the project on a full-time basis. He shall carry out such responsibilities in the project as are assigned to him by the Co-operating Agency.

10. The estimated cost of items included in the Government contribution, as detailed in the Project Budget, shall be based on the best information available at the time of drafting the project proposal. It is understood that price fluctuations during the period of execution of the project may necessitate an adjustment of said contribution in monetary terms; the latter shall at all times be determined by the value of the services, equipment and facilities required for the proper execution of the project.

11. Within the given number of work-months of personnel services described in the Project Document, minor adjustments of individual assignments of project personnel provided by the Government may be made by the Government in consultation with the Executing Agency, if this is found to be in the best interest of the project. UNDP shall be so informed in all instances where such minor adjustments involve financial implications.

12. The Government shall continue to pay the local salaries and appropriate allowance of national counterpart personnel during the period of their absence from the project while on UNDP fellowships.

13. The Government shall defray any customs duties and other charges related to the clearance of project equipment, its transportation, handling, storage and related expenses within the country. It shall be responsible for its installation and maintenance, insurance, and replacement if necessary, after delivery to the project site.

14. The Government shall make available to the project - subject to existing security provisions - any published and unpublished reports, maps, records and other data which are considered necessary to the implementation of the project.

15. Patent rights, copyright rights and other similar rights to any discoveries or work resulting from UNDP assistance in respect of this project shall belong to the UNDP. Unless otherwise agreed by the Parties in each case, however, the Government shall have the right to use any such discoveries or work within the country free of royalty and any charge of similar nature.

16. The Government shall assist all project personnel in finding suitable housing accommodation at reasonable rents.

17. The services and facilities specified in the Project Document which are to be provided to the project by the Government by means of a contribution in cash shall be set forth in the Project Budget. Payment of this amount shall be made to the UNDP in accordance with the Schedule of Payments by the Government.

18. Payment of the above-mentioned contribution to the UNDP on or before the dates specified in the Schedule of Payments by the Government is a prerequisite to commencement or continuation of project operations.

Participation of the UNDP and the Executing Agency

19. The UNDP shall provide to the project through the Executing Agency the services, equipment and facilities described in the Project Document. Budgetary provision for the UNDP contribution as specified shall be set forth in the Project Budget.

20. The Executing Agency shall consult with the Government and UNDP on the candidature of the Project Manager 1/ who, under the direction of the Executing Agency, will be responsible in the country for the Executing Agency's participation in the Project. The Project Manager shall supervise the experts and other agency personnel assigned to the project, and the on-the-job training of national counterpart personnel. He shall be responsible for the management and efficient utilization of all UNDP-financed inputs, including equipment provided to the project.

1/May also be designated Project Co-ordinator or Chief Technical Adviser, as appropriate.

21. The Executing Agency, in consultation with the Government and UNDP, shall assign international staff and other personnel to the project as specififed in the Project Document, select candidates for fellowships and determine standards for the training of national counterpart personnel.

22. Fellowships shall be administered in accordance with the fellowships regulations of the Executing Agency.

23. The Executing Agency may, in agreement with the Government and UNDP, execute part or all of the project by subcontract. The selection of subcontractors shall be made, after consultation with the Government and UNDP, in accordance with the Executing Agency's procedures.

24. All material, equipment and supplies which are purchased from UNDP resources will be used exclusively for the execution of the project, and will remain the property of the UNDP in whose name it will be held by the Executing Agency. Equipment supplied by the UNDP shall be marked with the insignia of the UNDP and of the Executing Agency.

25. Arrangements may be made, if necesary, for a temporary transfer of custody of equipment to local authorities during the life of the project, without prejudice to the final transfer.

26. Prior to completion of UNDP assistance to the project, the Government, the UNDP and the Executing Agency shall consult as to the disposition of all project equipment provided by the UNDP. Title to such equipment shall normally be transferred to the Government, or to an entity nominated by the Government, when it is required for continued operation of the project or for activities following directly therefrom. The UNDP may, however, at its discretion, retain title to part or all of such equipment.

27. At an agreed time after the completion of UNDP assistance to the project, the Government and UNDP, and if necessary the Executing Agency, shall review the activities continuing from or consequent upon the project with a view to evaluating its results.

28. UNDP may release information relating to any investment oriented project to potential investors, unless and until the government has requested the UNDP in writing to restrict the release of information relating to such project.

Rights, facilities, privileges and immunities

29. In accordance with the Agreement concluded by the United Nations (UNDP) and the Government concerning the provision of assistance by UNDP, the personnel of UNDP and other United Nations organizations associated with the project shall be accorded rights, facilities, privileges and immunities specified in said Agreement.

30. The Government shall grant UN Volunteers, if such services are requested by the Government, the same rights, facilities, privileges and immunities as are granted to the personnel of UNDP.

31. The Executing Agency's contractors and their personnel (except nationals of the host country employed locally) shall :

    (a) Be immune from legal process in respect of all acts performed by them in their official capacity in the execution of the project;

    (b) Be immune from national service obligations;

    (c) Be immune together with their spouses and relatives dependent on them from immigration restrictions;

    (d) Be accorded the privileges of bringing into the country reasonable amounts of foreign currency for the purpose of the project or for personal use of such personnel, and of withdrawing any such amounts brought into the country, or in accordance with the relevant foreign exchange regulations, such amounts as may be earned therein by such personnel in the execution of the project;

    (e) Be accorded together with their spouses and relatives dependent on them the same repatriation facilitites in the event of international crises as diplomatic envoys.

32. All personnel of the Executing Agency's contractors shall enjoy inviolability for all papers and documents relating to the project.

33. The Government shall either exempt from or bear the cost of any taxes, duties, fees or levies which it may impose on any firm or organization which may be retained by the Executing Agency and on the personnel of any such firm or organization, except for nationals of the host country employed locally, in respect of:

(a) The salaries or wages earned by such personnel in the execution of the project;

(b) Any equipment, materials and supplies brought into the country for the purposes of the project or which, after having been brought into the country, may be subsequently withdrawn therefrom;

(c) Any substantial quantities of equipment, materials and supplies obtained locally for the execution of the project, such as, for example, petrol and spare parts for the operation and maintenance of equipment mentioned under (b) above, with the provision that the types and approximate quantities to be exempted and relevant procedures to be followed shall be agreed upon with the Government and, as appropriate, recorded in the Project Document; and

(d) As in the case of concessions currently granted to UNDP and Executing Agency's personnel, any property brought, including one privately owned automobile per employee, by the firm or organization or its personnel for their personal use or consumption or which after having been brought into the country, may subsequently be withdrawn therefrom upon departure of such personnel.

34. The Government shall ensure : (a) prompt clearance of experts and other persons performing services in respect of this project and (b) the prompt release from customs of : (i) equipment, materials and supplies required in connection with this project and (ii) property belonging to and intended for the personal use or consumption of the personnel of the UNDP, its Executing Agencies, or other persons performing services on their behalf in respect of this project, except for locally recruited personnel.

35. The privileges and immunities referred to in the paragraphs above, to which such firm or organization and its personnel may be entitled, may be waived by the Executing Agency where, in its opinion or in the opinion of the UNDP, the immunity would impede the course of justice and can be waived without prejudice to the successful completion of the project or to the interest of the UNDP or the Executing Agency.

36. The Executing Agency shall provide the Government through the Resident Representative with the list of personnel to whom the privileges and immunities enumerated above shall apply.

37. Nothing in this Project Document or Annex shall be construed to limit the rights, facilities, privileges or immunities conferred in any other instrument upon any person, natural or juridical, referred to hereunder.

SUSPENSION OR TERMINATION OF ASSISTANCE

38. (a) The UNDP may by written notice to the Government and to the Executing Agency concerned suspend its assistance to any project if in the judgement of the UNDP any circumstance arises which interferes with or threatens to interfere with the successful completion of the project or the accomplishment of its purpose. The UNDP may, in the same or a subsequent written notice, indicate the conditions under which it is prepared to resume its assistance to the project. Any such suspension shall continue until such time as such conditions are accepted by the Government and as the UNDP shall give written notice to the Government and the Executing Agency that it is prepared to resume its assistance.

(b) If any situation referred to in subparagraph (a) above shall continue for a period of fourteen days after notice thereof and of suspension shall have been given by the UNDP to the Government and the Executing Agency, then at any time thereafter during the continuance thereof, the UNDP may by written notice to the Government and the Executing Agency terminate the project.

(c) The provisions of this paragraph shall be without prejudice to any other rights or remedies the UNDP may have in the circumstances, whether under general principles of law or otherwise.