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**IMPROVEMENT OF THE QUALITY OF CASTINGS AND
HEAT-TREATED PRODUCTS THROUGH THE RESEARCH INSTITUTE
OF TECHNOLOGY FOR MACHINERY (RITM)**

DP/VIE/85/007

SOCIALIST REPUBLIC OF VIETNAM

Report of the evaluation mission*

Prepared in co-operation with
the Government of Vietnam,
the United Nations Development Programme and
the United Nations Industrial Development Organization

* This document has not been edited.

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ABBREVIATIONS

AAS	-	Atomic Absorption Spectrometer
BSO	-	Backstopping Officer
CMEA	-	Council of Mutual Economic Assistance
CTA	-	Chief Technical Adviser
DRR	-	UNDP Deputy Resident Representative
GES	-	Gas Emmission Spectrometer
MOHI	-	Ministry of Heavy Industry
MOLI	-	Ministry of Light Industry
NPD	-	National Project Director
PPER	-	Project Performance Evaluation Report
R&D	-	Research and Development
RITM	-	Research Institute of Technology for Machinery
VN	-	Vietnam
VND	-	Vietnamese Dongs (the currency)

I. SUMMARY OF THE IN-DEPTH PROJECT EVALUATION

Project title: Improvement of the Quality of Castings and Heat Treatment Products through the Research Institute of Technology for Machinery (RITM)

Project number: DP/VIE/85/007

Executing Agency
UNIDO, Vienna

UNDP Budget USD
1.390.000,-

Project Approved
Oct. 11, 1990

Evaluation Date
April 9, 1993

Government Budget
VMD 979.000.000,-

Operations Started
October, 1990

Govern. Implementing Agency

Ministry of Heavy Industry (MOHI), Research Institute of Technology for Machinery (RITM)

Project Function, Objectives and Outputs

Project Function

The primary function of the Project is one of institution building; the Project was designed as to rehabilitate an existing but largely defunct research institute concerned with the technology of machinery for agriculture including diesel engines. The Project Document was formulated in 1988, approved in 1990 and revised in 1991 to take account of the changing needs of RITM and to impart a degree of financial self sufficiency, through a central core of production activity in both cast metal technology and in heat treatment of components such as dies, moulds, springs etc.

Development Objective

Participation in the Government Programme aimed at improving the basic engineering technologies.

Immediate Objectives

1. To refurbish and re-establish the foundry and heat treatment sections of the Research Institute of Technology for Machinery [RITM], thus strengthening the existing capacity for applied research and development in casting technology particularly with regard to the use of indigenous raw materials for moulding and coremaking and to master the conventional procedures for thermal and chemical heat treatment, particularly for dies and tools.
2. To strengthen the facilities which provide consultancy services to the foundry industry and through training programmes abroad and 'in house', improve markedly the level of expertise being offered to industry.
3. To establish a core of productive activity in both casting manufacture and the heat treatment of components, thus creating a business environment to RITM leading to a substantial measure of financial self sufficiency.

Project Outputs

Output 1

- a. to rehabilitate the present Foundry and Heat Treatment Sections of RITM;
- b. provide and install an electric induction melting furnace for both iron and steel alloys, moulding machines and sand conditioning plant, shell moulding equipment, fettling and shotblast plant;
- c. to set up a sand testing laboratory and a laboratory for atomic absorption

- d. spectrometry [AAS];
preparations to produce a large measure of self sufficiency through the marketing of RITM's services of sale of castings produced.

Output 2

To produce a trained corps of 22 engineers capable of acting as consultants to industry.

Output 3

Renewal of the policy and procedural guidelines governing the relationships between RITM and industry, reflecting the services that RITM will provide.

Output 4

Provide a team of five engineers skilled in the maintenance of selected equipment and the establishment and implementation of planned maintenance schedules.

Output 5

The Heat-Treatment Section of the Hand Tools Factory in Hanoi and at least two other foundries will be upgraded through the consultancy services of RITM.

Output 6

Improvement of the local manufacture of selected spare parts through the application of proven technology by RITM as consultants.

Purpose of the Evaluation Mission

The Project is to be completed by end 1993, but there are few activities yet to be realized and the funds available are limited.

The purpose of the In-Depth Evaluation was to assess the progress of the Project so far, and to identify the shortcomings, and additional activities which may be required or be advisable to counter the shortcomings or to fill the gaps which will become evident.

In accordance with the provisions contained in the UNDP Policies and Procedure Manual, the scope and the purposes of the evaluation mission were formulated as the following:

- a. assess the progress and the achievements of the Project so far, against the set objectives and expected outputs. This will include a re-examination of the project design;
- b. identify and assess the factors which facilitated the achievements of the Project's objectives at the mid-term point; as well as those factors which have impeded the fulfillment of these objectives and which also may act as constraints in the realization and attainment of the remainder of the Project and its final objectives;
- c. examine if the approach utilized in the Project is leading to optimum results in a cost-effective fashion and timely manner.

Findings and Recommendations

1. The Project Document design is relatively satisfactory. It is clear and realistic; outputs and activities are fairly well defined.
2. The quality and quantity of UNDP/UNIDO inputs delivered are by and large satisfactory; so is the level of expertise.
3. The Project was properly monitored and backstopped.
4. Substantial delays in delivery of some inputs were experienced during the life of the Project.

5. Most of the activities planned have been carried out or will be carried out and the majority of outputs are at hand.

6. In order to complete the delivery of assistance and full achievement of the objectives, the Mission recommends that the budget be revised so that certain additional equipment can be obtained and complementary short-term expertise be fielded before the Project is terminated.

7. The Mission recommends to terminate and operationally complete the Project by the end of 1993.

8. The Mission is of the opinion that the Research Institute of Technology for Machinery [RITM] in Hanoi should continue function as a focal point and development centre appointed to carry out research, consultancy, training, and technical services to the foundry industry in the country.

9. The Mission recommends to further intensify RITM efforts towards strengthening its general management and marketing activities all leading to a substantial measure of financial self sufficiency.

10. In view of financial constrains faced by RITM, particularly the shortage of working capital the Mission recommends to make the provision of soft loan in Vietnamese Dongs estimated on USD 150.000 and to increase the volume of monthly production of castings threefold. The loan would be needed to maintain 3 month operation of RITM production sections and to intensify services for industry.

11. Complementary technical assistance from UNDP/UNIDO for RITM cannot be excluded from future consideration mainly in the context of expected growing demand for sophisticated heat-treatment and casting techniques of metal parts used by newly modernized engineering, textile, food processing and other industries in the country.

12. UNDP and the Government may wish to entertain the idea of such assistance for very specific needs at an appropriate time. It is therefore suggested that a short-term mission of the UNIDO BSO to Hanoi will be taken, preferably at the beginning of 1994 in order to assess the progress in RITM performance and discuss with the Government particularly important aspects of RITM operation.

Lessons learned

1. In a project where institution building requires substantial technology development and its transfer to industry, and also a technology base building in a sophisticated and highly complex field, like metal casting quick results of long process of training, cannot be expected.

Institution building will have to progress from several baselines, each developing the institution in question to a progressively higher level of technical competence.

2. In order to avoid unforeseeable difficulties and delays in the procurement of equipment [e.g. embargo] alternative sources of its supply should be taken into consideration from the very beginning of project implementation. Selection of the given type of equipment [in this case the atomic absorption spectrometer] should have not been made unless expandable materials and spares and services needed to maintain its regular operation are locally identified and secured.

Evaluation Programme

Activities of the Evaluation Mission have been carried out in the period of two weeks (28.3-10.4.1993) according to the Terms of Reference - TOR (annex no.1) and the early agreed

work programme (annex 2).

Composition of the Evaluation Team

1. Mr. Michal Czub, UNIDO, Vienna
2. Mr. Phan Tu Phung, Ministry of Heavy Industry, Hanoi
3. Mr. F.W. Wallbank, UNDP, New York, Team Leader

II. PROJECT CONCEPT AND DESIGN

A. Overall context

1. Previous Phases

Foundry industry is an essential base for the manufacture of machinery of any kind; it is also indispensable for the supply of otherwise unobtainable spare parts for the operation and maintenance of equipment and machinery. The foundry industry in Vietnam had deteriorated almost completely over the past decades, and the cost to the economy of the lack of production, and of the extreme poor quality of the few castings which were produced was, and is unacceptable.

The foundry industry of Vietnam is operating at a low efficiency level. This also covers those plants which have technically adequate equipment installed, because most of the equipment is unserviceable. In addition, the foundry industry in Vietnam has suffered for many years from a lack of capital investment, an inability to import essential raw materials and spare parts and progressive obsolescence of existing plant and equipment. The resulting stagnation in technology and development coupled with low productivity and poor quality and un-reliability of cast and heat treated products has prompted the Government of Vietnam to include in its Five-Year Plan a programme for improving basic technologies.

A Preparatory Phase Report was prepared for this Project. This was derived from fact-finding visits of an expert team to a representative selection of the industry comprised of fifteen foundry and mechanical workshops. Foundries were visited in Hanoi and Thang Hoa in the north and Ho Hi Minh City and Bien Hoa district in the South.

The purpose of the preparatory phase was to identify the basic causes of low productivity and high reject rates in those foundries visited and to link them to RITM's ability to affect changes to solve the problems encountered, and to prepare the document for a project which was to address the problems.

Almost without exception the foundries visited showed a lack of the basic equipment necessary to process and control the quality of raw materials used in foundries. Those foundries possessing equipment had little to offer because of the lack of spare parts, poor maintenance and obsolete machinery. The lack of basic maintenance procedures and planned maintenance scheduling, i.e. the management of resources, is also closely linked to the problems of quality and productivity.

Despite the high number of academically qualified people in the industry, there was insufficient application or knowledge of the basic production and process techniques for casting manufacture.

2. Current trends in the economy of Vietnam

The Vietnamese economy has an great potential for growth, given its fertile soils, abundant mineral and water resources, strategic location in South-East Asia, as well as a highly educated and disciplined labour force. This potential has been garnered by an economic reform process begun in the late 1980s and part of the "Doi Moi" (renovation) policy formally adopted in 1986, under which the centralized command economy system is to be replaced by a market based system.

Past military conflict engaging two generations has had a deep impact on economic performance, as resources and efforts were concentrated on overriding priorities. Economic policies were then not prominent on the national agenda. As a consequence, Vietnam begins its economic reform process with a Gross Domestic Product (GDP) estimated at about US\$ 12 billion

for a population of 65 million.

By late 1990 and early 1991 the existing economic reform measures had begun to reach their limits, with difficulties emerging in certain branches of industry and inflationary pressures resurfacing. The present challenges have a deeper and more structural content than could be tackled by the initial reforms, and newer measures are to be taken to deal with these and to maintain the momentum of renovation.

These issues are undergoing examination and debate and include the restructuring and the establishment of new management mechanisms in the state enterprise sector and a reduction in the scope of that sector, the strengthening of the enabling environment for the private sector, a consolidation of banking reform, the further development of an appropriate legal system for a market economy open to foreign investment, establishing and training a management structure to formulate and implement indirect macroeconomic policies to replace the command economy system, public administration reform, labour market liberalization, and laying the basis for realizable social and poverty alleviation programmes. Successful changes in many of these areas will require strengthening the infrastructures for economic activity, especially transportation, energy and communications.

A number of bold economic reform steps have been taken up to mid-1991 examples of which include (a) the effective floating of the currency; (b) the introduction of banking reform; (c) fiscal reforms; (d) a reform of the land tenure system; and (e) the development of laws and administrative systems to govern the establishment of businesses and commercial transactions in a market economy.

A new foreign investment law, promulgated in 1988, sets liberal investment conditions, and offers financial incentives, as well as provisions for full profit repatriation and guarantees against nationalization. Some 200 joint venture projects, with a value nearing one-and-a-half billion dollars, have so far been licensed (the major portion in oil exploration). But actual investment inflows are slow in being realized and in mid-1991 stood at some US\$400 million.

Agricultural production provides a livelihood for two-thirds of the labour force and accounts for 30-40% of export earnings. While industrial performance has been mixed in recent years, light industries grew about 10% annually and the share of private enterprises in manufacturing output has doubled since the mid-1980s to about one-third of the total.

The labour force is approximately 33 million, of which 3.7 million are in the state sector and 230,000 are civil servants. As a consequence of economic reforms unemployment is increasing. Wages remain very low, while subsidies are being cut in many sectors (housing, water, health, education, etc.), and this is leading to a situation where many of the egalitarian benefits developed in recent decades in education, health and culture may be severely eroded.

3. National Development Strategies

Vietnam's Five-Year Socio-Economic Development Plan 1991-1995 is now in course of implementation.

The Plan has been formulated at a time of dramatic shifts in Vietnam's external economic relations. As a member of the Council of Mutual Economic Assistance [CMEA], Vietnam had benefitted from arrangements which included aid and concessional loans, centrally organized barter trade and co-production arrangements, and access to important raw materials such a fertilizer, insecticides, steel, refined petroleum products, and cotton at less than world prices and through clearing arrangements which permitted the accumulation of arrears. As of 1991 this system has broken down, as company-to-company contracts at world prices and denominated in convertible currencies are adopted and the respective countries' centrally-planned economic relationships are discontinued.

Recognizing the initial success of the reform process, but also the severe socio-economic strains now emerging, the overall objective of the 1991-1995 Plan is to stabilize the socio-economic situation in order to lay the foundation for accelerated growth. Stability is being sought in the context of continued economic reforms, increasing industrial and agricultural output, firm financial and monetary policies, and the final abolition of the pervasive subsidy system.

Among the Plan priorities identified the following areas need external assistance:

- a. Infrastructure development in energy and power generation, water resources, land, water and air transport networks, telecommunications and tourism.
- b. Adoption of technological improvements in small and medium scale enterprises in agriculture, fisheries, livestock, consumer goods, forestry and natural resources, mechanical engineering and electronics and other export oriented sectors.
- c. Improving the educational system including vocational training, retraining and upgrading current skills, and promoting non-State educational institutions.
- d. Development of the legal infrastructure for economic activities, restructuring the ownership of State enterprises to attract private capital and improving capabilities in the social sciences to support economic policy making.

Industrial sector activities will include a continuous support for the improvement of the quantity, variety, quality and presentation of products especially for export; the introduction of international standards; and the familiarization of enterprise managers with international management practices. Attention will also be given to the improvement of domestic products through improvements in production technologies and better use of locally available raw materials. Consequently the Government is seeking technical assistance in the following areas:

- (i) The economic reform process and the expansion and broadening of external trade.
- (ii) The transfer and application of appropriate technologies, with particular focus on recipient institutions' absorptive capacity and the sustainability of the modern technologies.
- (iii) Human recourse development and employment promotion.
- (iv) The management and utilization of natural resources.
- (v) Environmental and human settlements management.

4. The role of function of RITM

In 1985 the Ministry of Mechanical Engineering and Metallurgy (later split into two separate ministries - of Heavy Industry - MOHI and Light Industry MOLI), had delegated the responsibility for improving casting quality and the quality of heat treated components to the Research Institute of Technology for Machinery [RITM] and subsequently the Preparatory Assistance Project DP/VIE/85/007 was implemented in order to confirm the need of technical assistance implemented through RITM to provide an applied R&D and technical consultancy service to the cast metals industry.

The project was designed to:

- rehabilitate, change and supplement the obsolete facilities of the Institute as far as allocated funds would allow,
- upgrade the technical know-how of the staff of the Institute and provide a basis for extending the newly acquired technical knowledge to industry through consultancy services and 'in house' training programmes to both groups and individuals from all sectors of the industry,
- assist the Institute to attain a large measure of financial self sufficiency by the manufacture and sale of high quality specialist castings currently imported into Vietnam [VN] and to establish a productive environment and impetus for the

training programmes to be carried out, apply production disciplines to the activities of casting manufacture, heat treatment of components and to laboratory services so that acceptable principles of management and accountancy can be developed and applied.

As stated by MOHI RITM is to be today "the sole competent authority able to carry out applied research and development, consultancy and technical services to the casting industry". The Government has assigned the main responsibility for the programme of improving basic technologies to the Ministry of Heavy Industry through the Research Institute of Technology for Machinery [RITM].

RITM is involved directly in developing methods, materials and processes applicable to the Vietnamese casting industry whose resources are limited by the lack of capital investment and lack of hard currency for spare parts and material imports.

RITM's contribution to problem-solving associated with low-quality raw materials and poor application of basic technology is, and will remain, a function of its ability to select, test, prove, improve and standardize raw materials and transfer the technologies applicable to given situations.

Recognizing that research institutes cannot always rely on Government subsidy alone, RITM has planned (on the basis of the foundry activities developed by this project) to significantly raise the additional income generated by the sale of castings, products and services within three years of implementation of this project by the impetus created from the production in the foundry workshop of specialist type, complex castings of a quantity up to 400 tons per year. This core of production coupled with analytical and heat treatment services to industry was expected to generate the income to sustain an increasing programme of assistance to the foundry industry in Vietnam.

5. Priorities and problems of the sectors concerned

Issues discussed in this section of the Report relate to RITM and foundry industry and also to the industrial sub-sectors like engineering, cement, paper and other industries commonly considered as producers and consumers of metal castings.

a. Marketing

The present economic situation in Vietnam is such that the foundry industry at large is suffering. Many foundries are not operating and those that are making castings seem to be utilizing only a fraction of their stated capacity. The work situation appears to be better in the South but RITM has rather limited linkage with foundries and castings users in Ho Chi Minh district except possibly through the diesel engine manufacturer within the Corporation of Agriculture Machinery to which RITM directly reports. In terms of general engineering castings RITM may find some difficulty in breaking into this market on the grounds of costs and minimal profit expectations (3 percent). As per the reports of the CTA this market environment is very fiercely protected by current producers.

There appears to be an opportunity to produce cylinder liners and small diesel engine blocks from within the Corporation which may be diversified and offer to other potential customers. There is a valuable market for the production of complex, high alloy, high value steel and iron castings from the cement and paper industries with the possible future involvement in petro-chemical castings manufacture. Two markets for such castings were identified early in 1992 and following visits to those Companies, patterns and core boxes were produced, funded by the Project, and trial castings were made in early June 1992.

The quality of castings for cement plants still requires to be improved. It is important to recognize the potential value of such business to RITM. For example, one cement factory

visited has an annual budget for spare parts, all imported and paid for in US\$, of 4 million dollars. More than 40% of the budget is for replacement castings which can readily be supplied by RITM in larger quantities after meeting the quality requirements.

The import price of many of these castings are 10 -15 dollars per kilo and if RITM provides the quality castings acceptable to the customer at a mutually attractive price, then all concerned will benefit.

The paper mill castings such as conical pulping mill rotors and stators have an import value of 18 - 25 US\$ per kilo and these castings can also be made at RITM if the machining element can be sub-contracted.

b. Raw materials

The availability of the correct raw metallic materials for the foundries in Vietnam is becoming increasingly more difficult. Extensive exporting of metal scrap to Japan has diminished the country's stocks to a level, below which the castings industry could not return to full capacity if a demand was created.

The economy is not generating any new scrap for meltdown and RITM will probably not find quality selected scrap in the market unless a very high price is offered. [ref. para B.8 page 38]. Similarly, ferro alloys are not being imported in Vietnam and the stocks of chromium, manganese, nickel, molybdenum etc. are being steadily exhausted. This is one of the reasons for RITM to have sufficient working capital to be able to make spot purchases of such alloys so that its own stocks and order book are protected. In the current industrial situation little exploitation of indigenous materials is taking place with the exception of high grade silica sand normally used for glass making, which is being exported within the ASEAN group of countries.

RITM have demonstrated the superior use of phenolic resin binder and coating materials manufactured specifically for foundry use and imported into Vietnam. Without such materials RITM will face difficulties to produce the high alloy, high value castings indicated above. It is considered that it would be a retrograde step to use unproven indigenous materials for these castings and such a decision would cause the failure of RITM's work programme. This in turn would lead to the failure of project achievements.

c. Provisions of spare parts

Foundry industries - in general participate in about 70% of the overall production and supply of metal spare parts for construction of capital goods.

The acute deficit of spares in the country is mainly affected by:

- the use of obsolete and outdated equipment and non-availability of spares from the original suppliers (producers);
- poor technological capability of the local foundries (absence both of skill and advanced technological processes).
- scarcity of foreign exchange necessary to meet the growing demand of spares imported from abroad.

At the absence of actual statistic figures it is suspected that the present annual import of metal cast spare parts to Vietnam could reach about 30 million US Dollars.

It is also estimated that the potential income to RITM may easily reach the level of 10 million US\$ if the Institute will more dynamically enter into new business and have enough operation fund to diversify the production of quality castings.

B. Project document

The original project document had been formulated to develop RITM's capability in terms of:

- production potential through the equipment provided by the Project;
- upgrading the professional skill of the RITM's personnel through the training programmes and day-by-day consultations of the Project experts; modern techniques acquired by the RITM's staff.

The Project was designed and formulated on the basis of the concept presented and established in 1988 i.e. before implementing the new economic reform aimed among other at "open market" economy and new management mechanisms in the state enterprises. The original project document has only marked the need: "... to significantly raise the additional income generated by the sale of products and services within three years of implementation of this project", however without specific reference to financial self-sufficiency of RITM.

While in the late eighties the country development was still based on centrally planned economy and Government's subsidy for R&D institutions a drastic change of the economic policy in 1990/91 forced it to revise the project document to better reflect the forthcoming reform.

Consequently an additional immediate objective - related to ".... establishment of a core of productive activity creating a business environment to RITM leading to financial self sufficiency" - was incorporated into the revised project document.

Unfortunately, the newly formulated objective did not clearly interpret the meaning of "a core productive activity" and also an enigmatic expression such as "business environment leading to financial self-sufficiency".

Moreover this complementary objective was not supported both in qualitative and quantitative terms; no related inputs and outputs were formulated in the document. The same refers to the lack of description concerning the mode of achieving by RITM, wholly or partly, the given objective of financial self-sufficiency.

Government's intention was to have RITM (and other R&D institutions) functioning as financially independent unit, and in the consequence expected to apply an appropriate, modern cost accounting system. Particularly the Project did not provide any concrete assistance to RITM in this very specific and complex field.

C. Project Concept

The project concept was originated concurrently with Government's efforts to improve the basic engineering technologies. The project covers foundry and heat-treatment processes. The need for external assistance particularly in the field of casting and heat-treatment of metals has been sought by the Government a long time before the Project concept was developed. The reason was a very critical state of the underdeveloped foundry sub-sector and its close inter-linkage with other important industries like textile, cement, engineering, agricultural, etc. Since the beginning of implementation the Project has sufficiently proven its relevance in the new economic situation of Vietnam. After completing the erection of the equipment emphasis was put - in accordance with the recommendations of the UNIDO BSO - on the production of castings which require higher skills and advanced technologies generating, however slowly, additional financial income for RITM.

RITM is expected to utilize the knowledge and experience provided through the inputs of the Project absorbed by its staff; it is however the function of time.

A very complex nature of foundry process requires a considerably long period of several years to gain sufficient professional experience particularly in the manufacture of quality and jobbing type castings. Overall the objectives and outputs of the Project were well stated. Certain outputs however could not have been produced because of objective reasons. The present economic situation in the country owing to transformation of legal and financial status of the industries resulted in virtual collapsing of a large number of industrial plants; it has a negative influence on the relationship of RITM with industry. In essence there is no money to pay for consultancy and RITM cannot afford either to offer their services free of charge.

Despite the passage of time this Project is basically only 10 months old (March 1993) in terms of achievement of the immediate objectives. The efforts being undertaken by the RITM's staff to produce a large measure of financial self sufficiency merit to be appreciated; the results however are still below the expectations.

In general the relationship of the development objective with the immediate objectives were correctly determined. The same refers to the logically designed linkage between the immediate objectives, outputs, activities and inputs, with the exemption of the outputs related to:

- a. preparations to produce a large measure of financial self-sufficiency;
- b. procedural guidelines governing the relationships between RITM and industry.

No evidence of action has been produced - in the form of specific inputs for the Project like fellowship programme in cost accounting, expertise in industrial management/administration and others - to assist the project staff to satisfactorily generate those two outputs.

The delays in procuring the equipment (the induction furnace), unforeseeable in the time of designing the project document, were the main reason of shortening the full scale operation phase of the Project by at least 12 months as compared with the original time-schedule.

Consequently the activities considered adequate enough as they were defined in the project document, could not timely generate all the acquired outputs.

III. PROJECT IMPLEMENTATION

A. Budget Inputs

The budget figures presented at the end of this section show the original budget as approved on October 11th, 1990 in the left column and the latest approved revision (M) in the right column as per UNIDO computer printed report of February 28th, 1993.

Within the period of 2.5 years (October 90 - April 93) the overall budget has been increased by 3.2% i.e. by US\$ 44,840 .

The project originally envisaged 53 m/m of experts/short-term consultant assistance at a total cost of US\$ 535,499 .

The budget revisions allocated 32.95 m/m of international expertise (experts and consultants) to the Project at a cost of US\$ 355,805 i.e. 66.4% of the original allocation.

The international experts services have been partly complemented by 2 locally recruited engineers assigned to RITM Maintenance Section (24 m/m); thus the actual total personnel component (budget line 19-99) of 56.9 m/m service does not principally vary from the original of 53.0 m/m respectively at a cost of US\$ 408,706 and 575,269.

In terms of m/m service planned and delivered, the Project can be considered remarkably on target. However there have been some significant shifts within the personnel component of the budget.

As the result of deleting some of the equipment from the original list the services of two international consultants in die casting techniques and laser heat-treatment have not been provided to the Project.

Another major change already mentioned but not envisaged by the Project was the hiring of the two national experts in maintenance of equipment.

The change in experts assignment influenced the actual value of uncommitted balance of the project budget = US\$ 93,039 in 1993 (6.5% of the total project allotment).

Another project up-dating and revision will be required to program this money. Suggestions on further allocation of the uncommitted balance are provided in Chapter VI related to recommendations.

Budget line	Original Budget October 1990		Latest Budget (M) March 1993		
No/Component	m/m	USD	m/m	USD	
Personnel					
11-01 CTA	16.0	162,000	16.4	185,789	
Maintenance 11-02 Experts	9.0	92,000	-----		
Maintenance 11-03 Experts	6.0	62,000	-----		
11-59 Consultants	22.0	219,499	10.5	174,267	
Sub-Total 11-99 Personnel	53.0	535,499	32.9	355,805	
Project 15-00 Travel		6,500		9,161	
Mission 16-00 Costs		33,270		-----	
National 17-00 Experts			24.0	12,199	
Savings 18-00 Obligations				2,892	
Personnel	53.0	575,269	56.9	408,706	
Training					
31-99 Fellowships		215,000		227,518	
Study 32-99 Tours		35,000		64,058	
In-service 33-99 Training		1,000		540,000	
Training Component 39-99 Total		215,000		261,940	
Equipment					
41-99 Expandable		10,000		9,638	Nearly 70% in-crease
Non-Expandable 42-99 Equipment		538,137		921,458	Nearly 70% in-crease
Total 49-99 Equipment		548,137		931,096	
Miscellaneous 59-99 Total		15,594		13,797	
99-99 Project Total UNDP Contribution		1,390,000		1,434,840	+ 3.2% in- crease

B. UNDP Inputs

Personnel

Technical assistance of total 34.9 m/m including the Preparatory Assistance Phase has been provided till the end of 1992 to the Project through the following experts and consultants in specific fields namely:

- a. Chief Technical Advisor - 11-01;
expertise in foundry technology and melting techniques of alloy steels, ductile and grey iron. Advisory services on marketing of RITM's products and services. Selection of the equipment and supervisory services of its erection.
- b. Foundry Consultant in Shell Moulding Technologies - 11-52;
assistance in erection and commissioning of the equipment. Mould designing, implementation of the relevant technology for diesel engine blocks. On the job training.
- c. Heat-Treatment Consultant - 11-54;
Assistance in commissioning the newly erected equipment. Establishing appropriate technologies procedures, implementation of modern technologies, on the job training of operators and supervisory staff. Consultancy services to other heat-treatment sections of the local industries.
- d. Consultant in Manganese Steel - 11-56;
Assistance in designing gating and feeding systems and heat-treatment/quenching facilities. Advisory service in establishing appropriate metal composition of different types of castings.

An individual assessment of project personnel performance has not been made by the Evaluation Mission.

However definite general indications in this regard have been given during interviews with the National Project Staff and also confirmed in a report prepared by the National Project Director (see annex 3).

The experts and consultants recruited by UNIDO have been found co-operative with the counterpart staff and fully devoted to the duties assigned to them.

Several useful initiatives generated by the experts like the RITM's Open Days, involvement of the British Foseco Engineers with the demonstration of advanced moulding techniques, seminar on heat-treatment techniques - are considered to be a useful contribution to the Project.

Equipment

The list of equipment and accessories provided to RITM through the Project is presented in annex 4.

Due to limit of the UNDP project budget some of the originally planned machines could not have been procured, particularly:

- pressure die casting machines,
- investment casting equipment,
- laser beam for heat-treatment techniques,
- heat treatment furnace.

The Mission is of the opinion that the temporary absence of the equipment does not adversely affect the present performance of the Project.

It would be however advisable for RITM to have this equipment installed in a near future after reaching certain degree of financial self-reliance.

The equipment already provided by the Project is well maintained, used for the purposes intended and is considered appropriate to the needs. Its utilization however is still below an optimal level of 2 shift operation applied commonly by foundry workshops; the same refers to the existing heat-treatment facilities of RITM.

Training

The training programmes arranged by the Project have been successfully implemented. The training of total 29 members of RITM's technical staff has been provided through study tours and fellowship programmes offered by the Research Foundry Institute in Poland and the Institute of Heat-Treatment of Metals of the Birmingham University, UK.

Individual consultations as well as a group training have been designed and implemented in the following specific fields:

- a. green sand and self-hardening moulding methods,
- b. testing of moulding sands and related raw materials,
- c. core-making techniques,
- d. shell-moulding technology,
- e. high-pressure die casting,
- f. fettling and cleaning of castings,
- g. operation and maintenance of spectrometers,
- h. theory and practices of heat-treatment of metals among others:
 - normalizing,
 - hardening,
 - carbonizing,
 - carbonitriding,
 - nitriding,
 - boronizing,
- i. induction melting of cast iron and alloy steel,
- j. ultrasonic and X-ray testing of castings.

The training was found useful and appropriate; it effectively increased skills and knowledge and improved attitudes of RITM's staff towards improvement of products quality.

C. Government Inputs

The Project contributions in kind have been provided by the Government and RITM to cover the following:

- a. design and establishment of the Heat-Treatment Shop in RITM.
- b. renovation of the Foundry Workshop along with re-location of some of the equipment.
- c. maintenance and overhead costs of the Administration Building and the Chemical Laboratory.
- d. re-conditioning and installation of the equipment used by RITM before the Project commenced its activities.
- e. costs of local transportation (depreciation, maintenance, etc.).
- f. travels within the country.
- g. salaries and wages of the project staff.
- h. other costs.

As the result of devaluation the overall Government contribution has been 2,665 billion VND (about 250,000 US\$) vis-a-vis the originally committed amount of 979 millions VND.

D. Project Activities

UNDP signed the Project Document based on the understanding that searching and identification of the local market will be done by RITM in order to achieve a substantial measure of financial self-sufficiency from the supply of castings, training and technology transfer.

RITM has initiated the action to identify specific demands of industries in the country which requires to be continued in a more dynamic manner. In 1992 the output of the RITM Foundry reached the level of about 30 tons of castings providing the gross income of 612 million VND and additional financial input of 130 million VND for technology transfer.

The bulk of project activities envisaged in the project document consisted of experts' services providing the assistance in:

- design of equipment lay-outs,
- design and construction of additional buildings,
- extensions, alternations and re-siting of the RITM Foundry Plant, the laboratory, etc.,
- procurement of essential equipment,
- preparation of marketing programmes and plans of consultancy service for selected foundries,
- development of process technologies,
- maintenance of equipment,
- on-line job training of the Foundry Staff and Works,
- design and manufacture of prototype spare parts.

Meanwhile the RITM Staff has undertaken a research programming and R&D works aimed at identification of indigenous raw materials, their sources, suitability and quality.

The members of the RITM Project Team along with the RITM engineers and production supervisors have always actively participated in the works undertaken jointly with the experts.

In connection with the above, the experts provided assistance and advice in:

- selection and purchase of production and laboratory equipment; its installation and putting into operation;
- direct assistance in moulding, core-making, melting, heat-treatment, etc.

Experts also supported RITM in providing troubleshooting and consulting services to industry, especially in modern technology applications.

Finally, experts assisted RITM's staff in conducting training sessions and in developing training materials. As indicated earlier, the quality of expert input and their capability to upgrade RITM's staff were good.

The Mission found that on many occasions experts were used to supplement the staff resources to supervise production and to train trainees directly.

The experts had well specified job descriptions which clearly set out their capability building (training) and direct support functions.

Of particular interest is the specification of the performance standard expected from the experts. Generally the terms of reference were discussed and agreed upon by the expert, RITM and UNIDO at the beginning of the assignments. The experts' missions reports varied in quality and mostly summarized their technical activities. One notable exception are the correspondence and reports written by the CTA functioning as a foundry consultant which are analytical and provide realistic guidance to RITM in developing its capabilities.

Also noteworthy is the proposed work programme and its execution by the national experts in the fields of maintenance and related training. The programme basically covered the original scheme for maintenance however it revised the previous maintenance system applied by RITM.

E. Project Monitoring/Reporting

Project monitoring by RITM, UNIDO and UNDP was carried out conscientiously by all concerned. Project Performance Evaluation Reports (PPER) were prepared annually. On one occasion, however, it was prepared earlier for the In-depth Project Evaluation Mission.

Notable to the Mission was the quality of the tripartite review meeting (TPR) discussions as reflected in the TPR reports. Almost all the issues and problems of the project were thoroughly discussed during these meetings, although some issues related to RITM's commercial activities were never resolved.

The PPERs were effective in identifying problem areas. Some highlights include:

- late delivery of equipment procured by UNIDO.
- delays of Government financial inputs for rehabilitation of the RITM Foundry.
- deleting from the procurement list a pressure die casting machine and laser beam equipment.
- replacement of the AAS spectrometer by a GE type; justification was requested.
- need for more market research in the context of RITM financial self-sufficiency.

V. PROJECT RESULTS

A. Outputs

In a project such as this, where the focus is basically on institution building, several problems arise in measuring outputs. First, some important project results may be hard to quantify precisely. Second, quantifiable outputs require additional assessment for which there are no hard and fast rules. The Project Document attempts to specify success criteria as well as the necessary verifiers for each set of outputs. Quantitatively, therefore, to measure the outputs is less problematic. Qualitative assessments are based upon the Mission's interviews within and without RITM and on observations. In what follows a quantitative and qualitative assessment is given with respect to each set of outputs. The expected outputs are listed according to the project document namely:

Output 1

a. To rehabilitate the present foundry and heat treatment section of RITM. This refurbishment has been completed. All civil work was completed by the end of March 1992.

b. Provide and install an electric induction furnace melting unit for both iron and steel alloys, moulding machines and sand conditioning plant, shell moulding equipment and fettling and shotblast plant.

All the plant and equipment items purchased by UNDP/UNIDO have been installed and commissioned and are now operational. The planned implementation of the equipment was very much delayed by the late delivery of the electric furnace due to the USA embargo on goods to Vietnam, but also to the eventual lengthy delivery time (11 weeks) by the freight shipping company. The furnace finally arrived in Hai Phong Port beginning April 1992 and was installed by the project team in ten days despite the lack of pipe couplings and fittings which should have been supplied with the furnace. Since such fittings were not available in Vietnam many had to be machined or fashioned on site.

The AJAX furnace engineer requested for 12th of April actually arrived on 27th of April and within four days the furnace lining were rammed, fitted and production trials commenced satisfactorily. This fine achievement was the result of the enthusiastic efforts of the staff of RITM, the UNIDO experts on site and the commissioning engineer, all of whom worked day and night to obtain a result.

c. To set up a sand testing laboratory and a laboratory for AAS.

This output was fulfilled in 1991 but since there was no melting and moulding activity until the furnace was installed, the equipment had remained idle. Moreover, the non-availability of instrument grade gases for the AAS in Vietnam was "discovered" after its delivery to RITM without which the apparatus cannot usefully be employed. Several attempts have been made to obtain a supply from Thailand, Malaysia, Taiwan, Australia, China and the UK but either the costs were prohibitive or the gas producers were not willing to supply. This situation has not yet been resolved.

The AAS is suggested to be sold through UNIDO advertising.

d. Preparations to produce a large measure of self sufficiency through the marketing of RITM's services and sale of castings produced.

This output has not been achieved until now due to several reasons already discussed in the previous chapters. RITM is expecting to manufacture about 160 tones of castings in 1993 based on the contracts already concluded with its customers; the sales would be the main source of RITM's income estimated on 2.640 billions VND (about 260.000, - US\$).

A detailed financial cost analysis for the RITM's performance in 1992 had not been produced by the Institute; thus the Mission could not make comments in this regard. The Institute activities and existence are still partly subsidized by the Government; however the Ministry of Heavy Industry tends to have RITM financially independent. RITM is now legally allowed and officially advised to seek other financial resources to increase its working capital (or investment fund) through bank loans. So far no attempts have been made by RITM to identify additional sources of financing needed to diversify and intensify its production. It is felt that the absence of appropriate cost accounting system in RITM and elaborated business plan may be both a serious obstacle in future negotiating the terms of bank loans.

Output 2

a. To produce a trained corps of 22 engineers capable of acting as consultants to industry. This is to be accomplished by study tours, training fellowships and in house training, all of which will concentrate on industrial experience and applications.

This output has been achieved by the training programmes in Poland and in UK which complemented the previous graduate training of 29 Vietnamese engineers. The practical proof of their competence has to be firmly established during the next 1-2 years but the overall signs are promising. It is seen as very important to establish the concept that RITM is "centre of excellence" for cast metal technology in Vietnam. By producing high value, complex castings usually imported, because hitherto they could not be made in VN, it will be the quickest way to establish this desired reputation.

Output 3

a. Renewal of the policy and procedural guidelines governing the relationships between RITM and industry, reflecting the services that RITM will provide.

The present economic situation in VN and the resultant virtual collapse of industry at large has a negative influence on the relationship of RITM with industry. In essence there is no money to pay for consultancy and RITM cannot afford either to offer their services free of charge. It is timely for RITM to take up this matter with the Ministry of Heavy Industry. In spite of financial constraints RITM has provided technical assistance service to several industrial enterprises e.g.:

- GIALAM Construction Engineering Factory; on the job training of 10 trainees in foundry practices;
- Hanoi Machine Tools Factory; training programme in foundry techniques for 13 vocational school students;
- Ninhbinh Engineering Factory and Hanoi Electrical Engineering Plant; consultations provided by RITM on improving the quality of moulding sands;
- DUYENHAI Engines Plant; quality improvement of castings;
- DISOCO Co.; design of manufacturing process of cylinder blocks;
- Hand Tools Factory in Hanoi; design and implementation of nitrocarbonizing process applied in thermal treatment of dies;

b. Setting up group and individual training courses for personnel from foundry industry.

This output has been already established and RITM should continue on the job training and up-grading courses in the coming years. It is understood that no extensive training or transfer of technology can be effected until the RITM Foundry has attained a reasonable level of industrial operation and gained a relevant experience. Following the contacts with the potential clients established in May 1992 during "the RITM Open Days" the project management is expected to develop further concepts of technical assistance for local industrial enterprises. The competence and capability of RITM to provide the products and services should be appraised within the context of the changing economic policy in the country.

Output 4**a. Provide a team of five engineers skilled in the maintenance of selected equipment and the establishment and implementation of planned maintenance schedules.**

The team of maintenance engineers assigned to the two national maintenance experts has already been established. Maintenance schedules along with a service plan have been set up. The plan will enable to extend training to other foundry maintenance groups or individuals.

Meanwhile the RITM maintenance team provided services to:

- PHOYEN and GIALAM factories - in renovation of the existing induction furnaces;
- The Research Institute of Ferrous Metallurgy - in repairing the induction furnace operating under another UNDP/UNIDO project.

Moreover, some gauges and measuring instruments of the Hand Tools Factory have been calibrated by RITM. Utilization of the Maintenance Team in a near-future may be constrained by the shortage of money available by potential recipients of RITM's services in equipment maintenance.

Output 5**a. The heat treatment section of the Hand Tools Factory and at least two other foundries will be upgraded through the consultancy services of RITM.**

In the original project document it had been agreed that five foundries and two heat treatment workshops would be upgraded but the figures were modified during project revision to a more realistic level. Even so, it is rather doubtful whether the two other foundries will be upgraded due to the severe economic climate currently prevailing and non-availability of investments funds. In 1991 the Hanoi Tool Factory had requested help in improving die life through tighter control of heat treatment and other process variables. RITM were unable to respond because the new HT furnaces were not installed and the Institute had no real facility to carry out trials. The gaseous carburizing furnace was erected and became operational in May 1992. It should be recognized that low die life is not solely due to poor heat treatment, but many other factors including incorrect raw material, or incorrect specifications, and inaccurate forge machine setting. At the end of May 1992 RITM began trials with gaseous carbonizing of the dies with the objective of setting up complete procedures for die use. The trials have been successfully completed with the result of extending the durability of dies two-fold. RITM has already supplied about 200 sets of dies thermally treated and earned a high appreciation from the user.

Output 6**a. Improvement in the local manufacture of selected spare parts through the application of proven technology by RITM as Consultants.**

This output is an anticipated outcome of RITM's expected work programme till the end of 1993 following the planned procedures of "in house" trials, sample castings in service, measurement in qualitative and quantitative terms of any improvement and the resultant feedback of information to both RITM and the customer. This will be an ongoing activity conditioned by customer requirements and overall improvement in the economy. It should be noted that certain high value, complex, steel alloy, spare part castings were identified in 1992 from the cement and also from the paper making industries. Efforts to substitute the import of cast steel hammers and also grinding balls made of manganese and alloy cast steel have been taken by RITM. There is now more or less regular supply of these parts to one of the local cement factories. The prototype castings of stator and rotor for paper industries are being tested. The results are promising. The castings for cement plants require to improve the quality. Certain measures were taken based on the modified technology proposed by the UNIDO Expert. In case the problem of quality of the castings

for cement industry is resolved a significant saving in foreign exchange is expected to be achieved through import substitution. The amount of 4-5 mil. US\$ of annual savings may be anticipated.

It would be a natural and logical step for RITM to diversify and develop the production of other castings assortments along with further transfer of proven technology to other foundries in the country.

B. Utilization of Project Results

In addition to the discussion on each service output provided by RITM to industries presented on the previous section of this report, more detailed information is given in:

Annex 5: RITM Activities in Technology Transfer to Foundry Industry.

Annex 6: List of castings assortment manufactured by RITM in 1992 and in 1993.

Annex 7: RITM Training Courses for Vietnamese Foundry Personnel.

These annexes are a testimony to the capability and capacity of RITM to provide services to industry. Taking into consideration a relatively short period of the last 10 months during which the Foundry Shop has become operational and difficult circumstances accompanying the country's economic transformation, the utilization of the Project is comparatively good.

C. Immediate Objectives

Since its creation RITM has accumulated sufficient experience in manufacturing and in the design and production of castings, dies, moulds, and other products. The objective has been the provision of basic infrastructural services in these areas to the local industry and to train highly skilled engineers, technicians, for the country. RITM possesses a very well equipped foundry workshop, laboratories and modern heat treatment facilities, conventional machine shop equipment, metal production presses, and shell moulding facilities. RITM has made about 25 tones of prototype castings in the first 7 months of its operation in 1992 and reached a meaningful level of development.

The upgraded position of RITM vis-a-vis the underdeveloped foundry industry in Vietnam has been achieved largely because of considerable Government's inputs and of UNDP/UNIDO support to provide experts, equipment and training. The UNDP supported training programme was designed to cover areas of particular importance to the foundry and engineering industries and to upgrade the skills of technical personnel of RITM. Since the inception of this programme RITM began to provide training and consultancy service to technical personnel of industrial enterprises. The analysis so far indicates clearly that the project objectives have been achieved. Issues concerning the sustainability of this achievement are discussed below in Section E.

D. Development Objectives

RITM's range of services to the industry has been possible thanks to unquestionable improvement of the basic technologies such as metal casting and heat-treatment of metals. The Mission wishes to state that the Project, by successfully strengthening RITM, has contributed significantly to the attainment of the development objective of the Government of Vietnam as stated in the Project Document.

E. Unforeseen Effects

No unforeseen effects have been detected.

F. Sustainability

The sustainability of the results of a project of this nature is inextricably related to the sustainability of the institution to which assistance is directed. The project provided equipment, training, and advice to achieve certain objectives. The outputs conducive to that end are basically at hand. The project did help RITM reach a certain plateau. Whether RITM can continue at that plateau or even exceed it or whether it slides depends upon a number of issues which are yet to be resolved. Some of these issues are rather simple; others are quite complex. Moving from the simpler to the complex, mention has to be made first of the maintenance of the equipment provided by the Project. The failure of proper maintenance will seriously impair the training activities. A second issue is staff training. To maintain its present course RITM will have to continue with the training of its staff and the upkeep of the capacities and capabilities the project created. To do so it must command a certain amount of financial resources. Some fundamental issues need solution. By its present status RITM is to function as a commercial service establishment in addition to being a R&D centre.

The prevailing tendency is to make RITM as much as possible a self-financing venture. If so, RITM will have to distribute its activities between R&D, production and services, perhaps emphasizing more the production aspects. It is axiomatic that shortage of Government subsidies would cause training to suffer. And should financial strains force RITM to economize in its wage bill, the staff turnover will be higher than assumed at present and may affect the institution negatively. The salary level of management staff, engineers, technicians and operators etc. is significantly low. Under no circumstances can an institution function as a private commercially oriented enterprise with public sector salaries. The question of paying equitable wages in line with output and competence, has to be seen in light of current salary and wages level within the Corporation of Agricultural Machinery and the MOHI. Salaries are not uniformly distributed throughout industry and there are vast differences in levels of pay between engineering and say, tourism and between the North and the South of Vietnam. It may be difficult for RITM to openly pay incentive wages and salaries which would create disparity elsewhere in the system. This appears to be a problem, crucial to the future success of the Project. Management inertia at RITM reported by UNIDO experts may be caused by financial factors already expressed. However there are other reasons which may constrain the project performance since it is the opinion that the Institute needs further restructuring of its management. Further recruitment of outsiders to the RITM management team especially from qualified people who have relevant experience is seen as very important. What is apparently not recognized at RITM is the fact that consulting engineers, experts in specific technologies, do not necessarily make good production managers and supervisors or vice versa. Presently RITM has a few objectives. One seeks to train highly skills engineers, technicians, a foundry personnel to service the immediate needs of the country as a whole. The other, parallel to the first, is to attain commercial independence through provision of services to the industry. The synchronization of these two objectives will continue to required trade-offs and will remain a dynamic situation. It is, therefore, imperative to carefully weigh any major policy decision which may affect either stream of activity.

As already mentioned the general state of the Vietnam economy is such that the general market for cast products is very low, with most foundries operating at less than 10 percent of stated capacity except for a few with a captive market for their castings. Within this environment, individual foundries are fiercely defensive in protecting their interests and order book. If those foundries are to compete in this depressed market they will be forced to do so on price, not quality, unless it can be shown that the higher quality results in savings for the customer. The philosophy of the Project and the nature of its activities is not to compete; RITM should manufacture castings based on more advanced technologies in order not to disturb the market and operate on profitable level. One of the sources of its profit is the transfer of advanced technologies to local industries. RITM have recognized that it must operate largely in the market of imported castings and indeed if the Institute can do this successfully then the competition within VN will be minimal until such time when RITM will transfer the developed technology to other foundries. Given this competition, RITM more than ever, must sell a range of services that will be heavily

depended upon a base of highly skilled and motivated personnel who are conversant with rapidly changing technologies. Yet, RITM is faced with a risk of inability to undertake the increasing volume and calibre of work which is required to sustain growth and commercial operations in keeping with its objectives, size, and potential. Since its machinery and manufacturing techniques compare in many instances favorably with what is available in more developed plants, its role is becoming all the more complex as it interacts with more informed and demanding clientele. It must be absolutely essential for RITM to seek ways and means to ensure that its personnel stay with the Institute and be on top of the changing demands of industry. The ongoing service and production programmes on cast spare parts and latest technologies must go hand in hand with a greater appreciation of customer demands for timely and high quality products and services. This inter alia requires that RITM must deliver now more than it has in the past. The Mission suggests that, given its present limited experience RITM should audit regularly its own skills and capacities to render commercial services to assure that deliveries will be attainable. Skilled personnel is RITM's most vital resource. If RITM is to continue to meet the increasingly sophisticated demands of its clients, training must be a continuous activity. This is critical, because it requires sporadic financial subsidy to cover the cost of fellowships abroad, participation in international conferences, technical consultations with foreign experts, etc. Moreover the new private sector requires trained personnel who can walk into the job. Practically skilled engineers, technicians and operators may be available soon from RITM; an unexpected "escape" of qualified personnel from the Institute to the private sector may result in a sudden collapsing of RITM position and its viability. The comments indicate quite clearly that a precise and well-defined policy for RITM and its incorporation into the Government's guidelines are absolutely indispensable.

If this is not done and a concrete policy is not articulated, RITM sustainability becomes questionable, and with it that of the project result.¹

G. Project Follow-up

The current project, together with its preparatory phase, covers a time span of about four years. During this period considerable efforts and financial resources have been channelled to strengthening RITM as an institution. In view of the tangible evidence of the project's relative success, the Mission suggests that no new project of the same nature be planned at this point of time. The Project should be allowed to improve its budgetary course and be terminated thereafter. Some very specific consultancy and/or technical assistance may be warranted in a future. It is noted that industries in developed countries hire consultants from around the world. Hence, the "consultant mentality" as a cost-effective approach to progress should be developed. To this end specific recommendations are put forward in the last chapter of the Report.

¹ The report of the CTA contains views with respect to the institution's sustainability. Some of these have been incorporated into this evaluation report. His final report is worthy of consideration by the concerned Government Authorities.

V. CONCLUSIONS

A. General Conclusions

1. Despite the passage of time this Project is basically only 10 months old in terms of achievement of the objectives. There is much work to be done to consolidate the activities of RITM and it is of the utmost importance to maintain the impetus created by the Project outputs and related activities.
2. The collective efforts of the staff and workers at RITM and the UNIDO experts were demonstrably effective in showing what can be achieved from this Project. The role, contribution and effective service of the National Project Staff in implementing the Project merit to be appreciated.
3. The technical staff of RITM assigned to the Project has developed to a sufficient extent the ability to independently absorb and implement technological and operational procedures and to further improve the applied manufacturing process. RITM is considered capable of sustaining its programmes designed to resolve the fundamental problems in foundry processes and heat treatment technologies. RITM is also capable to assist other foundries in the country in testing and development of indigenous raw material standards and make recommendations to Government Authorities regarding the exploitation of mineral resources.
4. During the past months RITM have been able to meet orders for a number of castings for the cement and paper industries, as well as orders for diesel engine cylinder heads and liners from within the Corporation. Many of the castings are made of high alloy steel including stainless and heat resisting steel. It is roughly estimated that the potential target income to RITM could be at least 10 million US\$ per annum if the Institute have the courage and can control the "up take" of new business and still have an ability to fund the cost of production. It should be noted that the development of the market will take time and there is a risk element in that the castings are complex and difficult to produce in any event.
5. By virtue of providing extensive on-the-job training, the Project has also contributed to human resource development within the institution. RITM-trained operators and technicians command respect and fetch good remuneration in the market, a point which was frequently stressed by UNIDO experts.
6. Last but not least, the Project has begun to contribute directly and/or indirectly to RITM reputation within the foundry and engineering industries. RITM's reputation as a unique institution in heat treatment techniques and alloy steel castings has a good prospect to be soon well established.

B. Related to the Project Document

1. The project document was principally well drafted and formulated. The same refers to the consecutive revisions of the document reflecting the new development policy of the country aimed at open market economy and financial self-sufficiency of industrial enterprises.
2. In general the formulation of outputs and activities appears to correspond adequately to the immediate objectives.

3. The Mission wishes to point out emphatically that the major weakness of the Project Document is the absence of appropriate inputs supporting the establishment of a proper cost accounting system in the context of achieving by RITM a substantial measure of financial self-sufficiency. Otherwise the Mission is of the opinion that the stated outputs were principally sufficient to achieve the immediate objectives.

C. Related to Project Implementation

1. In general, despite major delays in input deliveries, the project is relatively well implemented, especially if judged on the basis of the quantity of outputs produced in a comparatively short time of ten months.
2. The National Project Director and his staff has a good understanding of the Project. All quarters recognize that the National Project Team did try to give its full attention to and was highly devoted to the Project.
3. The implementation might have even been even better if the following difficulties had not been encountered:
 - delays in supplying the induction melting furnace and electrical oven for heat-treatment of steel;
 - non-availability of technical gases in Vietnam and neighboring countries needed to calibrate and operate the early supplied gas absorption spectrometer;
 - chronic shortage of working capital available for RITM as the result of limiting the subsidies by MOHI;
 - a serious fire broken out in August 91 in the RITM Central laboratory which destroyed completely the chemical section, the metallography and part of the physical laboratories;
 - high interest rates on financial loans offered by local banks which were and are probably still beyond the means of RITM;
 - significant shortage of money in hand of potential customers of RITM particularly those interested in the transfer of technology and training activities.

D. Related to Institution Building

1. The Project contributed considerably, but perhaps unevenly, to RITM institutional capabilities. The major weakness is detected in the areas of financial analysis, cost accounting and general management with a few exceptional instances where international experts have had some input. RITM has recently introduced a new organizational structure demonstrating a good will toward strengthening the Institute as a production research and development centre (annex 7). A new management structure of the RITM Foundry has been also elaborated and adapted (annex 8). Unfortunately the new structure of RITM does not resolve the problems related to marketing of services and training in the context of sales and advertising activities. Relevant units would be desired to be established and staffed with capable and dynamic personnel. It would also demand the establishment of the standard management tools of production cost break-down and current financial analysis, all supported by an appropriate modern cost accounting system.

E. Related to Monitoring and Backstopping

The Mission concludes that monitoring and backstopping activities were carried out professionally and with high quality by UNDP/UNIDO Field Office in Hanoi, NPD and by

UNIDO HQ. The backstopping officer at the UNIDO Headquarter has been responsive to RITM's needs and has been prompt and efficient in the follow-up of all project related matters. From time to time he has made an extra effort, over and above his normal duties, to respond to RITM urgent needs. The Project Team perceives him as person with genuine understanding of the problems and needs of the institution. He is highly regarded and respected by the national counterpart staff, as well as by the concerned Government Authorities.

VI. RECOMMENDATIONS

A. Related to the Project

1. The Mission recommends that the Project be terminated as early suggested by the Tripartite Project Review Meetings, and be operationally completed by the end of 1993. The Mission is of the opinion that adequate formulation has been built to run the RITM in accordance with its primary function; thus no further "institutional building" is warranted.
2. The Mission also recommends that prior to the project's termination its present budget should be revised to provide RITM with some indispensable equipment and specific short term consultancy. The unspent balance of the current year budget, after completing the second leg of UNIDO expert's field assignment is recommended to be utilized for:
 - a. Procurement of a gas emission spectrometer (GES) and ancillary equipment i.e. standard samples, surface grinding machine, and copper moulds. Above subject to availability both of high purity argon gas and its provision ex-stock Hanoi and periodical maintenance service from the producer or supplier of the spectrometer.
Note: The requirements related to argon gas and maintenance service are strict pre-requisites of the future procurement of the GE spectrometer.
 - b. Electric or pneumatic ramming machines (rammers) for induction furnace lining.
 - c. 2 m/m service of expatriate consultant in financing and administration to assist RITM in establishing proper accounting and costing procedures and relevant policies. The service would be available from one of the foreign banks or banking institutions operating in Vietnam as suggested by the DRR of UNDP-Hanoi.

B. Related to RITM

1. The Mission recommends that the Management of the RITM will be strengthened as soon as possible amongst other through establishment of the new post of first deputy director RITM responsible for the operation of RITM with a particular emphasis on the production and also on the maintenance of equipment.

A mechanical engineer with a solid knowledge of manufacturing spare parts and strong managerial ability would be desired for this post. Good knowledge of foundry and heat-treatment processes would be a valuable asset.

Candidates having minimum 10 years of industrial on the shop floor experience should be pre-qualified for evaluation.

2. ITM is expected to establish and implement an effective system of cost analysis to enable the Board of Directors to:
 - a. implement proper accounting and costing procedures and relevant policies;
 - b. apply regular monitoring of the production, its manufacturing costs, market prices, overhead costs, etc.;
 - c. implement systematic production and financial planning, relevant

procedures, etc. needed to control actual cash-flow, state of inventories, break-even analysis, etc.

3. The Mission recommends to intensify RITM efforts towards marketing activities through further identification of cast parts imported to Vietnam which might be manufactured by the RITM Foundry in prototype series based on indigenous technologies. Regular consultations with local foundries should be maintained to attract them with the transfer and implementation of appropriate, proven foundry techniques.

The same refers to the services in heat-treatment of metal parts, laboratory testing, on-the job training, etc.

4. RITM is expected to elaborate comprehensive commercial proposals for selected foundry plants in Vietnam offering its consulting/technical services, packages of technologies, training programmes, heat-treatment of castings, etc. Promotional printed materials like leaflets, brochures, etc. about RITM's production profiles and materials testing would be desired for distribution amongst local industries.
5. In view of financial constrains faced by RITM, particularly the shortage of working capital, the Mission recommends to immediately organize 3 shift production of the Foundry Section based on an early provision of soft loan estimated as equivalent of US\$ 150.000 in VND, required to maintain 3 month operation of the Foundry, Heat-Treatment and Laboratory Sections.
6. A prime immediate objective must be for RITM to reach an acceptable level of financial self-sufficiency as rapidly as possible, so that it can afford to make a minimum profit necessary to finance further R/D works procurement of new equipment and financial incentives for its staff.
7. RITM should implement manpower planning and recruitment policies and provide equitable levels of salary and wages so that it can conduct its business in a dynamic, pragmatic and profitable manner.
8. Since the increasing shortage of metal scrap in Vietnam may badly affect the performance and financial efficiency of the foundry workshops RITM should officially approach the Government and to advise to immediately stop exporting the scrap to other countries. Relevant regulations prohibiting the export of metal scrap are recommended to be issued.

C. Related to Further Assistance

1. The Mission does not recommend any extension and/or a further phase of the Project. This should not be interpreted however, that in future RITM will be free from the need of further specific assistance.

UNDP and the Government may wish to entertain the idea of such assistance for very specific needs at an appropriate time.

2. At that point an unforeseen development of circumstances may call for ad-hoc consultancy services and/or UNIDO expertise. It is, therefore suggested that a short-term mission of the UNIDO BSO to Hanoi will be taken, preferably at the beginning of 1994 in order to assess the progress in RITM performance and discuss particularly important aspects of its further operation.

3. **Complementary short-term [6-8 weeks] technical assistance from UNDP/UNIDO for RITM cannot be excluded from future consideration mainly in the context of expected growing demand for some sophisticated heat-treatment techniques of metal parts used by newly modernized engineering, textile, food processing and other industries in Vietnam.**

**IN-DEPTH EVALUATION OF
PROJECT DP/VIE/85/007,
IMPROVEMENT OF THE QUALITY OF CASTINGS AND HEAT TREATED PRODUCTS,
THROUGH THE RESEARCH INSTITUTE OF TECHNOLOGY FOR MACHINERY
HANOI**

T E R M S O F R E F E R E N C E

A. Background

The foundry industry is an essential base for the manufacture of machinery of any kind; it is also indispensable for the supply of otherwise unobtainable spare parts for the operation and maintenance of equipment and machinery. The foundry industry in Vietnam had deteriorated almost completely over the past decades, and the cost to the economy of the lack of production, and of the extreme poor quality of the few castings which were produced was, and is unacceptable.

A Preparatory Phase Report was prepared for this project. This was derived from fact-finding visits of an expert team to a representative selection of the industry comprised of fifteen foundry and mechanical workshops. Foundries were visited in Hanoi and Thang Hoa in the north and Ho Chi Minh City and Bien Hoa district in the south.

The purpose of the preparatory phase was to identify the basic causes of low productivity and high reject rates in those foundries visited and to link them to RITM's ability to affect changes to solve the problems encountered, and to prepare the document for a project which was to address the problems.

1. Almost without exception the foundries visited showed a lack of the basic equipment necessary to process and control the quality of the raw materials used in foundries. Those foundries possessing equipment (on paper) had little to offer because of the lack of spare parts, poor maintenance and obsolete machinery. The lack of basic maintenance procedures and planned maintenance scheduling, i.e. the management of resources, is also closely linked to the problems of quality and productivity.

2. Each foundry visited seemed to have different types and sources of sand and clay. From a general observation some sands were not suitable for the type of casting being produced.

3. The facilities for grinding, fettling and shot blast cleaning were virtually non-existent.

4. Despite the high number of academically qualified people in the industry, (as indicated in an RITM survey annexed to the report), there is an insufficient application or knowledge of the basic production and process techniques for casting manufacture.

The foundry industry of Viet Nam is operating at an almost artisanal level. This also covers those plants which have technically adequate equipment installed, because most of the equipment is unserviceable. In addition, the foundry industry in Viet Nam has suffered for many years from a lack of capital investment, an inability to import essential raw materials and spare parts and progressive obsolescence of existing plant and equipment, the resulting stagnation in technology and development coupled with low productivity and poor quality and un-reliability of cast and heat treated products has prompted the Government of Viet Nam to include in its Five-Year Plan a programme for improving basic technologies.

The technologies involved in casting production worldwide, are well documented and today highly sophisticated. Such sophistication will only come to Viet Nam gradually by means of development from within unless massive injections of hard currency are made towards a total rationalization of the industry.

RITM is stated by MOHI to be 'the sole competent authority able to carry out applied research and development, consultancy and technical services to the casting industry'. The Government has assigned the main responsibility for this programme to the Ministry of Heavy Industry through the Research Institute of Technology for Machinery (RITM).

RITM is involved directly in developing methods, materials and processes applicable to the Vietnamese casting industry whose resources are limited by the lack of capital investment and lack of hard currency for spare parts and material imports.

RITM's contribution to problem-solving associated with low-quality raw materials and poor application of basic technology is, and will remain, a function of its ability to select, test, prove, improve and standardize raw materials and transfer the technologies applicable to given situations. The Institute's equipment must therefore adequately match the demands yet to be made on it. The staff of the Institute are apparently well qualified and experienced and they are aware of the difficulties facing them as a team. Given additional equipment and training, together with specialized technical assistance, RITM can make a very effective contribution.

Recognizing that research institutes cannot always rely on Government subsidy alone, RITM has planned (on the basis of the foundry activities developed by this project) to significantly raise the additional income generated by the sale of castings, products and services within three years of implementation of this project by the impetus created from the production in the foundry workshop of specialist type, complex castings of a quantity up to 400 tonnes per year. This core of production coupled with

analytical and heat treatment services to industry will generate the income to sustain an increasing programme of assistance to industry. The extent of consultancy and technical services are often a function of what the client can afford. On balance, these services should prove to be cost effective, and prudence dictates the need for financial stability in the overall concept. It is also considered that the most effective training, and the most convincing demonstrations of technologies are obtained within a plant which is operated with industrial and commercial standards and discipline.

The project effectively began October, 1990 with the arrival of the CTA on a 2 month, planning and preparatory mission.

1. The Immediate Objectives of the project are:

a. To refurbish and re-establish the foundry and heat treatment sections of the Research Institute of Technology for Machinery thus strengthening the existing capacity for applied research and development in casting technology, particularly with regard to the use of indigenous raw materials for moulding and coremaking, and to master the conventional procedures for thermal and chemical heat treatment, particularly for dies and cutting tools.

b.i. To train a sufficient team of Viet Nameese engineers to continue an independent programme of rehabilitation of foundries and heat treatment shops and other.

ii. To upgrade and improve heat treatment at the Hand Tools Factory and the Automobile Spare Parts Factory, and the operations of at least five foundries.

2. Achievements and Status:

i. To date (21/09/92) the project has established an operating foundry, and has effected the extensive training programme for the technical operators and staff. The operation has not been consolidated, although the transfer of technology to the industry has begun, and there exist technical production and operational problems which are to be solved by RITM, some with the help of expert assistance.

ii. Because of radical changes in government economic policy, the goal of economic self sufficiency for RITM became a rigid requirement during the early stages of the project, so that the major efforts were and are concentrated upon the foundry in order to generate income

and the heat treatment shop was not attended as expected.

iii. For similar reasons the programme for extending the maintenance services was not strongly pursued by the counterpart, although two national experts have been contracted in order to pursue this matter. These are presently working with the RITM.

B. Purpose of the Evaluation:

The project will end by end 1993, but there are few activities yet to be realized and the funds available are limited.

The purpose of the In-Depth Evaluation is to assess the progress of the project so far, and to identify the shortcomings, and additional activities which may be required or be advisable to counter the shortcomings or to fill the gaps which will become evident.

In accordance with the provisions contained in the UNDP Policies and Procedure Manual, the scope and the purposes of the evaluation mission should be to:

- a. Assess the progress and the achievements of the Project so far, against the set objectives and expected outputs. This will include a re-examination of the Project Design.
- b. Identify and assess the factors which facilitated the achievements of the Project's objectives at the mid-term point; as well as those factors which have impeded the fulfillment of these objectives and which also may act as constraints in the realization and attainment of the remainder of the project and its final objectives.
- c. Examine if the approach utilized in the Project is leading to optimum results in a cost-effective fashion and timely manner.

C. Issues to be covered:

C.1. Project Concept and Design:

- a. Examine the relevance of the project in the present economic situation of Vietnam.
- b. Assess the concept of the project and the relationship of the development objectives with the immediate objectives.
- c. Determine whether flaws in the logical linkage occurred

between objectives, outputs, activities and inputs.

- d. Examine whether the stated outputs are sufficient to achieve the immediate objectives, and whether the activities are adequate and timely enough to generate the acquired outputs.
- e. Determine whether the envisaged inputs, and the mode of implementation proposed to absorb them, are still expected to produce the outputs, given the request of the counterpart to reduce the expatriate expert input and the present/future business environment in the country.
- f. Make recommendations to improve the project document, in accordance with what is realistic within the programme resources and the business development of the foundries and their consumers.

C.2. Implementation and results:

In addition to the above main purposes of the evaluation, the mission should also comment and advise on the following technical and organizational matters:

- a. The ability of the technical staff to independently absorb and implement technological and operational procedures and improvements.
- b. The suitability and completeness of the inputs supplied, and the requirement for additional equipment or technologies.
- c. The state of RITM in general, and of the quality of the existing project organization and management and of the relationship of this to the general management of the RITM.
- d. The personnel structure of the RITM, and especially the project foundry, covering both administrative, technical and production (shop floor) personnel and review continuity and stability.
- e. The management procedures and tools available, with special emphasis on personnel management and policies, and financial management and policies, with emphasis on accounting, depreciation policies together with their relationship to maintenance, within an economy with high inflation. Of particular importance are input and product costing together with pricing policy.
- f. The policies of the RITM foundry for reinvestment in more advanced processes, as required by the market for both castings, and for training/technology transfer.

- g. Although no extensive training or transfer of technology can be effected until the foundry has attained a reasonable level of industrial operation, the contacts with the clients should have provided the project management with useful concepts. These should be developed, and the competence, present and expected of the RITM to provide the products and services should be appraised within the context of the changing economic climate.
- h. Comment upon the economic viability of the foundry, and of the RITM with the present structure, and within the changing economic climate .
- i. Comments upon the effectiveness and the level of co-operation between the CTA, NPD, UNDP/UNIDO Field office and UNIDO H.Q. staff, and the timely provision of critical inputs.
- j. The adequacy, sufficiency and relevance of the fellowship training programmes.
- k. The efficacy of the RITM to date, in the supply of castings to the market.
- l. The degree of confidence of the market in RITM as a manufacturer of castings, as a provider of technical assistance, and as a future supplier of training and 'in-plant' technology transfer.

While a thorough review of the project performance so far is very important, the evaluation is expected to lead to detailed suggestions for further assistance to the design, engineering, training, technology transfer and other activities which will be implemented by RITM as part of the services which are required by the clients. This could lead to a redesign, within the limits of the present budget.

D. Composition of the mission:

The mission will be composed of the following persons :

- One representative of the UNDP;
- One representative of the government of Vietnam;
- One representative of the UNIDO.

These representatives should not have been directly involved in the design, appraisal of implementation of the project; and each of the representatives of UNDP and UNIDO should demonstrate many years of experience working for the foundry industry, with significant experience in developing countries and with training and technology transfer. One should demonstrate competence in

financial analysis of the foundry processes.

E. Consultation in the Field:

The mission will maintain close liaison with the UNDP Resident Representative in Hanoi, the Unido Country Director and his staff, with the Ministry of Heavy Industry and other concerned government organizations and the project's national and international staff.

Although the mission is free to discuss with the authorities concerned, all matters relevant to its assignment, it will not be authorized to make any commitments on behalf of UNDP or UNIDO.

F. Timetable and report of the mission:

The UNDP and UNIDO representatives will receive briefings at their respective headquarters. Upon arrival in Hanoi, the mission will be briefed by the UNDP Resident Representative and the UNIDO Country director, who will also provide the necessary substantive and administrative support. The Mission will work only within the Hanoi region, and will visit the principal present and future clients of the RITM. The work within RITM and with the clients will be completed within a period of 10 days, the mission will be debriefed in Hanoi by the UNDP Resident Representative, and by the UNIDO Country Director. At the end of the mission the UNDP Resident Representative will organize a meeting involving senior Government Officials, and others at which the mission will present its initial findings, conclusions and recommendations; the mission will be ready to discuss these. The UNIDO representative on the mission will also discuss the preliminary findings at UNIDO headquarters upon his return for debriefing.

The mission will complete its report in draft form in Hanoi in accordance with UNDP policies and guidelines. The mission will be required to leave behind a copy of the draft with the Resident Representative in Hanoi, with the UNIDO Country Director, and with the Evaluation UNIT and the Substantive officer at UNIDO headquarters.

The final version of the report will be prepared by the UNDP and UNIDO representatives upon their return home and will be in a format specifically for reproduction, and will be submitted simultaneously to UNDP and UNIDO headquarters (3 copies each) and to the Resident Representative in Hanoi (10 copies) who will be responsible for the final submission of the report (6 copies) to the Government.

NOTE. The UNDP and UNIDO mission representatives will be required to co-ordinate the work of finalization of the report without reference to the agencies.

The report should be supplied, accompanied by a diskette, containing the document. The software used should be compatible with that available in the offices of the UNDP in Hanoi.

**TENTATIVE WORK PROGRAMME OF MESSRS FRANK WALLBANK
AND MICHAEL CZUB FOR THE IN - DEPTH EVALUATION
OF VIE/85/007, CASTING AND HEAT TREATMENT
FROM 29 MARCH TO 9 APRIL 1993**

Date	Hours	Programme	Locality	Remark
28-3-1993 Sunday		Arrival in Hanoi Accommodation, reserved Binhminh hotel	27 Lythaito Hanoi	
29-3-1993 Monday	9.00 11.00 14.30	Meeting with Mr. Preben Hjortlund UFO, UCD O.I.C. Work at UNDP office Meeting with RITM and project staff. Visit project foundry and heattreatment shops.	27-29 Phanboichau Hanoi as above 219 Langha Hanoi	
30 -3-1993 Tuesday	11.00 14.30	Meeting with Mr.Gautier Deputy RR of UNDP Hanoi Meeting with State planning committee and MOHI	27- 29 Phanboichau . 54 Haibatrung Hanoi	
31 -3 -1993 Wednesday	9 00 14.00	Work at UNDP office . Work at UNDP office	27-29 Phanboichau Hanoi	
1 -4 1993 Thursday	9.00	Work at RITM. Questions and Answers, Findings. Project staff reporting on achievements acquired by Technical studies; Technology transfer and assistance; training and manufacturing spare parts to Industries.	RITM 219 langha Hanoi.	

2-4 -1993 Friday	8.00	Visit to one factory, where RITM transfers technology to improve the quality of castings	Song cong Town	
3-4-1993 Saturday	8.30 16 00	Visit to Hoangthach cement factory, to which RITM supplied spare parts of alloyed steel	Kimmon- Haihung	
4-4-1993 Sunday	8.30	Shightseeing tour to Halong bay	Quangninh	
5-4-1993 Monday	8.30 14.00	Visit to Hand tool Factory, where demonstration point of Project in Heat-Treatment Work at RITM Questions and answers	Hand tool Factory, Hanoi 219 LangHa Hanoi	
6-4-1993 Tuesday	8.30	Work at RITM	219Langha Hanoi.	
7-4-1993 Wednesday	9.00	Work at RITM	219 LangHa Hanoi	
8-4-1993 Thursday	8.30	Work at UNDP office	27-29 Phanboichau Hanoi	
9-4-1993 Friday	9.00 18.30	Tripartite meeting on preliminary, findings, conclusions and recommendations of the evaluation mission at RITM Dinner party given by MOHI	219 Langha Hanoi	
10-4-1993 Saturday		Departure from Hanoi.		

**REPORT ON THE IMPLEMENTATION OF
THE PROJECT VIE \85 \007
IMPROVEMENT OF QUALITY OF CASTING AND HEATTREATMENT PRODUCTS**

According to the activities of the project document following works have been done:

1) Government inputs.

- One heatreatment shop of 270 m² has been designed and completed. The foundry shop has been renewed, resited the lay out. The administration building involved the library, project offices, seminar hall, laboratories for chemical analyses and others have been completed . The total cost about 1,014milions dong.
- Procurement of 7 items of heattreatment equipments 1,420 milions dong.
- Reconditioned and installed existing foundry and heattreatment equipments 70 milions dong.
- Local transportation 50 milions dong.
- Internal travel cost 30 milions dong.
- Project staff salaries 48 milions dong.
- Other cost 33 milions dong.
- Total Government inputs 2,665 milions dong.
(price in 1991)

2) Procurement and installation of project equipment.

After the CTA come with necessary discuss some items of the project equipment list have been changed for the goal of the establishment one pilot foundryshop. Due to limmit of the project budget the pressure die casting machine, investment casting equipment and laser beam for heat treatment have been cut off. By this time almost project equipments have been delivered, installed and commissioned. They are working well and give good services for the researching, producing, as well as training.

Among the project equipments the spectrophotometer can not normally work without N₂ and N₂O gases, which could not be obtained in Vietnam. UNIDO Vienna was informed about this but the gases still not be delivered for the project yet.

3) Training.

All the training programme is completed.

2 study tours :7m/m.

- 4 fellowship training groups with 22 persons:

- 2 fellowship training groups of foundry and spectrometer operation: 14 persons 7 weeks in Poland in the following fields:

- Green sand ,self hardening resin, material testing.
- The CO2 process technology.
- Shell moulding and core making.
- High -pressure die casting.
- Fettleing and cleaning.
- Ultrasonic and X ray testing for castings.
- Spectrometer operation.

1 fellowship group of heattreatment: 6persons, 7 weeks and 1 fellowship group in induction melting: 2persons , 5weeks have been trained in the UK.

Total 29 persons have been trained abroad.

The programme was successfully completed. All the trainees are working well, applying the results of training to Vietnam conditions. They are good experienced experts to offer adequate assistance to some factories and related institutes, retraining workers and technical staff.

4) Project international experts.

Beside 5.5 m/m experts in the P.A. of the project, during implementation period following experts have been working at project site:

- The CTA 17 m/m.
- Shell moulding expert 3m/m.
- Heattreatment expert, split mision 2m/m.
- Manganese steel casting expert, split mision 1.5m/m.

The CTA has assisted in changing and regulating list of project equipments for promotion of one foundry pilot production unit, made the lay-out of foundry shop, selected quotations of equipments, supevised the installation and in time solved problems ocured during implementation period. The CTA always has tight relationship with the project staff as well as representatives of UNIDO and UNDP,

All technical experts have done a lot of effective works in order to give technological guidances for RITM staff.

However because of Vietnam situation some experts ideas could not be in the force immediately.

Due to cut off the pressure die casting machine and laser beam for heattreatment, so the experts in that fields have been eliminated accordingly.

The CTA and the NPD recognized that most foundries in Vietnam are operating manually or with some obsolete equipments. In the other hand they have not enough funds for upgrading, so it is not necessary to have international experts for the maintenance. Instead of them two national experts have been selected to do maintenance of the project equipments. Contract 2men 4months. They made maintenance schedules for all project equipments and together with the team of maintenance and repair engenmeers of RITM they guaratees all project equipments working normally.

5) Project objectives and results.

Obejective 1:

Output1: After alterations of foundry shop and construction additional building, heattreatment shop and laboratories RITM have contracted with numerous factories for marketing. At the same time some research programmes have done and transfered to selected foundries.

FOUNDRY:

Some kinds of cement equipment spare parts made of wear resistant alloys such as high Mn steel (hard field steel) and high Cr cast iron are regularly produced in project foundry shop. It is cited that manganese steel for the hammers supplied to Hoangthach cement factory is acceptable both quality and schedule stably and so on.

The spare parts for the paper milling (startor and rotor) are made and being testing now with expected good quality.

Shell moulding technology has succēfully applied to produce engine spare parts, cylider block of DX4 with high surface quality and more precision dimentions, reduce material loss machining fees and the reject ratio.

The foundry shop with capacity 200T/year has produced many kinds of castings (see the annex of castings made in RITM)

RITM has applied and trasfered some technologies in order to improve the quality of castings to the factories as folowing:

+ Improvement of green sand technology for production the UNICEF pump details in Ninhbinh engineering factory.

+ Improvement quality of the motor housing castings in Hanoi electrical engineering factory.

+ Preparing for the machine moulding of cylinder block 12 Hp engine in DISOCO factory.

+ The progamme of research and development of local moulding materials for foundries is being processed. RITM effectively uses the Silicon sand from Vanhai deposit, Codinh bentonite, Hoanglienson grafite as main moulding and core making materials. During emplementation time RITM has practicaly used some new materials like Zr powder for painting moulds and cores, cromite sand for protection of surface burning especially for steel castings. RITM applied the CO2 process to make moulds in order to reduce material consumption, sucsefully used exothermic material and isolating sleeves, made the filter for slag prevention of steel.

HEATTREATMENT:

RITM has researched and developed nitrocarburizing process to improve the Service life and reliability of die stamp moulds for the hand tools factory. The is increased 1.5 up to 2 time more than the old moulds. Now RITM regularly does heattreatment for the factory. Up to now 200 set of the moulds has been put in production.

RITM also signed numerours contracts doing heattreatment spare parts with industry.

In order to widen the maketing and introduce new technological materials for the foundry Project staff in co operation with FOSECO has organised 2 days demonstration in the open day. After the demonstration Clients

acknowledged the capacity of RITM with distinguished assistance of the UNIDO project. Many factories come to RITM to make contracts, ask for expertises, advices. RITM also demonstrates some facilities of measuring temperatures, defect testing by ultrasonic detectors at some foundries.

1.2. RITM has organized some training programmes for selected foundries. With a lot of instruments and means the training have done successfully. The trainees for a short time learned good knowledge and skill and at the time they are working well in their foundries and heat treatment shops.

1.3. RITM has done next services for upgrading some factories :

- 10 trainees of Gialam construction engineering factory have been trained at RITM foundry shop.

- 13 school students has practised foundry skill at RITM for 5 months from Hanoi machine tool factory.

- The Ninhbinh engineering factory and Hanoi electrical engineering factory have improved of quality of green sand moulding technology by RITM.

- The Phoyen bearing factory and Gialam construction engineering factory have equipped induction furnaces with technology transfer from RITM.

- The Duyenhai engine factory has improved quality of castings for engines D22T.

The DISOCO has been prepared production the cylinder block for engine 12 by RITM.

Objective 2:

2.1 A team of 5 Vietnam engineers has established for maintenance and repair equipments. Some of them have been trained abroad in maintenance of selected equipments like induction furnaces, fettling machines and so on.

National experts have set on the schedules of maintenance for the foundry and heat treatment shops. After 6 months maintenance it is proved that RITM with own National experts could manage and regulate all project line of equipments and give guaranty for normal operation.

2.2 Upgraded and improved heat treatment capacity at the hand tools factory and some selected foundries.

One fact remarkable that almost foundries have not enough budget for the upgrading at this time. Some of them has partly increased capacity and facility to meet the demand of the market. However RITM has offered the assistances for upgrading some foundries such as VINAPRO, VIKINO, Duyenhai engine factory .. But due to lack of budget the plans has not implemented yet.

Some job - upgrading has been done by RITM:

- Design for manufacturing the mixer for Ninhbinh factory.

- Renew existing induction furnaces for the Phoyen and Gialam factories.

- Repairing the UNIDO project induction furnace at the Ferrous research institute.

Under the guidance of UNIDO expert some items of gauges and measuring instruments of the hand tool factory have adjusted and regulated. RITM has supplied to the factory heat resistant plates for the heat treatment furnaces.

2.3 Local manufacture of selected spare parts.

After the open day of the foundry shop RITM tries to do the best for the

manufacturing many kinds of spare parts, which up to this time have to be imported such as spare parts for cement, paper, engines, chemical industries.

2.4 Importation selected spare parts.

The demand of own foundry spare parts is not so many. some items of them the foundries could make themselves, some items are imported by the state in accordance with the self sufficient system.

6) RITM management structure and cost calculation.

The RITM and foundry section management structures have changed.(see the annex of management structures).

The cost calculation contents:

+ General concept and rules for the cost calculation for all contracts in RITM.

+ Cost calculation for the most popular casting produced at RITM.

(see the annex of cost calculation).

7) General development direction for RITM with the project assistance.

- Widen shellmoulding and core making technology. Research and manufacture some additional equipments for making resin sand in order to supply to the industry with technology transferring.

- Improve the moulding materials properties such as paints, binders, exothermic materials, the filters for steel castings.

- Research and develop Low pressure casting technology.

- Complete machine moulding at DISOCO for cylinder block D12 engines.

- Research ,manufacture difficult castings for spare part instead of imported.

- Put in production startor and rotor for the paper mills.

- Improve the duration and reliability of die moulds by heattreatment.

- Build up the furnace for heattreatment of Manganese steel.

Recommendation:

For the quick analysing in order to regulate chemical composition of metals it is necessary to buy as soon as better one emission spectrometer for the project foundry shop.

Hanoi 25 March 1993



Nguyen Vinh Dien
N.P.D.

PERSONNEL STAFF OF FOUNDRY SHOP

1. Management staff:

Section head	1
Deputy section head	1

2. For research and development:

2.1 Moulding materials and sand moulding, cores making research group	5 engineers
2.2 Alloys and melting research group	3 engineers
2.3 Special casting technology research group (shell moulding casting and low pressure die casting technologies)	2 engineers
2.4 Casting equipment research and design group	2 engineers

3. For the production field:

3.1 Pattern making	2 empl.
3.2 For the melting	2 empl.
3.3 Sand preparation and mould, cores making group	5 empl.
3.4 Casting fettling and cleaning group	2 empl.
Total	28 persons

COST STRUCTURE OF CASTING PRODUCT MADE IN RITM

1) The direct expenditures:

- Main materials and submaterials.
 - Energy including electric power, water, air.
 - Analysis and test fees.
 - Maintenance equipments fees.
 - Transportation fees.
 - Machining fees (if require).
 - Labour and foundry shop management fees.
- total of those fees are about 78% of selling price.

2) Depreciation of equipments.

According to the state rules of the depreciation of the using equipments by the plan of foundry shop in 1993 the ratio of depreciation of casting product is about : 13%

3) For the RITM management fees : 4%

4) for the insurances : 3%

5) Minimum profit : 1%

6) The state tax : 1%

Total 2+3+4+5+6 = 22%

So the selling price 100% the direct expenditure should be 78 %

Project Number
DP/VE/85/007

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
NON-EXPENDABLE PROPERTY CONTROL RECORD

Page No. : 1

Period Ending : DECEMBER-92

Country : VIETNAM

Project Title : IMPROVEMENT OF QUALITY OF CASTINGS AND HEAT-TREATED PRODUCTS THROUGH RITM

Purchase Order Number	Item No.	Description	Qty. Ord.	Stock-on-hand in US\$	Received			Cond.	Qty On Hand	Remarks
					Qty.	M	Y			
15-0-01724	1	SPEEDY MOISTURE TESTER TYPE C2.	1	888.00	1	06	91	G	1	
15-0-01724	2	RIDSDALE-DIETERT METRIC SAND RAMMER, COMPLETE.	1	1,363.00	1	06	91	G	1	
15-0-01724	3	RIDSDALE-DIETERT ELECTRIC PERMMETER.	1	2,304.00	1	06	91	G	1	
15-0-01724	4	RIDSDALE-DIETERT UNIVERSAL SAND STRENGTH MACHINE MOTORIZED.	1	4,746.00	1	06	91	G	1	
15-0-01724	5	WET TENSILE STRENGTH TESTING APPARATUS TYPE PNZ.	1	18,957.00	1	06	91	G	1	
15-0-01724	6	RIDSDALE LABORATORY SAND MIXER.	1	2,858.00	1	06	91	G	1	
15-0-01724	7	RIDSDALE-DIETERT RAPID SAND WASHER.	1	1,022.00	1	06	91	G	1	
15-0-01724	8	ENDECOTTS BENCH-MOUNTED OCTAGON 200 SIEVE SHAKERS.	1	1,891.00	1	06	91	G	1	
15-0-01724	9	RIDSDALE-DIETERT METHYLENE BLUE CLAY TESTER.	1	1,478.00	1	06	91	G	1	
15-0-01724	10	ULTRASONIC CLEANER.	1	726.00	1	06	91	G	1	
15-0-01725	1	GBC 904BT DOUBLE BEAM ATOMIC ABSORPTION SPECTROPHOTOMETER WITH FLAME EMISSION CAPABILITY WITH OTHER ACCESSORIES.	1	21,500.00	1	06	91	G	1	
15-0-01725	2	SYSTEM 3000 AUTOMATED GRAPHITE FURNACE SYSTEM COMPRISES GF3000 GRAPHITE FURNACE POWER SUPPLY AND WORKHEAD PLUS PAL 3000 PROGRAMMABLE AUTOMATIC SAMPLE LOADER, CONTROLLED BY GBC 904 COMPUTER.	1	21,780.00	1	06	91	G	1	

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Purchase Order Number	Item No.	Description	Qty. Ord.	Stock-on-hand in US\$	Received			Cond.	Qty On Hand	Remarks
					Qty.	M	Y			
15-O-01726	1	DIGILAB K68/R68 CALIBRATION.	2	8,863.00	2	08	91	G	2	
15-O-01726	2	DIGITAL METER STICK MK3 240V.	2	1,923.00	2	08	91	G	2	
15-O-01734	1	LABORTECHNIK PORTABLE HARDNESS TESTER ROCKWELL WITH SMOOTH UPPER JAW, FOR ROUND AND FLAT SPECIMENS.	1	3,623.00	1	04	91	G	1	
15-O-01734	2	PORTABLE BRINELL HARDNESS TESTER FOR DETERMINATION OF HARDNESS OF RAW AND COMPLETED PARTS OF METALLIC MATERIALS, MODEL 38559.	1	3,827.00	1	04	91	G	1	
15-O-01734	3	MEASURING MICROSCOPE WITH MAGNIFICATION 20 X.	1	405.00	1	04	91	G	1	
15-O-01734	4	STAND FOR STATIONARY TESTS.	1	910.00	1	04	91	G	1	
15-O-01734	5	CHAIR WITH LINK CHAIN TO CLAMP TO CYLINDRICAL SPECIMENS UP TO MAXIMUM 100MM DIAMETER.	1	2,491.00	1	04	91	G	1	
15-O-01743	1	SAND SUPPLY SYSTEM GREEN SAND.	1	26,138.00	1	08	91	G	1	
15-O-01743	2	GREEN SAND KNOCK OUT AND CONDITIONING UNIT.	1	25,126.00	1	08	91	G	1	
15-O-01743	3	SHELL MOULDING EQUIPMENT.	1	20,455.00	1	08	91	G	1	
15-O-01743	4	SHELL CORE MACHINE.	1	10,287.00	1	08	91	G	1	
15-O-01743	5	PIN TYPE CLOSER.	1	2,530.00	1	08	91	G	1	
15-O-01743	6	SHOT BLAST MACHINE.	1	21,180.00	1	08	91	G	1	

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					Qty.	M	Y			
15-0-01743	7	FUME EXTRACTION HOODS FOR SHELL AND CORE EQUIPMENT.	2	6,192.00	2	08	91	G	2	
15-0-01743	8	GREEN SAND MILL.	1	11,189.00	1	08	91	G	1	
15-0-01743	9	SNAP FLASKS.	4	3,889.00	4	08	91	G	4	
15-0-01755	1	TOYOTA LAND CRUISER DIESEL STATION WAGON. CHASSIS NUMBER ==> HZJ80-0004719 ENGINE NUMBER ==> 1HZ-0030007 REGISTRATION NO. => NN2488	1	16,196.00	1	06	91	G	1	
15-1-00516	1	OSF 214 NOISE CONTROLLED MOULDING MACHINE, MODEL L1901. S/NOS. DH10655/10656.	2	20,337.00	2	08	91	G	2	
15-1-00649	1	CUT OFF SAWING MACHINE, 300 MM FOR CUTTING MILD STEEL, COMPLETE.	1	1,678.00	1	12	91	G	1	
15-1-00649	2	DOUBLE ENDED PEDESTAL GRINDER WITH MOTOR AND ACCESSORIES.	1	3,131.00	1	12	91	G	1	
15-1-00649	3	STRAIGHT GRINDER WITH VITRIFIED POINTS.	1	521.00	1	12	91	G	1	
15-1-00649	4	OVERHEAD CRANE, 2 TONNE COMPLETE WITH ACCESSORIES.	1	18,038.00	1	12	91	G	1	
15-1-00649	5	POWER CONNECTION AND SUPPLY DOWN SHOP CONDUCTOR SYSTEM SUITABLE FOR THE OVERHEAD CRANE.	1	949.00	1	12	91	G	1	

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Purchase Order Number	Item No.	Description	Qty. Ord.	Stock-on-hand in US\$	Received			Cond.	Qty On Hand	Remarks
					Qty.	M	Y			
15-1-00649	6	COMPAIR BROOMWADE AIR COOLED, PACKAGED SCREW COMPRESSOR - TYPE 6025E-08A SERIAL NO. F1292060.	1	12,083.00	1	12	91	G	1	
15-1-00649	7	AIR RECEIVER, VERTICAL TO BS5189-1975, COMPLETE WITH SAFETY VALVE, PRESSURE GAUGE, DRAIN AND SUPPORTING.	1	882.00	1	12	91	G	1	
15-1-00649	8	COMPAIR BROOMWADE COMPRESSED AIR REFRIGERATE DRYER TYPE CBD40 SERIAL NO. G0420110.	1	3,837.00	1	12	91	G	1	
15-1-00649	9	FILTRATION SET, MODEL GPP65A.	1	914.00	1	12	91	G	1	
15-1-00649	10	DUST EXTRACTOR UNIT FOR USE ON ITEM 2.1 DOUBLE ENDED PEDESTAL GRINDER, COMPLETE.	1	2,385.00	1	12	91	G	1	
15-1-00649	11	STEEL GRIT FOR USE WITH TUMBLE/DRUM BLAST MACHINES.	3	3,077.00	3	12	91	G	3	
15-1-00649	12	RS 777 PHENOLIC RESIN, PER 250 KG, FOR CORE PPRODUCTION.	1	517.00	1	12	91	G	1	
15-1-1004K	1	MEDIUM FREQUENCY FURNACES FOR MELTING IRON AND STEEL, MFB 500 INSULATED CASE FURNACE ASSEMBLY, POWER SUPPLY.	2	163,118.00	2	4	92	G	2	
15-1-1004K	2	POWER SUPPLY: ONE AJAX/MAGNETHERMIC PATENTED 'PACER AC/DC/AC FREQUENCY CONVERTER WITH A RATING OF 300 KW, 1000HZ FOR CONNECT TO 380V, 3PHASE SUPPL.	1	1.00	1	4	92	G	1	PRICE INCLUDED IN ITEM 1.

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					Qty.	M	Y			
15-1-1004K	3	CAPACITOR STATION: ONE INTEGRAL CAPACITOR STATION CONTAINING THE WATER COOLED POWER FACTOR CORRECTION CAPACITORS.	1	1.00	1	4	92	G	1	PRICE INCLUDED IN ITEM 1.
15-1-1004K	4	CHANGE-OVER SWITCH: ONE ELECTRICALLY OPERATED FURNACE CHANGE-OVER SWITCH.	1	1.00	1	4	92	G	1	PRICE INCLUDED IN ITEM 1.
15-1-1004K	5	WATER COOLED BUSBAR: TWO SETS OF WATER COOLED BUSBAR FOR CONNECTION BETWEEN THE CONVERTER AND FURNACE OF UP TO 3M LENGTH.	2	1.00	2	4	92	G	2	PRICE INCLUDED IN ITEM 1.
15-1-1004K	6	FORMERS: TWO SET OUT LINING FORMERS.	2	1.00	2	4	92	G	2	PRICE INCLUDED IN ITEM 1.
15-1-1004K	7	HYDRAULIC SYSTEM: ONE HYDRAULIC PUMP UNIT TO EFFECT TILTING OF THE FURNACE.	1	1.00	1	4	92	G	1	PRICE INCLUDED IN ITEM 1.
15-1-1004K	8	WATER COOLING: ONE AJAX MAGNETHERMIC CLOSED CIRCUIT COOLING WATER RECIRCULATING SYSTEM COMPLETE.	1	26,732.00	1	4	92	G	1	
15-1-1004K	9	VISUAL DISPLAY CONSISTING OF DIGITAL DISPLAY TO INDICATE THE ELECTRICAL CONDITION OF THE FURNACE CHARGE - AN ANALOGUE METER SHOWING EARTH DECT.C..	1	1,485.00	1	4	92	G	1	
15-2-0575Z	1	RIDSDALE-DIETERT TENSILE CORE STRENGTH ACC.FOR UNIVERSAL SAND STRENGTH MACHINE (METRIC).	1	769.00	1	6	92	G	1	O4115
15-2-0575Z	2	MOULD PERMEABILITY ACC.,METRIC TRANS CORE ACC.,METRIC SHEAR STRENGTH ACC..	3	994.00	3	6	92	G	3	C

Country : VIETNAM

Purchase Order Number	Item No.	Description	Qty. Ord.	Stock-on-hand in US\$	Received			Cond.	Qty On Hand	Remarks
					Qty.	M	Y			
15-2-0709Z	1	UTP 90 WIRE FEED MECHANISM, COMPLETE WITH ALL PERIPHERALS EXCEPT POWER SOURCE.	1	4,444.00	1	10	92	G	1	
15-2-0709Z	2	RB61GD (500 AMP 60% WORKING TIME, 400 AMP WITHOUT GAS) MIG 2MM.	1	547.00	1	10	92	G	1	
15-2-0709Z	3	K4000 (4.500.001) ARC-AIR TORCH; 82KON CARBON ELECTRODES, A6824LC WIRE ROD.	1	3,357.00	1	10	92	G	1	
15-2-0811Z	1	SITEGAN 110 ULTRASONIC FLAW DETECTOR, CLEAR SCALE WITH SS110 NON-MONITOR.	1	5,815.00	1	10	92	G	1	
15-2-0811Z	2	ACCESSORIES.	1	5,342.00	1	10	92	G	1	
15-8-00414	1	PEUGEOT 305 BREAK GR, 5-SPEED PETROL ENGINE 1580CC WITH AIRCONDITIONING. CHASSIS NUMBER ==> 9 760 498 ENGINE NUMBER ==> 9 760 498 REGISTRATION NO. => 29E52-31	1	10,736.00	1	08	88			
19-0-09364	1	COMPUTER AT 386-NIPONTEC WITH OPTIONS INCLUDING PRINTER.	1	6,235.00	1	08	91	G	1	
19-1-08699	1	PHOTOCOPIER MODEL FT 4470.	1	4,690.00	1	08	91	G	1	
19-1-08750	1	DIESEL ENGINE FORK LIFT TRUCK.	1	11,000.00	1	08	91	G	1	
19-1-09272	1	TRANSFORMER 400 KVA.	1	8,982.00	1	12	91	G	1	
19-2-08619	1	GRINDING BALL AND SHOT FOR CEMENT INDUSTRY.	2	3,200.00	2	2	92	G	2	LOCAL PURCHASE
19-2-08619	2	CYLINDER LINE FOR 12HP ENGINE.	1	2,100.00	1	2	92	G	1	LOCAL PURCHASE

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Country : VIETNAM

Purchase Order Number	Item No.	Description	Qty. Ord.	Stock-on-hand in US\$	Received			Cond.	Qty On Hand	Remarks
					Qty.	M	Y			
19-2-08619	3	ROTOR AND STATOR FOR PAPER MILL.	2	4,600.00	2	2	92	G	2	
19-2-8725Z	1	PROJECT TRUCK/LORRY.	1	6,500.00	1	7	92	G	1	LOCAL PURCHASE
19-2-8772Z	1	CORE DRYING OVEN.	1	2,500.00	1	8	92	G	1	LOCAL PURCHASE
19-2-8772Z	2	JOB CRANE.	2	3,000.00	2	1	93	G	2	
19-2-8772Z	3	LADLE.	2	500.00	2	10	92	G	2	
19-2-8772Z	4	PNEUMATIC RUMMER.	2	500.00	2	10	92	G	2	
19-2-8772Z	5	WELDER POWER UNIT.	1	2,500.00	1	10	92	G	1	

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RITM ACTIVITIES IN TECHNOLOGY TRANSFER TO FOUNDRY INDUSTRY

Item No	Description of activities in technology transfer	Name of Factory required RITM assistance	Realizing time	Price
1	<p>Green sand casting technology transfer for hand pump components of UNICEF</p> <ul style="list-style-type: none"> - Renew sand mixtures, made new sand mill, change moulding technology on floor to mould boxes, use new moulding materials to improve the quality of casting surface finished. 	Ninhbinh Mechanical Engineering Factory	1992	12,000,000d
2	<p>Casting technology transfer for 12HP cylinder block of DISOCO Factory.</p> <ul style="list-style-type: none"> - Design casting technology, make patterns and coreboxes according to machine moulding technology. - Use moulding materials of good quality to improve the quality of casting surface finished. - Conduct correct melting technology. 	DISOCO Engine Factory MOHI	1993	20,000,000d
3	<p>Green sand casting technology transfer for cylinder block and other components of 22HP engine.</p> <ul style="list-style-type: none"> - Make metallic patterns and coreboxes and pattern plates according to standards. - Change new sand mixtures for moulds and cores to improve the quality of casting surface finished. 	Duyenhai mechanical Engineering Factory	1992	32,000,000d

1	2	3	4	5
4	<p>Casting technology transfer for motor housing and other motor components in green sand.</p> <ul style="list-style-type: none"> - Change casting technology design for some components - Use facing sand with additives to improve the quality of casting surface finished. 	<p>Hanoi electrical Engineering factory MOHI</p>	<p>1992</p>	<p>3,000,000 d</p>
5	<p>Casting technology transfer to Phoyen mechanical Engineering Factory.</p> <ul style="list-style-type: none"> - Maintenance and installation of induction furnace. - Design and make the ingot moulds for steel castings. - Introduce melting and casting technology for ingot moulds. 	<p>Phoyen mechanical Engineering Factory.</p>	<p>1992</p>	<p>83,000,000d</p>
6	<p>Casting technology transfer to Gialam construction Engineering Factory.</p> <ul style="list-style-type: none"> - Installation of induction furnace IMSK 250. - Introduce melting technology. - Transfer casting technology for grinding balls, shots and other cast iron and steel castings of cement industry. 	<p>Gialam construction Engineering Factory</p>	<p>1993</p>	<p>120,000,000d</p>

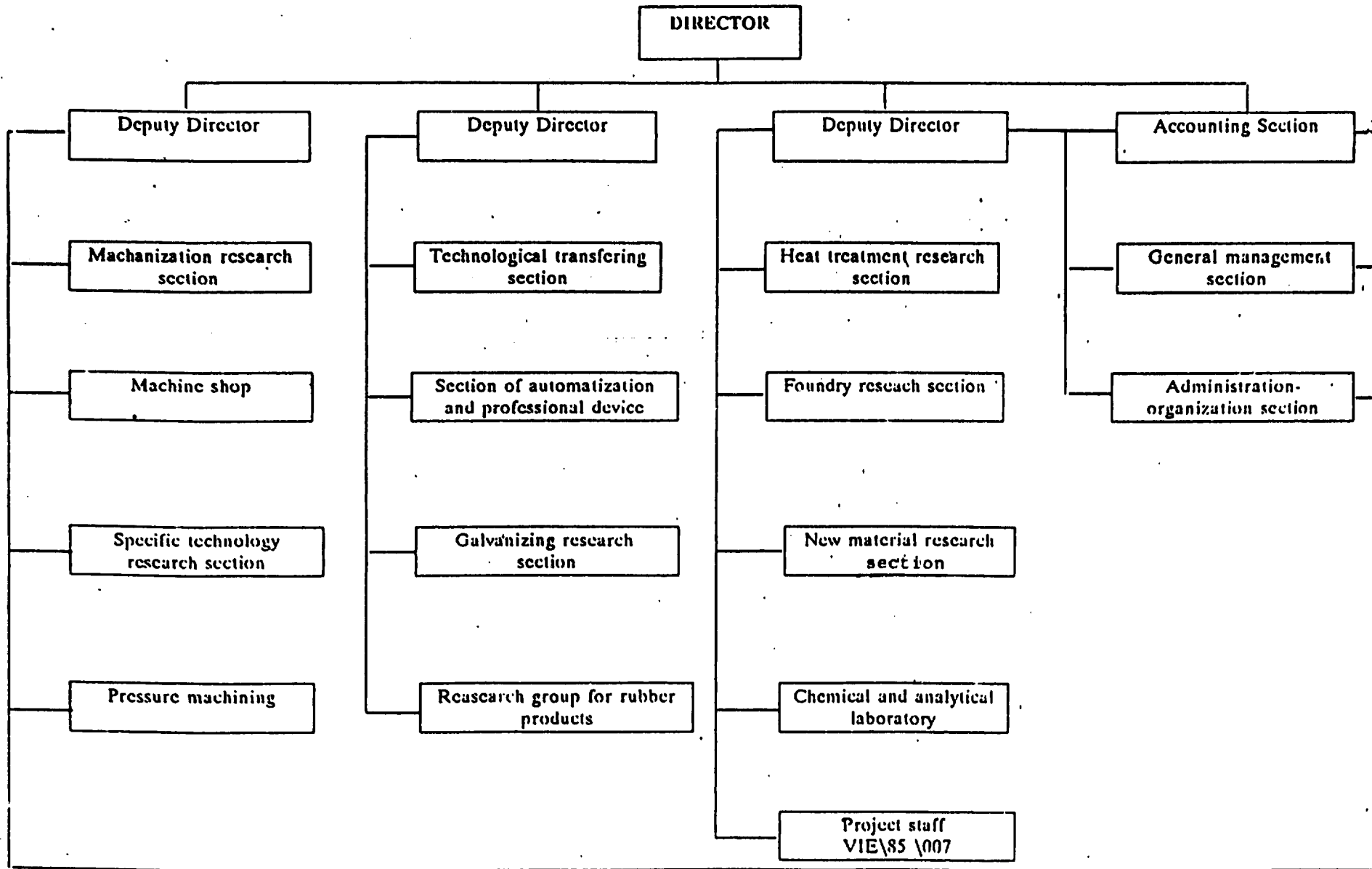
ACTIVITIES OF CASTING PRODUCTION IN FOUNDRY SHOP OF RITM (VIE/85/007)

Item No	Name of castings	Material	Weight unit (kg)	Price unit price (d/piece)	Production in 1992			Proposed production plan for 1993 *			Remark
					Qty (pieces)	Total weight (kg)	Total price (1000d)	Qty (pieces)	Total weight (kg)	Total price (1000d)	
1	Hammer for Hoang-Thach Cement Factory	Manganese steel (13%Mn)	90	22200	182	16380	363636	500	95000	999000	
2	Chain link for Bimson Cement Factory	40 Cr 24Ni 12Si	9	39000	160	1440	56160	900	8100	315900	
3	Rotor and Stator of paper mill for Vinhphu paper Plant	3Cr 13	200	150000	2	400	60000	10	2000	300000	
4	Hydraulic jack block with pressure capacity of 300 at	C45	70	15000	19	1330	19950	50	350	14000	
5	Heat resistant aluminium cast iron for bottom plate of heat treatment furnace	Cast iron contain 13%Al	12	20000	55	660	13200	100	1200	24000	
6	Spare parts for Petrol Industry	Carbon steel	20	18000	30	600	10800	100	2000	36000	
7	Cylinder block of Engine 12 HP	Cast iron	50	7000	60	3000	21000				
8	Cylinder Head of Engine 12 HP	Cast iron	10	6000	50	500	3000	100	1000	6000	

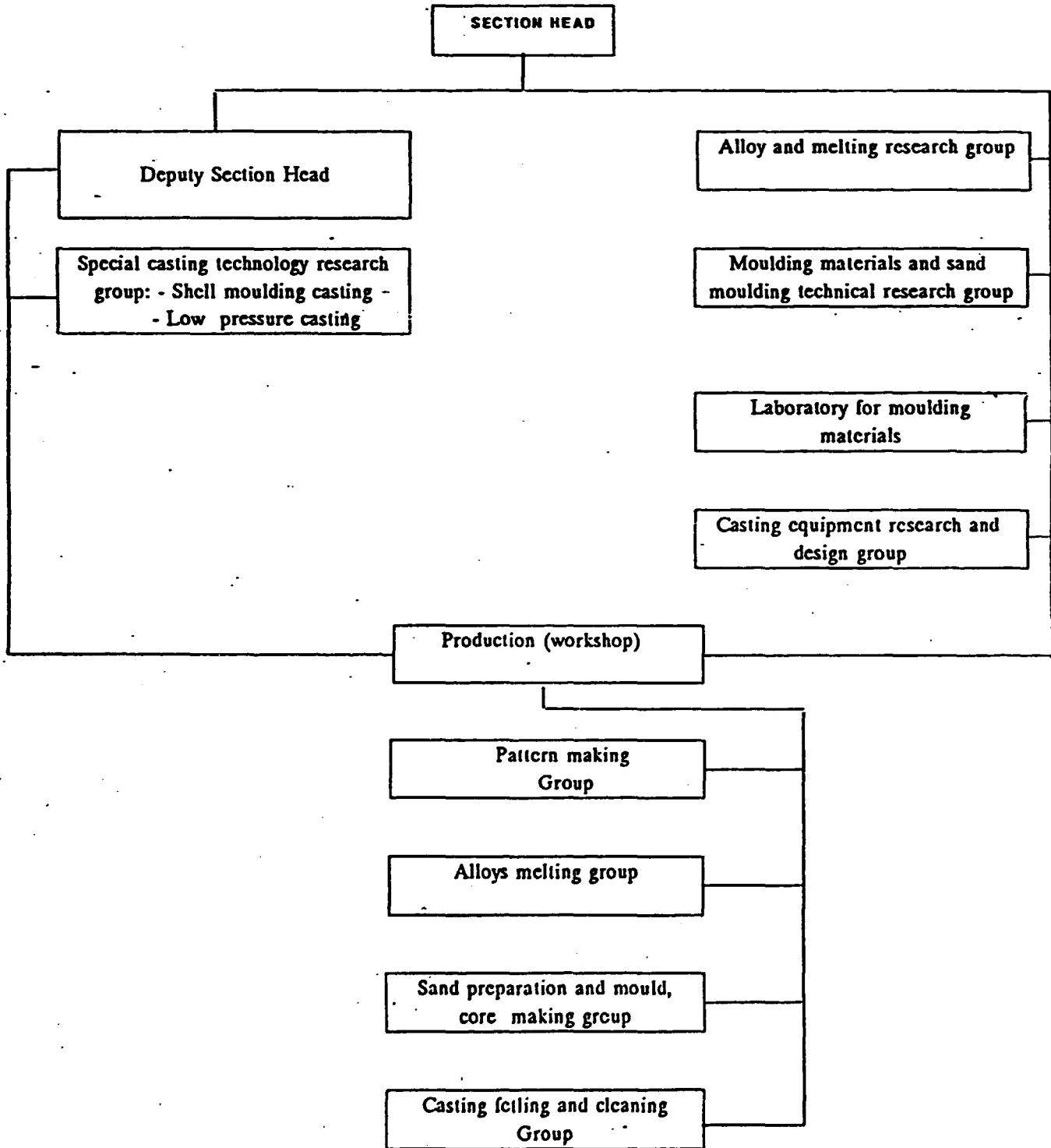
* Based on the contracts already signed with customer.

1	2	3	4	5	6	7	8	9	10	11	12
9	Cylinder slaves of Engine 12 HP	Cast iron	8	6000	70	560	3360	200	1600	9600	
10	Balance weights of Engine 12HP	Cast iron	3	6000	100	300	1800	200	600	3600	
11	Turbine rotors for small hydrolic power station	Carbon Steel	9	15000	40	360	5400				
12	Cylinder block of Engine DX14 (Shell moulding casting)	Cast iron	12	12000	5	60	720	1200	14400	172000	
13	Front cover of Engine 12HP	aluminium	5	20000				600	3000	60000	
14	Hammer for clinker grinder of Hoangthach cement Factory	manganese steel	20	22200				1000	20000	400000	
15	Bearing of large dimation	copper alloy	220	50000	4	880	44000				
16	Cylinder of Engine for Ship	Cast iron	560	18000				12	6720	120960	
17	Bearings	Cu - alloy	5	50000				100	500	25000	
18	Spare parts for plastic industry		10	20000	10	100	2000				
19	Pump of high pressure	Cast iron	20	18000	10	200	3600				
20	Lining plates for grinder of Cement industry	Manganese steel	70	20000				100	7000	140000	
21	Acid resistant pump part for Viettri paper plant	Cr 18 Ni9	7	40000	10	70	2800	50	350	14000	

NEW MANAGEMENT STRUCTURE OF THE RITM



NEW MANAGEMENT STRUCTURE OF THE FOUNDRY SECTION OF RITM



**GROUP AND INDIVIDUAL TRAINING COURSES FOR PERSONAL
FROM THE FOUNDRIES**

Item No	Activities on training course	Responsible parties	Participant in training courses	Number of them	Duration	Locality
1.	Open day of the foundry shop and heat treatment shop. Demonstration of new casting materials and technology of The FOSECO company Seminar on foundry technology.	- RITM - CTA Foundry experts from FOSECO and UNIDO.	Directors, vice Directors, Managers of foundries, foundrymen from industries, representatives of universities and research institutes, representatives from MOHI and Government organizations	210	26-28 May 1992	RITM.
2.	Seminar and training course on heat treatment technology	Mr. Van Heijst UNIDO expert RITM	Representatives from universities and research institutes related to heat treatment, managers and heat treatment engineers from industries.	40	6 Oct. 1992	RITM
3.	Training course on new materials.	Dr. Hans Berns from Ruhr university FRG, RITM	Representatives from universities and research institutes, engineers from industries and RITM	50		RITM
4.	Training course on green sand, Design casting technology for	Foundry experts from RITM.	Foundrymen of the Duyenhai Engineering Factory	20	Oct. 1991 -Jan. 1993	The Duyenhai factory

	<p>cylinder block and parts of 22 hp engine, Sand preparation, sand mould and core making.</p>					
5.	<p>Training course to improve technology for foundry engineers and workers of the Gialam construction engineering Factory. Melting technology in induction furnace for cast iron and steel, moulding material preparation, Moulding and core making technology, fettling and cleaning casting.</p>	<p>Foundry of RITM.</p>	<p>Technicians and workers Gialam construction engineering Factory</p>	<p>10</p>	<p>Jan-Feb. 1993</p>	<p>RITM</p>
6.	<p>Practical training course. Melting technology of cast iron and steel in induction furnace. Preparation of sand mixtures for cast iron and steel castings technology, fettling and cleaning castings.</p>	<p>Foundry experts RITM</p>	<p>Trainees from machine tool factory</p>	<p>13</p>	<p>Nov.1992 -Feb. 1993</p>	<p>RITM</p>