インドネシア共和国
鋳造技術分野裾野産業育成計画
終了時評価調査報告書

平成 16 年 10 月

（2004 年）

独立行政法人 国際協力機構

鉱工業開発協力部

序　文

インドネシア共和国においては、自動車、電機産業等の組立産業に部品を供給する裾野産業（サポーティング・インダストリー）が十分育成されておらず、経済開発の原動力と位置づけられる工業化の妨げとなっています。このため同国政府は、産業界のニーズが高い鋳造技術分野に関し、1995 年 11 月に我が国に対して旧プロジェクト方式技術協力の実施を要請いたしました。

これを受け、我が国はインドネシア共和国側と協議を進めた結果、金属機械工業研究所（IRDMMI／MIDC）を実施機関として、技術協力を実施することで合意し、1999 年 4 月から 5 年間の技術協力プロジェクトが実施されております。

これまでに我が国からは長期専門家 8 名、短期専門家 61 名を派遣し、研修員 18 名を受け入れるとともに、必要な機材の供与を実施して参りました。

今次終了時評価調査団は、協力期間終了 2004 年 3 月末に控え、プロジェクトの活動を総括し。評価・分析を実施するとともに、技術移転の進捗度を確認した上で、今後の MIDC に対する協力のあり方について検討を行うことを目的として派遣されたものです。

本報告書は、現地における調査及び競技結果を取りまとめたものです。調査団派遣にご協力頂いた日本国、インドネシア共和国双方の関係各位に対し、深くお礼申し上げ、今後も引き続きご支援頂けるようお願い申し上げます。

2004 年 1 月

独立行政法人 国際協力機構
理事　伊沢　正

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1. 案件の概要

国名：インドネシア共和国		案件名：鋳造技術分野裾野産業育成計画プロジェクト
分野：裾野産業		援助形態：技術協力
所轄部署：鉱工業開発協力部鉱開第一課		協力金額（評価時点）：8.8 億円
協力期間	（R/D）1999 年 4 月 1 日～2004 年 3 月 31 日	先方関係機関：商業工業省・中小企業総局、研究開発庁、金属機械工業研究所
		日本側協力機関：（財）素形材センター

1-1 協力の背景と概要

インドネシア（以下「イ」）国においては、自動車、電機等の組立産業に部品を供給する裾野産業（サポーティング・インダストリー）が十分育成されておらず、経済開発の原動力と位置づけられる工業化推進の妨げとなっている。鋳造技術は、裾野産業の代表的な要素技術の一つとして位置づけられ、1990 年代前半には国内企業約 500 社が関連していたが、組立産業の要求に見合った品質・精度の部品を安定的に供給することが困難であり、量的にも国内需要をカバーできずに輸入に依存している状況であった。このような状況から、「イ」政府は金属機械工業研究所（IRDMMI/MIDC）の強化により、鋳造技術分野等の裾野産業振興を図り、「イ」の産業構造を強化・高度化することを目的としたプロジェクト方式技術協力を、1995 年 11 月に日本政府に対して要請してきた。これに対し、JICA は 5 回の調査団派遣等を経て、1998 年 12 月に実施協議討議議事録（R/D）に署名し、1999 年 4 月より 5 年間のプロジェクト方式技術協力が開始された。

1-2 協力内容

鋳鉄鋳造技術（鋳造方案、模型製作、溶解、造型等）につき、専門家が MIDC の C/P に対して技術移転を行うと共に、OJT の一環として、中小鋳造企業を対象に、試作品製作サービス、技術普及サービス（巡回指導、研修等）、情報サービス（セミナー、出版物の発行等）を実施する。

（1）上位目標：中小の鋳物企業が、国内の組立産業が要求する水準の鋳物を生産できるようになる。

（2）プロジェクト目標：MIDC の中小鋳物企業に対する技術サービスが向上する。

（3）成果：

0. プロジェクト実施のための運営体制が強化される。
1. 鋳造技術向上に必要な施設・機材が整備され維持管理される。
2. カウンターパート（C/P）が育成される。
3. 試作品製作サービスが体系的に実施される。
4. 技術普及サービスが体系的に実施される。
5. 情報サービスが体系的に実施される。

（4）投入（評価時点）

日本側：（総額：8.8 億円）
- 長期専門家派遣　のべ 8 名
- 短期専門家派遣　のべ 61 名

インドネシア側：
- C/P 配置　40 名
- 建物、設備、材料の提供

機材供与：292 百万円（2003 年 5 月末時点）

研修員受入：18 名（2003 年 8 月末時点）

ローカルコスト負担：約 8,292 千円（機材・消耗品含）

2. 評価調査団の概要

調査者	団長・総括：寺西　義英　国際協力機構鉱工業開発協力部鉱工業開発協力第一課課長 技術移転計画：岡田　千里　（財）素形材センターテクニカルアドバイザー 研修計画：山内　知香子　（財）素形材センター企画室主任 協力計画：山田　　実　国際協力機構鉱工業開発協力部鉱工業開発協力第一課職員 評価管理：原　礼有　国際協力機構鉱工業開発協力部鉱工業開発協力第一課ジュニア専門員 評価分析：間宮志のぶ　（株）グローバル・リンクマネージメント　社会開発部　研究員	
調査期間	2003 年 10 月 6 日～10 月 25 日	評価種類：終了時評価

3. 評価結果の概要

3-1 評価結果の要約

（1）妥当性

「イ」政府は工業再活性化を目的に Industrial Revitalization Plan を策定したが、その中で裾野産業振興を重視しており、本プロジェクトの「イ」側の開発政策との整合性は確保されているといえる。また、協力対象機関である MIDC の監督官庁が研究開発庁(BPPIP)から中小企業総局（IDKM）に移管したことは、裾野産業振興を重視する政策を促す結果となり、本プロジェクトの実施機関としての MIDC の妥当性をより高めることにつながった。また、アジア経済危機の影響もあり、ターゲットグループを自動車部品産業に加え、農業機械部品等にまで拡大した経緯があるが、この裨益者グループの拡大は裾野産業振興の観点からも妥当であったと判断される。また、日本の援助政策との関連でも、本件が JICA 実施の開発調査の提言から生じており、同提言に基づき包括的な中小企業振興プログラムを推進していることから妥当性が認められる。ただし、プロジェクトデザインについては、上位目標、プロジェクト目標の達成状況にかかる指標及びその入手手段が曖昧なまま終了時評価を迎えてしまったことから、その達成状況の客観的、数量的な把握が困難になったことが指摘された。本件の協力開始時は経済危機直後であり「イ」側のベースラインデータ提供体制の不備はやむをえないとしても、指標の明確化のための作業がプロジェクト活動中に積極的に行われていればプロジェクトデザインの妥当性はさらに高まったと思われる。

（2）有効性

日本人専門家の指導により C/P に対する技術移転は順調に進み、彼らの技術レベルは、概ね日本の技能者検定 2 級程度に相当する水準に達していると判断された（2000 年に 9%であった MIDC 内の不良率は評価時点で 3.5%程度にまで減少）。技術サービスの提供体制強化については、協力期間中に様々な分野において 242 件の試作品製作サービスを行ったほか、71 の民間鋳造業者を対象にのべ 192 回の巡回指導、21 件の研修コース、5 回のセミナー（のべ参加者 980 名）、5 種類の刊行物の発行を行い、受益者から概ね高い評価を得ている。これに加え、協力期間中に鋳造方案シミュレーション等新規のサービスが開始されたことも特筆に値する。技術サービスの提供体制が強化された結果、MIDC の自己収入についても増加の傾向が見られる。研修コースについては新規コースの開設など、概ね自立的に行われているが、巡回指導については日本人専門家に相当程度依存している状態であり、今後の改善に課題を残している。また、MIDC が開催するセミナーについては、現状において「イ」の鋳造業界関係者が一堂に会する貴重な機会を提供していると評価できるが、日本人講師に講演が高い集客力につながっていると考えられ、協力期間終了後は MIDC 独自で魅力的なセミナーを企画できるか否かが課題である。

（3）効率性

日本および「イ」側からの投入は概ね効率的になされた。日本側については、個別分野を担当する専門家を補完すべく、巡回指導など複数の技術分野をまたがる専門家を派遣したことが技術サービスの改善に大きく貢献した。全体的に供与機材は技術移転にあたり有効に活用されたものの、先述の通りターゲットグループが拡大したため、一部の機材の技術水準は実際のターゲットグループのニーズよりも高くなったと思われる。一方、「イ」側については、C/P の離職率が低く、また公務員の雇用を抑制する Zero-Growth 政策の下で C/P2 名を新たに雇用したことは高く評価されるべきである。ただし、検査部門専属の C/P が配置されなかったため同分野の技術移転の効率性がやや損なわれたほか、スペアパーツ類の補給、巡回指導の実施にあたり「イ」側の予算の執行の遅れなどが今後の課題として指摘された。

（4）インパクト

先述の通り、指標が曖昧なまま終了時評価を迎えたこと、また現状においても統計類の入手が困難な状況であることから、上位目標の達成状況について客観的に評価することは困難であった。しかしながら、協力期間中に重点的に指導を行った 12 の民間鋳造業者を対象とした経年比較においては、年間平均生産量が 2000 年の 1,970 トンから 2002 年の 4,630 トンに増加、返品率が 2000 年の 11.3%から 2002 年の 8.7%に減少したことが確認された。これに加え、MIDC の指導を受けた結果、外資系組立メーカーへの部品・製品の納入を実現した企業や、これまで「イ」国内では生産が困難であった技術的に高度な鋳物の生産に着手している企業の事例も確認された。

これらの点は、部分的にではあるものの上位目標達成の兆しが現れてきていることの証左ともいえ、高く評価されるべきである。本プロジェクトの予期せざる正のインパクトとしては、（ア）MIDC の開催するセミナーにおいて、鋳造業界関係者の間での情報交換の場が提供されたほか、鋳物生産に関連する資機材の展示が行われたことから業界の商取引活性化につながったこと、（イ）現地調達機材の納入、据付、あるいは試作品製作サービスの過程において、現地企業の、仕様の遵守など、適正な商取引に係る意識が向上したことが確認された。一方、負のインパクトについては特に確認されなかった。

（5）自立発展性

政府レベルでは所管官庁が BPPIP から IDKM に変わったこと、MIDC 内部レベルでは関係者の議論を通じて策定されたビジネスプランが始動していること（マーケティングセクションを各技術担当部の内部に設置する等）は制度的自立発展性を強化する動きとして評価されるが、この種の制度的変更には常に不確定要素がつきまとうものであり、MIDC 自身の改革へ向けての高い意識が自立発展性をより確固たるものにするために強く求められるところである。財政的自立発展性については、MIDC に対する政府予算が今年度急増したことからも、比較的安泰といえるが、一層の自立発展性を得るためには MIDC 自身が技術サービスの提供を通じて自己収入をあげていく必要がある。技術的自立発展性については、巡回指導を始めとするサービスの提供が日本人専門家の支援なしに独力で実施できるか、現行の Zero-Growth 政策の下、職員の増加が見込めない中、専門家により移転された技術が定着するかが懸念されるところである。しかしながら、協調体制を重視する協力期間中の技術移転方針が C/P 間の連帯感を生んでおり、また多くの C/P が自発的にさらなる技術レベルの向上を望んでいることから、技術的自立発展性が確保される可能性は高いと判断される。

3-2 結論

C/P に対する技術移転は概ね順調に実施され、MIDC の技術サービスは向上したと判断された。プロジェクト目標は当面十分に達成され、協力終了後の自立発展性が確保される相応の見込みもあるとされたことから、合同調整員会の場において、本プロジェクトを予定どおり来年 3 月をもって終了することを確認した。残された協力期間中には 3 名の長期専門家が引き続き配置されたほか、3 名の短期専門家が派遣された。

3-3 提言

（1）インドネシア政府に対する提言

「イ」政府は本プロジェクトの成果を効果的に継続し、制度的、財政的自立発展性をより強固なものにするために MIDC への支援を継続することが必要である。また、経済危機後弱体化した状態にある統計資料は、産業政策立案の基盤となるばかりでなく、ますます成果重視の志向を強めるドナーの協力の成果指標としても重要であり、この点を十分に認識した上で裾野産業育成のための事業実施体制を強化する必要がある。

（2）MIDCに対する提言

MIDC がこれまでの技術協力の成果をもとにさらに発展するためには、技術サービスの裨益者たる民間鋳造業界のニーズに応えるべく、受益者からのフィードバックを重視するとともに、業界団体、教育機関との連携、あるいは MIDC 内部での連携体制強化を図る必要がある。そのためにも MIDC の経営陣は現場レベルでもかかる意識が浸透するよう配慮すべきである。また、予算関連情報、巡回指導の結果等について確実に文書化する習慣を定着させるとともに、技術サービスの提供を通じた自己収入の増加にも力をいれ、C/P の雇用、スペアパーツ類の安定供給と活用を図ることが望ましい。

また、専門家が重点的に指導してきたねずみ鋳鉄、ダクタイル鋳鉄にかかる基礎的技術の習熟にプロジェクト終了後も継続的に注力し、高度な技術分野への知見の拡大については慎重に取り組むことが望ましい。これは生産が容易な鋳物の大量生産を通じて自己収入の増加を図るよりも、技術的に高度な鋳物の受注生産に力を入れ、研修コース等の技術サービスの質の向上に活かすことが中小鋳物企業の技術レベルの向上を導き、裾野産業振興に貢献する MIDC の本来の役割だと思われるからである。

3-4 教訓

本件評価を通じて得られた教訓としては、次の点を挙げることができる。（1）本プロジェクトにおいては、C/P の独立性を尊重し、また技術部門間の連携体制を重視する技術移転方針を採用したことから、MIDC が以前受けたベルギーからの協力に比べ、彼等の職務に対するモティベーションが高まったことが確認された。（2）部門をまたがる専門家の配置が効果的な技術移転、技術サービスの提供体制強化につながったこと（鋳造技術管理、製造技術担当の長期専門家、設備保全、巡回指導に特化した短期専門家）も確認された。このような事例は他の類似プロジェクトにおいても参考にされるべきである。（3）本プロジェクト計画段階の改善すべき点として指摘された上位目標、あるいはプロジェクト目標の達成状況にかかる指標の明確化、実施機関側の指標提供体制の確認、ターゲットグループのニーズに適った機材の選定は他の類似プロジェクトにおいても案件計画段階の留意点として認識される必要がある。

第 1 章　終了時評価調査の概要

1-1　調査団派遣の経緯と目的

1-1-1　経緯

インドネシア（以下「イ」と略称）においては、自動車・自動二輪車、電気機器・電子製品等の組立産業に部品を供給する裾野産業（サポーティング・インダストリー）が十分育成されておらず、経済開発の原動力と位置付けられる工業化の推進の妨げとなっている。鋳造技術は、裾野産業の代表的な要素技術の一つとして位置付けられ、国内約500の企業が関連しているとみられるが、組立産業の要求に見合った品質・精度の部品を安定的に供給することは容易ではない。かかる事情に鑑み、「イ」国政府は、金属機械工業研究所（IRDMMI／MIDC）の強化により、鋳造技術分野等の裾野産業振興を図り、「イ」国の産業構造を強化・高度化することを目的としたプロジェクト方式技術協力（現・技術協力プロジェクト）を、1995年11月に我が国に対して要請してきた。

この要請に対して我が方は、1997年2月～3月に事前調査団を派遣し、さらに1997年8月～9月および12月には長期調査員を派遣し、鋳造企業調査、協力期間の設定、技術協力計画、PDM（案）等の計画管理表の策定、日・「イ」双方の投入計画を確認した。1998年3月には実施協議調査団を派遣し、討議議事録（R/D）の署名・交換を行う予定であったが、「イ」の経済危機、その後のジャカルタ騒乱、スハルト大統領の辞任などの国内情勢が不安定な状態にあったことから、実施協議調査団の派遣を延期した。そのため、1998年9月に改めて短期調査員を派遣し、「イ」側運営体制の再確認、技術協力計画の再検討を実施し、その結果を踏まえ、1998年12月に実施協議調査団を派遣、討議議事録（R/D）の署名・交換を行った。

これを受け、1999年4月より「MIDC が中小鋳造企業に対して質の高い技術サービスを提供できるようになること」をプロジェクト目標と設定した5年間の協力を実施中である。2000年9月に第1回運営指導調査団、2002年1月には第2回運営指導調査団（中間評価）をそれぞれ派遣し、技術移転進捗状況の確認、プロジェクトがモニタリング・評価体制を確立するための支援、対象企業に対する巡回指導（技術普及サービス）の現状と課題の検討、「イ」側の運営体制に対する助言・改善提案等を実施した。プロジェクトが実施された5年間で、長期専門家のべ8名、短期専門家のべ61名が派遣されており、C/P研修員をのべ18名受け入れ、機材供与については 約3億円を実施した。

なお、技術移転分野は、以下の5分野となっている。

a）鋳造方案（Casting Plan）
b）模型製作（Pattern Making）
c）造型（Moulding）
d）溶解（Melting）
e）試験検査（Testing）

1-1-2 目的

2003年10月で協力期間（1999.04.01 – 2004.03.31）が残り6か月となることから、以下の2項目の調査を目的として、終了時評価調査団が派遣された。

a) 技術協力の進捗状況および目標の達成状況を確認した上で、評価5項目に基づき、プロジェクト終了時評価を実施した。

b) 協力を予定通り終了することの可否の検討を行った。

1-2 評価対象プロジェクトの概要

本技術協力プロジェクトにおいては、5 年間にわたる本体プロジェクトの成果を受け、1999 年 4 月から 8 名の長期専門家、のべ 61 名の短期専門家が派遣され、技術移転を行っている。協議議事録（R/D）署名時に合意された PDM の概要は以下のとおりである（PDM のオリジナルについては別添資料 2 合同評価報告書の Annex 1 を参照。なお、以下、Annex とは合同評価報告書の別添資料を指す。

上位目標「インドネシア国内の鋳造企業が、組立メーカーが要求するレベルを満たす鋳造製品を供給できるようになる」

↑ 外部条件 1「鋳造業界が MIDC の技術サービスを活用する。」
外部条件 2「組立メーカーと裾野産業のリンケージが確立される。」

プロジェクト目標「MIDC が中小鋳造企業に提供するサービスが改善される。」

↑ 外部条件 1「訓練を受けたカウンターパートが MIDC に留まる。」

成果 0「プロジェクト運営体制が強化される。」
成果 1「鋳造技術に関する機材が適切に供与、据付、運転、維持管理される。」
成果 2「インドネシア側カウンターパートの技術力が向上する。」
成果 3「試作品製作サービスが体系的に運営される。」
成果 4「技術普及サービスが体系的に運営される。」
成果 5「情報サービスが体系的に提供される。」

本 PDM は技プロ実施期間中、修正されていない。計画と実績を対比した技術協力計画、活動計画、暫定実施計画については Annex 2、3、4 を参照。

1-3 終了時評価の手法、考え方

（1）情報の収集・整理方法

協力の実績、実施プロセスを確認するため、文献資料、MIDC や民間鋳造企業の生産現場の直接視察、聞き取り調査、アンケート調査など複数の情報源を活用した。聞き取り調査、

アンケート調査については、実施機関である MIDC のほか、日本人専門家チーム、監督官庁である商工省、鋳造に係る民間の業界団体、MIDC の技術サービス利用者（民間企業等）などを対象に行い、ステークホルダーからの多様な意見が評価に反映されるよう留意した。回答内容を集約した質問票を別添資料 5 に示す。また、入手した情報は評価グリッド（別添資料 3）を用いて体系的に整理した。

（2）5 項目評価

収集した情報に基づき、評価 5 項目（妥当性、有効性、効率性、インパクト、自立発展性）の観点からプロジェクト評価を行った。

（3）結論、提言、教訓の導出

評価結果を基に、結論、今後のプロジェクト活動に対する提言、類似の技術協力プロジェクトの企画・実施に関わる教訓を導き出した。

（4）インドネシア側との共同作業

上記（1）～（3）の作業はインドネシア側評価チームと合同で行った。特に、実績の確認を受けた 5 項目評価、提言・教訓の導出については、先方評価チームの積極的参画を得た。

1-4 調査団の構成と調査日程

氏　名	分　野	所　属
寺西　義英	団長・総括	独立行政法人国際協力機構　鉱工業開発協力部 鉱工業開発協力第一課　課長
岡田　千里	技術移転計画	（財）素形材センター テクニカルアドバイザー
山内　知香子	研修計画	（財）素形材センター 企画室　主任
山田　実	協力企画	独立行政法人国際協力機構　鉱工業開発協力部 鉱工業開発協力第一課　職員
間宮志のぶ	評価分析	グローバル・リンク・マネージメント（株） 社会開発部　研究員
原　礼有	評価管理	独立行政法人国際協力機構　鉱工業開発協力部 鉱工業開発協力第一課　ジュニア専門員

1-5 調査日程

日順	月日	曜日	日　程		
			団長	研修計画、技術移転計画、協力企画	評価分析団員（コンサルタント）および評価管理
1	10 月 6 日	月			成田発（JL715）11:05 ジャカルタ着 16:30
2	10 月 7 日	火			JICA 事務所打ち合わせ 関連省庁、機関へのインタビュー、民間企業へのインタビュー
3	10 月 8 日	水			民間企業へのインタビュー （夕方）バンドンへ移動
4	10 月 9 日	木			MIDC 表敬、専門家との打合せ及びインタビュー、サイト視察
5	10 月 10 日	金			MIDC・専門家へのインタビュー 関係機関・業界団体へのインタビュー
6	10 月 11 日	土			アンケート、インタビュー結果分析、評価グリッド記入、合同評価報告書（JER）ドラフト作成
7	10 月 12 日	日			同上
8	10 月 13 日	月			補足調査 JER ドラフト作成
9	10 月 14 日	火		成田発（JL715）11:05 ジャカルタ着 16:30 、バンドンへ移動	同上
10	10 月 15 日	水		コンサルタントによる調査進捗状況報告、インドネシア側評価チーム打ち合わせ、MIDC 表敬、専門家協議（実績・協力プロセスの確認）、サイト視察	同上
11	10 月 16 日	木		専門家との打合せ及びインタビュー	
12	10 月 17 日	金		関連機関協議（間宮団員）、民間企業視察（岡田、山内団員）、BPPIP 及びアグス IDKM 総局長との打合せ（山田団員）	
13	10 月 18 日	土	成田発 （JL715）11:05 ジャカルタ着 16:30	調査結果整理分析、団内打ち合わせ JER、M/M 案作成	
14	10 月 19 日	日	バンドンへ移動	同上	
15	10 月 20 日	月	MIDC・専門家協議（5 項目評価、結論、提言、教訓）		
16	10 月 21 日	火	MIDC・専門家協議（総括、署名文書の確認）、ジャカルタへ移動		
17	10 月 22 日	水	インドネシア評価チーム協議（JER、M/M 内容確認）		

18	10 月 23 日	木	合同調整委員会（JCC）開催、JER、M/M 署名、調査団主催レセプション
19	10 月 24 日	金	JICA 事務所、日本大使館報告、ジャカルタ発（JL716）23:55
20	10 月 25 日	土	成田着 09:10

1-6 主要面談者

（1）**商業工業省** (MOIT)

a) **中小企業総局**

Mr. Agus Tjahajana	Director General
Mr. Nurdin Noor	Leader of Indonesian Evaluation Team Secretary to the Directorate General
Mr. Effendi Sirait	Deputy Director
Mr. Ramon Bangun	Head of Division for Extension Services and International Cooperation Directorate General of Small and Medium Industries and Trade
Ms. Roosalinda Marthiany Loebis	Head of Sub Division for International Cooperation

b) **研究開発庁**

Mr. Sudarmasto	Head
Mr. Imam Haryono	Secretary
Mr. Abdul Wahid	Head, Centre for Industry and Trade, Technology R&D
Mr. Achmad Sjafudin T.	Balai Besar Behan Dan Bahan Teknik (B4T) Head of Business Development Division

c) **計画局**

Mrs. Hj. Kusni Pangestuti	Head of Technical Assistance Sub Division

d) **金属機械工業研究所** (MIDC)

Mr. Taufiq Rochim	Head
Mr. Hadi Nugroho	Head, Administration Division
Ms.Williany Aminuddin	Head, Program and Reporting Division
Mr. Mochamad Furqon	Head, Foundry Department

（2）**インドネシア側評価チーム**

Mr. Yos Rizal Anwar	Member of Supervisory Board of Indonesian Foundry Industries Association CEO of Bakrie Tosanjaya
Mr. A. Safiun	President of APLINDO
Mr. Cuk Sutoyo	Agrindo

Mr. Soejitno	Head of Ceper Laboratory
Prof. Dr. Rachim Suratman	Institute of Technology of Bandung

（3）**産業界**

Mr. Dikdik Kusmayadi	Manager, Maintenance and Engineering Bakrie Tosanjaya
Mr. Thomas Hanan Thoha	Chairman Himpunan Ahli Pengecoran Logam Indonesia (HAPLI)
Mr. Adi Taruli	Director of Commerce Himpunan Ahli Pengecoran Logam Indonesia (HAPLI)
Mr. L. Armansjah	Expert Staff Himpunan Ahli Pengecoran Logam Indonesia (HAPLI)
Dr. SlametoWiryolukito	Metallurgical Laboratory Department of Mechanical Enginnering Institute of Technology of Bandung
Dr. Supono Adi Dwiwanto	Metallurgical and Technology Foundry Institute of Technology of Bandung

（4）**インドネシア日本大使館**

岸本道弘	一等書記官

（5）JICA **インドネシア事務所**

加藤圭一	所長
本間徹	企画調査員

（6）**プロジェクト専門家**

榊原實男	チーフアドバイザー
宮崎正	業務調整
竹本義明	造型・生産技術

（7）JICA **専門家**

永江勉	専門家（インドネシア商業工業省計画局）

（8）**現地日系企業**

金井孝雄	Engineering Director P.T. Toyota Motor Manufacturing Indonesia
牧野和郎	Division Head P.T. Toyota Motor Manufacturing Indonesia
Sadao Kikuchi	Technical Advisor Bakrie Tosanjaya

第 2 章　協議結果

本調査団はプロジェクト関係者との協議を通じ評価作業を取り進め、2003 年 2 月 25 日に合同調整委員会の席上において、ミニッツ（別添資料 1）及び合同評価報告書（別添資料 2）に署名を行った。先方の署名者は、ミニッツおよび合同評価報告書ともに商工省・中小企業総局のMr. Nurdin Noorであった[1]。

ミニッツにおいては、(1) 合同評価報告書の内容が合同調整委員会の場で承認されたこと、(2) 本技術協力プロジェクトが予定通り本年 5 月末で終了する予定であること、(3) 本技術協力プロジェクト終了までの双方からの投入、特に、日本側の投入として短期専門家 3 名（巡回指導、溶解・品質管理、D/S 造型システム）の派遣を予定していることを確認した。

これに加え、技術移転が予定通りに進んでいることを考慮し、合同評価チームは予定通り 2004 年 3 月をもって、本技術協力プロジェクトを終了することが妥当であると結論した。

合同評価報告書の内容については、次章以降に記載する。

[1] 先方署名者は、ミニッツ・合同評価報告書ともに中小企業総局（IDKM）のSecretary to the Directorate GeneralであるMr. Nurdin Noorとなった。当初、前者についてはプロジェクトダイレクターであるIDKMのAgus総局長、後者についてはインドネシア側評価チームのリーダーを務める予定であったIDKM Directorate of Small, Metal Machinery and Electronic IndustriesのPutjuk局長を想定していたが、両氏とも合同調整委員会の当日不在であったことからMr. Nurdin Noorがそれぞれの立場において署名を代行にするになったもの。

第 3 章　調査結果

本章以降においては、英文の合同評価報告書の内容に準じ、本プロジェクトの実績、成果について詳説する。

3-1　プロジェクトの実績

3-1-1　投入

若干の不足、遅れは見られたものの、日本・インドネシア双方からの投入は概ね当初計画に沿って提供された。

（1） 日本側投入

a) 専門家派遣

本技術協力プロジェクトが実施された 5 年間で、長期専門家 8 名および短期専門家 61 名が派遣された（Annex 5 参照）。

b) 機材供与

本技術協力プロジェクトの実施期間中、約 3 億円相当の機材が供与された。供与された機材の詳細については Annex 6 を参照。

c) 研修員受け入れ

5 年間で 18 人のカウンターパートを受け入れた。研修員受け入れの詳細については Annex 7 を参照。

d) ローカルコスト負担

2003 年 10 月に実施された終了時評価調査の時点で、およそ 39 百万円を日本側が負担していた。詳細については Annex 8 を参照。

e) その他

運営指導調査、中間評価調査、終了時評価調査の 3 調査団が派遣された。

（2）インドネシア側投入

a) 人員の配置

40 名の常勤カウンターパート（契約ベースのワーカー9 名を含む）が配置された。詳細は Annex 8 を参照。

b) プロジェクト運営経費の負担について

3 億 1,860 万ルピア（約 420 万円）（2000 年）、2 億ルピア（約 265 万円）（2001 年）、2 億 6,900 万ルピア（約 356 万円）（2002 年）をインドネシア側が負担した。詳細については Annex 10 を参照。

3-1-2 活動と成果

活動計画やカウンターパート及び日本人専門家に対するインタビューから、プロジェクト活動の進捗とそれに伴う成果の達成状況は概ね予定通りであることが確認された（Annex 2、3、4、12 を参照）。

（1）成果 0「プロジェクト運営体制が強化される。」

MIDC の鋳造部門のプロジェクト実施能力は、概ね向上したといってよい。2003 年 10 月の終了時評価実施時に MIDC 内部で組織の改変が実施されていたが、こうした変革によって鋳造部門はより一層強化されることが期待される。

（2）成果 2「インドネシア側カウンターパートの技術力が向上する。」

カウンターパートの技術力を評価する場合、彼らの知識や技術だけでなく、一人一人の職務に対する姿勢や責任感も考慮される。特に次の三点が重要である。第一は、生産量や不良品率などに重点を置く MIDC の鋳造製品製造のパフォーマンスである。第二は受注品生産（ターゲット・キャスティング）を通じた技術移転の進捗、第三はここの技術分野に関するカウンターパートの技術レベルの測定である。

（3）成果 3「試作品製作サービスが体系的に運営される。」

終了時評価実施前（2003 年 9 月）時点で、プロジェクトでは 242 種類の試作品が製作された（Annex 25 参照）。2000 年に 9%程度だった不良品率は、終了時評価実施前には 3.5%となった。この結果、試作品製作サービスによるプロジェクトの収入は 2000 年以降徐々に増加してきている。

（4）成果 4「技術普及サービスが体系的に運営される。」

a) 巡回指導

終了時評価実施までに鋳造企業 71 社、のべ 192 回の巡回指導がプロジェクトによって実施された。巡回指導については鋳造企業からの要望が強く、特に特定の 14 社については定期的に実施されている。なお、本プロジェクトの専門家は、現地で活動中のシニアボランティアとの情報交換を実施している（Annex 26 参照）[2]。

[2] シニアボランティアは、インドネシアではシルバーエキスパートと称されているが、本報告書ではJICAにおける一般的な呼称であるシニアボランティアを用いる。

b) 研修コース

研修コースについては、カウンターパートは、日本人専門家からの必要最小限の指導で運営することができる（Annex 26 参照）。特に、鋳造設計シミュレーションについては、カウンターパートが独力で新しい研修コースを企画して立ち上げた。2001 年以来、研修受講生の満足度は高いレベルを維持している。

（5）成果 5「情報サービスが体系的に提供される。」

a) セミナー

プロジェクトが実施したセミナーによって関係者、関係諸団体、企業など様々なアクター間の交流、情報交換、意思疎通が促進されている。また、MIDC はこうしたセミナーの実施を通じて、インドネシアにおける裾野産業育成の中心機関としての地位を確立しつつある。

b) 出版物

終了時評価実施までにプロジェクトのリーフレット、同パンフレット、”Casting Technology Handbook”、”Metal Indonesia”の 4 種類の出版物が発行されている（Annex 30 参照）。また、プロジェクトのプロモーション・ビデオが製作され、関係者に配布された。

3-2 実施プロセス

3-2-1 モニタリング・プロセス

a) PDM は、プロジェクトの進捗をモニタリングするために、プロジェクトの開始前に策定された。しかし、上位目標とプロジェクト目標それぞれの指標およびその入手手段の設定が不明確であったこと、加えて 1997 年に発生した東アジア通貨危機による混乱と、プロジェクトのベースラインデータが不十分であったために、モニタリング・プロセスに係るこれら諸条件をプロジェクト実施の途上で整備していこうという了解が関係者間であったように思われる。その後、2002 年 1 月の中間評価調査で、指標およびその入手手段は終了時評価までに見直すべきだと明記されたにもかかわらず、終了時評価の時点でも依然として不明確である。

b) モニタリングは、必ずしも日本側とインドネシア側の共同で実施されなかった。

c) 2002 年度の下半期、モニタリング・レポートは日本側とインドネシア側が協力して年に二回作成することが決まったが、終了時評価調査の時点では提出されていない。

3-2-2 コミュニケーション

日本人専門家とカウンターパート間の技術移転に係るコミュニケーションは、おおむね順調であった。

a) 語学の問題はコミュニケーションの上で大きな障壁であったが、一部の日本人専門家がインドネシア語を習得しようと努めたこと、また専門用語にも明るい通訳を有効活用したことにより、潤滑な意思疎通を維持することができた。

b) 日本人専門家、事務局など日本側関係者間の意思疎通は非常に活発であった。特に、週報が電子メールで関係者間に配布されていたことが議論を活発にした。

c) 不定期に開催された日本人専門家とカウンターパート間の会合、および定期的に開催された朝礼によって両者の相互理解が促進された。

d) 日本人専門家への技術支援の提供およびプロジェクトと JICA 本部のコミュニケーション円滑化のために国内支援委員会が設置された。また、プロジェクトのニーズに合致する専門家をリクルートするために事務局が設置された。

e) 関係者間の意見交換および協力の促進を目的に、合同調整委員会は少なくとも毎年 1 回は開催すると R/D に記されているが、終了時評価調査が実施される前までに 3 回実施されただけであった。

3-2-3 カウンターパートの意識と行動

終了時評価調査実施時のアンケートや聞き取り調査によれば、日本人専門家が導入した労働規範をカウンターパートは当初大変困難だと感じたが、徐々に各自の業務に取り入れることができた。

3-2-4 技術移転の方針

（1）ベルギーの協力との比較

過去に実施されたベルギーによる技術移転は個人をベースとしていたのに対し、日本の協力はチームワークに重点があった。また、ベルギーが移転した知識および技術は基本的なレベルのものが多かったのに対し、日本による協力ではより高度な知識および技術が移転されている。この意味で、巡回指導など、複数の分野にまたがる技術を移転する専門家を派遣したことは非常に効果的であった。

（2）設備の調達

設備の調達に際し、適正技術の欠如および図面等に係る意識の欠如を処理するのに多大な努力を要した。

3-2-5 外部条件

本技術協力プロジェクトの PDM には、次の通りプロジェクト目標達成のための 6 つの重

要な前提条件がある。

a) インドネシア国内で政治的および経済的に大規模な変化がないこと。
b) 裾野産業育成に係る政策的な重要性に変化が生じないこと。
c) 国内の鋳造製品に対する需要が安定的であること。
d) 鋳造業界が MIDC の技術サービスを活用する。
e) 組立メーカーと裾野産業のリンケージが確立される。
f) 訓練を受けたカウンターパートが MIDC に留まる。

6 つの外部条件のうち、e)「組立メーカーと裾野産業のリンケージが確立される。」については、これを立証する有力な材料がないことからこの条件は満たされなかったと結論づけられる。しかし、e)以外の 5 つの外部条件は満たされているといってよいだろう。

第 4 章　評価結果

4-1　合同評価結果の概要

4-1-1　評価 5 項目による評価結果

（1）妥当性

Industrial Revitalization Plan 等において裾野産業振興の重要性が謳われており、インドネシア側上位政策と本プロジェクトの整合性は維持されている。監督官庁の研究開発庁(BPPIP)から中小企業総局（IDKM）への移管は、鋳造分野中小企業の育成を図る本プロジェクトの実施機関としての金属機械工業研究所（MIDC）の妥当性をより高めることにつながった。本件は、アジア経済危機の影響もあり、ターゲット・グループを自動車部品鋳物産業に加え、農業機械部品等の鋳物部品を生産する中小企業にまで拡大した経緯があるが、この裨益者グループの拡大は妥当であったと判断される。日本の援助政策との関連でも、本件が JICA 実施の開発調査の提言から生まれたものであり、また『浦田レポート』に基づく包括的な中小企業振興プログラムを推進しているところであることから妥当性が認められる。ただし、本件のプロジェクト・デザインについては、上位目標、プロジェクト目標の達成状況にかかる指標及びその入手手段が曖昧なまま終了時評価を迎えてしまったことから、特に上位目標についてその達成状況の客観的、数量的な把握が困難になったことが悔やまれる。協力開始時においては、経済危機直後ということもあり、インドネシア側のベースライン・データ提供体制が整っていなかったことから、やむを得ずとられた措置であったと思われるが、指標の明確化へ向けての作業がプロジェクト活動の一部として更に積極的に行われていれば、プロジェクト・デザインの妥当性は一層高まったものと推察される。また、「組立産業と裾野産業の連関（linkage）が確立される」というプロジェクト目標から上位目標に至る外部条件については、正に今日においても係る linkage の欠如が中小鋳物企業の直面している課題であり（インドネシア側評価チームのコメント）、やや達成が困難な外部条件であったと思われることに加え、linkage という言葉が組立産業と裾野産業の商取引の活性化を意味するとすれば、本外部条件と上位目標である「中小鋳物業界が国内組立産業の要求する品質水準を満たす製品を供給できるようになる」はほぼ同義ではないかとの指摘をした。

（2）有効性

日本人専門家の指導により C/P に対する技術移転は順調に進み、彼らの技術レベルは、ほとんどの技術分野について概ね日本の技能者検定 2 級程度に相当する水準に至っていると判断された（2000 年の段階で 9%であった MIDC 内の不良率は評価時点において 3.5%程度にまで減少）。民間鋳造業界に対する技術サービスの提供体制強化については、協力期間中に様々な分野において 242 件の試作品製作サービスを行ったほか、71 の民間鋳造業者を対象にのべ 192 回の巡回指導、21 件の研修コース、6 回のセミナー（のべ参加者 980 名）、5 種類の刊行物の発行を行い、受益者からも概ね高い評価を得ている。これに加え、協力期間中に鋳造方案シミュレーション・サービス等新規のサービスが開始されたこ

とも特筆に価する。技術サービスの提供体制が強化された結果として、MIDC の鋳造部のサービス提供を通じた自己収入額についても増加の傾向が見られる。

ただし、それぞれの技術サービスが、どの程度日本人専門家のサポートを得ず C/P の独力で行われているかについては、サービスの種類によって一様でない。研修コースについては新規コースの開設、教材の改訂を含め、おおむね自立的に行われているが、特に巡回指導について、C/P が日本人専門家に相当程度依存している（企業を訪問しても指導は専門家が行い、C/P は傍観している）状態であり、今後の改善に課題を残している状況である。また、MIDC が開催するセミナーについては、現状においてインドネシアの鋳造業界関係者が一堂に会する極めて貴重な機会を提供していると評価できるが、日本人講師によるプレゼンテーションが高い集客力につながっていると考えられ、協力期間終了後、以下に魅力的なセミナーを企画していくかが課題である。

以上を踏まえプロジェクト目標である「中小鋳物業界に対する MIDC の技術サービスが改善する」については、（達成レベルの維持に不断の努力が必要としつつも）現段階においては概ね達成されていると評価された。

特記事項として、MIDC が提供する各サービス間のバランスに関し、C/P が、ともすると自己収入の増加を念頭に鋳物生産を行っており、高度な鋳物の受注生産を通じて自らの技術レベルを向上し、よって MIDC の本来の主要業務であるべき研修コースや出版物の発行といった技術サービスの質の向上につなげていこうという姿勢にやや欠けるように見受けられる点を指摘した。

（3）効率性

日本、インドネシア側からのプロジェクトへの投入は概ね効率的になされた。日本側投入については、特に、複数の技術分野をまたがる専門家を配置し、個別分野に係る専門家を補完するよう取り計らったことが円滑な技術移転、技術サービスの改善に大きく貢献した。ただし、供与機材は技術移転にあたり有効に活用されたものの、当初自動車部品鋳物業者をプロジェクトの主要ターゲット・グループとしていたことから、一部の機材の技術水準は（農業機械部品等の製造業者に拡大された）実際のターゲット・グループのニーズにあわせ、もう少し低くてよかったとも思われる（同様の趣旨の発言が JCC の場でインドネシア側からもあった）。ただし、協力期間途中から機材の現地調達化を推進したため全体としての効率性は維持されたと判断される。

一方、インドネシア側の投入に関しては、C/P の離職率がきわめて低く、また公務員の雇用を抑制する現行の Zero-Growth 政策の下で新規の C/P 2 名を雇用したことは高く評価されるべきである。ただし、検査部門専属の C/P が配置されなかったことが同分野の専門家による技術移転の効率性をやや損なったほか、機材の円滑な稼動に必要な水の供給にやや難があること、スペアパーツ類の補給、巡回指導の実施にあたりインドネシア側の予算の執行が的確になされない事例があったことが、マイナス要因として指摘できる。

（4）インパクト

上述のとおり、指標が曖昧なまま終了時評価を迎えたこと、また現状においても統計類の入手が困難な状況であることから、上位目標の達成状況について客観的に評価すること

は困難であった。しかしながら、協力期間中に重点的に指導を行った 12 の民間鋳造企業を対象とした経年比較においては、年間平均生産量が 2000 年の 1,970 トンから 2002 年の 4,630 トンに増加、返品率が 2000 年の 11.3%から 2002 年の 8.7%に減少したことが確認された。これに加え、MIDC の指導を受けた結果、外資系組立メーカーへの鋳物部品の納入を実現した企業や、これまでインドネシアでは国産が非常に困難であった高度な鋳物の生産に着手している企業の事例も確認された。これらの点は、部分的にではあるものの上位目標達成の兆しが現れてきていることの証左ともいえ、高く評価されるべきである。

いずれにせよ、上位目標の達成状況は協力期間終了の数年後に行われる事後評価において重点的に評価されることになる。従って、事後評価までに、より客観的な評価が可能となる指標の設定が行われることが重要である。

本プロジェクトの予期せざる正のインパクトとしては、MIDC の開催するセミナーにおいて、鋳造業界関係者の間での情報交換の場が提供されたほか、鋳物生産に関連する資機材の展示が行われたことから業界の商取引活性化につながったこと、②現地調達機材の納入、据付、あるいは試作品製作サービスの過程において、インドネシア民間企業の仕様の遵守など、適正な商取引に係る意識が向上したことが確認された。一方、負のインパクトについては特に確認されなかった。

（5）自立発展性

政府レベルでは所管官庁が BPPIP から IDKM に変わったこと、MIDC 内部では関係者の議論を通じて策定されたビジネスプランが始動していること（マーケティング・セクションを各技術担当部の内部に設置する等）は一般論として制度的自立発展性を強化する動きとして評価されるが、この種の制度的変更には常に不確定要素がつきまとうものであり、自立発展性をより確固たるものにするためには、MIDC 自身の改革へ向けての高い意識が強く求められるところである。財政的自立発展性については、MIDC に対する政府予算が今年度急増したことからも、比較的安泰といえるが、一層の自立発展性を得るためには MIDC 自身が技術サービスの提供を通じて自己収入をあげていく必要がある。技術的自立発展性については、巡回指導を始めとする技術サービスの提供が日本人専門家の支援なしに独力で実施できるか、現行の Zero-Growth 政策の下、職員の増加が見込めない中、専門家により移転された技術が定着するかが懸念されるところである。しかしながら、C/P 間の協調体制を重視する協力期間中の技術移転方針が C/P 間の連帯感を生んでおり、また多くの C/P が自発的に更なる技術レベルの向上を望んでいることから、技術的自立発展性が確保される可能性は高いと思われる。

4-2 調査団長所見

4-2-1 インドネシア国の自動車、自動二輪車、電気・電子製品等いわゆる組立産業に部品を供給する裾野産業が十分育成されておらず、工業化の妨げになってきた。鋳造技術は、裾野産業の代表的要素技術の一つとして位置づけられるが、中小の鋳造企業は組立産業の要求に見合った品質・精度の鋳造部品を安定的に供給することが出来ていない状況にある。

このため、インドネシア政府は、MIDC の強化により鋳造技術分野の裾野産業振興を図り、もって産業構造を強化・高度化したいとして日本政府に対して 1995 年、技術協力要請を行った。本協力は、その後、数次の事前調査を経て、アジアを覆った深刻な経済危機とインドネシア国内の政治的・社会的混乱がまだ続く中、1999 年 4 月から 5 年間の協力期間をもって開始した。

プロジェクトは、「中小の鋳物産業が国内の組立産業が要求する水準の鋳物を生産できるようにする」ことを上位目標として、協力の目的を「MIDC の中小鋳物企業に対する技術サービスの向上」とした。

4-2-2 2004 年 3 月末のプロジェクト終了に際し、本調査団は、10 月 7 日から当国で終了時評価調査を行った。各調査団員の精力的な調査活動を通じて取り纏めた JER 案は、インドネシア側政府機関、産業界代表、研究機関からなるインドネシア側評価チームとの議論を経て、10 月 23 日に開催された当プロジェクトの JCC に提出され、インドネシア側の評価チーム団長兼 JCC の議長のインドネシア商工省中小企業総局次長のヌルディン・ヌル氏との間で、確認署名を行った。

技術協力の現場においては、協力開始時から、MIDC は労務管理や業務管理体制が脆弱で、スタッフの勤労意欲も必ずしも高くないという問題を抱えていた。このため、専門家チームと国内支援体制の緊密な連繋の下で、長期・短期の熟練した各専門家は精力的な技術指導を行い、横断的チームワークや時間管理の姿勢なども併せて指導を行ってきた。

専門家の指導の下で協力期間中に行ってきた試作品製作サービス、個別企業訪問による巡回指導及び研修コース実施の技術普及サービス、セミナー開催と鋳造技術ハンドブックの発行など情報サービスの諸活動や日本での C/P 研修は、MIDC の C/P の技術力向上に確実に繋がった。今回、技術担当団員が行った評価において、ターゲット・キャスティングの 5 段階評価においても、鋳造方案、模型製作技術、調砂・造型技術、溶解技術、検査・品質管理技術、設備保全技術の各項目の技術評価においても一部未達成の状況にはあるものの、C/P チーム全体の熟達度において全般的に高い向上度が認められ、供与した設備・機材も有効に活用されている状況なども確認された。

よって現時点で所期のプロジェクト成果が発現しており、今後の協力終了時までの協力活動を通じ、プロジェクト目的は概ね達成できると認められたため、プロジェクトは期間延長せず、予定通り終了することを上記 JCC 議長との間のミニッツにおいて署名確認した。

4-2-3 本協力は、MIDC が中小鋳造企業への公的な技術支援の拠点となる政府機関と位置づけられる MIDC の C/P チームを技術移転対象グループとし、主に技術面でのキャパシティ・ビルディングを目指したものであった。しかし、この協力成果を同国国内の中小鋳造業の発展に直接繋げていくためには、インドネシア国内において、更に関係する諸活動の推進が必要とされる。MIDC においては、新たなビジネス・プランの下で、産業界のニーズに応じた技術サービス提供体制の強化と財政面でより自立した経営を目指した抜本的な組織改革、事業改革、そして職員へのインセンティブ付与を含

めた人事対策のための一層の自助努力が求められる。また、組立企業、鋳造企業との連繋強化、そして、これらを後押しするインドネシア政府の戦略的な政策支援・財政的支援が求められると判断された。このため、調査団は、当プロジェクトを拠点とする観点からインドネシア政府に対し 2 項目、MIDC に対し 7 項目の提言を合同評価調査報告書に残した。

我が国が、インドネシア国全体の今後の裾野産業育成を目指す上では、商工省、産業界、そして MIDC など中小企業向けの支援機関の動向を継続的にモニタリングし、MIDC の有効活用を促すと同時に、当地日系企業との連携を含め、JICA、JBIC、JETRO、JODC 各種スキームによる包括的な協力アプローチの下で協力を展開していくことが肝要と思料された。JICA の協力においては、同国の産業界との連携強化の視点を重視しつつ、個別専門家、研修を組み合わせた技術協力プロジェクト、開発調査、さらにシニア海外ボランティアの各スキームを包括的に展開していく戦略的な協力アプローチを強化・推進することが肝要である。

4-3 結論

上記評価結果において、今後のモニタリングは必要であるものの、プロジェクト目標は当面十分に達成され、協力終了後の自立発展性が確保される相応の見込みもあるとされたことから、合同調整員会の場において、本プロジェクトを予定どおり来年 3 月をもって終了することを確認した。残された協力期間中には 3 名の長期専門家が引き続き配置されるほか、3 名の短期専門家が派遣される予定である。また、平成 15 年度中途採択見込みの MIDC アドバイザーについては、MIDC の他の技術部門への波及も念頭におきつつ、鋳造部の技術サービスのモニタリング、さらなる提供体制の強化にあたるべきと考えられる。

第 5 章　提言と教訓

5-1　提言

以上の評価結果を踏まえ、合同評価チームはインドネシア政府、MIDC の双方に対し、以下の提言を行った。

5-1-1　インドネシア政府に対する提言

（1）制度的、財政的自立発展性をより強固なものにするため、インドネシア政府からの MIDC への支援継続が望まれる。
（2）経済危機後弱体化したままの状態にある統計資料の提供体制が強化されるべきである。かかる統計資料は産業政策立案の基礎となるばかりでなく、ますます成果重視の志向を強めるドナーの協力の成果指標としても重要であることが認識されるべきである。

5-1-2　MIDC に対する提言

（1）技術サービスの裨益者たる民間鋳造業界のニーズに応えるべく、受益者からのフィードバックを重視するとともに、業界団体、教育機関との連携、あるいは MIDC 内部での連携体制強化が図られるべきである。MIDC の経営陣は現場レベルでもかかる意識が浸透するよう配慮すべきである。
（2）予算関連情報、巡回指導の結果等について確実に文書化される習慣を定着させるべきである。
（3）技術サービスの提供を通じた自己収入の増加に力をいれ、C/P の雇用、スペアパーツ類の安定供給に活用につなげるべきである。
（4）専門家が重点的に指導してきたねずみ鋳鉄、ダクタイル鋳鉄にかかる基礎的技術の習熟にプロジェクト終了後も当面は力を入れる必要があり、より高度な技術分野への知見の拡大は慎重に執り行うべきである。
（5）生産が容易な鋳物の大量生産を通じて自己収入の増加を図るよりも、技術的に高度な鋳物の受注生産に力を入れ、研修コース等の技術サービスの質の改善に活かすべきである。
（6）事後評価に備え、関係者との協議を通じ、上位目標の達成状況を図る指標の設定に取り組むべきである。その際、今次終了時評価に用いた特定鋳物業者の経年比較を継続する必要は必ずしもなく、MIDC の技術サービスを活用した結果としてパフォーマンスが向上した民間企業の事例をさらに積み重ね、指標として活用することも検討に値する。
（7）以上に加え、技術団員の尽力により、MIDC の各鋳造技術部門が取り組むべき、技術向上、意識改善等に係る提言がなされた。

5-2 教訓

本件評価を通じて得られた、他の技術協力プロジェクトに対する教訓は以下のとおり。

（1）計画段階において、上位目標、あるいはプロジェクト目標の達成状況にかかる指標の明確化、実施機関側の指標提供体制の確認がなされるべきである。

（2）本プロジェクトにおいては、MIDC が以前受けたベルギーからの協力に比べ、カウンターパートの独立性を尊重し、また技術部門間の連携体制を重視する技術移転方針を採用したことから、彼等の職務に対するモティベーションが高まったことが確認されたところ、他の類似プロジェクトにおいても参考にされるべきである。

（3）機材供与の効率性を高めるために、計画段階においてターゲット・グループのニーズに適った機材を選定するよう留意すべきであることに加え、可能な範囲で機材の現地調達を推進すべきである。

（4）本プロジェクトにおいては、部門をまたがる専門家の配置が効果的な技術移転、技術サービスの提供体制強化につながったことから（鋳造技術管理、製造技術担当の長期専門家、設備保全、巡回指導に特化した短期専門家）、他の類似プロジェクトにおいても参考にされるべきである。

別 添 資 料

1　ミニッツ
2　合同評価報告書
3　評価グリッド
4　調査団員による技術指導評価報告
5　質問票

別 添 資 料

1　ミニッツ
2　合同評価報告書
3　評価グリッド
4　調査団員による技術指導評価報告
5　質問票と集計結果

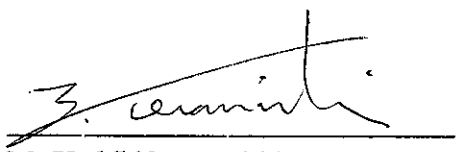
MINUTES OF MEETING
BETWEEN THE JAPANESE FINAL EVALUATION TEAM AND THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF THE REPUBLIC OF INDONESIA ON THE JAPANESE TECHNICAL COOPERATION FOR THE PROJECT ON SUPPORTING INDUSTRIES DEVELOPMENT FOR CASTING TECHNOLOGY IN THE REPUBLIC OF INDONESIA

The Japanese evaluation team organized by the Japanese Evaluation Team (hereinafter referred to as "the Japanese Team") organized by Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Mr. Yoshihide Teranishi, visited the Republic of Indonesia from October 6 until 24, 2003 for the purpose of undertaking final evaluation jointly with the Indonesian Evaluation Team (hereinafter referred to as "the Indonesian Team") on the achievement of the Japanese technical cooperation for the Project on Supporting Industries Development for Casting Technology in the Republic of Indonesia (hereinafter referred to as "the Project") on the basis of the Record of Discussions (hereinafter referred to as "the R/D") signed on December 15, 1998.

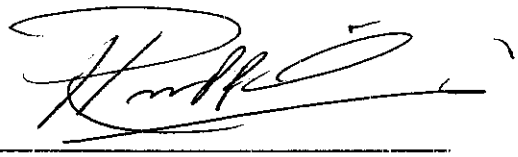
After the Joint Evaluation of the Project, the Japanese Team discussed with the authorities concerned of the Republic of Indonesia for the successful implementation of the Project.

As a result of the discussions, both sides mutually agreed upon the matters referred to in the document attached hereto.

Jakarta, October 23, 2003



Mr. Yoshihide Teranishi
Leader, Japanese Evaluation Team
Director, First Technical Cooperation Division
Mining and Industrial Development
Cooperation Department,
Japan International Cooperation Agency



Mr. Nurdin Noor
Secretary to the Directorate General
Directorate General of Small and Medium
Industries, Ministry of Industry and Trade

ATTACHED DOCUMENT

1. Recognition of the Joint Evaluation Report

The Joint Coordinating Committee recognized the Joint Evaluation Report submitted as the result of the joint work by both teams.

2. Completion of the Project

Both sides agreed that the Project would be completed on March 31, 2004 as stipulated in the R/D.

3. Further Input into the Project until March 31, 2004

Both sides confirmed the further input until the end of the Project as follows.

3.1. Japanese side

The Japanese side continues the technology transfer of three (3) long-term experts in the following fields:

a) Chief Advisor (until March 31, 2004)

b) Project Coordinator (until March 31, 2004)

c) Moulding / Manufacturing Technology (until March 31, 2004)

In addition, the dispatch of three (3) short-term experts is scheduled.

3.2. Indonesian side

The Indonesian side continues to provide the input into the Project as agreed upon in the R/D.

4. List of Attendants

The list of attendants is as shown in the Annex 1and 2

JOINT EVALUATION REPORT ON

JAPANESE TECHNICAL COOPERATION FOR THE

PROJECT ON SUPPORTING INDUSTRIES DEVELOPMENT FOR

CASTING TECHNOLOGY IN THE REPUBLIC OF INDONESIA

October 23, 2003

Jakarta, The Republic of Indonesia

Mr. Teranishi Yoshihide
Leader, Japanese Evaluation Team
Japan International Cooperation Agency

Mr. Nurdin Noor
Leader, Indonesian Evaluation Team
Ministry of Industry and Trade

CONTENTS

1. Introduction

1-1 Background of the Final Evaluation

The Japanese evaluation team (hereinafter referred to as "the Japanese Team") organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Mr. Yoshihide Teranishi visited the Republic of Indonesia from 6 October, 2003 for the purpose of conducting a final evaluation jointly with the Indonesian evaluation team (hereinafter referred to as "the Indonesian Team") on the Project on Supporting Industries Development for Casting Technology in the Republic of Indonesia (hereinafter referred to as "the Project") on the basis of the Record of Discussions (hereinafter referred to as "the R/D") signed on 15 December, 1998.
Through careful investigation and discussions, both Teams summarized their findings in this report.

1-2 Objectives of the Final Evaluation

The evaluation exercise had the following objectives:

(1) To comprehensively evaluate the Project by reviewing (a) the degree of achievements of the Overall Goal and Project Purpose and (b) the results of Outputs, Activities and Inputs;
(2) To make recommendations to those who are involved in the Project taking the result of the evaluation into consideration; and
(3) To derive lessons from the Project for improving planning and implementation of similar technical cooperation projects in the future.

1-3 Methodology of the Final Evaluation

The evaluation was conducted in terms of five criteria, namely relevance, effectiveness, efficiency, impact and sustainability[1], in accordance with the Project Design Matrix (hereinafter referred to as "the PDM") for the Project by means of:

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[1] **Relevance:** Relevance refers to the validity of the overall goal and the project purpose of a project in connection with recipient country's development policy, actual needs of the target beneficiaries and the aid policy of the donor country.
Effectiveness: Effectiveness refers to the extent to which the project purpose has been achieved as a result of the outputs of the project.
Efficiency: Efficiency refers to the productivity of the implementation process, i.e. to what extent the inputs and activities of the project have been converted into the outputs.
Impact: Impact refers to direct/indirect, positive/negative and foreseeable/unforeseeable effects that have been or will be caused by implementation of the project. The overall goal of the project could be interpreted as the direct, positive and foreseeable impact of the project.
Sustainability: Sustainability refers to the extent to which the benefits generated by the project can be sustained.

(1) examination of related documents (the R/D, minutes of meeting on the Project, Japanese experts' reports, various documents prepared by related organizations, etc.);
(2) a questionnaire survey and interviews with the Japanese experts, Indonesian counterpart personnel (hereinafter referred to as "C/P") and other parties involved in the Project; and
(3) discussion between the Japanese team and the Indonesian side including evaluation team members and related officials on the results and future prospect of the project activities.

1-4 Members of the Evaluation Teams

1-4-1 Indonesian Team

Mr. Nurdin Noor	Leader Secretary to the Directorate General Directorate General of Small and Medium Industries and Trade, Ministry and Industry and Trade (MOIT)
Mr. Yos Rizal Anwar	Member of Supervisory Board of Indonesian Foundry Industries Association (hereinafter referred to as "APLINDO") CEO of Bakrie Tosanjaya
Mr. A. Safiun	President of APLINDO
Mr. Cuk Sutoyo	Agrindo
Mr. Soejitno	Head of Ceper Laboratory
Prof. Dr. Rachim Suratman	Institute of Technology of Bandung

1-4-2 Japanese Team

Mr. TERANISHI Yoshihide	Leader Director, First Technical Cooperation Division Mining and Industrial Development Cooperation Department JICA
Dr. OKADA Senri	Technology Transfer Planning Technical Advisor The Materials Process Technology Center
Ms. YAMAUCHI Chikako	Training Planning The Materials Process Technology Center

Mr. YAMADA Minoru	Cooperation Planning Staff, First Technical Cooperation Division Mining and Industrial Development Cooperation Department JICA
Ms. MAMIYA Shinobu	Evaluation Analysis Global Link Management, Inc.
Mr. HARA Hiromichi	Evaluation Management Associate Expert First Technical Cooperation Division Mining and Industrial Development Cooperation Department JICA

1-5 Schedule of the Final Evaluation

October 6	Arrival at Jakarta (Ms. Mamiya and Mr. Hara)
October 7	Meeting with JICA Indonesian office Meeting with IDKM, Ministry of Industry and Trade Interview with a private firm
October 8	Interview with APLINDO and Indonesian Foundrymen's Association (hereinafter referred to as "HAPLI") Interview with a private firm Move to Bandung
October 9	Courtesy call to MIDC Discussion with the Japanese experts
October 10	Interviews with C/P Drafting the Joint Evaluation Report (here JER)
October 11	Drafting JER
October 12	Ditto
October 13	Ditto Supplementary survey
October 14	Drafting JER Arrival at Jakarta (Dr. Okada, Ms. Yamauchi and Mr. Yamada) Move to Bandung
October 15	Interview with C/P Observation of the project site
October 16	Interview with C/P Discussion with the Japanese experts
October 17	Move to Jakarta (Mr. Yamada) Meeting with the JICA Indonesia office

	Meeting with BPPIP
	Meeting with the Director General of IDKM
	Move to Bandung (Mr. Yamada)
	Interview with C/P
	Visit to a private firm
	Meeting with the former head of MIDC
October 18	Data collection and analysis
	Drafting JER and Minutes of Meeting (M/M)
	Arrival at Jakarta (Mr. Teranishi)
October 19	Drafting JER and M/M
	Move to Bandung (Mr. Teranishi)
October 20	Discussion with MIDC on JER
October 21	Ditto
	Move to Jakarta
October 22	Discussion with the Indonesian Team
October 23	Joint Coordinating Committee
	Signing of M/M
October 24	Report to the embassy of Japan
	Report to the JICA Indonesia office
	Departure from Jakarta

2. Outline of the Project

2-1 Background of the Project

The Institute for Research and Development of Metal and Machinery Industries (IRDMMI/MIDC; hereinafter referred to as "MIDC") under the Ministry of Industry and Trade is one of the central public technical support organizations which was established with the aim of strengthening the technical capability of the metalworking and machinery industries in the Republic of Indonesia.
In response to the request from the Indonesian government, both Japanese and Indonesian sides agreed on the implementation of the Project between 1 April 1999 and 31 March 2004, which aims at the development of the supporting industry in Indonesia focusing on casting technologies.

2-2 Project Design Matrix

The PDM for the Project is shown in Annex 1. There has not been any change in the PDM during the project period. The Overall Goal, Project Purpose, Outputs and Activities of the Project described in the PDM are as follows:

(1) Overall Goal

Small and medium scale foundry industries will be able to provide domestic assembly industries with casting products to meet their quality level.

(2) Project Purpose

Technical services for small and medium scale foundry industries extended by MIDC will be improved.

(3) Outputs and Activities

The Outputs and Activities for realizing each Output as described in the PDM are as follows:

Output 0. Project operation unit will be enhanced.
0-1. Allocate necessary personnel.
0-2. Make plans of activities.
0-3. Make budget plan and execute properly.
0-4. Establish and operate management system.

Output 1. Machinery and equipment will be provided, installed, operated and maintained properly.
1-1. Make facility refurbishment plan and implement as planned.
1-2. Provide and install machinery and equipment.
1-3. Operate and maintain the machinery and equipment properly.

Output 2. Technical capability of the counterpart personnel will be upgraded.
2-1. Make Technical Cooperation Program
2-2. Implement technology transfer to the C/P.
2-3. Monitor and evaluate the technology transfer to the C/P.

Output 3. Trial Prototyping services will be implemented systematically.
3-1. Make plan of trial prototyping services.
3-2. Implement the trial prototyping services.
3-3. Monitor and evaluate the trial prototyping services.

Output 4. Technical dissemination services will be implemented systematically.
4-1. Make plan of technical dissemination services.
4-2. Implement the technical dissemination services.
4-3. Monitor and evaluate the technical dissemination services.

Output 5. Information services will be implemented systematically.
5-1. Make plan of information services.
5-2. Collect and compile technical information and material.
5-3. Provide industries with technical information and material.
5-4. Monitor and evaluate the information services.

2-3 Plan of Operation

The latest Plan of Operation for the Project (hereinafter referred to as "PO"), showing the actual results as well as the original plan, is shown in Annex 2.

2-4 Technical Cooperation Program

The latest Technical Cooperation Program (hereinafter referred to as "TCP") for the Project, showing the actual results as well as the original plan, is shown in Annex 3. The items of technology transfer to be covered as described in the TCP are as follows:

(1) Casting Design
(2) Pattern Making
(3) Moulding
(4) Melting
(5) Examination and Quality Control

2-5 Tentative Schedule of Implementation

The latest Tentative Schedule of Implementation (hereinafter referred to as "TSI") for the Project, showing the actual results as well as the original plan, is shown in Annex 4.

3. Results and Achievements of the Project

The overall performance of the Project was found to be satisfactory. Details of the results and achievement of the Project are described in this chapter.

3-1 Inputs

Inputs from both Japanese and Indonesian sides were generally provided in line with the original plan, although some shortage and delay were noticed.

3-1-1 Inputs from the Japanese Side

3-1-1-1 Dispatch of Experts

Eight long-term experts were dispatched. For the project management, two Chief Advisors and two Project Coordinators (the one covered the SME development as well) were dispatched to cover the project period. For the technology transfer, the fields of experts include the Casting Technology Management; Pattern Making; Moulding, and Moulding & Manufacturing Technology. 58 short-term experts were dispatched as of Oct. 2003. List of experts is shown in Annex 5.

3-1-1-2 Equipment Provision

There has been equipment provision, an equivalent of JPY 292 million. The details of the equipment are shown in Annex 6.

3-1-1-3 Training of Indonesian C/P in Japan

18 C/P received the training in respective fields under the C/P training program in Japan. The details of the training are shown in Annex 7.

3-1-1-4 Local Cost Support

As of September 2003, the total amount of expenditures for the Project borne by the Japanese side was 39.0 million Japanese yen. The breakdown of expenditures is shown in Annex 8.

3-1-1-5 Others

In addition, three study teams were dispatched, such as the Consultation (Uneishido), a Mid-term Evaluation, and the Final Evaluation during the project period.

3-1-2 Inputs from the Indonesian Side

3-1-2-1 Input of Personnel

There have been 40 full-time C/P (including 9 daily workers) allocated over the project period from the Indonesian side. The list of C/P is shown in Annex 9.

3-1-2-2 Input of Operational Cost

As of September 2003, the annual amount of expenditure for the Project borne by the Indonesian side was Rp.318.6 million in 2000, Rp.200.0 million in 2001, and Rp 269.0 million in 2002. A breakdown of expenditures is shown in Annex 10.

3-1-2-3 Others

Indonesian side also allocated 133 sorts of equipment or machinery to be used for the project activities. Some of them are not in operative condition. Details of the equipment are shown in Annex 11. Office space and office equipment were provided for the Japanese experts and local staff was allocated to support the administrative work of the Project.

3-2 Activities and Outputs

The progress of each activity and the achievement of each output were confirmed to be correspondent with the schedule. Details of the activities are shown in Annex 2 for the PO, in Annex 3 for the TCP, in Annex 4 for the TSI, and Annex 12 for the Achievement of the Project.

3-2-1 Output 0: Project operation unit will be enhanced.

In general, project management of the casting department has been successfully enhanced. It is expected that the organizational restructuring, which is now in progress, has served to further strengthen the foundry activities.

(1) The addition of new permanent staff was a remarkable achievement under the current zero-growth policy. Furthermore, during the project period, four staff members were employed under the project budget and assigned as C/P of the Project.

(2) In 2002, due to the change of the supervisory body of MIDC from BPPIP to IDKM, the organization of MIDC has been restructured based on the "Business Plan" proposed by IDKM. This organizational change has strengthened the foundry activities as it is now promoted to the departmental level, which used to be the section under the product department. The current organization chart of MIDC is shown in Annex 13-1.

(3) Although the amount of Indonesian budget was sufficient, it is identified that there were some delays in disbursement of the budget due to institutional reasons. In some occasions, the Japanese side had to cover such costs as spare parts of equipment that should have been borne by the Indonesia side.

3-2-2 Output 1: Machinery and equipment will be provided, installed, operated and maintained properly.

Most of the equipment provided by JICA for the foundry activities was operated and maintained properly under the maintenance system.

(1) Provision and installation of machinery and equipment were completed during the first year of the Project. Preparation of the manuals for operation and maintenance of machinery and equipment were also completed during the first year.

(2) Each section assigned a person to monitor the condition of the equipment used and the maintenance section takes the overall responsibility to repair the equipment as well as to conduct safety control if needed. The list of person in charge is shown in Annex 14.

(3) Much effort was made to install the equipment, as the local suppliers did not have the appropriate technologies required for meeting the specifications of the equipment.

(4) Some problems were observed in the process of obtaining necessary spare parts and consumables. This relates to the problem of timing in budget disbursement by the administration of MIDC.

3-2-3 Output 2: Technical capability of the counterpart personnel will be upgraded

In this subsection, the achievement of the Output 2 is reviewed. In evaluating the technical capability of the C/P, not only their technical knowledge as engineers/technicians but also their mindset for being in charge of a specific technical part of the diverse casting production process were considered. The observation consists of three parts: first, a general review on the overall performance of MIDC's casting production focusing on such factors as production volume and defect ratio; second, survey on the progress of technology transfer from the viewpoint of the target castings; third, an examination of the C/P's technical capability in respective technical fields.

3-2-3-1 General Review on the Overall Performance of MIDC's Casting Production

During the project period, 242 castings have been produced as of the beginning of September 2003 (Annex 15). In the process of production, the technology transfer was conducted in respective technical fields. The trend of ordered castings production is shown in Annex 16. The average monthly production volume has increased from 2.3t at the beginning of the Project (i.e. in 2000) to 6t in 2003 (as of September 2003). It is assumed that this increase was made possible by the fact that, as a result of the decrease in the defect ratio from 9% in 2000 to 3.5% in 2003 (as of September 2003) (Annex 17), the rate of castings that could be directly delivered to the customers increased.

The decrease in the defect ratio could be attributed to three factors. First, C/P's technical level in individual fields was upgraded. Second, C/P's awareness towards teamwork was increased; for example, the "inter-field" linkage among respective technical fields was strengthened, which was the major policy of technology transfer in the first half of the Project. Finally, the awareness towards operation emphasizing "visual control", which has been the major policy of technology transfer in the latter half of the Project, has been steadily instilling among the C/P.

In addition, "*kaizen*" activities, where improvement of quality and efficiency is sought with the participation of all the C/P, have been started recently. Some proposals have been already submitted by the C/P. An example of "*kaizen*" is shown in Annex 18.

Furthermore, it should be noted that the composition of the Japanese experts in charge of technological transfer was elaborately considered. In addition to the experts in specific technological fields, the long-term experts in charge of "casting technology management" and "manufacturing technology" were dispatched with the aim of enabling systematic transfer of diverse technologies (which are characteristic of casting production).

Overall, it could be concluded that technology transfer for casting production was conducted as scheduled.

3-2-3-2 Survey on the Progress of Technology Transfer from the Viewpoint of the Target Castings

In the Project, five technological levels have been defined according to their difficulty as shown in Annex 19. Several appropriate target castings that require the expertise in each technological element for production were selected. The list of the target castings successfully produced is also shown in Annex 19. In the course of technology transfer, quality of those target castings was checked in order to grasp C/P's technical level. The numbers of the target castings that were satisfactorily produced and approved by the Japanese experts are, from Level One (the easiest) to Level Five (the most difficult), 9, 7, 12, 7 and 3 respectively (Annex 19). It should be noted that the technologies required for producing Level Five target castings are highly appreciated even in Japan.

Another remarkable achievement is that the cylinder head, one of the successfully produced target castings, is currently imported but will be produced domestically in the near future. Annex 20 shows the illustrated process of successful manufacturing of the stick cup, another example of the successfully produced target casting. Although the policy of selecting target castings was changed in the course of the Project[2], comparing the lists of the target castings before and after this change in policy, it could be concluded that the technical capability of the C/P to produce advanced castings has been upgraded as planned.

3-2-3-3 Examination of C/P's Technical Capability in Respective Technical Fields

During the cooperation period, C/P's technical levels in respective technological fields have been periodically measured making use of the Monitoring and Evaluation Sheet for TCP (Annex 21). The grading system was designed so that Grade Four is roughly equivalent to the

[2] Although target castings were assigned by the Japanese side at the initial stage, as the Project went on, castings ordered from the customers of the trial prototyping services came to be used as the target castings. This change in the policy was authorized when the Mid-term Evaluation Team visited the Project in January 2002.

technical level required for a Grade Two technician under the Japanese skills evaluation system. It should also be noted that the grade given represents the technological levels of the technical groups as a whole rather than individual C/P in respective groups. With the help of this Annex, the achievements of technology transfer in respective technical fields are presented below.

(1) Casting Design

It can be observed that, in the field of casting design, the C/P have reached the target level in most of the subjects covered by Annex 21.
The quality of casting design could be evaluated by observing the frequency of shrinkage defects. Annex 22 shows the Pareto diagram analyzing the type of defects that occurred in production of ordered castings from 2001 to 2003. It can be observed that shrinkage defects occurred most frequently among all types of casting defects in 2001 and 2002. In 2003, however, the occurrence rate of this type of defect has remarkably decreased (third most frequent) accounting for only 5% of all the defects, which illustrates the significant improvement in the technical level of casting design.

It is assumed that this improvement is partly attributed to the fact that the provided casting simulation device was effectively utilized. It should be noted that, with the help of this device, the C/P can now provide casting design services for private companies. The name of companies that utilized this service is listed in Annex 23.

Although the grade given to the C/P in terms of casting specification falls behind the target level, this could be partly attributed to the unfavorable commercial custom where the awareness towards clear specifications is generally low.
Despite the above achievement, it seems to be problematic that produced casting designs are left in individual computers, not being stored in a database.

(2) Pattern Making

According to Annex 21, C/P's technical level has improved to Grade Four as targeted in many subjects. In addition, when the group leader of this field came to Japan for training, he was said to be well qualified as a Grade Two technician under the Japanese skills evaluation system. Thus, it could be concluded that this group has generally achieved the target technical level.

Regarding the subject of "handling and maintenance of hand tools", the C/P has not reached the target level yet. This could be partly attributed to a difference in customs between Indonesia and Japan; in the finishing process of pattern making, while hand tools are widely used in Japan, use of emery is common in Indonesia. As the Japanese experts who taught the C/P in the past have the opinion that "Although, in Japan, proficient use of hand tools is indispensable for producing patterns of required accuracy, finishing by using emery might be appropriate to improve efficiency in Indonesia considering the current level of required

accuracy", it should be reasonable to change the target level itself from Four to Three and conclude that the current technical level is satisfactory.
The target level has not been achieved in the subject of "inspection of pattern", either. The major cause of this situation seems to lie in carelessness rather than technical capability.
Regarding "mending and storage of patterns", another subject where further improvement is required, the fact that the reform of the workplace for pattern making is underway seems to be the obstacle to the achievement of the target level.

(3) Sand Preparation and Moulding

This technical field contains a wide range of technologies/skills such as sand preparation, green sand moulding (hand moulding and machine moulding), organic sand moulding, core making and sand reclamation. Accordingly, many Japanese experts have been dispatched. As far as the defects related to sand preparation and moulding are concerned, the defect ratio has remarkably decreased. This is a clear evidence of improvement in the overall technologies/skills related to sand preparation and moulding. Accordingly, the targeted Grade Four has been achieved in most subjects.

Regarding hand moulding, the Japanese experts often work jointly with MIDC's daily workers employed on a temporary basis. The grade recorded in the Monitoring and Evaluation Sheet for TCP falls behind the target level assumedly due to the limited skills of these workers.

Regarding double squeeze sand moulding, the basics of mechanized mass-production moulding were taught and the taget technical level has been achieved. Although moulding machines are highly mechanical facility, gradual improvement in technologies for undertaking repair and renovation of related machinery can be observed.

The technical subjects related to the jolt squeeze moulding machine are not evaluated. This is because the moulding machine, originally owned by MIDC, is too obsolete and has not been in order in spite of Project's attempt to overhaul it. It should be noted, however, the knowledge of double squeeze sand preparation and the practical skills required for hand moulding could be applied to jolt squeeze operation.

Regarding organic sand moulding, control of moulding sand and facility maintenance were particularly emphasized in technology transfer. The technologies for sand control have been improved through collaboration with the sand laboratory and appropriate control has come into practice. Accordingly, this technical field could be viewed as the model of the visual control in MIDC foundry.

Regarding core making, the originally planned way of technology transfer had to be revised due to the difficulty in procuring binder from the local market. As the Japanese experts taught to accumulate basic data on substituting processes, however, this change did not hinder the technology transfer in this field.

(4) Melting

If melting time is taken up as an indicator for technical evaluation, it can be said that C/P's overall technologies has reached the target level because the time required for melting has become shorter as well as less dispersive (Annex 24).

However, the subject of "selection of storage of materials" could not be adequately covered because, in Indonesia, it is currently impossible to procure raw materials that are provided with appropriate quality control as is common in Japan. In addition, the C/P do not have sufficient basic knowledge regarding some technical measures such as the change in melting elements.
The problem of this technical field seems to be that the C/P lack in theoretical knowledge such as fundamental metallurgy and practical experience in temperature measuring, pouring, sampling of analytical samples, and so on.

(5) Examination and Quality Control

The technology transfer of casting examinations and countermeasures against defects has been conducted in terms of both theories and practice. Currently, the C/P understand inspection methods and are gradually becoming proficient in skills through accumulation of experience in practical inspections. The C/P also came to have adequate knowledge for drawing relevant conclusions in pursuing the causes of casting defects.
As castings are ordered without sophisticated specifications, however, the C/P have not fully realized the significance of quality assurance.[3] In addition to this, as currently no C/P are exclusively responsible for this technical field, the Japanese experts were unable to make them proficient in technologies through repeated guidance. It seems that the achievement of the target technical level in some subjects is unattainable unless the Indonesian foundry industry as a whole including end-users of castings has a higher level of awareness towards inspection technologies.

In terms of quality control technologies, the overall policy of promoting visual control has been taking root; the C/P have come to not only record the data but also understand the processed statistical data on quality control.

(6) Facility Maintenance

Casting production requires a complicated facility system. A failure of the facilities in a part of the production process can cause a stoppage of the whole production line. The technology transfer in this field has covered a wide range including guidance on facility maintenance to the responsible C/P, guidance on daily checkup and maintenance to device operators and the establishment of a management system of tools and spare parts. Considering this wide range of technologies to be transferred, a Japanese expert exclusively in charge of facility

[3] This issue is also related to the item 1-5 of the TCP, i e "casting specification"

maintenance was dispatched repeatedly, nine times in total.
A facility maintenance room was set up within MIDC foundry and expert's guidance was made to facilitate the control of tools and spare parts. C/P's basic technologies of facility repair have also improved mainly through training in Japan.
The importance of daily checkup and maintenance has been taught to many device operators by preparing formats for inspections. It is observed, however, the custom of regularly filling in the formats has not fully taken root.
Regarding the maintenance system of spare parts, a proposal on the system was submitted to the management, urging them to introduce a system suitable to MIDC based on the proposal.

Overall, it has to be concluded that the target technical level has not yet been fully achieved despite the continuous efforts extended by the Japanese experts. It seems that the awareness of all the staff, which is indispensable to introducing the practice of effective facility maintenance practice, is still low.

3-2-4 Output 3: Trial prototyping services will be implemented systematically.

The total of 242 trial prototypical products has been made by the beginning of September 2003 as shown in Annex 25. The defect ratio has fallen from around 9% in 2000 to 3.5% in 2003. As a result, the income earned by providing these services has been gradually increasing since the year 2000.

(1) The numbers of prototypical products by products type are as follows:

77	for Automotive components
9	Agricultural machinery components
20	Electrical components
48	Textile machinery components
20	Castings for Jig and Fixture for automotive assembling
12	Industrial machinery components for multifarious industries
56	Others

(2) The collaboration among staff in each process is essential for producing prototypical products. The Project helped strengthen the teamwork among the casting department through technology transfer, thus increase the efficiency in production process.

(3) The recent organizational reform has resulted in decentralization of the marketing section to each technical department. The marketing section will be responsible for the planning, implementation, and monitoring of various technical services.

3-2-5 Output 4: Technical dissemination services will be implemented systematically.

Technical dissemination services include extension services (technical consultation) and training services.

3-2-5-1 Extension Services

The total number of 71 foundries has been visited by the Project. The number of extension services has accumulated to 192 times. Such consultancy services have been appreciated by those foundries and they have been continuously conducted on a regular basis for those identified targeted clients, 14 companies. JICA silver experts have also exchanged information with the experts of this Project in terms of local market needs and technologies. (See Annex 26)

(1) The extension services helped improve the knowledge and skills of the C/P, especially in the process of problem solving.

(2) The services also greatly contributed to increasing the reputation of MIDC among foundry companies. According to the survey and interviews conducted for the service recipients, professional advice by the Project is highly evaluated, especially for the improvement of product quality.

(3) Short-term experts who are exclusively in charge of extension services were dispatched in order to complement the work of long-term experts.

(4) Some concerns arise whether or not the Indonesian C/P themselves can manage to deliver services after the completion of the Project, as MIDC has heavily relied on the Japanese side technologically and financially.

3-2-5-2 Training Services

Training courses have been successfully conducted with limited assistance from the Japanese side. (See Annex 27) The C/P have even developed new training courses such as casting design simulation. The average satisfaction ratio of trainees has maintained the preferable level (4 out of 5) in the series of services provided since 2001.

(1) 18 training courses have been carried out for small and medium scale foundries and in total 229 trainees have participated in the courses.

(2) Three training courses have been offered for joint venture companies and universities on a charged basis and in total six trainees have participated in the courses.

(3) Some textbooks were revised to reflect the current technology in the market, and the additional manuals and materials were prepared to cover new subjects such as countermeasures for the defects in production, defect analysis, and material improvement. For details, see Annex 28.

(4) Interns from various universities were accepted in MIDC foundry providing them with precious learning opportunities on the OJT basis.

3-2-6 Output 5: Information services will be implemented systematically.

Information services have been implemented in the form of seminars and publications.

3-2-6-1 Seminars

Seminars conducted by the Project have served to improve the communication among participants, concerned organizations and companies. And they also contributed to enhancing the reputation of MIDC as the center of excellence to help improve the supporting industries.

(1) Five seminars on Iron Casting Technology and one commemorative seminar have been held so far. In total, 980 participants attended these seminars as shown in Annex 29.

(2) The average satisfaction level of seminar conducted in 2003 has slightly decreased compared with those conducted previously but for good reasons. The location of the seminar has been shifted to MIDC instead of local hotels resulting in the limitation of the number of participants accommodated. However, the change of location minimized the budget, and gave good opportunity for participants to visit MIDC's facilities.

(3) Seminars have also provided good opportunities for the stakeholders involved in the Indonesian foundry circle to gather in one place. At the same time, they offered the chance to exhibit the materials and consumables used in the production process.

(4) MIDC took the initiative in organizing the seminars. However, the support from the Japanese side, especially at the planning stage, contributed to increasing the satisfaction level of participants.

(5) The critical comments were heard that the current needs of the foundry industry should always be reflected to the topics of seminars in order to meet the requirement of the industries and maintain the satisfaction level of participants.

3-2-6-2 Publications

Publications and video have been produced during the project period as shown in Annex 30. These publications were distributed to related parties and contributed to disseminating the information of casting technologies.

(1) Four publications such as Project Leaflet, Project Pamphlet, Casting Technology Handbook, "Metal Indonesia, vol. 024/2002", Iron Casting Technology Edition, were produced by the Project. They were distributed to the participants of seminars, related organizations and visitors of MIDC. It should be noted that the Casting Technology Handbook has been widely used as a useful reference book not only by private foundries but also by the users of casting products and students.

(2) One promotion video for the Project was prepared and distributed to the related organizations.

(3) It is identified that the distribution of these publications could have been conducted more actively by utilizing various channels such as APLINDO, HAPLI, etc.

3-3 Project Purpose

The Project Purpose is "Technical services for small and medium scale foundry industries extended by MIDC will be improved."

In general, the beneficiaries of MIDC's technical services have shown satisfaction to their quality. The six Outputs have directly contributed to the achievement of the Project Purpose. Combined efforts of Japanese and Indonesian sides have contributed to improving the overall performance of technical services of MIDC.

(1) Average satisfaction ratio of the participants for the training courses and the seminars has maintained the preferable level (4 out of 5) in the series of services throughout the project period.

(2) The data to monitor the expectation of the technical services by the industries were collected by questionnaires for those participated in the seminars. The respondents were requested to select their preferable services with multiple choices. The percentage obtained represents comparative preference of the respondents among the given service choices. Therefore, it is not appropriate to compare the percentage of preference for one service with that of the previous survey.

(3) The number of beneficiaries for these services has increased as shown in Annex 31. For extension services, the number of visits increased every year and the total number of visits as of September 2003 reached 192 times. The number of the trainees participated in the training courses have also increased every year. As of September 2003, in total 235 trainees received the training courses provided by MIDC. More than 100 people participated in each seminar. The total number of seminar participants so far reached 980 as of September 2003.

(4) In addition, MIDC is now ready to launch new technical services for the clients such as casting design simulation, sand testing and metal analysis.

(5) The increasing trend of income received through technical services has served to confirm that more clients expect to receive such services from MIDC. According to the income report of MIDC, the annual self-income of foundry shop for product manufacturing was Rp.8.8 million in 2000 and it increased to Rp.35.2 million in 2002. For 2003, the annual income up to September is Rp.24.5million as shown in Annex 32.

(6) The trend of defect ratio of the products in MIDC foundry indicates the quality improvement. The average defect ratio per month in 2000 was 9.0% and then decreased to 3.5% in 2003 (as of September 2003) as shown in Annex 17.

(7) In conclusion, judging from the performance of these indicators and the comments received from beneficiaries and related industries, the project purpose could be said as "achieved." However, in order to sustain the current level of achievement, continuous efforts to identify the needs of the industry and to improve the contents of the services are needed.

3-4 Overall Goal

The Teams could not obtain sufficient information for objectively confirming the achievement level of the Overall Goal.

(1) According to the PDM, the verifiable indicators for measuring the achievement level of the Overall Goal are "the increase of production delivered to assembly industries", "improvement of quality of products" and "improvement of productivity and efficiency".

(2) As the information related to the performance of the first indicator "increase of production delivered to assembly industries", the Teams confirmed that the annual production of automobile, the largest user of casting products, has increased from 123, 244 in 1999 to 299,257 in 2002.[4] However, this increase in automobile production has little relationship with the performance of "small and medium scale foundry industries".[5] The sector-wide statistics of the foundry industry, which could be much more relevant indicator, are not currently available. As alternative information, the Teams found that the annual average casting production of 12 selected Indonesian foundries (which are beneficiaries of MIDC's services) increased from 1,970t in 2000 to 4,630t in 2002.[6] In addition, according to the interviews conducted during the evaluation, one of these selected foundries successfully received orders from world-class assemblers. These could be regarded as partial achievement of the Overall Goal.

(3) The performance of the second indicator "improvement of quality of products" can partly be explained by the reject ratio of the 12 selected foundries, which improved from 11.3% in 2000, 9.6% in 2001 and 8.7% in 2002.[7] The above-stated example of the beneficiary foundry that received orders from world-class assemblers could also be viewed as the evidence of "improvement of quality of products". Another example is that other

[4] Source of data is "GAIKINDO, 2002"
[5] This irrelevant information was collected for reference as this was also used in the Mid-term evaluation conducted in January 2002.
[6] Source of data is "Survey on Productivity and Expectation of Indonesian Foundries" conducted by the Project in 2001 and 2003.
[7] Source of data is "Survey on Productivity and Expectation of Indonesian Foundries" conducted by the Project in 2001 and 2003

beneficiary foundry is now in the process of developing new products (e.g engine for an agricultural machine) by utilizing the technology transferred by MIDC. Thus, it could be said that the Overall Goal has been to some extent achieved with regard to the second indicator.

(4) As for the performance of the third indicator "improvement of productivity and efficiency", it cannot be examined because reliable data are not available at the time of final evaluation.

(5) Thus, although comprehensive performance could not be confirmed, some preferable incidents indicating the achievement of the Overall Goal are surely taking place.

(6) However, as the verifiable indicators do not offer objective criteria for measuring the success, the Teams cannot make objective comments as to the achievement level of the Goal. At the same time, interpretation of the preferable incidents stated above does not seem to be uniform among stakeholders; while some insist that these are remarkable achievement, others argue the significance of such individual examples of success are marginal in the light of the Overall Goal.

4. Implementation Process

4-1 Monitoring process

(1) The PDM was developed before the inception of the Project as a tool to monitor the progress of project implementation. The verifiable indicators and means of verification for the Overall Goal and the Project Purpose were ambiguously determined. As the Indonesian economy was still in turmoil just after the 1997 East Asian Economic Crisis (hereinafter referred to as the "Crisis") and the institutional settings for providing baseline data were not operative, there seems to have been a consensus that these components of the PDM should be specified in the course of project implementation. However, the ambiguous verifiable indicators and means of verification has remained unchanged to date in spite of the fact that, when the Mid-term evaluation was conducted in January 2002, both Indonesian and Japanese sides exchanged M/M explicitly stipulating that some parts of the PDM, including verifiable indicators and means of verification, would be reviewed along with the progress of the Project by the time of final evaluation.

(2) The monitoring was not necessarily conducted through the joint work of both Japanese and Indonesian sides.

(3) In the second half of fiscal 2002, it was determined that the monitoring report was jointly prepared twice a year by both Indonesian and Japanese sides. Nevertheless, it has not been submitted so far.

4-2 Communications

Overall, the communications between the C/P and the Japanese experts have been very smooth in technology transfer, and the supporting system of the Project has contributed to maintaining such a level of communication.

(1) There were some language barriers between the C/P and the Japanese experts. However, the effort by the side of Japanese experts who struggled to acquire the Indonesian language and the effective use of an interpreter, who has been competent enough to learn complicated technical terms of casting production, has greatly contributed to maintaining the smooth communications between both parties.

(2) Communication among the Japanese experts has been extremely active. Especially exchanging the weekly reports by e-mail has facilitated the communication.

(3) Meetings between the C/P and the Japanese experts are held although not on a regular basis, contributing to mutual understanding of both sides. The morning meetings conducted on a regular basis have also served to promote the communication between the C/P and the Japanese experts.

(4) Japanese domestic advisory committee for the Project has set up for the purpose of providing the technical support with the Japanese experts and to facilitate the communication between the Project and the JICA headquarters. The secretariat was set up to help recruit the experts whose field perfectly matches the needs of the Project in a timely manner.

(5) It is notified that the Joint Coordinating Committees were held only three times although it is stipulated in the Record of Discussions that it should be held at least once a year. The committee members were supposed to exchange their views and comments in order to promote collaboration among the member organizations.

4-3 Awareness and Behavior of the C/P

According to the questionnaires and interviews conducted by the Japanese Team, many C/P expressed that, although they have experienced difficulties in following the working discipline introduced by the Japanese experts, they have gradually adopted it into practice. Those in management level, those belong to the other departments of MIDC, and the Japanese experts also recognized the change of working customs of MIDC foundry.

4-4 Policy and Special Consideration for Technology Transfer

The Japanese experts have adopted the policy of technology transfer to increase the effectiveness of the technology transfer. According to the interviews conducted during the evaluation, some C/P commented on the difference between the Japanese and Belgium cooperation.

4-4-1 Comparison of Technology Transfer between Japan and Belgium

(1) The technologies provided by Belgium were more or less fundamental knowledge and skills for casting production which might have been needed at that time, while the technologies transferred by the Japanese experts have been more advanced, which also match the current needs of MIDC.

(2) The mode of technology transfer is more or less towards individuals in case of Belgian assistance, while the Japanese assistance places a strong emphasis on teamwork. Especially, it is considered that the collaboration among staff in each production process, which is a common practice in Japan, is essential for successful technology transfer.

(3) In this sense, it is quite effective to dispatch long-term experts who can cover "inter-fields" issues. The expert in the fields of casting technology management was dispatched in the first half of the project period, while the expert in the field of manufacturing technology was assigned for the second half of the project period.

4-4-2 Procurement of Equipment

In the process of installation of equipment, much effort was made to cope with local suppliers' lack of appropriate technologies and awareness in specification and commercial procedures.

4-5 Important Assumptions

The PDM for the Project includes the following six important assumptions as the conditions for achieving the Project Purpose.

(1) There is no drastic change in the politic and economic situation in Indonesia.
(2) Supporting industries development policy will continue to be stable.
(3) Demand for Indonesian casting products will continue to be stable.
(4) Indonesian foundry industries will utilize the technology obtained from MIDC.
(5) Linkage between assembly and supporting industries will be established.
(6) Trained C/P will remain at MIDC.

There has been no persuasive evidence showing establishment of "linkage between assembly and supporting industries". Indeed, the Indonesian Team commented that the lack of the linkage is a serious problem small and medium foundries currently face. Thus, it has to be concluded that the fifth important assumption was not met. On the other hand, all other important assumptions were more or less met in the progress of the Project.

5. Five Criteria Evaluation

5-1 Relevance

5-1-1 Consistency with the Overall Development Policy of Indonesia

Since the mid-1990s, the Indonesian government has laid a strategic emphasis on the supporting industries. In particular, the ministry of trade and industries prepared *Industrial Revitalization Plan* that discusses the significance of the supporting industries.
Since the foundry industry is one of the supporting industries, the development of casting technologies is consistent with the policies of the Indonesian government.

5-1-2 Relevance of Implementing Body

It was appropriate to select MIDC as the implementing body of the Project. The mission of MIDC is to promote small and medium enterprises (hereinafter referred to as "SMEs"). The recent change of its supervising authority from BPPIP to IDKM could be regarded as a factor enhancing the relevance.

5-1-3 Relevance of the Target Group

At the planning stage of the Project[8], the target groups of the Project was expanded so that they include manufacturers of components of agricultural machinery etc. as well as automobile. The Teams conclude that this decision was appropriate for the following reasons.

(1) The Crisis inflicted severe damage on the Indonesian automobile industry.
(2) The scope of industrial development policies expanded into the agro-industry.
(3) In consideration of its technological level at the time, MIDC should put priority on building up basic technological capability.

5-1-4 Consistency with the Overall Aid Policy of Japan

In the first place, a development study conducted by JICA in 1997 emphasized the importance of the supporting industries and proposed implementation of this Project. Later, JICA has implemented a comprehensive SME promotion program in accordance with *Policy Recommendation for SME Promotion in The Republic of Indonesia* (hereinafter referred to as the '*Urata Report*'). As the *Urata Report* emphasizes the importance of strengthening the supporting industry, it could be said that the relevance of the Project was enhanced. Moreover, the Japanese metal casting industry is internationally competitive and it thus has precious resources to provide assistance for developing countries. The overall aid policy of Japan is also consistent with the Project.

[8] Report of the short-term study conducted by JICA in October 1998

5-1-5 Relevance of Project Design

The following two questions could be raised as to the relevance of the project design:

(1) Were the Overall Goal and its verifiable indicators and means of verification appropriately determined?

(2) Was the important assumption for ensuring the achievement of the Overall Goal, "Linkage between assembly and supporting industries will be established" appropriate?

As to the first question, it has to be admitted that the verifiable indicators and means of verification are rather ambiguous. Given the Overall Goal, in order to ensure sound monitoring and evaluation of the Project, verifiable indicators should have been determined more clearly. For example, such indicators as "the volume of casting products delivered to assemblers will increase by X%", "Y foundries will successfully deliver their products to assemblers with the help of MIDC's technical services" or "Local contents of selected assemblers in terms of casting components will increase by Z%" should have been worked out. It is impossible to measure the achievement level of the Overall Goal without this kind of clear indicators. In addition, ambiguous indicators caused different interpretation of the Overall Goal among stakeholders.

It is understandable that, taking economic turmoil after the Crisis into account, the Project was started with the consensus that the indicators and means of verification should be clarified in the course of implementation. However, the relevance of the project design might have been more sound if the formulation of such indicators and means of verification was internalized in the PDM as activities for enhancing the "project operation unit" (as stipulated in Output 0), which then should have the function to monitor the achievement level of the Overall Goal.

Given that such internalization was not considered, it is also regrettable that the agreement between both the Indonesian and Japanese sides could not be fully observed; although it has to be admitted that the Indonesia government has not fully recovered its function of providing industrial statistics as of yet, if the verifiable indicators and means of verification had been realistically determined paying attention to the actual progress of the Project, the relevance of the project design could have been significantly restored.[9]

With regard to the second question stated above, the important assumption seems to be inappropriate for two reasons. First, as the lack of linkage between assemblers and supporting industries is a serious problem even to date, the prospect of meeting this assumption cannot have been high at the planning stage. Second, in the general sense of the term, "linkage" between assemblers and supporting industries should mean active commercial transactions between the two parties. If that is the case, this important assumption and the Overall Goal seem to be almost tautology. On the other hand, if the "linkage" implied some different relationship between assemblers and supporting industry (e.g. some kind of institutional

[9] The JCC meetings, which were not frequently held, could have been an appropriate occasion to reconsider the project design

framework), such implication should be explicitly recorded in the PDM.[10]

5-2 Effectiveness

5-2-1 Achievement of the Project Purpose

The Project Purpose has been achieved to a fair degree. Technical services for small and medium scale foundry industries extended by MIDC have been improved.
This observation could be supported by the achievements stated in Chapter 3. Average satisfaction ratio of the participants for the training courses and seminars has maintained the preferable level. The increasing trend of income received through technical services has served to confirm that more clients expect to receive such services from MIDC. The quality of MIDC products has increased because of falling defect ratio.

5-2-2 Contribution of the Outputs to the Achievement of the Project Purpose

Six outputs have directly contributed to the achievement of the Project Purpose.

(1) Output 0
In general, project management of the casting department has been successfully enhanced. It is expected that organizational restructuring, which is now in progress will serve to further strengthen the foundry activities.

(2) Output 1
Most of the equipment provided by JICA for the foundry activities was operated and maintained properly under a fairly appropriate maintenance system, which has provided a sound basis for technology transfer.

(3) Output 2
Through the successful technology transfer, the C/P acquired technical capability necessary for improving the quality of various technical services for small and medium foundries. This observation could be supported by the achievements referred to in Chapter 3.

(a) The observed increase in average monthly production volume and decrease in defect ratio are regarded as the overall evidence of improved technical capabilities;
(b) Successful production of the target castings (above all Level Five castings) implies that, in terms of pure casting production technologies (that is, if such factors as

[10] Another thing that should be considered is that the Overall Goal is "Small and medium scale foundry industries will be able to provide domestic assembly industries with casting products to meet their quality", not "will provide" as seems to be understood by most stakeholders. In a sense, this was a cautious arrangement because it can be interpreted that the Goal is just expecting technical upgrading of target foundries and not expecting that they actually deliver their products to assemblers. If this is the case, however, the important assumption about linkage would not be necessary.

efficiency and costs are not considered), the technology transfer has been effectively conducted;

(c) The Monitoring and Evaluation Sheet for TCP clearly suggests that the technical levels of the C/P in respective fields have been significantly improved, many of them estimated to be qualified as a Grade Two technician under the Japanese Skills Evaluation System.

Various technical services of MIDC have been provided on the basis of upgraded capabilities. The performance of the three types of technical services specified in PDM is presented below.[11]

(4) Output 3

By the beginning of September 2003, MIDC has received 242 orders for trial prototypical products from various industries including the automobile, textile, electric appliances. Income through services has increased for these two years. During the project period, delivery time required for production has shortened due to the falling defect ratio, leading to a higher level of beneficiaries' satisfaction.

(5) Output 4

Technical consultancy has been carried out extensively. One of the beneficiary foundries has provided their products for world-class assemblers. According to the survey and interviews conducted for the service recipients, professional advice by the Project is highly evaluated, especially for the improvement of product quality. Nevertheless, as was pointed out by the beneficiary, it is questionable due to technological and financial limitations whether or not the C/P themselves manage to deliver extension services after the completion of the Project.

21 training courses have been provided. The satisfaction level of the participants has been generally high and textbooks and manuals were revised to meet the technological trends in the markets. This serves as evidence that the quality of the service has been improved. Training courses have been successfully conducted with minimum assistance from the Japanese experts.

(6) Output 5

In order to disseminate the casting technologies, the Project held seminars six times during the project period. These seminars provided participants with technological information and market trends. They offered the chance to gather in one place to the stakeholders of the Indonesian foundry industry. These occasions were particularly precious because currently no other institutions, such as industrial associations, play the role in promoting the network among them. Although the satisfaction level of participants has maintained the preferable level, this high level of satisfaction might be partly attributed to the fact that Japanese lecturers were invited to present the latest casting technologies. Thus, it raises concern whether or not the C/P will be able to organize seminars as attractive as those held during the project period.

[11] It should be noted that some new services such as casting design simulation were developed during the Project period.

The Project produced publications and video to disseminate the information on casting technologies. *The Casting Technology Handbook* prepared by the C/P has been widely used as a useful reference book not only by the foundries, but also by the users of casting products. It is observed, however, that the distribution of these publications could have been conducted more actively in order to publicize MIDC's activities and enhance its reputation.

5-2-3 Consideration on MIDC's Production Activities

Regarding the balance of various technical services, although the Teams understand MIDC's necessity to receive whatever orders from its customers to generate income and maintain its reputation from the industry, it was observed that the C/P could have stronger commitment to undertaking production of castings that require higher technical capability and, by means of upgraded capability, improving the quality of MIDC's technical services such as training courses.

5-3 Efficiency

5-3-1 Inputs from the Japanese Side

Inputs by the Japanese side were generally appropriate in terms of timing, quantity and quality. Dispatch of the experts in charge of "inter-fields" issues facilitated the technology transfer. And it was also efficient that short-term experts in charge of facility maintenance and extension services were dispatched for the purpose of complementing the activities of long-term experts. Although the provided equipment was effectively utilized, the specification of some equipment could have been adjusted to the local settings.

5-3-2 Inputs from the Indonesian Side

Particularly, it should be highly appreciated that MIDC made a great effort to employ two engineers as new permanent C/P under the zero-growth policy in order to ensure the steady technology transfer. The allocation of the C/P was generally appropriate. It would be more preferable if C/P exclusively in charge of inspections were assigned. On the other hand, some problems arose regarding water supply which could hinder stable operation of some equipment. In addition, there have been some delays in disbursing the project budget. This situation has inhibited stable procurement of spare parts and timely provision of extension services.

5-4 Impact

5-4-1 Possibility of Achieving the Overall Goal

In addition to the ambiguity of the verifiable indicators as was pointed out in the subsection of relevance, the Teams could find no statistics that clearly show the overall performance of the

foundry industry. This made it extremely difficult to measure the achievement level of the Overall Goal quantitatively. What the Teams can comment at this time is that, as stated in Chapter 3, some preferable performance of individual foundries that made use of MIDC's technical services has been observed and this could serve as a limited sign of the positive impact of the Project.

It should be noted that according to JICA's evaluation practice, the Overall Goal is not expected to be fully achieved at the time of completion of the Project. As the impact is supposed to fully emerge several years after the completion of the Project, the achievement level of the Overall Goal will be intensively examined at the Ex-post evaluation several years after the completion. It is strongly expected that, by the time of Ex-post evaluation, appropriate verifiable indicators and means of verification will be worked out so that objective evaluation in terms of impact can be possible.

5-4-2 Positive Impact

The Teams confirmed that the following unintended positive impacts took place in the process of project implementation.

(1) The Project has offered to beneficiary foundries opportunities of information exchange between them and of exhibiting materials and consumables related to casting production, which activated commercial transactions in the foundry industry.

(2) The awareness of beneficiaries towards quality improved. As the Project promoted local procurement of the equipment, in the course of communication with the local suppliers, their capacities to meet the requirement of the clients have enhanced and their awareness towards proper commercial transactions increased.

(3) When several clients placed an order for trial prototypical goods, they were required to submit specifications and, consequently, their awareness towards quality improved.

5-4-3 Negative Impact

Although the Team looked into the negative impacts, they turned out to be nonexistent.

5-5 Sustainability

5-5-1 Institutional Sustainability

(1) Policy Level

While the Project Purpose was consistent with the overall policies of the Indonesian government from the inception of the Project, the recent change of the supervisory body from BPPIP to IDKM has, indeed, further strengthened the political position of MIDC to assist SMEs. The Japanese Team confirmed strong commitment of IDKM to improving management

of MIDC, which could be viewed as a favorable factor ensuring institutional sustainability. It should be pointed out that, in order to meet the expectation placed on it, MIDC needs to exert strong ownership for exploring its future direction.

(2) MIDC

As was referred to in the previous chapter, the Business Plan was formulated. The progress of its implementation could affect the institutional sustainability of the project activities. More specifically, as part of the organizational reform, marketing sections were newly created in each department and they are responsible for providing technical services. This arrangement is naturally expected to improve MIDC's management. The sections are not fully functioning as of yet, however, there could be some uncertainty in terms of institutional sustainability during the transition period. Detailed implementation plans of the technical services the casting department has to offer needs to be worked out without delay to ensure the sustainability.

5-5-2 Financial Sustainability

In fiscal 2003, there has been a major increase in the project budget and, if this trend continues in the future (which is considerably likely), the financial sustainability would be ensured. Yet, given that there is a decrease in the project budget after its completion, such a decrease is perceived as a serious threat to its financial sustainability. It is thus suggested that MIDC should increase its service budget by generating income on their own, namely, through the provision of technical services.

5-5-3 Technological Sustainability

Because the support from the Japanese experts is currently playing a significant role in providing technical services, there is some concern as to the technological sustainability after the Project is over. This concern is particularly serious in terms of extension services. Another factor that could undermine the technological sustainability is the aging issue of the C/P under the strict zero-growth policy; it is questionable whether or not the technologies transferred by the Japanese experts would remain in the future once old C/P retire MIDC. However, some positive factors could also be pointed out. The policy of technology transfer, which encourages collaboration and teamwork within the production process, has generated sense of solidarity among the C/P and is expected to contribute a lot to enhancing technological sustainability. In addition, as the C/P now have strong commitment to improving their technical capabilities on their own, there is high possibility that technological sustainability will be ensured in the near future.

6. Conclusion

The implementation of the Project was relevant as it has been consistent with the overall policy of both Indonesian and Japanese sides. At the planning stage, MIDC, whose mission is to support SMEs in the metalworking sector, was appropriately selected as the implementation body of the Project and the target group was deliberately expanded to meet the needs of a wide range of private foundries.

Owing to generally efficient inputs from both sides, the technology transfer to the C/P has been generally successful and thus MIDC has significantly improved its technical capabilities. Making good use of the upgraded capabilities, the Project has provided various technical services, including some new services as well as the three services specified in the PDM. As the clients of these services show a preferable level of satisfaction, it could be concluded that the Project Purpose has currently been achieved to a fairly extent. It has to be pointed out that, however, support from the Japanese experts is more or less required for effective provision of technical services and that MIDC's efforts to undertake technical services for private foundries, rather than production activities, could be further enhanced.

Although it should be appreciated that some preferable examples are emerging that indicate the improvement of the performance of MIDC's beneficiary companies, the achievement level of the Overall Goal cannot be comprehensively evaluated due to ambiguous verifiable indicators.

The prospect of sustainability is not necessarily clear as of this final evaluation and close monitoring will be necessary even after the Project. The strong commitment of IDKM and formulation of the Business Plan could be generally viewed as factors ensuring institutional sustainability. However, strong ownership of MIDC itself for exploring its future direction is of crucial importance. Although there is considerable likelihood that the government will continue to provide necessary assistance to MIDC, it is absolutely necessary for MIDC to make maximum efforts to ensure financial sustainability by generating income through provision of marketable technical services. Absence of the Japanese experts will be naturally a serious challenge after the Project is over, the sense of solidarity that has taken root in MIDC and C/P's strong willingness to further improve their technical level should be encouraging factors for ensuring technological sustainability and thus maintaining and furthering the current achievement level of the Project Purpose.

7. Recommendations

Based upon the foregoing evaluation, the Teams recommend the following to ensure that the benefits brought about by the Project will be sustained and further enhanced.

7-1 Recommendations to the Indonesian Government

7-1-1 Political and Financial Assistance for MIDC

In the first place, the Indonesian government should provide MIDC with political assistance. The supervisory body of MIDC changed in 2002 from BPPIP to IDKM that plays a central role in SME promotion in the country, and MIDC is now a leading organization in terms of the promotion of the supporting industries. It can be observed that the position of MIDC has been strengthened politically.
Secondly, when it comes to finance, there is a sharp increase in its budget in Fiscal 2003 and it seems therefore that MIDC is also in the financially stable position. It is desirable that the government should continuously provide financial assistance for MIDC in the future.

7-1-2 Re-Establishment of Database on the Foundry Industry

Statistical data on the foundry industry (e.g. production volume) seem to have been available before the Crisis. In recent years, however, the Indonesian economy has gradually restored its stability and vitality.
Since the availability of such statistics are of considerable significance, the Indonesian government should establish an institutional framework to provide reliable statistics on the foundry industry. This is partly because statistics are indispensable for the government to formulate sound industrial policies and partly because multilateral and bilateral donor agencies tend to rely increasingly on such data that could be used as quantitatively verifiable indicators in measuring the achievement level of their cooperation projects.

7-2 Recommendations to MIDC

7-2-1 Towards Beneficiary-Oriented Service Provider

The final evaluation study has revealed that there is room for further improvement in communication between MIDC and stakeholders. Good communication enables MIDC to satisfy clients' expectations. Moreover, the following recommendations are made:

(1) MIDC should remain open to the opinions of related industrial associations such as APLINDO and HAPLI, related organizations and related institutions such as ITB.
(2) MIDC should establish a monitoring practice. By collecting beneficiaries' voices from the results of questionnaire surveys of training courses and seminars, MIDC can satisfy beneficiaries' requirements.
(3) Within MIDC, the casting department can explore the possibility of collaborating with

other departments. After all, such inter-departmental collaboration helps meet beneficiaries' demands.

(4) The management should attempt to gain the understanding of the C/P. Such attempts help maintain C/P's motivation. It is also important to spread the idea within MIDC that its mission includes beneficiaries' satisfaction.

7-2-2 Importance of Database and Documentation

MIDC is expected to play a leading role in the above-mentioned establishing process and is also required to prepare well-structured financial records in order to present them if necessary, and thus MIDC should attempt to update the data as part of its daily practices.
In this Project, it is also important for the C/P to record the results of extension services in the form of documents, inheriting the practice that the Japanese experts introduced, so that everyone else can refer to them as "best practices" at a later date.

7-2-3 Self-sufficiency of MIDC

The Teams support the idea that MIDC should generate income on their own by providing a variety of services. In order to address an aging issue, the generated income should be utilized for ensuring the continuous employment of the C/P who are currently hired on a temporary basis. The generated income should also be spent for ensuring the stable supply of spare parts and consumables.

7-2-4 Steady and Gradual Expansion of Technological Expertise

Although MIDC's eagerness to learn advanced technologies can be understood, the Teams recommend that, for the time being, MIDC concentrate on further enhancing its expertise in the field of gray cast iron and ductile iron. Considering the current level of MIDC's technological capabilities, technologies of these fields should not be underestimated. It should be remembered that, historically, Japan engaged in acquiring these technologies in the early stage of industrialization and that Japan applied them to other fields in the following stages.

7-2-5 Technical Recommendations

With regard to respective technical fields, the following could be pointed out as recommendations for further improvement.

(1) Casting Design
A filing system, or a database, which can store casting designs should be introduced so that they could be conveniently classified based on their shapes. This arrangement should enable the C/P to work out following casting designs efficiently and precisely.

(2) Pattern Making
Regarding the subject of "inspection of pattern", the C/P should achieve the target level of

Grade Four by the end of the Project by strengthening mutual monitoring for getting rid of careless errors. In addition, with regard to "mending and storage of patterns", the ongoing reform of the workplace for pattern making should be accelerated in order to ensure the achievement of the target level.

(3) Melting
To ensure the technological capability of this field, a knowledgeable engineer should be assigned in the section and learn such knowledge as fundamental metallurgy. It is also expected that the skills of the C/P are further improved through accumulating experience in temperature measuring, pouring, sampling of analytical samples, and so on.

(4) Examinations and Quality Control
In the field of examinations, C/P exclusively in charge of inspections should be assigned and the custom has to be established where MIDC produces and delivers castings based on the specifications determined by itself through negotiation with the customers. It should be noted that this could be an effective way of promoting the achievement level of the Overall Goal; beneficiaries that came to have higher awareness towards specifications and technical requirements would have higher possibility of successfully delivering their products to assembly industries. In terms of quality control, by the end of the Project, the C/P engineer should be trained to the extent that he can pay attention to quality control of all casting production processes starting from casting design to moulding, melting and analysis/inspection/casting evaluation.

(5)Facility Maintenance
C/Ps' awareness towards facility maintenance should be further enhanced so that MIDC could make best use of the efforts extended by the Japanese experts during the cooperation period.

7-2-6 Improvement of Technical Capability through Production of Advanced Castings

MIDC should put a priority on production of castings that require higher level of technological capability rather than mass-production of simple casting products. Although the latter is a simple way to generate income, it should be realized that, for MIDC, income generation is the secondary purpose of production activities. It should be understood that the former type of production could contribute more to improving C/P's technological capability and thus improving the quality of MIDC's technical services.

7-2-7 Preparation for Ex-Post Evaluation

It is strongly recommended that MIDC should take the initiative for working out appropriate verifiable indicators through intensive discussion with stakeholders in preparation for the Ex-post evaluation JICA will conduct several year after the completion of the Project. In this evaluation, impacts of the Project will be intensively examined.
Although the overall trend of the performance of the selected 12 beneficiary foundries was used as a partial indicator for measuring the achievement level of the Overall Goal, the Teams

do not insist that MIDC continues to use this indicator in the future. This is because, considering its functions, MIDC is not obliged to continue to provide services for these 12 foundries. Rather, under the current situation where relevant statistics are not available, it might be a good idea to collect further examples of the individual foundries that improved performance as a direct result of making use of MIDC's technical services. Indeed, this attempt coincides with what MIDC should do as a beneficiary-oriented service provider for the purpose of collecting "best practices" to be shared among the foundry industry.

8. Lessons Learned

In line with the evaluation of the Project, the following lessons were drawn for similar technical cooperation projects in the future.

8-1 Importance of the Planning Stage

It is advisable in similar projects that, at the planning stage, verifiable indicators need to be clarified, and it is necessary to confirm the institutional capability of the implementing organization to prepare documents used as means of verification. In this Project, as verifiable indicators determined at the planning stage remained ambiguous to date, it is not easy to assess to what extent the Overall Goal and the Project Purpose have been achieved.
In addition, taking into account the fact that the equipment provision in this Project slightly lacked efficiency, specifications of the equipment should be determined cautiously paying attention to the needs of the target group at the planning stage.

8-2 Technology Transfer Emphasizing Independence and Teamwork

Several C/P commented that, in the past Belgian cooperation, experts from the country had just taught MIDC staff how to operate equipment or machinery. As a result, once the cooperation was over, the staff could not exactly figure out what to do by themselves. In addition, engineers successfully acquired technical knowledge are said to have left MIDC.
On the other hand, the Japanese experts have encouraged the C/P to do with their minimum assistance. In addition, the concept of Japanese cooperation differs from the Belgian approach in that technology transfer is considered to include two dimensions; one is the transfer of technology itself, and the other is that of "manufacturing systems". The Japanese manufacturing systems center on teamwork, through which the sense of solidarity is nurtured. It seems that the C/P are motivated by such sense, seemingly contributing to the high retention rate. Thus, it is advised in similar projects that independence of C/P and teamwork among them play a major role in the process of technology transfer.

8-3 Measures for Enhancing Efficiency of Equipment Provision

Both positive and negative factors were observed in the implementation of this Project; while, at the planning stage, selection of the equipment was made rather focusing on the limited part of the whole target group, efficiency of equipment provision was well ensured by promoting local procurement in the course of implementation. Thus, in similar projects, selection of the equipment should be made paying enough attention to the local settings of the recipient country and local procurement should be encouraged where possible.

8-4 Dispatch of "Inter-fields" Experts

In this Project, technology transfer was facilitated by the fact that "inter-fields" were appropriately dispatched; i.e. long-term experts in charge of the production process as a whole

complemented the technology transfer of the experts in respective technical fields, the short-term expert exclusively in charge of extension services contributed a lot to improving MIDC's capacities to implement these services. Thus, in similar projects, it should be recommended that such intentional assignment of "inter-fields" experts should be encouraged to facilitate technology transfer even though such experts' expertise lies in individual technical fields.