№

タイ王国
金型技術向上事業
運営指導調査団（中間評価）報告書

2002年 6 月

国 際 協 力 事 業 団

鉱 開 一
ＪＲ
02－11

序　　文

タイ王国政府は、第５次経済社会開発５か年計画（1981～1986年）において、農業国から工業国への転換をめざし、その一環として輸出指向型産業振興策を進め、金属加工・機械産業分野の中小企業の育成に努めてきました。同政府はこの政策を具現化する方策の１つとして、工業省内に中小企業の技術改善を担当する金属加工機械工業開発研究所（MIDI）を設立することを計画しました。これに対し我が国は無償資金協力によりMIDIの施設を建設・整備するとともに、1986年10月から５年間わたり、プロジェクト方式技術協力（金属加工機械工業開発振興プロジェクト）を通じて、中小企業に対する技術指導の協力を行いました。

その後、日本・タイ両国政府の政策協議において、タイの裾野産業の輸入依存体質を改善することが重要かつ緊急課題であるとの認識で一致しました。なかでも自動車部品産業及び電気・電子部品産業は、金型やプラスチック加工等を含み、産業としての広い裾野を有するものの、現在、部品を輸入に依存していることから優先的に改善すべき分野として選定され、1993年からこの分野を対象とする開発調査「工業分野振興開発計画（裾野産業）」が実施されました。

このような経緯を踏まえ、タイ政府は、同調査で作成されたマスタープランに基づき、上述のMIDIを裾野産業開発部（BSID）として改編するとともに、MIDIに付与された基礎的な機能を拡充し、金型分野のローカル企業の育成を通じてタイの部品産業を中心とした裾野産業の国際競争力を強化することを目的として、1996年９月、プロジェクト方式技術協力を要請してきました。

我が国は、この要請を受け、1998年３月に事前調査、同年８月に第１次短期調査、1999年３月に第２次短期調査を実施し、プロジェクトの基本計画及び投入計画などの詳細について協議を行いました。1999年７月には実施協議調査団を派遣し、日本・タイ双方の責任分担や具体的な技術移転内容などについて最終的に合意した結果を討議議事録（R／D）及び協議議事録（ミニッツ）に取りまとめたうえ、署名・交換を行いました。

上述の経緯を経て、本プロジェクトは、金型設計、加工、磨き・組立・試打の各分野に係る技術をタイ側カウンターパートに移転し、その後、カウンターパートが移転された技術を生かした質の高い技術サービスを民間金型企業に提供することにより、タイにおける金型分野の裾野産業育成に貢献することを目的として、1999年11月から５年間の協力を実施しています。

本調査においては、これまでのプロジェクトの実績を確認し、評価５項目の観点から中間評価を実施し、必要な申し入れや提言をするとともに、残り協力期間の技術協力計画に関する協議を行い、それら結果をミニッツに取りまとめ、署名・交換を行いました。

本報告書は同調査団の調査結果をまとめたものです。

ここに本調査団の派遣に関し、ご協力いただいた日本・タイ両国の関係各位に対し深甚の謝意

を表するとともに、あわせて今後のご支援をお願いする次第です。

2002年６月

国際協力事業団
鉱工業開発協力部
部長　中島　行男

目　　次

略　語　一　覧

APO	Annual Plan of Operation
ATCP	Annual Technical Cooperation Program
BIPA	Bureau of International Promotion Administration
BSID	Bureau of Supporting Industries Development
CAD／CAM	Computer-aided Design／Computer-aided Manufacturing
DIP	Department of Industrial Promotion
IRP	Industrial Restructuring Plan
IT	Information Technology
JICA	Japan International Cooperation Agency
MIDI	Metalworking and Machinery Industries Development Institute
NC	Numerical Control
OJT	On the Job Training
PDM	Project Design Matrix
PDMe	Project Design Matrix for Evaluation
R／D	Record of Discussions
TAI	Thai Automobile Institute
TCP	Technical Cooperation Program
TDIA	Thai Tool and Die Industry Association
TGI	Thai German Institute

要　　約

１．中間評価の概要

タイ政府は、近年、中小企業の育成を通じて、国内裾野産業の競争力を強化し、工業製品の輸入依存体質からの脱却に取り組んでおり、なかでも産業として広い裾野を有する部品及び金型産業の技術向上が課題となっている。

本プロジェクトは、工業省工業振興局裾野産業開発部（BSID）を実施機関として、金型設計、加工、磨き、組立・試打の各分野に係る技術をカウンターパートに移転し、その後、カウンターパートが移転された技術を生かした質の高い技術サービスを民間金型企業に提供する。これにより、金型業界を中心としたタイ裾野産業の育成に寄与することを目的として、1999年11月１日から５年間の協力を実施している。

2002年５月をもって、協力期間の中間点を迎えることから、本プロジェクトの実績を確認したうえで、評価５項目の観点から中間評価を実施し、今後の技術協力計画について協議を行うことを目的として、2002年６月２日から６月８日にかけて運営指導調査団（中間評価）が派遣された。

２．プロジェクトの実績と現状

プロジェクト活動は、プロジェクト・デザイン・マトリクス（PDM）を中心とした計画管理諸表に基づいて進められており、成果０「プロジェクト実施体制が強化される」、成果１「必要な機材が供与・設置され、適切に操作・管理がなされる」及び成果２「設計、加工、組立・試打の各分野でカウンターパートの技術力が向上する」が達成されつつある。専門家によるモニタリング評価では、ほぼすべての技術カウンターパートは、設計、加工、組立・試打の各技術分野の基礎知識を熟知し、研修コースの中で一般講義ができるレベルに達したことが確認された。2001年６月に第１回研修コースが開催されるなど、これまでのところおおむね計画どおりに実施されてきたと評価される。

しかしながら、当初計画していた民間金型企業からの試作品製作サービスの件数が期待したほど伸びていない。また、プロジェクト内でこれまでに製作した金型の個数が少ないことから、カウンターパートは、実際に金型製作に従事した経験が不足しており、実技面での技術力向上が今後の課題となっている。これまでタイ側と日本側双方で定期的にミーティングが行われてきたにもかかわらず、長期専門家の指導方法に対して一部のカウンターパートが抱える不満や日本人専門家チーム内の意見の相違が表面化した状況にあることが確認されている。したがって、プロジェクト目標である「BSIDの技術力が向上し、タイ国内のプラスチック金型産業界に良質なサービスを提供できるようになる」の達成に向け、プロジェクト実施体制を一致団結するための改善が

必要である。

３．評価結果

３－１　妥当性

タイ政府の国家政策、受益者のニーズそして我が国のタイ国別援助計画とプロジェクト目標及び上位目標は、整合性が高く妥当であることが確認された。

３－２　有効性

これまで長期専門家からの指導､短期専門家派遣及びカウンターパートの本邦研修を通じて、当初の計画どおりに技術移転が行われ、各カウンターパートは各分野の基礎知識については習得したと判断される｡各成果とプロジェクト目標との整合性も高いことが確認された｡しかし、カウンターパートは、実技面で期待された技術レベルに到達していないと判断される。また、業界団体を中心にタイ側からは、プロジェクトの成果の一つであるアドバイザリーサービスを通じた民間企業への技術支援サービスをもっと活発化してほしいという声が強い。

３－３　効率性

建物の改築工事及び組立・試打分野の長期専門家派遣の遅れが生じたほかは、これまで技術移転に必要な投入がほぼ計画どおりに行われ、おおむね効率よく成果へと転換されつつある。ただし、供与された３次元CAD／CAMネットワークステーションが３次元金型設計に精通した長期専門家の不在から十分に活用されていない点、刃具などの消耗品類の不足が原因で、供与された高性能NC加工機の機能を十分に生かしていない点などが、効率性を一部損なっている。

３－４　インパクト

上位目標の達成度合い、プロジェクト実施に伴う経済・社会面への波及効果は、発現するまで長時間を要することから、終了時評価時に行うこととした。

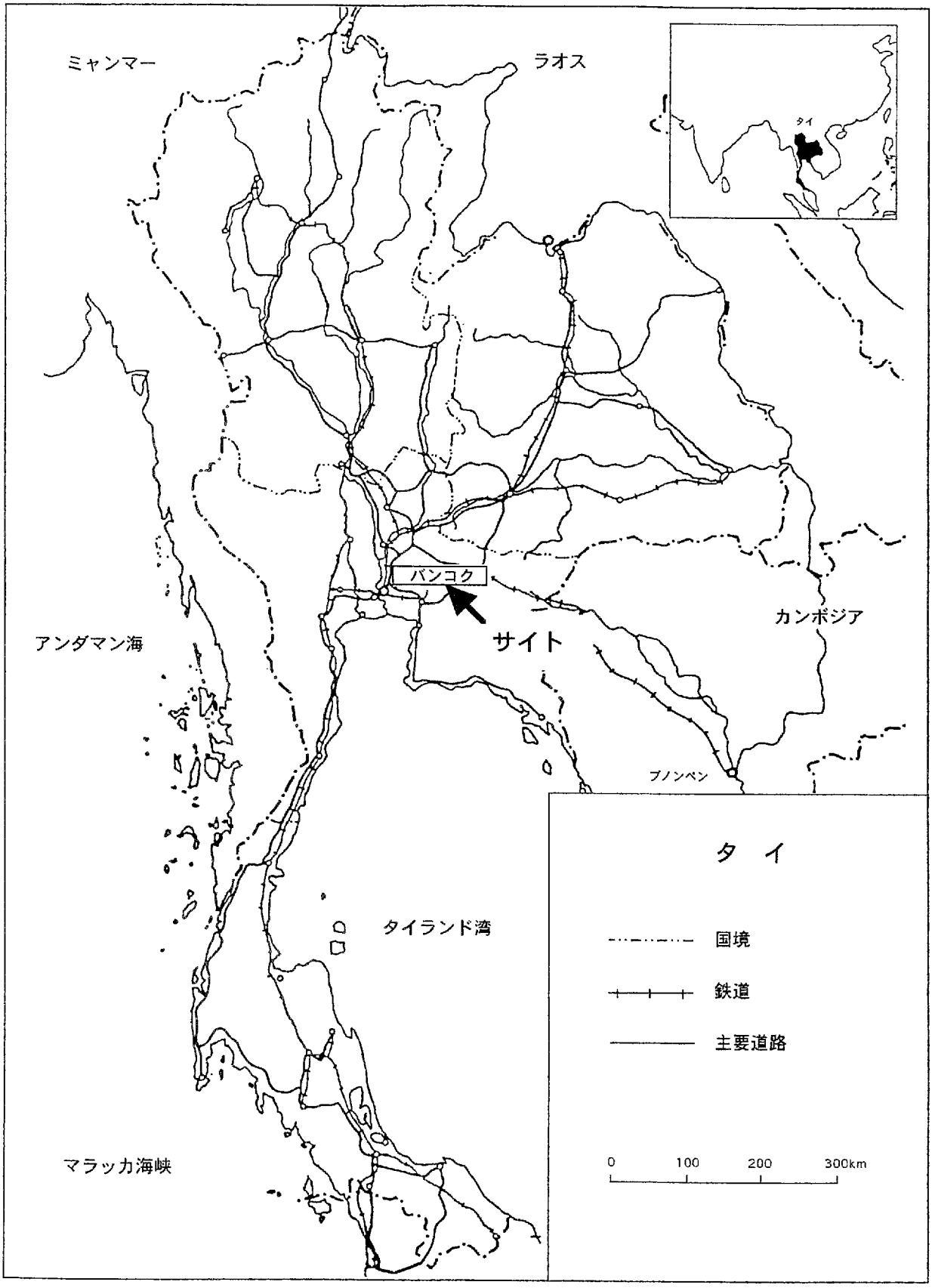
３－５　自立発展性

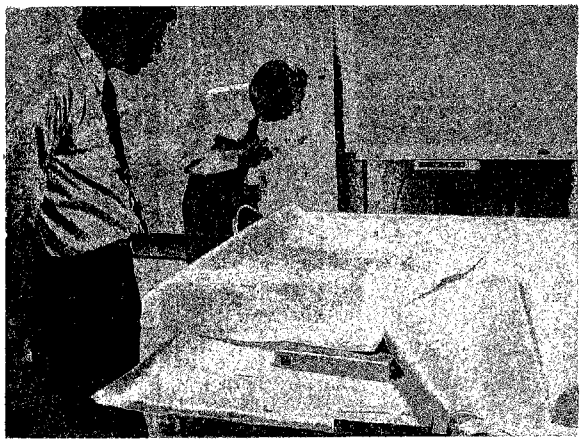
カウンターパートは適切に配置され、これまで目立ったカウンターパートの離職は発生しておらず、プロジェクトの技術移転の成果を継続させる点で組織面の問題はない。財政面では、これまで政府から計画どおりに予算が配付され、BSID自体の運営に大きな問題はないが、金型製作に必要な消耗品を購入する予算の執行が速やかに行われることが望まれる。技術面については、民間金型企業に対して質の高い技術支援サービスを行っていくためには、金型製作の実技レベルの向上が課題となっている。

４．今後の計画

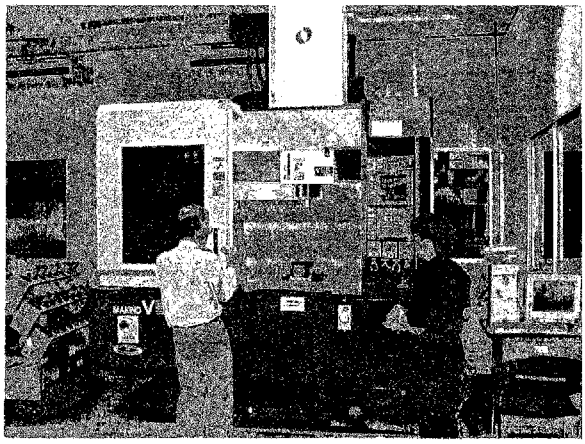
本評価結果を踏まえ、Annex17「Re-planning TCP」のとおり、今後の技術移転計画の軌道修正を行った。具体的には、モジュール化された研修コースの年２回の実施、カウンターパートに現場経験を積ませることを目的としたアドバイザリーサービスの継続実施、５つのモデル金型に加えて６つの内製金型を設計から仕上げまで一貫した工程で試作を行うことの３点をタイ側と合意した。さらに、３次元CAD／CAM技術を専門とする長期専門家1名を新たに派遣し、様々な型を教材にした３次元設計の指導を行うこととし、本プロジェクトの技術移転活動の質と量を上げることとした。

プロジェクトサイト位置図

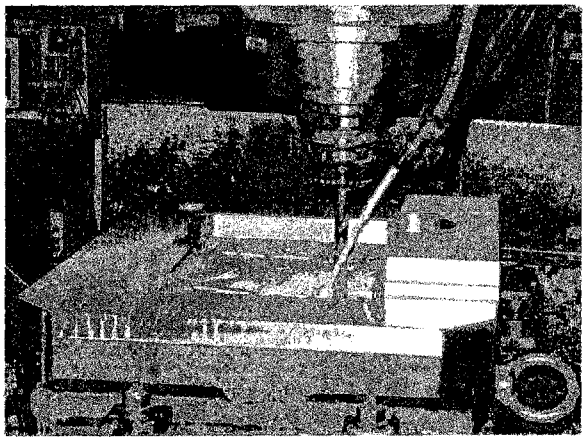




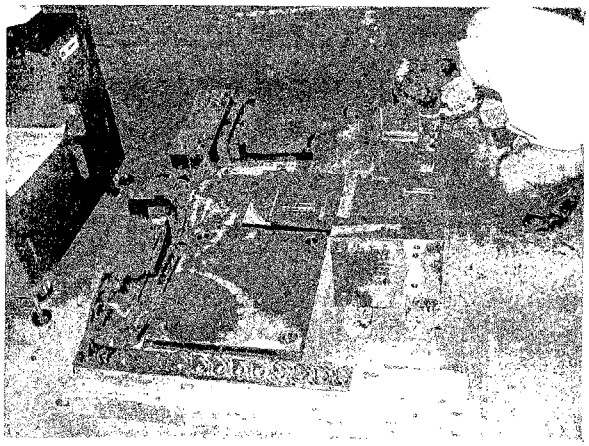
指導図面確認



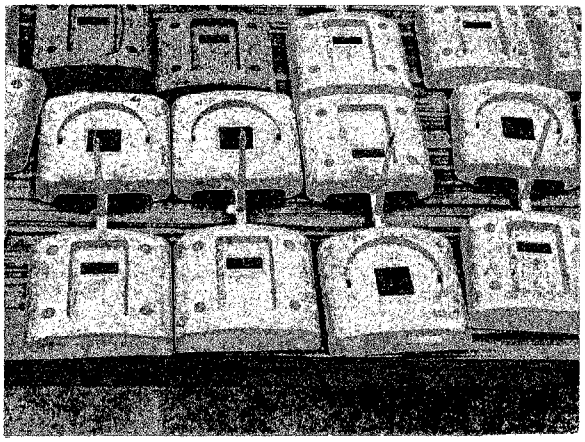
機材確認（CNCマシニングセンタ）



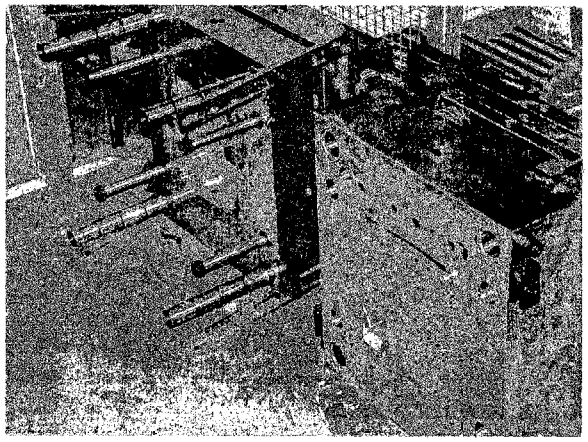
加工中サンプル



加工品質確認



射出成型品



教材用金型

第１章　中間評価の概要

１－１　運営指導調査団（中間評価）派遣の経緯と目的

タイ政府は1998年１月に「産業構造改革マスタープラン（1998～2002年）」を閣議承認し、中小企業の育成を通じて、国内裾野産業の競争力を強化し、工業製品の輸入依存体質の改善に取り組んでいる。近年、タイでは、日本及び欧米の自動車産業の集積化が進行し、外資系自動車メーカーが部品の現地調達比率の向上を図っていることから、部品産業は全体的に活況を呈している。しかし、部品を製造するうえで欠かせない金型自体は、依然として大半を輸入に依存しているのが現状である。

本プロジェクトは、産業として広い裾野を有する部品及び金型産業の国際競争力強化に力を注いでいるタイに対し、金型設計、加工、磨き・組立・試打の各分野に係る技術をカウンターパートに移転し、その後、カウンターパートが移転された技術を生かした質の高い技術サービスを民間金型企業に提供する。これにより、金型分野を中心とした裾野産業の育成に寄与することを目的として、1999年11月１日から５年間の協力を実施している。

プロジェクトが開始された1999年11月からチーフアドバイザー１名、業務調整員１名、金型設計及び加工分野の専門家２名、そして2000年５月に組立・試打分野の専門家１名が派遣された。金型製作に必要な主要供与機材の納入及び設置が2000年３月に完了した結果、これまでの技術移転計画に沿った専門家による講義のほかに、実機を使った技術移転も行われている。また、長期専門家では十分対応できない３次元CAD／CAM、金型磨きなどの分野については、短期専門家の派遣及びカウンターパートの本邦研修を通じて技術移転を行ってきている。

2002年５月をもって協力期間（1999年11月１日～2004年10月31日）の中間点を迎えることから、今次調査を本プロジェクトの中間評価と位置づけ、これまでの技術移転の進捗状況及びプロジェクトの実績を確認したうえで、評価５項目の観点から中間評価を実施し、必要な申し入れ・提言を行うものである。また、2004年に実施される終了時評価に備え、残り協力期間でプロジェクト目標の達成及びタイ側の自立発展性を高めることを視野に入れた今後の技術協力計画に関する協議を行い、それら結果をミニッツに取りまとめ、署名・交換する。

１－２　評価者の構成

本調査団は、団長をはじめとし、金型技術評価、技術移転計画、評価管理を担当する４名で構成された。

担当分野	氏名	所属・役職
団長	瀧沢　浩一	国際協力事業団　鉱工業開発協力部 鉱工業開発協力第一課　課長代理
金型技術	佐々木哲夫	日本工業大学　機械工学科　教授
技術移転計画	岩壁　清行	株式会社　日本デザインエンジニアリング 代表取締役社長
評価管理	久保倉　健	国際協力事業団　鉱工業開発協力部 鉱工業開発協力第一課

１－３　　調査日程

日順	月日	曜日	時間	団長／総括、評価管理	技術移転計画、金型技術
1	６／２	日	11：00 15：15	成田発（JL717） バンコク市着	
2	６／３	月	９：00 10：30 13：00 14：00 15：00 18：00	工業振興局（DIP）表敬 JICAタイ事務所打合せ 裾野開発産業部（BSID）表敬／キックオフミーティング プロジェクトサイトの視察 専門家チームとの打合せ（協議日程・内容、評価資料の確認） DIP局長主催夕食会	
3	６／４	火	９：00 13：00 15：00 16：30	BSIDとの協議１（プロジェクト実施体制、日本・タイ側投入実績の確認） BSIDとの協議２（技術移転進捗状況の確認） タイ金型工業会との協議 専門家チームとの打合せ（技術移転進捗状況、課題について）	カウンターパートインタビュー
4	６／５	水	９：00 11：00 13：00 16：30	BSIDとの協議３（PDM等計画管理諸表、中間評価結果の確認） BSIDとの協議４（今後のプロジェクト運営、APO、ATCPの確認） 金型企業訪問（小規模ローカル企業：Salaya Industrial Co., Ltd社） 専門家チームとの打合せ（今後の技術移転計画・体制について）	専門家インタビュー
5	６／６	木	９：00 13：00 16：00 17：30	BSIDとの協議５（2002年度以降の活動計画の確認） ミニッツ案、添付資料作成 専門家チームとの打合せ（ミニッツ案の確認） DIP、BSIDとの協議（ミニッツ最終案及び添付資料の確認）	金型企業訪問（日系企業：Thai Stanley社、先進ローカル企業：Sirithai Mold社）
6	６／７	金	９：00 11：00 12：00 15：00 16：00	団内打合せ（インタビュー結果、今後の技術移転計画・体制に係る提言） ミニッツ署名・交換式 DIP、BSID官僚との意見交換会 在タイ日本大使館及びJICAタイ事務所への報告 専門家チームとの打合せ（調査結果の総括）	
7	６／８	土	８：00 16：35	バンコク市発（JL708） 成田着	

１－４　主要面談者

〈タイ側〉

(1) Department of Industrial Promotion（DIP）

Virat Tandaechanurat	Deputy Director-General, DIP
Vim Roongrout	Deputy Director-General, DIP

(2) Bureau of International Promotion Administration（BIPA）

Arpa Vongbunyong	Director of International Cooperation Division, BIPA

(3) Bureau of Supporting Industries Development(BSID)

Sirichai Pothitapana	Director of Metal-Working and Machinery Industries Division, BSID
Pasu Loharjun	Director of Plastic and Electronic Development Subdivision, BSID
Kittiphat Panitakorn	Assistant Director of BSID
Prakob Janma	Head of Product, Mold & Die Design Development Subdivision, BSID
Paiboon Tekapan	Chief of Machining Section, BSID
Sasivimol Suthilert	Planning and General Coordinating Section, BSID

(4) Thai Tool and Die Industry Association(TDIA)

Vechprasith Toommongkol	Vice Chairman, TDIA
Sombat Wudhanasrap	Deputy Secretary, TDIA

(5) Salaya Industrial Co., Ltd.

Sunant Punyacharoensin	Managing Director

〈日本側〉

(1) 在タイ日本国大使館

山澄　　克	二等書記官

(2) JICAタイ事務所

高島　宏明	次　長
渋谷　　晃	所　員

(3) プロジェクト専門家

池内　　準	チーフアドバイザー
内田　恭男	業務調整員
大塚　敏哉	金型設計
関　　繁信	金型加工
大岩　　昇	金型組立・試打

１－５　評価項目・評価の方法

(1) PDM_E

1999年７月の実施協議調査時に策定されたPDMは、2001年１月の運営指導調査時に、指標

及び指標入手手段を中心に見直しを行った。修正内容は、上位目標の指標である「組立産業に納入される金型及び部品が増加する」を把握できる工業統計資料が存在しないことから、同指標の入手手段を「工業統計」から「調査レポート」とした。

中間評価用PDM_Eについては、プロジェクト目標達成に向けた個々の活動及び成果の因果関係について再確認したあと、目標及び各成果の達成状況をより明確に表現するよう指標及び指標入手手段を中心に記載内容を改めて修正した（付属資料１のAnnex.10参照）。

(2) 主な評価・調査項目

1) 評価５項目による評価

日本・タイ双方の投入実績、プロジェクトの活動実績、成果達成状況、プロジェクト運営管理状況を含む実施体制、カウンターパートへの技術移転状況などについて、以下の５つの観点（「評価５項目」）から評価を行うとともに、その結果を残る協力期間の技術移転計画の改善に役立てる。

ただし、プロジェクトの中間地点で、長期的、間接的効果や波及効果の発現を確認することは困難であることから、インパクト評価を省略することとした。

① 妥当性
② 有効性
③ 効率性
④ インパクト
⑤ 自立発展性

2) 総括

3) 教訓・提言（今後の技術移転計画について）

(3) 評価の方法

1) 文献資料調査

本プロジェクトの四半期報告書、モニタリング記録、プロジェクト作成資料・データ及びタイ金型産業の統計資料から必要な情報を収集する。

2) 直接観察

プロジェクトサイトの設備の視察のほか、成果品（図面、ターゲット金型、成形品、教材など）を技術的観点から観察する。

3) インタビュー調査

カウンターパート及び長期専門家に対し、個別インタビューを行う。

第２章　プロジェクトの実績と現状

２－１　実績と現状の総括

プロジェクト協力期間の中間点を迎えた現時点では、建物の改築工事及び組立・試打分野の長期専門家派遣の遅れが生じたほかは、技術移転に必要な投入がほぼ計画どおりに行われた。

プロジェクト活動は、プロジェクト・デザイン・マトリックス（PDM）を中心とした計画管理諸表に基づいて進められており、成果０「プロジェクト実施体制が強化される」、成果１「必要な機材が供与・設置され、適切に操作・管理がなされる」及び成果２「設計、加工、組立・試打の各分野でカウンターパートの技術力が向上する」が達成されつつある。

モニタリング評価シートによると、ほぼすべての技術カウンターパートは、設計、加工、組立・試打の各技術分野の基礎知識を熟知し、研修コースの中で一般講義ができるレベルに達したことが確認された。その結果、2001年６月に開催された第１回研修コースでは、参加者からおおむね良好な評価が得られた。

しかしながら、当初計画していた民間金型企業からの試作品製作サービスの件数が期待したほど伸びておらず、またプロジェクト内でこれまでに製作した金型の個数が少ないことから、カウンターパートは、実際に金型製作に従事した経験が不足しており、実技面での技術力向上が今後の課題となっている。

最後に、プロジェクト実施体制については、これまでタイ側と日本側双方で定期的にミーティングが行われてきたにもかかわらず、長期専門家の指導方法に対して一部のカウンターパートが抱える不満や日本人専門家チーム内の意見の相違が表面化した状況にあることが確認された。プロジェクト後半期は、タイ側と長期専門家がプロジェクト目標である「BSIDの技術力が向上し、タイ国内のプラスチック金型産業界に良質なサービスを提供できるようになる」の達成が共通目標であることを再認識し、そのための活動を積極的かつ柔軟に実施することが望まれる。

２－２　投入実績

(1) 日本側投入実績（2002年６月現在）

1) 長期専門家派遣（合計６名）

チーフアドバイザー（1999年11月10日～2002年６月）	１名
業務調整（1999年11月10日～2001年11月９日）	１名
業務調整（2001年10月22日～2002年６月）	１名
金型設計（1999年11月10日～2002年６月）	１名
金型加工（1999年11月10日～2002年６月）	１名
金型組立・試打（1999年11月10日～2002年６月）	１名

2) 短期専門家派遣（合計13名）

CAD／CAM運用保守管理（2000年５月８日～2000年５月20日）	３名
CAD／CAMオペレーション（2000年９月４日～2000年９月16日）	２名
CAD／CAMオペレーション（2000年11月13日～2000年11月25日）	１名
金型技術セミナー（2000年11月28日～2000年12月２日）	１名
CAD／CAMオペレーション（2001年５月14日～2001年５月26日）	１名
CAD／CAMオペレーション（2001年10月８日～2001年10月20日）	１名
金型技術セミナー（2001年10月30日～2001年11月３日）	１名
CAD／CAMオペレーション（2001年12月６日～2001年12月27日）	１名
金型磨き（2002年１月14日～2002年１月26日）	１名
CAD／CAMオペレーション（2002年５月６日～2002年６月29日）	１名

3) 研修員受入れ（合計９名）

運営管理（1999年10月３日～1999年10月16日）	３名
CAD／CAMオペレーション（2000年10月３日～2000年12月22日）	３名
金型加工（2001年９月24日～2001年12月21日）	２名
金型磨き・組立・試打（2001年９月24日～2001年12月21日）	１名

4) 機材供与（総額２億8,579万円）

CAD／CAMネットワークステーション、マシニングセンタ、放電加工機、細穴加工機、平面研削盤、射出成形機、金型治具等

5) ローカルコスト負担（総額944万円、1999年11月～2002年３月まで）

(2) タイ側投入実績（2002年６月現在）

1) カウンターパートの配置（合計24名）

管理カウンターパート	６名
技術カウンターパート	13名
調整業務スタッフ	１名
サーポートスタッフ	４名

2) 建物、施設、機材の提供

作業ルーム、専門家執務室、縦型切削加工機、グラインダー、３次元測定器、作業デスク、金型治具等

3) 投入実績額〔総額約3,500万円：1,177万8,570バーツ（１バーツ=2.985円)〕

建物改築費、機材メンテナンス費、消耗工具購入費、資機材輸送費等

２－３　成果達成状況

本プロジェクトで設定された５つの成果と、その達成状況は以下のとおりである。

〈成果０〉「プロジェクト実施体制が強化される」

５名の支援スタッフを含む24名のカウンターパートが配置されている。現時点では、管理カウンターパートの定期的人事異動があったのみで、カウンターパートの離職などの問題は発生していない。

タイ側からは、2000年度に698万4,940バーツ、2001年度397万8,704バーツ、2002年度280万バーツの予算が当初の計画どおりに適切にプロジェクトへ配分されてきた。ただし、必要な備品の購入の申請・承認が円滑に行われていないため、金型刃具など金型加工に必要な消耗品類が不足している。

合同調整委員会はこれまでに４回開催された。また、毎週1回定期的にプロジェクト運営会議が行われ、タイ側・日本人専門家チームとの間で意見調整がなされてきた。しかし、定期的なミーティングが行われてきたにもかかわらず、今回実施されたタイ側に対するインタビューの結果から、一部のカウンターパートは長期専門家の指導方法に不満をもっていることが確認された。

プロジェクトの活動は、パンフレットの配付、ホームページでの紹介、テレビ・ラジオなどのマスメディアの利用、展示会へのブース出展を通じて広く宣伝されている。

〈成果１〉「必要な機材が供与・設置され、適切に操作・管理がなされる」

CAD／CAM用コンピューター及び金型加工機材を設置する建て屋の改築工事が遅れ、必要機材の設置の完了までにプロジェクト開始から半年を費やした現在、機材は適切に操作・管理がなされている。問題点としては、金型治具、消耗品の不足が原因で、供与されたNC加工機（コンピューター制御の金型加工機）の高い性能を十分に生かしきった使い方がなされていないことである。

〈成果２〉「設計、加工、組立・試打の各分野でカウンターパートの技術力が向上する」

長期専門家による指導、短期専門家の派遣及びカウンターパートの本邦研修を通じて、当初の技術移転計画（TCP）どおりに技術移転が行われた。長期専門家が作成したモニタリング評価シートによると、ほぼすべての技術カウンターパートは、各担当技術分野の基礎知識を熟知し、研修コースの中で一般講義ができるレベルに達している。

しかしながら、カウンターパートは実際に金型を製作した経験がまだ不足しているため、現時点では、実技面の技術力に不安があることが確認された。

〈成果３〉「研修コース・セミナーが体系的に実施されるようになる」

2001年６月に56人の参加者を集め、設計、加工及び組立・試打の各分野で第1回研修コースが開催された。参加者へのアンケートの集計結果によると、第１回目としてはおおむね良好な評価（平均して４段階評価中の３：「Equal with Expected」及び５段階評価中の３：「Fair」）が得られた。

また、2000年11月に約100名の聴講者を集め、「金型技術の最新動向」のテーマでセミナーが開催された。2001年11月には約130名を集め、「高速切削加工理論」に関するセミナーが行われた。

〈成果４〉「アドバイザリーサービス・技術情報提供が体系的に実施されるようになる」

2001年に９社､2002年１月から５月までに11社を､長期専門家とカウンターパートが訪問し、アドバイザリーサービスを実施した。

訪問先企業の技術者とカウンターパートとの間では、タイ語で質疑応答がなされるケースがあり、長期専門家がカウンターパートの技術的アドバイスの質を評価できないという問題が発生している。

現時点では、アドバイザリーサービスの実施件数も少ないため、サービスの質・量を評価するにはまだ早い段階である。

〈成果５〉「プロトタイピングサービスが体系的に実施されるようになる」

これまで加工部門では、プロジェクトに供与された高性能のNC加工機の利点を生かして、民間金型企業から56件の機械加工を受注した。

しかしながら、設計から仕上げまで一貫して金型を製作した経験が不足しており、民間金型企業が求める金型の品質、納期にまだ十分応えることができないことから、現時点では、試作品製作サービスの受注件数は少ない。

２－４　技術移転状況

本プロジェクトの当初計画では、長期専門家が５つのターゲット金型（ペントレイ、アラームクロック・フロントカバー、コンピューター・フロントカバー、電話機カバー、カメラボディー）を題材に設計、加工、組立・試打の各分野の技術移転を行うとともに、民間金型企業から試作品製作サービスを受注し、カウンターパートに金型製作の経験を補完的に積ませることを予定していた。

これまでに、設計及び加工部門では、３つのターゲット金型（ペントレイ、アラームクロック・フロントカバー、コンピューター・フロントカバー）の技術移転が完了し、組立・試打部門は２

つめのターゲット金型（アラームクロック・フロントカバー）の修繕を行っている。組立・試打分野の長期専門家の派遣がリクルートの問題で約半年遅れたため、他分野と比較して若干の技術移転の遅れがあるが、全体として当初の技術移転計画（TCP）どおりに技術移転が行われてきた。

ただし、当初計画していた民間金型企業から試作品製作サービスの受注については、民間金型企業から受注する程カウンターパートの技術力は高くないことから、これまで加工部門を除くと実施されていない。したがって、２－３成果達成状況の〈成果２〉で上述したとおり、カウンターパートは金型の各分野における一般講義ができる基礎知識は習得したが、これまでに製作した金型の個数が少ないため、実技面の技術力向上が課題となっている。

第３章　評価結果

３－１　評価結果の総括（調査団所見）

タイでは中小規模の裾野産業企業を支援するため、1998年からIndustrial Restructuring Plan（IRP）を実施しており、現在はそのフェーズ２の期間に入っている。このIRPの中では金型産業の発展が重要とされている。また、タイ金型工業会との協議、そして実際の企業訪問においては、タイの金型産業が抱える最大の問題として、技能のある人材の不足、あるいは技術訓練機会の不足により、いまだ輸入金型に依存することが多いことが指摘された。本プロジェクトのカウンターパート機関であるBSIDは、主に中小金型メーカーを対象に研修などの技術サービスを行っているが、以上のことからBSIDの技術サービスのレベル向上をめざす本プロジェクトはタイの開発ニーズと合致していることを、今回あらためて確認することができた。

1999年11月に開始された本プロジェクトは、これまでのところおおむね計画どおりに実施されてきたと評価される。今回の調査では協力期間の後半での実施計画を作成、確認した。これは、技術移転の「スピードアップ」、対外研修コースの「高度化」など、タイ側からの要望を反映させたものともなっている。具体的には、研修コースについては年２回実施し、モジュール化を導入する、工場訪問によるアドバイザリーサービスを継続的に実施していく、５つのモデル金型に加えて６個の金型を実技として内製する、そしてCAD／CAMの指導を設計と加工分野に位置づけて技術移転を行っていくことなどである。この計画に基づき、カウンターパートが実際の経験をより多く積み重ねていくことを通じて、彼らが実施する技術サービスの質が向上していくことを期待する。

カウンターパートの技術習得への意欲は高く、これまでのところ技術移転を受けたスタッフの離職もない。また、BSIDは金型工業会など、タイ国内の関係機関、団体とも緊密に連携をとっており、本プロジェクトに積極的に取り組んでいる。しかし、金型部品などの発注手続きや納入予定のフォローでの詰めの甘さ、金型製造における各工程間の連携の不足など、組織のマネジメントの面において弱い部分が見られるため、これらの改善に向けた努力を申し入れた。

予算については、工具、原材料などの購入に支障を来さないよう、引き続き必要な予算が確保されるための措置を依頼した。

一方、日本側では専門家チーム内においてこれまで以上にチームワークを深め、残る２年５か月の協力期間でのプロジェクト目標達成に向け、「一枚岩」となった協力体制の強化が重要であるとの印象を受けた。

３－２　評価５項目による分析

３－２－１　妥当性

タイ国内では、日本・欧米を中心とした外資系自動車産業及び電子・電気産業の集積化が進行し、部品の現地調達比率の向上を図るなど部品産業全体が活況を呈しており、それを支える金型産業の育成の重要性がますます高まっている。したがって、プロジェクト目標及び上位目標は、受益者のニーズに適合している。また、タイの国家政策である「産業構造改革マスタープラン（1998～2002年）」に基づく業種別アクションプランの１つである「産業構造調整事業（IRP）」において、金型を含む部品産業の育成を重要な国家開発戦略の１つとして位置づけていることから、タイの裾野産業育成を援助重点分野の１つとしている日本政府の国別援助計画とも整合性が高いことが確認された。

３－２－２　有効性

これまで長期専門家からの指導､短期専門家派遣及びカウンターパートの本邦研修を通じて、当初の計画どおりに技術移転が行われ、各成果とプロジェクト目標との整合性も高いことが確認された。「２－３成果達成状況」で述べたとおり、ほぼすべての技術カウンターパートは、各担当技術分野の基礎知識を習得したことが確認されている。しかし、実際に金型を製作した経験が少ないことから、実技面では期待された技術レベルに到達していない。また、業界団体を中心にタイ側からは、プロジェクトの成果の１つであるアドバイザリーサービスを通じた民間企業への技術支援サービスをもっと活発化してほしいという声が強い。プロジェクト後半期では、内製金型の製作個数を増やし、アドバイザリーサービスをカウンターパートのオンザジョブ・トレーニング（OJT）の場として積極活用することなどを通じて、カウンターパートの実技レベルの向上を図り、プロジェクト目標の達成に向けて技術移転計画を修正することとした。

３－２－３　効率性

建物の改築工事及び組立・試打分野の長期専門家派遣に遅れが生じたほかは、これまで技術移転に必要な投入がほぼ計画どおりに行われ、おおむね効率よく成果へと転換されつつある。ただし、供与された３次元CAD／CAMネットワークステーションが３次元金型設計に精通した長期専門家の不在から十分に活用されていない点、刃具などの消耗品類の不足が原因で供与された高性能NC加工機の機能を十分に生かしていない点などが、効率性を一部損なっている。

また、「２－３成果達成状況」で述べたとおり、タイ側と日本人専門家チームとの間で定期的に各種会議が行われてきたにもかかわらず、タイ側との間のみならず日本人専門家チーム内においても技術移転活動に対する意見の対立が見られ、これまでプロジェクト運営会議が意見調整の場として効率的に機能していなかった。

３－２－４　インパクト

上位目標の達成度合い、プロジェクト実施に伴う経済・社会面への波及効果は、発現するまで長時間を要することから、終了時評価時に行うこととした。

３－２－５　自立発展性

カウンターパートは適切に配置され、これまで目立ったカウンターパートの離職は発生していないことから、プロジェクトの技術移転の成果を継続させる点で組織面の問題はない。財政面では、これまで政府から計画どおりに予算が配付され、BSID自体の運営に大きな問題はないが、金型製作に必要な消耗品を購入する予算の執行が速やかに行われることが課題である。技術面については、ほぼすべての技術カウンターパートは、各担当技術分野の基礎知識を身につけたものの、民間企業に対して質の高い技術支援サービスを行っていくためには、金型製作の実技レベルの向上が不可欠である。

第４章　今後の計画

４－１　今後の計画の総括

本プロジェクトが、協力終了を迎える2004年10月までに各成果を達成し、プロジェクト目標である「BSIDの技術力が向上し、タイのプラスチック金型業界に良質なサービスを提供できるようになる」を達成するためには、今後、カウンターパートへの教育訓練の質と量を大幅に上げ、カウンターパートの実技レベルの向上と金型業界への技術サービスの活発化が必要である。

本評価結果を踏まえ、Annex17「Re-planning TCP」のとおり、モジュール化された研修コースを年２回実施すること、カウンターパートに現場経験を積ませることを目的としたアドバイザリーサービスのを継続実施すること、５つのモデル金型に加えて６つの内製金型を設計から仕上げまで一貫した工程で試作を行うことをタイ側と合意した。加えて、３次元CAD／CAM技術を専門とする長期専門家１名を新たに派遣し､様々な型を教材にした３次元設計の指導を行うこととし、本プロジェクトの技術移転活動の質と量を上げることとした。

４－２　投入計画

(1) 日本側投入

1) 長期専門家派遣

チーフアドバイザー	１名
業務調整	１名
金型設計（CAD／CAM）	１名
金型加工	１名
金型組立・試打	１名

2) 短期専門家派遣（2002年度）

CAD／CAMオペレーション（2002年５月６日～６月29日）	１名
金型技術セミナー（2002年11月初旬）	１名
金型加工（2003年１月）	１名
金型磨き（2003年１月）	１名

3) 研修員受入れ（2002年度）

金型加工（2002年８月20日～11月16日）	１名
金型磨き・組立・試打（2002年８月20日～11月16日）	１名

4) 機材供与（2002年度）

なし

5) ローカルコスト負担（2002年度）

344万円

(2) タイ側投入

1) カウンターパートの配置（合計24名）

管理カウンターパート	６名
技術カウンターパート	13名
調整業務スタッフ	１名
サーポートスタッフ	４名

2) 消耗品・備品の提供

刃具などの消耗品、モールドベース等

3) 投入予算計画額

2002年度	280万バーツ
2003年度	355万バーツ
2004年度	355万バーツ
2005年度	29万5,100バーツ

４－３　技術移転計画

本プロジェクトの当初計画は、長期専門家による５つのターゲット金型（ペントレイ、アラームクロック・フロントカバー、コンピューター・フロントカバー、電話機カバー、カメラボディー）を題材にした設計、加工、組立・試打の各分野の技術移転、民間金型企業に対する試作品製作サービス及びアドバイザリーサービスで構成されている。しかしながら、民間金型企業に対する試作品製作サービスとアドバイザリーサービスは、これまで期待されたほど実施されなかったことも一因となって、カウンターパートが実際に金型製作に携わった経験が極めて少ない。そのため実技面の技術力向上が課題となっていることが確認された。

協力終了を迎える2004年10月までに、プロジェクト目標である「BSIDの技術力が向上し、タイのプラスチック金型業界に良質なサービスを提供できるようになる」を達成するためには、カウンターパートの実技面の技術レベルの向上と金型業界への技術サービスの活発化が必要であることから、以下のように技術移転計画の軌道修正を行った。

(1) 研修コース

2002年度後半期以降、顧客企業の利便性やニーズに応えるため、基礎講座から実践的な応用技術までの様々なテーマで構成されるモジュール形式の短期研修コースを金型設計、加工、

組立・試打の各分野ごとに年２回づつ実施する。

(2) アドバイザリーサービス

カウンターパートの現場経験を積ませることを目的として、専門家とカウンターパートは積極的に金型関連企業を訪問し、アドバイザリーサービスを実施する。同サービスはカウンターパートのOJTの場として活用される。

(3) プロトタイピングサービス

試作品製作サービスについて、顧客からの注文に応じて、今後も加工部門を中心に継続して対応していく他、当初計画の５つのモデル金型に加えて６個のプロジェクト内製金型を製作する。追加される６個の金型は、金型設計から仕上げまでを一貫した工程管理で内製することで、カウンターパートの金型製作全般にわたる実技レベルの向上を図る。

付　属　資　料

１．ミニッツ

２．団員報告

３．主要訪問先議事録

1．ミニッツ

MINUTES OF MEETING
BETWEEN THE JAPANESE MID-TERM EVALUATION TEAM AND THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF THE KINGDOM OF THAILAND ON THE JAPANESE TECHNICAL COOPERATION FOR SIC-TOOL AND MOLD TECHNOLOGY DEVELOPMENT PROJECT IN THE KINGDOM OF THAILAND

The Japanese Mid-term Evaluation Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Mr. Koichi Takizawa visited the Kingdom of Thailand from 2 to 8 June, 2002 for the purpose of conducting mid-term evaluation and of formulating further operational plans of SIC-Tool and Mold Technology Development Project in the Kingdom of Thailand (hereinafter referred to as "the Project").

During its stay in the Kingdom of Thailand, the Team had a series of discussions and exchanged views with the authorities concerned of the Government of the Kingdom of Thailand over the matters for the successful implementation of the Project.

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

Bangkok, 7 June, 2002

Koichi Takizawa
Leader
Mid-term Evaluation Team
Japan International Cooperation Agency
Japan

Virat Tandaechanurat
Deputy Director General
Department of Industrial Promotion
Ministry of Industry
The Kingdom of Thailand

Attached Document

I General Items

1 Purpose of the Mid-term Evaluation

The Team explained that the main purpose of this survey was to conduct a mid-term evaluation of the Project so that both sides could monitor the progress of technical cooperation, make a plan for further effective implementation in the remaining period, and discuss necessary measures to be taken by both sides in preparation for a final evaluation.

2 Monitoring

The Team requested the Thai side and the latter agreed that the monitoring should be conducted continuously and periodically every six (6) month as shown in "Monitoring and Evaluation Plan" attached as Annex 34, and be reported and discussed at the Joint Coordinating Committee.

In the monitoring, the formats should be utilised such as "Project Design Matrix (hereinafter referred to as "PDM")", "Monitoring and Evaluation Sheet" and "Progress Report of Technical Cooperation Project" as shown in Annex 10, 34 and 35. All these formats should be used from the fifth monitoring authorized by JCC in December, 2002.

3 Joint Final Evaluation

The Team reaffirmed and the Thai side understood that, toward the end of the project period, around May 2004, the final evaluation would be conducted to examine the level of achievement of the Project objectives.

It will be a joint evaluation conducted by the Japanese evaluation team dispatched by JICA and the Thai evaluation team, as stipulated in the Record of Discussions (hereinafter referred to as "R/D").

In this connection, the Team explained to the Thai side that the members of the Thai evaluation team should include persons who were not directly involved in the Project to secure the fairness of the said evaluation, and that the nomination would be requested formally through JICA Thai Office in due course of time, while JICA would hire a consultant exclusively for the Japanese evaluation team for the same reason.

4 **Current Situation of Japan's ODA**

The Team explained and the Thai side understood that Japan's Official Development Assistance (hereinafter referred to as "ODA") continues to face budgetary constraints such that the budget of ODA has been already cut by ten (10) percent this year, and the necessity of efficiency, effectiveness and accountability in each project has been increasing even more.

II Current Status of the Project

1 Current Situation of Thai Mold and Die Industries

The Team exchanged views with the Bureau of Supporting Industries Development (hereinafter referred to as "BSID") and the Thai Tool and Die Industry Association (hereinafter referred to as "TDIA") to capture the current situation of Mold and Die industries in the Kingdom of Thailand.

From the recent information compiled and surveyed by TDIA, it was estimated that there were about five hundred (500) mold and die factories in the Kingdom of Thailand. More than ninety (90) percent of the factory was mold and die factory for plastics and metals. From this number, around seventy (70) percent was categorized as small-scale industry, twenty (20) percent medium-scale industry and the rest ten (10) percent large-scale industry.

In the past few years, many foreign auto-manufacturers including Japanese auto-companies intensified their assembling operations in the Kingdom of Thailand, having increased the ratio of tool procurement from local suppliers. Therefore, overall, Thai Tool and Die manufactures have been operating actively at present time.

While Japanese mold makers, as well as local mold companies technically affiliated with foreign tool and die manufactures, have accumulated advanced technologies, there are a number of small-sized mold makers that own a few old machinery and produce simple molds with low quality. As a result, a huge technology gap has been going on between foreign-affiliated modern and small-sized local mold companies in the Kingdom Thailand.

Mold and Die industry is the core sector in the Thai Tool industry, and the both have become more and more important as supporting industries for growing assembly industries in the Kingdom of Thailand. However, Thai mold and die industry has faced a shortage of skilled labour forces. Most Thai mold companies have not been able to arrange and offer new employees job trainings on their own.

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2 Government Policy and Strategies

Both sides confirmed that Thai government continues to put emphasis on the development of small and medium scale, supporting industries stated in the National Master Plan, that is Industrial Restructuring Plan (hereinafter referred to as "IRP") started in 1998, and that Department of Industrial Promotion (hereinafter referred to as "DIP"), as well as BSID, have identified the development of tool and mold industries as an important strategy leading to the development of supporting industries in the Kingdom of Thailand.

At present, IRP gets into the second phase in which forty thousand (40,000) people will be trained for tool industries through the Supplier Development Program. BSID has taken tasks of supporting electronics parts suppliers as well as mold makers by conducting factory evaluations and advisory services.

Accordingly, both sides reconfirmed that BSID and the Project have been and will expectedly play a significant role in the said national policy.

On the other hand, the Plastic Injection Mold Committee completed the master plan about the development of plastic-injection mold industry. This year the committee is planning to draw another master plan on the whole mold and die industry, and a workshop organized by private mold companies, and related institute and association has already made a framework of the new master plan that emphasizes on a systematic support for the development of the whole mold and die industry at the national level.

3 Present Situation of BSID

(1) Organization

The organization chart of Ministry of Industry, DIP and BSID is shown as in Annex 1.

(2) Budget Allocation

The annual budget and expenditure of BSID are shown in Annex 2.

The Team requested and the Thai side understood that the transparency of income and expenditure of BSID should be maintained.

The Team also asked the Thai side if BSID has any discretionary income generated by their technical services. Thai side explained to the Team that, at present, BSID has an obligation to return all income generated by their technical services to the government.

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(3) **Staff Allocation**

The staff allocation of BSID is shown in Annex 20.

The Team showed a concern about a job-hopping of C/P trained by the Project and asked the Thai side if there have been any changes in the allocation of counterpart personnel (hereinafter referred to as "C/P") of the Project since the visit of JICA Management Consultation Team dispatched in January, 2001.

Thai side explained to the Team changes of C/P as follows:

There has been no job-hopping of C/P. Only some administrative C/P moved from BSID to other departments as a part of periodical personnel transfers. However, the Thai side will make efforts to keep technical C/P trained by the Project to remain at BSID even after the completion of the Project.

III Mid-term Evaluation of the Project

1 Review of the Inputs to the Project from November 1999 to May 2002 by the Japanese side

(1) **Dispatch of the Japanese Experts and Mission Team**

Both sides confirmed the record of dispatch of Japanese experts and mission teams to date as shown in Annex 4.

(2) **Training of the Thai C/P in Japan**

Both sides confirmed the record of training of C/P in Japan to date as shown in Annex 5.

The Team requested and the Thai side agreed that those ex-training-participants will conduct internal seminars for other C/P to share their knowledge and techniques gained in Japan among all C/P.

(3) **Provision of Machinery and Equipment**

Both sides confirmed the record of provision of machinery and equipment to the Project to date as shown in Annex 6, and those machinery and equipment are properly used and maintained as shown in Annex 24.

(4) **Allocation of the Budget for the Project**

Both sides confirmed the budget allocation for the local cost of the Project as shown in Annex 8.

2 Review of the Inputs to the Project from November 1999 to May 2002 by the Thai side

(1) Allocation of the C/P and the Administrative Personnel for the Project

Both sides confirmed the allocation of C/P and staff for the Project as shown in Annex 20.

(2) Allocation of the Budget for the Project

Both sides confirmed the budget allocation for the Project as shown in Annex 21.

In this connection, the Team requested and the Thai side agreed that the Thai side would continue to make their best effort to bear necessary local costs for the smooth implementation of the Project, especially costs of tools and raw material for mold processing and trial shot. The Thai side has put high priority on the SIC project in the aspect of budget.

(3) Building and Facilities

Both sides reconfirmed that the Thai side prepared buildings, office spaces for JICA Experts and other necessary facilities.

(4) Provision of Machinery and Equipment

Both sides confirmed the record of equipment provided by the Thai side as shown in Annex 7.

The Team requested and the Thai side understood that provided machinery and equipment should be maintained properly, utilizing maintenance records.

3 Review of the Progress of Technology Transfer from November 1999 to May 2002

The Project started in November, 1999 when a chief advisor, a project coordinator and two long-term experts in the fields of Mold Design and Mold Processing were dispatched to the Project. Project activities were implemented almost as planned although there were some unforeseen problems such as the delay of the completion of workshop facilities, the delayed dispatch of the expert in the field of Assembling and Trial Shot, and the bankruptcy of the Japanese mold company which had been expected to support the Project.

Since the Thai side made a request of speeding up the progress of technology

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transfer during the discussions with the Japanese Management Consultation Team dispatched in January, 2000 and at the Joint Coordinating Committee (hereinafter referred to as "JCC"), the Project revised a part of the Annual Technical Cooperation Program (hereinafter referred to as "ATCP") and, then, has made a progress mostly as planned in the revised ATCP as shown in Annex 14.

(1) Technology Transfer from Japanese Experts to C/P

Regarding the skills of technical C/P, both sides confirmed following achievement records:

a The mold design group completed the design of three (3) target products, namely Pen Tray, Case for Alarm Clock and Front Panel of Personal Computer as shown in Annex 14 and 27. In addition, the Project is on the way to producing internal prototyping molds which should be completed through a consistent process from Mold Design to Trial Shot. The mold design group finished the design of the first internal prototyping mold as a PR gift, namely Case for Name Cards. The result of assessment of technical capability of C/P is as shown in Annex 26.

b The mold processing group completed the processing of three (3) target products, namely Pen Tray, Case for Alarm Clock and Front Panel of Personal Computer, and finished eighty (80) percent of processing the forth target product, that is Telephone Cover, as shown in Annex 14 and 27. Regarding the internal prototyping molds, the group has been working with the processing of Case for Name Cards. The result of assessment of technical capability of C/P is as shown in Annex 26.

c The assembling and trial shot group completed the first target product, namely Pen Tray as shown in Annex 14 and 27. At present, the group is mending the mold for the second target product, namely Alarm Clock, having finished its lapping, assembling and trial shot. The result of assessment of technical capability of C/P is as shown in Annex 26.

(2) Outputs of the Project

Regarding the main outputs of the Project, the both sides confirmed following achievement records:

a Advisory services were conducted to nine (9) companies in the year of 2001 and eleven (11) companies from February to May in 2002 shown as in Annex 31.

b Three (3) training courses were implemented respectively in the fields of Mold Design, Mold Processing, and Mold Assembling and Trial Shot in June, 2001, fifty six (56) participants in total. In addition, two (2) seminars were opened, attracting around

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one hundred (100) audiences in November, 2000 and one hundred thirty (130) attendants in November, 2001 as shown in Annex 30.

c The mold processing group accepted fifty six (56) prototyping services ordered from local mold companies, having taken an advantage of superior machinery and equipment as shown in Annex 32.

4 Mid-term Evaluation based on Five (5) Basic Evaluation Components

Both sides confirmed the results of mid-term evaluation based on five (5) basic evaluation components as described in Annex 9.

Summary of the results is as follows;

(1) Relevance

Implementation of the Project is relevant enough with regard to following two points:

(1) Mold and Die industry is a core sector in the Thai Tool Industry, and the both have become more and more important for growing assembly industries in the Kingdom of Thailand. The government has given a high priority to the development of supporting industries such as stated in the National Master Plan, that is Industrial Restructuring Plan started in 1998.

(2) To assist the development of Thai manufactures, especially supporting industries, is one of key-issues for the policy of Japan's ODA.

(2) Efficiency

Many outputs have been efficiently achieved by utilising given inputs, while the timing and quality of inputs should have been improved in the beginning stage.

(3) Effectiveness

The Project is on the right track to achieve the Project Purpose "Technical capability of BSID will be upgraded to extend appropriate technical services to the Thai plastic tool ad mold industries". However, it is still early to evaluate capabilities of technical C/P due to the lack of their practical experiences. Therefore, the quantity and quality of technical services conducted by the Project cannot be evaluated by the same reason. The satisfaction level of beneficiary of the Project, as well as the number of

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technical services, should be monitored periodically and carefully in the remaining cooperation period.

(4) Impact

Though this item is available to a large extent such as an increase of quality of products, productivity, etc. for certain Thai Mold and Tool companies benefited from a training course, advisory services or prototyping services, it will be further studied in the final evaluation.

(5) Sustainability

It is still early to monitor sustainability of the Project. It is needed to monitor all of project activities carefully. However, the following two points should be noted:

(1) In the technical aspect, C/P need to gain more practical skills through the trial productions of various kinds of molds.

(2) In the financial aspects, BSID continues to allocate necessary budget for the purchase of tools and raw materials.

5 Reconfirmation of the Project Concept (Review and Confirmation of the PDM)

In the process of mid-term evaluation, both sides jointly reviewed the PDM for mid-term evaluation as shown in Annex 9 to check the achievement-level of the "outputs" and "project purpose", and by "verifiable indicators". At the same time, both sides also reviewed the "activities", "means of verifications" and "important assumptions" of the PDM.

In conclusion, both sides confirmed that the PDM for Mid-term Evaluation shown in Annex 9 should be authorized as the formal PDM for the remaining cooperation period of the Project. However, it should be surveyed continuously that "indicators" of the "overall goal" would be changed to more practical and obtainable one, because they should be monitored regularly to judge the impacts of the Project.

IV Plan of the Project in the Remaining Cooperation Period

1 Annual Technical Cooperation Program (ATCP) and Annual Plan of Operation (APO) for JFY 2002

Both sides confirmed the ATCP and APO for JFY 2002 as shown in Annex 17 and 18.

2 Input by the Japanese side for JFY 2002

(1) Dispatch of Japanese Experts

a Long-term Experts

Both sides confirmed as follows:

(a) Chief Advisor

(b) Mold Design

(c) Mold Processing

(d) Mold Assembling and Trial Shot

(e) Project Coordinator

b Short-term Experts

Both sides confirmed as follows:

(a) CAD/CAM Operation

(b) Seminar on Trends of Mold Technologies

(c) Mold Processing

(d) Mold Lapping

(2) Training of the Thai C/P in Japan

Both sides confirmed as follows:

(a) One (1) technical C/P from the mold processing group will be trained approximately three (3) months in Japan.

(b) One (1) technical C/P from the the mold assembling and trial shot group will be trained approximately three (3) months in Japan.

(3) Provision of Machinery and Equipment

Both sides confirmed that two (2) sets of milling machines provided by the Japanese side would be delivered to the Project, and, besides those, no machinery and equipment would be provided in JFY 2002. The Team requested and the Thai side understood that the running costs including tools and raw materials should be borne by the Thai side in order to implement the Project activities more smoothly.

3 Input by the Thai side for JFY 2002

Both sides confirmed that, if any complementary equipment or materials are needed for the Project, and not to be provided by Japanese side, those would be purchased properly by the Thai side.

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4 Prospect for JFY 2003 and 2004

The Team explained and the Thai side agreed that major activities of the Project consisted of training courses, advisory services and prototyping services are to be conducted in accordance with the Re-planning TCP as shown in Annex 17.

V Specific Issues

1 Technical Services for Mold and Die Industries

Both sides reconfirmed that the main purpose of the Project is to upgrade technical services of BSID for the Thai plastic mold industries, so that the Project would make efforts to conduct more active technical services as follows:

(1) Training Courses

The Project will introduce new training courses, that is a module course. The module course is consisted of various kinds of short-term courses covering the contents from fundamentals to applied specific techniques, which meet the needs of clients.

(2) Advisory Services

The Team explained and the Thai side understood that Japanese experts and C/P would visit factories more frequently in response to mold companies. The Project conducts advisory services in the purpose of increasing On-the-job Training of technical C/P.

(3) Prototyping Services

The Team explained and the Thai side understood that "Production Design" itself is out of scope of the Project. Other than the first PR gift, namely Name Card Case, basically internal prototyping molds will be conducted, utilizing a copy of drawing of "Production Design".

(4) Technology Transfer of 3D-CAD/CAM

The Thai side requested that technical C/P need to deal with more different kinds of mold design and production. The Team responded that, other than the internal prototyping molds, the Mold Design group would have a chance to design various kinds of molds and experience to see 3-D modeling of molds on the screen if one additional long-term expert in the field of 3-D CAD/CAM is dispatched as planned.

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In addition, the Team explained and the Thai side understood that the technical item of 3-D CAD/CAM would be placed not only in the area of Mold Design but also in the area of Mold Processing.

2 **Cooperation and Distinction from Other Related Organization**

Thai side explained to the Team as follows:

Kingmongut Institute of Technology trains students general knowledge and skills on mold and die academically, and Kasetsart University is equipped with advanced technologies including CAD/CAM system to conduct advisory services and prototyping services for the companies producing metal, polymer, plastic, etc. Material Technology Center (hereinafter referred to as "MTEC"), which is the semi-governmental organization under the National Science and Technology Development Agency, provides Computer-Aided Engineering (hereinafter referred to as "CAE") with mold and die industries which need any computer-analyzed information about materials of their products.

Thai German Institute (hereinafter referred to as "TGI") provides Mold and Die industries with advanced and long-term trainings. At the same time, TGI has conducted trainings for teachers from vocational schools and unemployed people sponsored by the government.

While TGI implements long-term training courses, charging mold and die companies relatively high fees for the trainings, the Project of BSID provides small and medium scale companies with short-term trainings consisted of module courses. In addition, the training course of the Project sets cheap training fees to attract employees of small and medium sized mold makers.

3 **Publicity of the Project**

Other than brochures, homepage, television and radio listed in Annex 23, the Project provided booths with Mold and Die exhibitions such as the Mold and Die 2000 where 1000 people visited in October, 2000 and with METALEX attracting two thousand (2000) people in November, 2001.

VI Attendees of the Meeting

The list of attendees of the meeting is as shown in Annex 36.

List of Annexes

No	Name of Documents
1	Organization Chart of BSID
2	Annual Budget Allocation (Income/Expenditure) of BSID
3	Annual Income Earned by Section of BSID
4	List of the Dispatched Japanese Experts and Mission Teams
5	List of the C/P trained in Japan
6	List of Machinery and Equipment Provided by the Japanese Side
7	List of Machinery and Equipment Provided by the Thai Side
8	Expenses by the Japanese Side (From JFY 1999 to JFY 2001)
9	Results of Mid-term Evaluation
10	Project Design Matrix (PDM) for Mid-term Evaluation
11	Technical Cooperation Program (TCP)
12	Plan of Operations (PO)
13	Tentative Schedule of Implementation (TSI)
14	Annual Technical Cooperation Program (ATCP) for JFY 1999, 2000, 2001 and their Achievement
15	Annual Plan of Operations (APO) for JFY 1999, 2000, 2001 and their Achievement
16	Annual Tentative Schedule of Implementation (ATSI) for JFY 1999, 2000, 2001 and their Achievement
17	ATCP for JFY 2002
18	APO for JFY 2002
19	ATSI for JFY 2002
20	Allocation of the C/P and Staff for the Project
21	Budget Allocation (Local Cost) for the Project
22	Number of Committee and Meeting, and iths Member List
23	Number of Publicity (Brochures, Periodicals, etc.)
24	Maintenance Record of Machinery and Equipment
25	List of Spare Parts and Local Suppliers
26	Monitoring and Evaluation Sheet (Assessment of Technical Capability by Japanese Experts)
27	Progress Record of Completed Target Products
28	List of Mannuals, Textbooks and Materials Prepared by Japanese Experts
29	List of Mannuals, Textbooks and Materials Developed by Thai C/Ps
30	Record of Technical Trainings and Seminars Conducted by the Project
31	Record of Technical Information and Advisory Services Conducted by the Project
32	Record of Prototyping Services Conducted by the Project
33	Results of Questionnaire to Beneficiaries (Participants in Trainings/Seminars, Clients of Advisory /Prototyping Services)
34	Monitoring and Evaluation Plan
35	Progress Report of Technical Cooperation Project
36	List of Attendance of the Discussions

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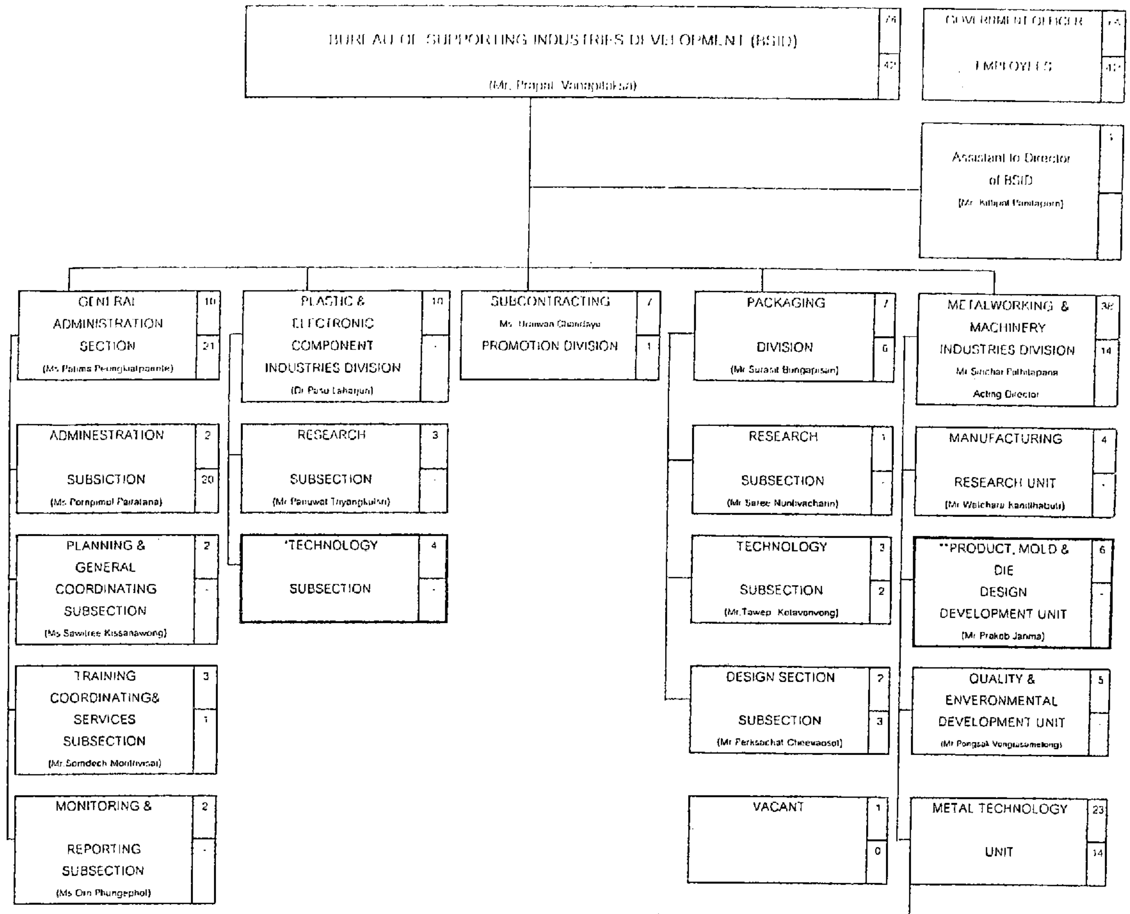
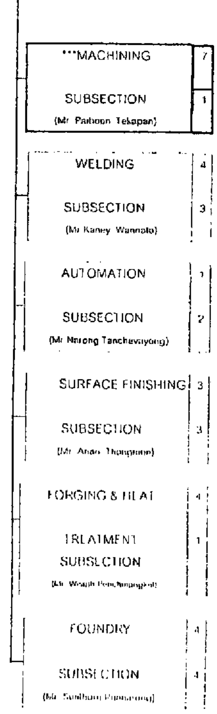
Unit -

Annex 1 Organization Chart of BSID





Note 1 The Head of respective organization are called as follows:

(1) Bureau	Director
(2) Division	Director
(3) Section	Chief
(4) Subsection	Chief
(5) Unit	Chief

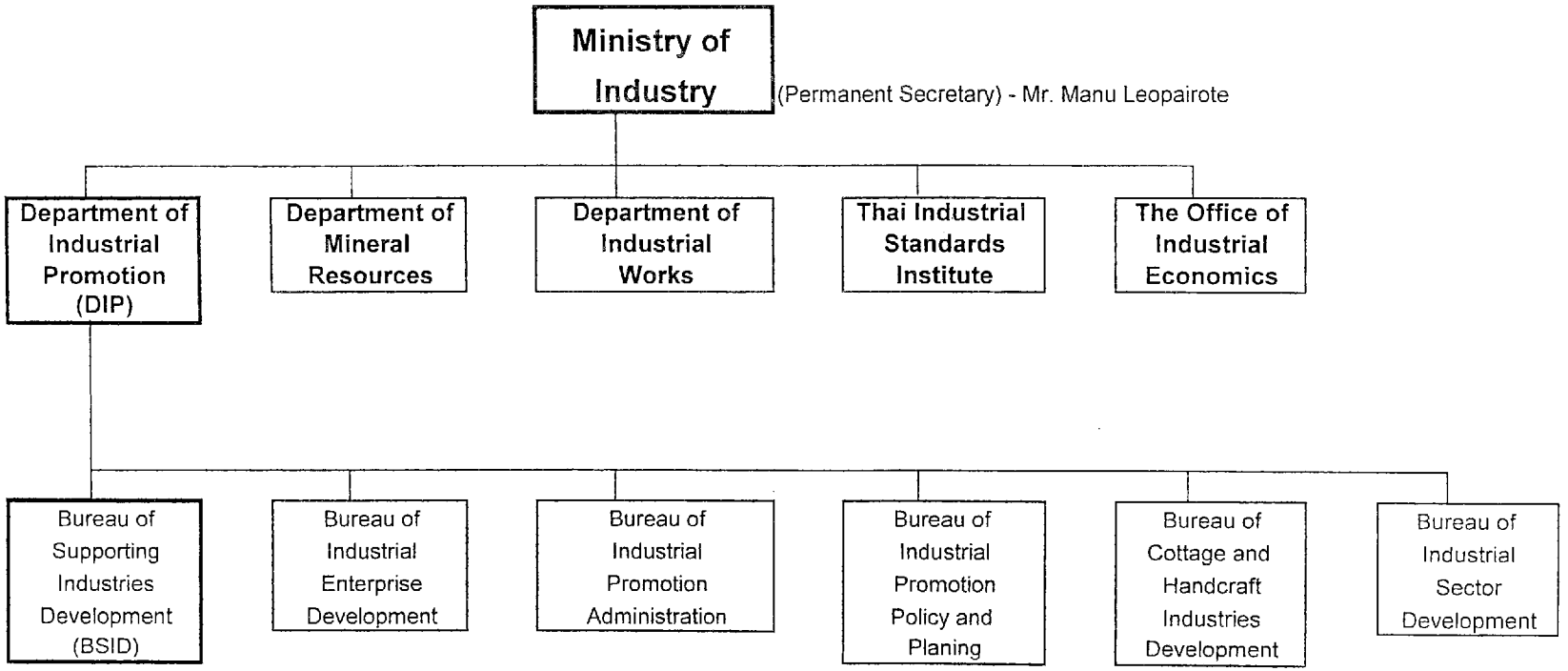
2 The subsection and unit surrounded by bold line are the ones related to the Project.

*TECHNOLOGY SUBSECTION
1 MR PONGSAK VONGRASAMETONG
2 MR TAWEESIT TIUAMLE
3 MR KIJJA CHONGKWANYUEN
4 MR VIRIT VEFESHSINON

**PRODUCT MOLD& DIE DESIGN DEVELOPMENT UNIT
1 MR PRAKOB JANMA
2 MR WORAPONG CHNETIONSAKULCHAI
3 MR PRECHA JAMTAIB
4 MR SOMPONG TERACANOTI
5 MR CHANON SUKTAYA
6 MR CHAIRAT ELAWDOUNG

***MACHING SUBSECTION
1 MR PAIBOON TEKAPAN
2 MR SATTA DENPRADITI
3 MR PAISAL THOKAEW
4 MR SAHAS CHUMSOONGNOEN
5 MR DAMRONG KRATUMEHETR
6 MR BANTAO WONGPRACHANUKUL
7 MR SIRISAK RITHGAM

Annex 1 Organization Chart of MOI and DIP



Annex 2 Annual Budget Allocation (Income/Expenditure of BSID)

Items	TFY 2000		TFY 2001		TFY 2002	
	Allocated	Spent	Allocated	Spent	Allocated	Spent
1. Salaries & wages	16,526,400.00	Fully	16,738,500.00	Fully	19,421,640.00	12,947,760.00
2. Remuneration and Supplies	4,610,700.00	Fully	3,961,600.00	Fully	3,122,600.00	1,575,343.78
3. Equipment, Properties & Construction	5,000,000.00	Carry-over	-	-	-	-
4. Public Utilities	2,430,000.00	Fully	2,303,000.00	Fully	2,162,238.00	371,717.34
5. Other Expense *	20,169,600.00	Fully	11,450,000.00	Fully	10,250,000.00	5,239,007.39
Total	**48,736,700.00**	Fully	**34,453,100.00**	Fully	**34,956,478.00**	**20,133,828.51**

(THB)

*** Budget for SIC project, please refer to Annex No. 21**

TFY : Thai Fiscal year starts in October and ends in September

Annex 3 Annual Income Earned of BSID

Annex 3

Thai Fiscal year	Income
2000	162,000.00
2001	321,639.00
2002	166,972.00
2003	-
2004	-
2005	-
Total	**650,611.00**

Thai Fiscal year starts in October and ends in September

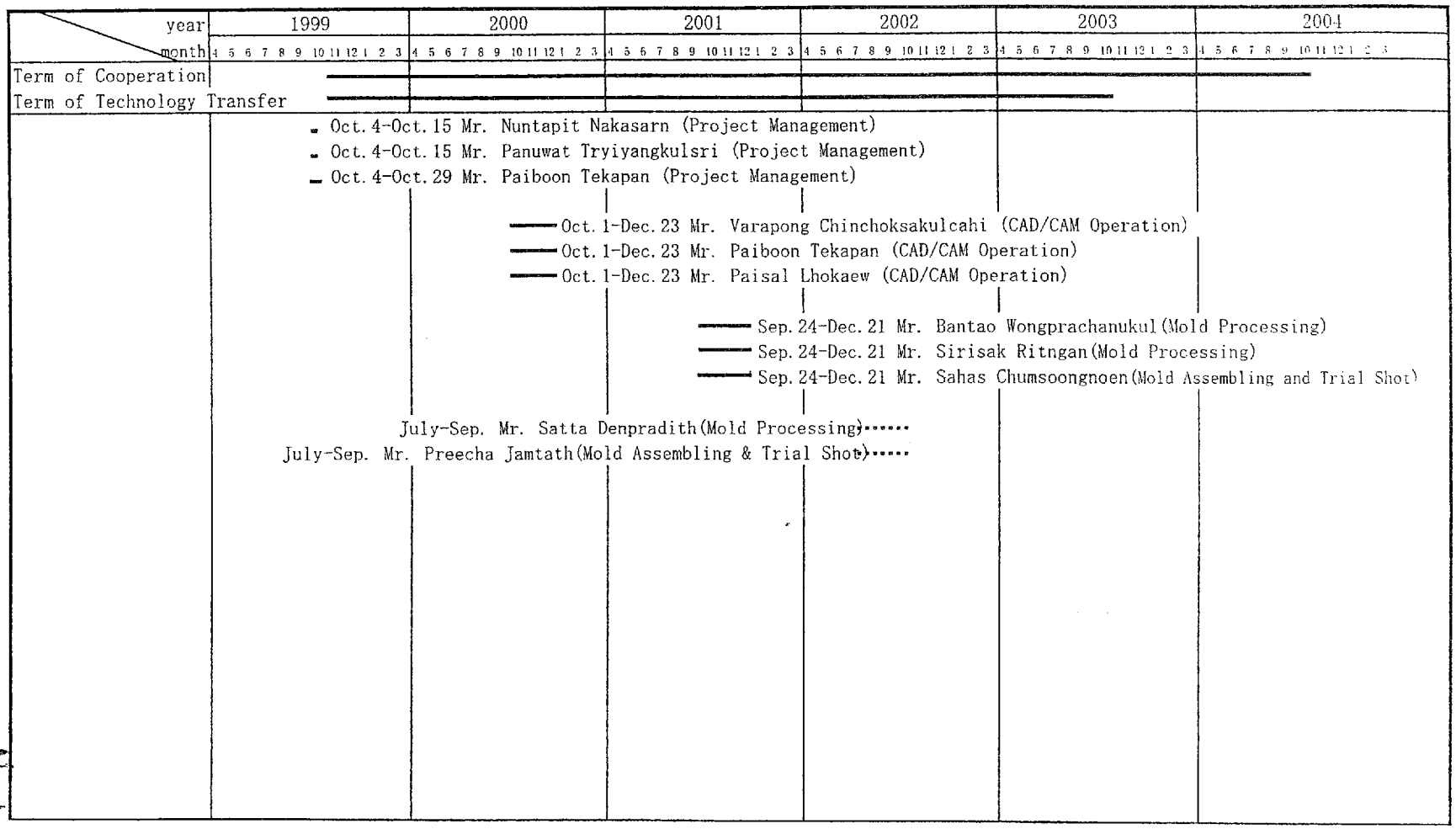
Annex 4 Dispatch of the Japanese Experts

	year	1999	2000	2001	2002	2003	2004
	month	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	1 5 6 7 8 9 10 11 12 1 2 3
	Term of Cooperation	———	———	———	———	———	———
	Term of Technology Transfer	———	———	———	———	———	
	Mission Team	↓	↓		↓		
	Long Term Experts						
	Chief Advisor	Dr. Jun Ikeuchi (Nov.10,1999–Nov.10,2001)					
	Coordinator	Mr. Kenichi Machida (Nov.10,1999–Nov.10,2002)					
	Coordinator			Mr. Yasuo Uchida (Oct.22,2001–Oct.21,2003)			
	Mold Design	Mr. Toshiya Otsuka (Nov.10,1999–Nov.10,2001)					
	Mold Processing	Mr. Shigenobu Seki (Nov.10,1999–Nov.10,2001)					
EXPERTS	Mold Assembling and Trial Shot	Mr. Noboru Oiwa (May.19,2000–May.18,2002)					
	Short Term Experts						
	Machinery Operation and Management (CAD/CAM/DNC)		Mr. Atsuhiko Hatakeyama (May.9,2000–				
	Machinery Installation and Operation (CAD/CAM/DNC)		Mr. Junzo Ono (May.9,2000–				
	Machinery Installation and Operation (CAD/CAM/DNC)		Mr. Kiyoyuki Iwakabe (May.9,2000–May.19,2000)				
	Machinery Operation and Management (CAD/CAM/DNC)		Mr. Fumio Hoshi (Sep.4,2000–Sep.16,2000)				
	Machinery Operation and Management (EDM/W-EDM)		Mr. Setsuo Nakayama (Sep.4,2000–				
	Machinery Operation and Management (CAD/CAM/DNC)		Mr. Fumio Hoshi (Nov.13,2000–				
	Mold Technology Seminar		Mr. Tetsuo Sasaki(Nov.28,2000–Dec.2,2000)				
	Machinery Operation and Management (CAD/CAM/DNC)			Mr. Hiroshi Sekiguchi(May 14,2001–May 26,2001)			
	Machinery Installation and Operation (CAD/CAM/DNC)			Mr. Junzo Ono (Oct.8,2001–Oct.20,2001)			
	Mold Technology Seminar			Mr. Toshitaka Matsuoka(Nov.28,2001–			

Annex 4 Dispatch of the Japanese Experts

year	1999	2000	2001	2002	2003	2004
month	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3
Machinery Installation and Operation (CAD/CAM/DNC)			Mr. Koji Sawada (Dec.6,2001-Dec.27,2001)			
Mold Lapping			Mr. Koji Kondo(Jan.14,2002-Jan.26,2002)			
Machinery Installation and Operation (CAD/CAM/DNC)				Mr. Koji Sawada (May.6,2002-June.29,2002)		

Annex 5 C/P training in Japan



Annex 6 List of Machinery and Equipment Provided by Japanese Side

No.	Equipment name	Manufacture/Model	Unit	Usage frequency	Maintenance condition	Delivery Time	Remarks
1	CAD/CAM Network station(Software)	IK Tool International	1	A	A	March'00	
	(1)CADCEUS Software						
	(2)CAD/CAM Application						
2	CAD/CAM Network station(Hardware)		1	A	A	March'00	
	(1)PC for 3D	COMPAQ SP750 SERIES					
	(2)PC for 2D	COMPAQ AP250 SERIES					
	(3)Server	COMPAQ PROLIANT 800 SERIES					
	(4)Printer	FUJITSU 20W					
	(5)Protter	HP C4716A/HP Design Jet 450					
	(6)Others						
3	Test Mold Set	IK Tool International	1	B	A	Mar.'00	
4	Machining Center	MAKINO V-55	1	B	A	Mar.'00	
5	Tool presetter and Tools	IK Tool International	1	B	A	Mar.'00	
	(1)Toolpresetter	VDM-3040-3					
	(2)Optional Accessories						
	(3)Tool&Holder						
	(4)Tool&Jigs						
6	EDM	Sodick AQ600+MARK30+AVT	1	B	A	Mar.'00	
7	W-EDM	Sodick AN55L+LN1+ATC	1	B	A	Mar.'00	
8	Small Hole Drilling Machine	Sodick K1C	1	B	A	Mar.'00	
9	Surface Grinder	KURODA GS-515PFL	1	B	A	Mar.'00	
10	Injection Machine	Nissei Plastic FN7000	1	B	A	Mar.'00	
11	Waterless Cooler	MATSUI MCN-60H	1	B	A	Mar.'00	
12	Mold Temperature Controller	KANNETU WL-15	1	B	A	Mar.'00	
13	Welding Machine and others	Yozo Welding Machine Type Series 4	1	B	A	Mar.'00	
14	Photocopy Machine	Xerox MF 400CP	1	A	A	Feb.'00	
15	FAX	Brother MFC-6650MC	1	A	A	Feb.'00	
16	White Board(1)Large	Panasonic KX-B630G Copyboard	2	B	A	Mar.'00	
17	White Board(2)Small	Panasonic KX-B530G Copyboard	2	B	A	Mar.'00	
18	TV	JVC AV-S33MS6	1	B	A	Mar.'00	
19	VTR	Sony SLV-GF99K Hi-Fi	1	B	A	Mar.'00	
20	Projector	3M 2770	1	B	A	Mar.'00	
21	LCD Projector	Epson LCD Projector EMP-7250	1	A	A	Mar.'00	
22	Screen for Projector	Sopar Tripod Screen 70"×70"	1	B	A	Mar.'00	
23	Printer	Epson Color 880	1	A	A	Oct.'01	
24	Tool Wagon with Vice	Harn & Kolb	2	A	A	Dec.'01	
25	Air Blow for MAKINO V-55	For V-55 SNR 852	1	B	A	Dec.'01	
26	Floating Holder for Sodick AM 55L	EROWA EJ-1403	1	B	A	Dec.'01	
27	Caliper	MITSUTOYO 500-154	5	B	A	Dec.'01	
28	Caliper	MITSUTOYO 500-156	5	B	A	Dec.'01	
29	Caliper	MITSUTOYO 530-122	2	B	A	Dec.'01	
30	Caliper	MITSUTOYO 530-124	2	B	A	Dec.'01	
31	Caliper	MITSUTOYO 500-10	2	B	A	Dec.'01	
32	Depth Gauge	MITSUTOYO 571-201-10	3	B	A	Dec.'01	
33	Depth Gauge	MITSUTOYO 7221	2	B	A	Dec.'01	
34	Depth Gauge	MITSUTOYO 7213	2	B	A	Dec.'01	
35	Depth Gauge	MITSUTOYO 7210	2	A	A	Dec.'01	
36	Depth Gauge	MITSUTOYO 7223	2	B	A	Dec.'01	
37	Dial Tester	MITSUTOYO 523-426-E	3	B	A	Dec.'01	
38	Floating Holder for Sodick AM 55L	EROWA EJ-1403	1	B	A	Feb.'02	
39	Magnet Block Base	PFSPL-L105*W45*H45	4	B	A	Mar.'02	
40	Handy Forklift	Hyduric SK-500/1.6M	1	A	A	Apr.'02	

Usage frequency : A-use daily B-use often (1～3 times / week) C-use only specific period
D-use rarely (3～11times / year) E-not useable with specific reason
Maintenance condition : A-maintained well B-maintained good C-need maintenance to use D-not useable condition

K.T.

Unt.

Annex 7 List of Machinery and Equipment provided by the Thai side

No.	Equipment Name	Manufacture/Model	Unit	Usage Frequency	Maintenance Condition	Obtained year
1	Working Desk and Chair	Desk/PSP (0011384) Chair/GL35A1 (000112214)	15 set	B	B	2000
2	Desk for Printer	PSP VCD 1202 (00113835)	1	B	B	2000
3	Desk for Server		1	B	B	2000
4	Vertical Milling Machine	Makino/BVII J-70	1	A	B	1987
5	Surface Grinder	Okamoto/PSS	1	B	B	1987
6	Tool Grinder	ito/DP-250 No. 1322	1	B	B	1987
7	Grinder (Floor)	Showa/5EA-516	1	B	B	1987
8	Band Saw (Hack saw)	Economy/PSB 280 U	1	B	B	1987
9	Lathe (High Speed)	Daimichi/DLG-SH	1	B	B	1987
10	Horizontal Boring Machine	Toshiba/BTD-11B	1	E	D	1987
11	Cutting Grinder	Bosch/GWS 6-100	1	B	C	1987
12	12.1 Working Desk 12.2 Surface Plate	Size 900 x1800 x 750 mm. Size 1200 x 2400 x 320 mm.	1 1	A A	A A	1987 1987
13	Middle Size Injection Machine	Japan Steel Works (JSW) /J 150 EII-P (150 Tons)	1	C	C	NEDO 1997 1998
14	Small Size Injection Machine	Sodick/TR 80 S2 (80 Tons)	1	C	C	NEDO 1997
15	Flexible Mold Temperature Controller	Kanetsu/TM-05A = 2 set TM-03A = 1 set	3	C	C	NEDO 1998
16	Temperature Controller	Matsui/MCN 30 H = 1 set MCN-135/31AX = 1 set	2	C	C	NEDO 1997
17	Plastic Material Drier	Matsui/PO-120	1	C	B	NEDO 1998
18	Three Coordinate Measuring Machine	Mitutoyo FJ-805/No.871153	1	E	D	Dec. 1987
19	Steel Hardness Tester 1. Rockwell Hardness Tester 2. Brinell Hardness Tester 3. Vickers Hardness Tester 4. Shor Hardness Tester	 Shimasu/Type HR No. 8222 Shimasu/Type HR No. 8536 Matsuzawa Seiki Co.,Ltd./ SER No. V5964 Shimadzu Seisakusho Ltd. SER No. 17424	- 1 1 1 1	 E B B B	 D B B B	 Aug. 1986 Aug. 1986 Oct. 1986 Oct. 1986

K.T. Unit.

Annex 7 List of Machinery and Equipment provided by the Thai side

No.	Equipment Name	Manufacture/Model	Unit	Usage Frequency	Maintenance Condition	Obtained year
20	Tool Makers Microscope					
	1. Microscope and IT's Accessories	Ver samet-2 No. 7611	1	C	B	Oct. 1986
	2. Microscope and IT's Accessories	Olympus No. 7611	1	E	D	Oct. 1986
	3. Microscope and IT's Accessories	Olympus No. 7612	1	B	B	Oct. 1986
	4. Measuring Microscope and IT's Accessories	Nikon No. 12172	1	B	B	Dec. 1987
21	Gauge Unit		1 set	C	B	
	1. Block Gauges and IT's Accessories	Mitutoyo/No. 114358				Dec. 1987
	2. Block Gauges and IT's Accessories	Mitutoyo/No. 209541				Dec. 1987
	3. Block Gauges and IT's Accessories	Mitutoyo/No. 143584				Dec. 1987
	4. Block Gauges and IT's Accessories	Mitutoyo/No. 200103				Dec. 1987
	5. Optical Gauges and IT's Accessories	Nikon No. 3443				Dec. 1987
	6. Optical Gauges and IT's Accessories	Nikon No. 4839				Dec. 1987
	7. Optical Gauges and IT's Accessories	Nikon No. 10548				Dec. 1987
	8. Cylinder Gauges and IT's Accessories	No. 740491				Dec. 1987
	9. Cylinder Gauges and IT's Accessories	No. 511-172				Dec. 1987
	10. Cylinder Gauges and IT's Accessories	No. 511-173				Dec. 1987
	11. Cylinder Gauges and IT's Accessories	No. 511-174				Dec. 1987
	12. Cylinder Gauges and IT's Accessories	No. 511-175				Dec. 1987

Note:

Usage Frequency

A = Use Daily
B = Use often (1-3 Times/week)
C = Use Only specific Period
D = Use rarely (3-11 Times/week)
E = Not Useable with specific reason

Maintenance condition

A = Maintained Well
B = Maintained Good
C = Need Maintained to use
D = Not Useable Condition

K.T.

Unit.

Annex 8 Expenses by the Japanese Side from JFY1999 to JFY2001

Unit: Thousand Yen

Japanese Fiscal Year	1999	2000	2001	Total (from 1999 – 2001)
Dispatch of Experts	39,287	104,788	(88,400)	(232,475)
Acceptance of C/P in Japan	3,074	16,212	19,198	38,484
Provision of Machinery and Equipment	274,333	0	7,718	282,051
Local Cost Support	1,008	3,921	4,510	9,439
Dispatch of Study Team	4,304	1,506	0	5,810

Estimated Grand Total Spent from JFY1999 - JFY2001: JPY568, 259

Note: Expenses in Japanese Fiscal Year 2001 includes estimate ( ).

K.T.

Unit

ANNEX 9 RESULT OF MID-TERM EVALUATION

Evaluation Result		Reference
0. Overall	**Abstract** ➢ In conclusion, during the former half of the cooperation period, the Project activities have been implemented as planned in general. ➢ However, since the remaining period of technology transfer in the Project is limited to two years and half, the both Japanese and Thai sides have to accelerate to finalise the rest of technology transfer subjects, increase practical trainings from experts to C/P through the production of various kinds of molds and establish to manage technical training courses systematically.	
1. Relevance	**Abstract** ➢ Implementation of the Project is relevant enough with regard to following two points: ➢ (1) Mold and Die industry is a core sector in the Thai Tool Industry, and the both have become more and more important for growing assembly industries in the Kingdom of Thailand. The government has given a high priority to the development of supporting industries such as stated in the National Master Plan, that is Industrial Restructuring Plan started in 1998. ➢ (2) To assist the development of Thai manufactures, especially supporting industries, is one of key-issues for the policy of Japan s Official Development Assistance. **(1) Relevance of Overall Goal** ➢ The overall goal of the Project is relevant to the current development issue in the Kingdom Thailand and in accordance with the Thai governmental policy. **(2) Relevance of Project Purpose** ➢ The project purpose is relevant since BSID is the core governmental organization for the development of mold and die industries, and the Project has a target to provide such appropriate technical trainings, advisory services and prototyping services that plastic tool and mold manufactures need in the Kingdom of Thailand. **(3) Factors Diminishing the Relevance** ➢ There have been observed no factors that could diminish the relevance of the Project.	

ANNEX 9 RESULT OF MID-TERM EVALUATION

Evaluation Result		Reference
2. Effectiveness	**Abstract** ➢ The Project is on the right track to achieve the Project Purpose Technical capability of BSID will be upgraded to extend appropriate technical services to the Thai plastic tool ad mold industries . However, it is still early to evaluate capabilities of technical C/P due to the lack of their practical experiences. Therefore, the quantity and quality of technical services conducted by the Project cannot be evaluated by the same reason. The satisfaction level of beneficiaries of the Project, as well as the number of technical services, should be monitored periodically and carefully in the remaining cooperation period. **(1) Achievement of Outputs** **Output 0: Project operation unit will be enhanced.** **[Indicators]** 0-1. C/P is allocated as planned. 0-2. Budget is adequately allocated to the local cost of the Project. 0-3. Committees and the Project management meetings are held periodically. 0-4. The number of publicity of the Project increases. **[Comment]** **0. Overall** ➢ BSID has allocated enough number of C/P to the Project. While most C/P are positive with the Project activities, there are some technical C/P who are not satisfied with the way of technology transfer from Japanese experts. Therefore, it is recommended to promote more smooth communications between C/P and experts in each group. ➢ It is expected to proceed with preparing enough tools and materials for the Project activities as planned. ➢ Management systems are well established although further effective modifications are needed to adjust unexpected different views between Japanese experts and the Thai side. **0-1. C/P is allocated as planned.** ➢ 24 C/P personnel are allocated to the Project. Technical C/P consists of 3 personnel in the Mold Design group, 3 personnel in the NC Programming, 4 personnel in the Mold Processing, and 7 personnel in the Lapping and Assembling/Trial Shot. ➢ Almost all technical C/P have remained in the same group since the start of the Project, while some administrative C/P changed due to periodical personnel transfers. **0-2. Budget is adequately allocated to the local cost of the Project.** ➢ BSID has put high priority on the Project and allocated necessary budget each year, especially in the Thai Fiscal Year 2000 when the renovation of the project facilities was needed. ➢ Best efforts have been made to secure the necessary budgets for the Project, however there were some unexpected delays of the completion of Workshop A and procurement of materials.	Annex 20 Annex 2 Annex 21

ANNEX 9 RESULT OF MID-TERM EVALUATION

Evaluation Result		Reference
	0-3. Committees and the Project management meetings are held periodically. ➢ Thai side and Japanese experts have held joint weekly meetings almost every week since the start of the Project. Other than those, the Project had monthly meetings 15 times and the JCC meeting four times from December, 2000 to April, 2002.	Annex 22
	0-4. The number of publicity of the Project increases. The Project not only published 2 kinds of brochures but also introduced their activities through a web page. In addition, the Project provided booths with Mold and Die exhibitions, attracting more than 3,000 clients in total in November, 2000 and 2001.	Annex 23
	<u>Output 1: Necessary machinery and equipment will be provided, installed, operated and maintained properly.</u> **[Indicators]** 1-1. The type and quantity of machinery and equipment provided are appropriate. 1-2. Provided machinery and equipment are inspected and operated appropriately. 1-3. Spare parts are appropriately procured through local suppliers.	
	[Comment] **1. Overall** ➢ Major machinery and equipment have been appropriately provided, installed, operated and maintained. ➢ Some NC machines are not operated by the full usage of the advanced functions due to the lack of tools and materials. It is recommended that the Thai side makes the best efforts to prepare tools and raw materials which the Japanese side has not provided. ➢ Regarding local sources for raw materials and spare parts, C/P has already had routes to contact with local supplier.	
	1-1. The type and quantity of machinery and equipment provided are appropriate. ➢ Major Machinery and Equipment, total of 40items, which are worth around JP· 282,051,000, has been provided by the Japanese side. ➢ Most of the machinery and equipment was installed in Workshop A of BSID by the end of March, 2000, although there were some delays of installation caused by of the delayed completion of the workshop facilities.	Annex 8
	1-2. Provided machinery and equipment are inspected and operated appropriately. ➢ The machinery and equipment mentioned above are generally kept and utilised in good conditions at BSID. However, some NC machines are not operated, fully utilizing the advanced functions, due to the lack of drill, tools and raw materials. ➢ Some machinery and equipment provided by the Thai side are not used frequently and needed to be maintained. It is recommended that the Project discuss the effective way of usage of machinery and equipment provided by the Thai side.	Annex 6 Annex 24 Annex 7

ANNEX 9 RESULT OF MID-TERM EVALUATION

Evaluation Result		Reference
	1-3. Spare parts are appropriately procured through local suppliers. ➢ Thai side has already had routes to contact with local supplier. However, it is recommended that the Thai side manage the well-timed order and delivery of spare parts, as well as raw materials, for the effective implementation of technology transfer.	Annex 25
	<u>Output 2: Technical capability of the counterpart personnel (C/P) will be upgraded in the fields of mold design, mold processing, mold assembling and trial shot.</u> **[Indicators]** 2-1. Each C/P improves his knowledge and skill of respective technology transfer items. 2-2. The number of achieved target products increases. 2-3. Original manuals, textbooks and training materials are developed. **[Comment]** **2. Overall** ➢ Technology transfer from JICA expert to the Thai technical C/P has been implemented through several measures such as lectures and hands-on training mostly as planned in the TCP. ➢ Two years and half have past since the start of the Project. All C/P have acquired fundamentals of each technology-transfer item. According to the assessment of experts, some C/P have the knowledge above average on certain items and can instruct others without any assistance from Japanese experts. However, all C/P need to gain much more experience by practice in order to instruct participants from private mold companies without any assistance from Japanese experts by the end of the Project. ➢ The both mold design and processing groups completed 3rd target product, and the assembling/trial shot group is mending the second target product. It is expected that, other than 5 different kinds of target products, the Project produce trial molds as many as possible through a consistent and systematic process from Mold Design to Trial Shot.	
	2-1. Assessment by the Japanese experts ➢ The recent assessment points on the subjects already transferred by Japanese experts are shown as follows. - (1) Mold Design [2-4] - (2) Mold Processing [3-4] - (3) Assembling and Trial Shot [2-4] Note: Progress Status: 1= When asked, C/P cannot explain the subject in detail but can perform the job under expert s instruction. 2= When asked, C/P can explain the subject in detail but can perform the job with expert s advise. 3= When asked, C/P can explain the subject in detail without any assistance from expert and can perform the job by themselves. 4= C/P has superior of the subject and can instruct others.	Annex 26

ANNEX 9 RESULT OF MID-TERM EVALUATION

Evaluation Result		Reference
	2-2. Progress of completed target products	
	➢ The mold design group completed the design of 3 target products, namely Pen Tray, Case for Alarm Clock and Front Panel of Personal Computer. In addition, the group finished the design of the first internal prototyping mold, namely Case for Name Cards.	Annex 14 Annex 27
	➢ The mold processing group completed the processing of 3 target products, namely, Pen Tray Case for Alarm Clock and Front Panel of Personal Computer. In addition, the group has been working with the processing of Case for Name Cards.	Annex 14 Annex 27
	➢ The assembling and trial shot group completed the first target product, namely Pen Tray. At present, the group is mending the mold for the second target product, namely Alarm Clock.	Annex 14 Annex 27
	2-3. Original manuals and textbooks	
	➢ Japanese experts have prepared 91 kinds of manuals and textbooks in total since the start of the Project. Thai C/P developed 9 kinds of materials for the training course of Mold Design, 11 kinds for Mold Processing and 7 kinds for Assembling and Trial Shot.	Annex 28 Annex 29
	<u>Output 3: Seminars and training courses in the said fields will be implemented systematically.</u>	
	[Indicators]	
	3-1. The number of implemented seminars, training courses and its participants increases.	
	[Comment] **3. Overall**	
	➢ The Project conducted one training course respectively in the fields of Mold Design, Mold Processing and Mold Assembling/Trial Shot in June, 2001.	
	➢ It is recommended that the Project should feed back the results of the implemented training courses to the next training courses starting from May, 2002 to June, 2002 in order to improve the quality of the training courses.	
	3-1. The number of implemented seminars, training courses and its participants increases.	
	➢ A training course was implemented respectively in the fields of Mold Design, Mold Processing, and Mold Assembling/Trial Shot in June, 2001 in which 56 people from Mold and Die companies, and other related organizations participated.	Annex 15 Annex 30
	➢ Two seminars were opened in November, 2000 and 2001. Each seminar attracted approximately 100 audiences and 130 attendants respectively.	Annex 30
	<u>Output 4: Technical information and advisory services in the said fields will be implemented systematically.</u>	
	[Indicators] 4-1. The number of implemented advisory services increases.	

ANNEX 9 RESULT OF MID-TERM EVALUATION

Evaluation Result		Reference
	4-2. Related technical data including client information is accumulated. 4-3. The quantity and quality of technical information and advisory services satisfy the clients needs. **[Comment]** **4. Overall** ➢The Project has conducted 20 companies in total from the start of the Project. ➢Since C/P does not have enough practical experience in spite of having gained fundamental knowledge of specific subjects, it is still early to evaluate the quality of consultation of C/P. **4-1. The number of implemented advisory services increases.** ➢Advisory services were conducted to 9 companies in the year of 2001 and 11 companies from February to May, 2002. **4-2. Related technical data including client information is accumulated.** ➢Each time advisory services were conducted, C/P submit reports to Japanese experts. ➢Advisory reports were written in Thai language, which makes it harder for Japanese experts to evaluate its contents. **4-3. The quantity and quality of technical information and advisory services satisfy the clients needs.** ➢It is still early to evaluate the satisfaction level of the clients benefited from advisory services of the Project. **<u>Output 5: Trial prototyping services will be implemented systematically.</u>** **[Indicators]** 5-1. The number of implemented trial prototyping services increases. 5-2. The quality of trial prototyping services satisfies the clients needs. **[Comment]** **5.Overall** ➢The Project conducted 56 prototyping services in the field of Mold Processing. ➢It is still difficult for technical C/P to produce commercial molds through a consistent process from Mold Design to Trial Shot, it is recommended that the Project should implement to produce internal prototyping molds in order to let C/P gain practical experiences. **5-1. The number of implemented trial prototyping services increases.** ➢Japanese experts and C/P conducted 56 prototyping services in the field of Mold Processing, having taken an advantage of superior machinery and equipment installed at BSID. **5-2. The quality of trial prototyping services satisfies the clients needs.** ➢Since C/P does not have practical skills enough to produce commercial molds through a consistent process from Mold Design to Trial Shot, it is still early to evaluate the satisfaction level of the clients.	Annex 31 Annex 32

ANNEX 9 RESULT OF MID-TERM EVALUATION

Evaluation Result		Reference
3. Efficiency	<u>Abstract</u> ➢ Many outputs have been efficiently achieved by utilising given inputs, while the timing and quality of inputs should have been improved in the beginning stage. <u>1. Adequacy of timing, quality and quantity of Inputs from Japanese Side</u> **[Comments]** **(0) Overall** ➢ Most of the inputs from the Japanese side were delivered in accordance with required quality and quantity. However, the timing of dispatching a long-term expert in the field of Assembling and Trial Shot was delayed. **(1) Dispatch of Japanese Experts** ➢ Total of 5 long-term experts and 13 short-term experts were dispatched almost as planned. Only the long-term expert in the field of Assembling and Trial Shot was dispatched with delay due to the recruitment problem in the Japanese side. **(2) C/P Training in Japan** ➢ 9 C/P have been trained in Japan as planned. The trained C/P are expected to serve to the project as core members in the Project. It is reported that 3 C/P dispatched in the JFY 2001 are quite satisfied with the practical training in the Japanese mold manufacturer **(4) Provision of Machinery and Equipment** ➢ Major Machinery and Equipment, total of 40items, which are worth around JP· 282,051,000, has been provided by the Japanese side. **(5) Budgetary Allocation for Supporting Local Cost** ➢ Total of JPY9,439,000 was borne by the Japanese side from November,1999 to the end of March, 2002. <u>2. Adequacy of timing, quality and quantity of Inputs from Thai Side</u> **(1) Provision and maintenance of building and facilities** ➢ The renovated Workshop and experts office have been provided properly. However, the timing of the completion of the Workshop was delayed, which caused some delay of hands-on trainings. **(2) Allocation of C/P and administrative personnel** ➢ Necessary number of C/P and administrative personnel, 24 in total, has been allocated. **(3) Provision and maintenance of machinery and equipment** ➢ Maintenance of machinery and equipment is generally done properly so far. However, in order to carry out maintenance by C/P themselves, it is recommended to guide them to keep the maintenance records revised. **(4) Local cost - Necessary budget for the implementation of the pro-**	Annex 4 Annex 5 Annex 6 Annex 8 Annex 8 Annex 20 Annex 7

ANNEX 9 RESULT OF MID-TERM EVALUATION

Evaluation Result		Reference
	ject ➢ Thai side has allocated necessary budget for the Project since the start of the Project. However, it is requested that the Thai side would make orders and contracts more quickly, and manage the delivery time more effectively.	Annex 2 Annex 21
4. Impact	**Abstract** ➢ Though this item is available to a large extent such as an increase of quality of products, productivity, etc. for certain Thai Mold and Tool Companies benefited from a training courses, advisory services or prototyping services, it will be further studied in the final evaluation. **Achievement of Overall Goal** **Overall Goal: Thai plastic tool and mold industries will become internationally competitive to provide assembly industries in Thailand with high quality tools and molds.**	
5.Sustainability	**Abstract** ➢ It is still early to monitor sustainability of the Project. It is needed to monitor all of project activities carefully. ➢ In the technical aspect, C/P need to gain more practical skills through the trial productions of various kinds of molds. ➢ In the financial aspects, BSID continues to allocate necessary budget for the purchase of tools and raw materials.	

Annex 10 Project Design Matrix (PDM) for Mid-term Evaluation

Project Name: SIC-Tool and Mold Technology Development Project in the Kingdom of Thailand
Duration: November 1, 1999 - October 31, 2004
Thai Side Implementing Agency: Bureau of Supporting Industries Development (BSID), Department of Industrial Promotion, Ministry of Industry
Japanese Side Implementing Agency: Japan International Cooperation Agency (JICA)
Target Group: Thai Plastic Tool and Mold Industries

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumption
(Overall Goal) Thai plastic tool and mold industries will become internationally competitive to provide assembly industries in Thailand with high quality tools and molds	1 The plastic tool and mold industries benefited from BSID services improve the quality of their products 2 The above industries improve their productivity and efficiency through BSID services 3 The number of products of the above industries delivered to assembly industries increases	1 Survey report of respective institutes, questionnaire to and interview with industries concerned 2 Survey report of respective institutes, questionnaire to and interview with industries concerned 3 Survey report of respective institutes, questionnaire to and interview with industries concerned	a There is no drastic change in political and economic situation in the Kingdom of Thailand. b Supporting industries development policy continues to be stable. c Demand form assembly industries for plastic tool and mold industry continues to be stable
(Project Purpose) Technical capability of BSID will be upgraded to extend appropriate technical services to the Thai plastic tool and mold industries.	1 The plastic tool and mold industries show the high level of satisfaction on the technical services of BSID 2 The number of technical services, clients increases and there are repeater clients.	1 Questionnaire to and interview with related industries 2 Records of Technical Trainings, Seminars, Technical Information / Advisory Services and Prototyping Services	a Thai plastic tool and mold industries utilize the technology obtained from BSID. b Linkage between assembly industry and plastic tool and mold industry is established.
(Outputs) 0 The Project operation unit will be enhanced	0-1 C/Ps are allocated as planned 0-2 Budet is adequately allocated to the local cost of the Project. 0-3 Committees and the Project management meetings are held periodically. 0-4 The number of publicity of the Project increases.	0-1 Organization Chart, Allocation of C/Ps and Staffs for the Project 0-2 Budget Allocation for the Project 0-3 Number of Committees and Meetings 0-4 Number of Publicity	a Trained C/Ps remain at BSID b The private sector of Thai plastic tool and mold industries is cooperative to the Project.
1 Necessary machinery and equipment will be provided, installed, operated and maintained properly.	1-1 The type and quantity of machinery and equipment provided are appropriate 1-2 Provided machinery and equipment are inspected and operated appropriately. 1-3 Spare parts are appropriately procured through local supplier.	1-1 List of Machinery and Equipment, Maintenance Record of Machinery and Equipment 1-2 Maintenance Record of Machinery and Equipment 1-3 List of Spare Parts and Local Suppliers	
2 Technical capability of the counterpart personnel (hereinafter referred to as "C/P") will be upgraded in the fields of mold design, mold processing, mold assembling and trial shot.	2-1 Each C/P improves his knowledge and skill of respective technology-transfer items. 2-2 The number of achieved target products increases. 2-3 Original manuals, textbooks and training materials are developed.	2-1 Evaluation Sheet (Assessment of Technical Capability by Japanese Experts) 2-2 Progress Record of Completed Target Products 2-3 List of Mannuals, Textbooks and Materials Developed by C/Ps	
3 Seminars and training courses in the said fields will be implemented systematically.	3-1 The number of implemented seminars, training courses and its partcipants increases	3-1 Record of Technical Trainings and Seminars	
4 Technical information and advisory services in the said fields will be implemented systematically.	4-1 The number of implemented advisory services increases. 4-2 Related technical data including client information is accumulated. 4-3 The quantity and quality of technical information and advisory services satisfy the clients' needs.	4-1 Record of Advisory Services 4-2 Record of Technical Information, Survey Report 4-3 Questionnaire to and interview with related industries	
5 Trial prototyping services will be implemented systematically.	5-1 The number of implemented trial prototyping services increases. 5-2 The quality of trial prototyping services satisfies the clients' needs.	5-1 Record of Prototyping Services 5-2 Questionnaire to and interview with related industries	
(Activities) 0-1 Allocate necessary personne las planed. 0-2 Formulate plans of activities. 0-3 Make budget plan and execute properly. 0-4 Establish and operate management system.	**Inputs**		a C/P remain at BSID b Machinery and equipment provided will pass customs smoothly.
	The Thai side	The Japanese side	
1-1 Make facility refurbishment plan and implement as planned. 1-2 Provide and install necessary machinery and equipment. 1-3 Operate and maintain the machinery and equipment properly. 2-1 Make Technical Cooperation Program. 2-2 Implement technology transfer to the C/P. 2-3 Monitor and evaluate the result of technology transfer to the C/P 3-1 Make plan of technical training and semi 3-2 Implement technical training and seminar 3-3 Monitor and evaluate technical training and seminars. 4-1 Make plan of trial technical information and advisory services. 4-2 Collect and compile technical information and material. 4-3 Implement trial technical information and advisory services. 4-4 Monitor and evaluate trial technical Information and advisory services 5-1 Make plan of trial prototyping services. 5-2 Implement trial prototyping service. 5-3 Monitor and evaluate trial prototyping service	1 Provision and Maintenance of Building and Facilities 2 Allocation of C/P and Administrative personnel (1) Administrative C/P 4 (2) Technical C/P 14 at the commencement (3) Administrative Staff Necessary number (4) Supporting Staff a Secretary 2 b Driver 1 c Other necessary staff upon request by the Japanese experts 3 Provision of Machinery & Equipment and their Maintenance 4 Local Cost Necessary budget for the implementation of the Project	1 Dispatch of Japanese Experts (1) Long-term Experts a Chief advisor b Coordinator c Plastic Tool and mold (2) Short-term Experts Appropriate number of short-term experts will be dispatched as necessity arises 2 Thai C/P Training in Japan A certain number (about 2 persons) of the C/P yearly 3 Provision of Machinery and Equipment 4 Supporting Local Cost	(Preconditions) a Construction of SIC building completed as scheduled

Annex 11 Progress of Technical Cooperation Program (TCP)

implemented ▬ F finished Plan

Calendar Year	1999				2000				2001				2002				2003				2004		
Technology Transfer Item / Japanese Fiscal Year	98 IV	1999 I	II	III	IV	2000 I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III
	Signing of the R/D																							
Term of Technical Cooperation	▼	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬							
PO 2-2 Implement Technology Transfer to the C/P		▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬			
0 Fundamentals (common items)																								
0.1 Precondition for mold technology																								
(1) General engineering drawing		▬	▬	▬	▬	F																		
(2) Property of plastic						F																		
(3) Fundamentals of steel for mold					▬	▬	F																	
(4) Fundamentals of metal processing						▬	F																	
(5) Fundamentals of plastic injection							▬	F																
0.2 Principles of injection mold																								
(1) Primary injection mold (what is mold ? cutting tools. industrial standard etc.)					▬	F																		
(2) Name and function of components of mold (guide pin, locate ring etc.)					▬	F																		
(3) Name and function of elements of mold (runner, gate etc.)						▬	F																	
0.3 Standard of mold design																								
(1) Name and function of injection products (boss, rib etc.)					▬	F																		
(2) Determination of injection condition					▬	F																		
(3) Process from product model to mold design						▬	F																	
(4) Layout of basic mold						▬	F																	
(5) Design of injection product (product design, product quality, shrinkage rate, mold flow etc.)						▬	▬	F																
(6) Design of mold standard parts							▬	F																
(7) Undercut							▬	F																
(8) Fundamental design by target product-1 (pen tray)								▬	F															
0.4 Fundamentals of processing mold and plastic injection molding							▬	F																
0.5 Fundamentals of computer																								
(1) Computer operation						▬	▬	▬	▬	Follow-up														
(2) Operation of CAD, CAM and CAD/CAM						▬	▬	▬	▬	Follow-up														
1 Injection mold design																								
1.1 Fundamentals of mold design																								
(1) Usage of the applications for mold layout				▬	▬	F																		
(2) Common use of parts and standardization of common parts					▬	▬	F																	
(3) Mold design based on prediction (to remove poor injection products beforehand)						▬	F																	
(4) How to design target product-1					▬	F																		

Annex 11 Progress of Technical Cooperation Program (TCP)

implemented ▬ F finished Plan

Calendar Year	1999				2000				2001				2002				2003				2004		
Technology Transfer Item / Japanese Fiscal Year	98 IV	1999 I	II	III	IV	2000 I	II	III	IV	2001 I	II	III	IV	2002 I	II	III	IV	2003 I	II	III	IV	2004 I	II	III
(Pen Tray)																								
(5) How to design target product 2					▬	Follow-up																		
(Front Case for Alarm Clock)																								
1.2 Mold design by CAD/CAM																								
(1) Techniques of CAD, CAM and CAD/CAM					▬	▬	▬	▬	▬	Follow-up														
(2) Guidance by each CAD/CAM software					▬	▬	▬	▬	▬	Follow-up														
makers for mold making																								
(3) Exchange of CAD/CAM network data					▬	▬	Follow-up																	
(4) CAD/CAM operation and mold design						▬	▬	▬	▬	Follow-up														
(2-dimension/2.5D/3D)																								
(5) Design of target product-1 by CAD									▬	F														
(Pen Tray)																								
(6) Design of target product-2 by CAD										▬	▬	F												
(Front Case for Alarm Clock)																								
(7) Design of target product-3 by CAD											▬	▬												
(Front Panel for Personal Computer)																								
(8) Design of target product-4 by CAD																								
(Upper Case for Telephone)																								
(9) Design of target product-5 by CAD																								
(Camera Body)																								
1.3 Design of prototyping molds (for needs												▬	▬											
of model companies etc.)																								
1.4 Solve problem after trial shot (problems												▬	▬											
and solution of assembling of injection																								
molding)																								
2 Injection mold processing																								
2.1 Fundamentals of processing																								
(1) Cutting theory condition				▬	F																			
(2) EDM Processing theory and condition					▬	F																		
(Edit of CAD/CAM/CNC data)																								
(3) Inspection and measurement					▬	▬	Follow-up																	
2.2 Operation and function of processing																								
machines																								
(1) Operation and function of conventional				▬	▬	Follow-up																		
machines																								
(2) Operation and function of MC					▬	▬	Follow-up																	
(3) Operation and function of CNC machines					▬	▬	Follow-up																	
(EDM, W-EDM etc.)																								
(4) CAM operation and programming					▬	▬	Follow up																	
(5) CAM/CNC operation and programming					▬	▬	Follow-up																	

Annex 11 Progress of Technical Cooperation Program (TCP)

implemented ▬ F finished Plan

Calendar Year	1999				2000				2001				2002				2003				2004		
Technology Transfer Item / Japanese Fiscal Year	98 IV	1999 I	II	III	IV	2000 I	II	III	IV	2001 I	II	III	IV	2002 I	II	III	IV	2003 I	II	III	IV	2004 I	II	III
(6) Mold production technology										Follow-up														
(Processing condition and Tooling)																								
(7) Processing of Provided mold parts (Provided mold)										F														
2.3 Processing of target products																								
(1) Processing process planning																								
(2) Processing of target product-1							F																	
(3) Processing of target product-2										F														
(4) Processing of target product-3										F														
(5) Processing of target product-4																								
(6) Processing of target product-5																								
2.4 Processing of prototyping molds																								
2.5 Regular check and maintenance of machines										Follow-up														
2.6 Solve problem of processing mold and mold repairing										Follow-up														
3 Mold assembling & maintenance and trial shot of injection molding																								
3.1 Fundamentals of finishing																								
(1) Process of lapping							Follow-up																	
(2) Lapping standard of cavity side							Follow-up																	
(3) Lapping standard of core side							Follow-up																	
3.2 Fundamentals of mold assembly																								
(1) Mold assembly								Follow-up																
(2) Process of trial shot								Follow-up																
(3) Process of disassembling and assembling of standard parts								Follow-up																
(4) Mold trial assembly								Follow-up																
3.3 Trial shot of mold																								
(1) Preparation and check of mold specification									Follow-up															
(2) Process of setting condition according to sample data									Follow-up															
(3) Moving check on mold attached in injection machine									Follow-up															
(4) Trial shot and assembling of target product-1 and 2 (Provided mold)										Follow-up														
(5) Trial shot and assembling of target product-3 (Provided mold)									Follow-up															
(6) Trial shot and assembling of target product-4 (Provided mold)																								
(7) Trial shot and assembling of target																								

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Unit

Annex 11 Progress of Technical Cooperation Program (TCP)

implemented ▬ F finished Plan

Calendar Year	1999				2000				2001				2002				2003				2004		
Technology Transfer Item / Japanese Fiscal Year	98 IV	1999 I	II	III	IV	2000 I	II	III	IV	2001 I	II	III	IV	2002 I	II	III	IV	2003 I	II	III	IV	2004 I	II	III
product-5 (Provided mold)																								
(8) Evaluation of mold								▬		Follow-up														
(9) Evaluation of products									▬	Follow-up														
3.4 Assembling and trial shot of target product manufactured in the project																								
(1) Target product-1 assembling and trial shot										▬	Follow-up													
(2) Target product-2 assembling and trial shot											▬	Follow-up												
(3) Target product-3 assembling and trial shot																								
(4) Target product-4 assembling and trial shot																								
(5) Target product-5 assembling and trial shot																								
3.5 Assembling and trial shot of prototyping molds																								
3.6 Regular check and maintenance of machines						▬	Follow-up																	
3.7 Solve problems on molding										▬	Follow-up													
4 Monitoring and necessary feedback (Supplementary Technology Transfer)																								

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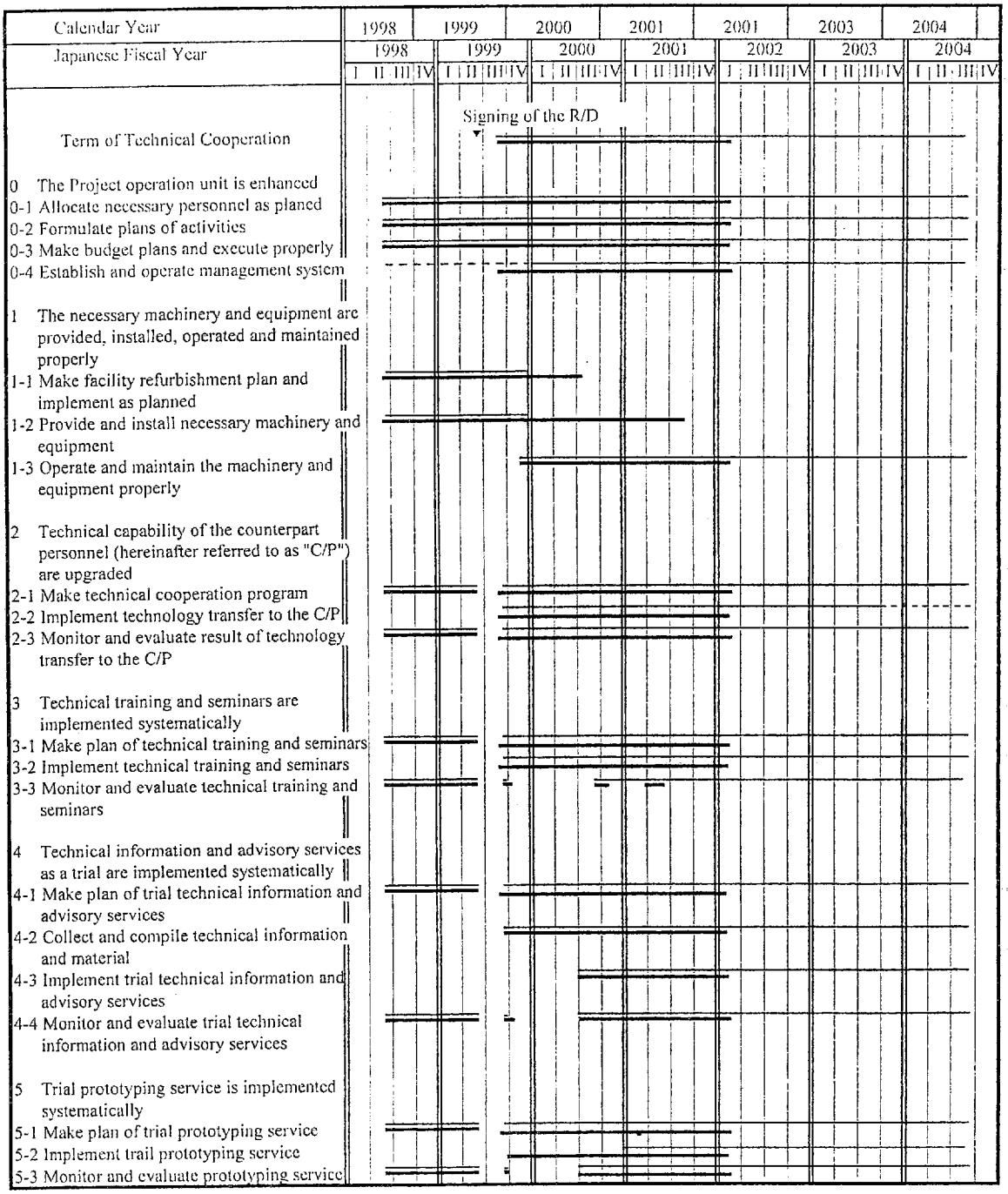
Annex 12 Progress of Plan of Operations (PO)



Note 1 The Japanese fiscal year starts in April and ends in March.
2 This schedule is subject to change in accordance with the Progress of the Project.

——— Plan
——— Implemented

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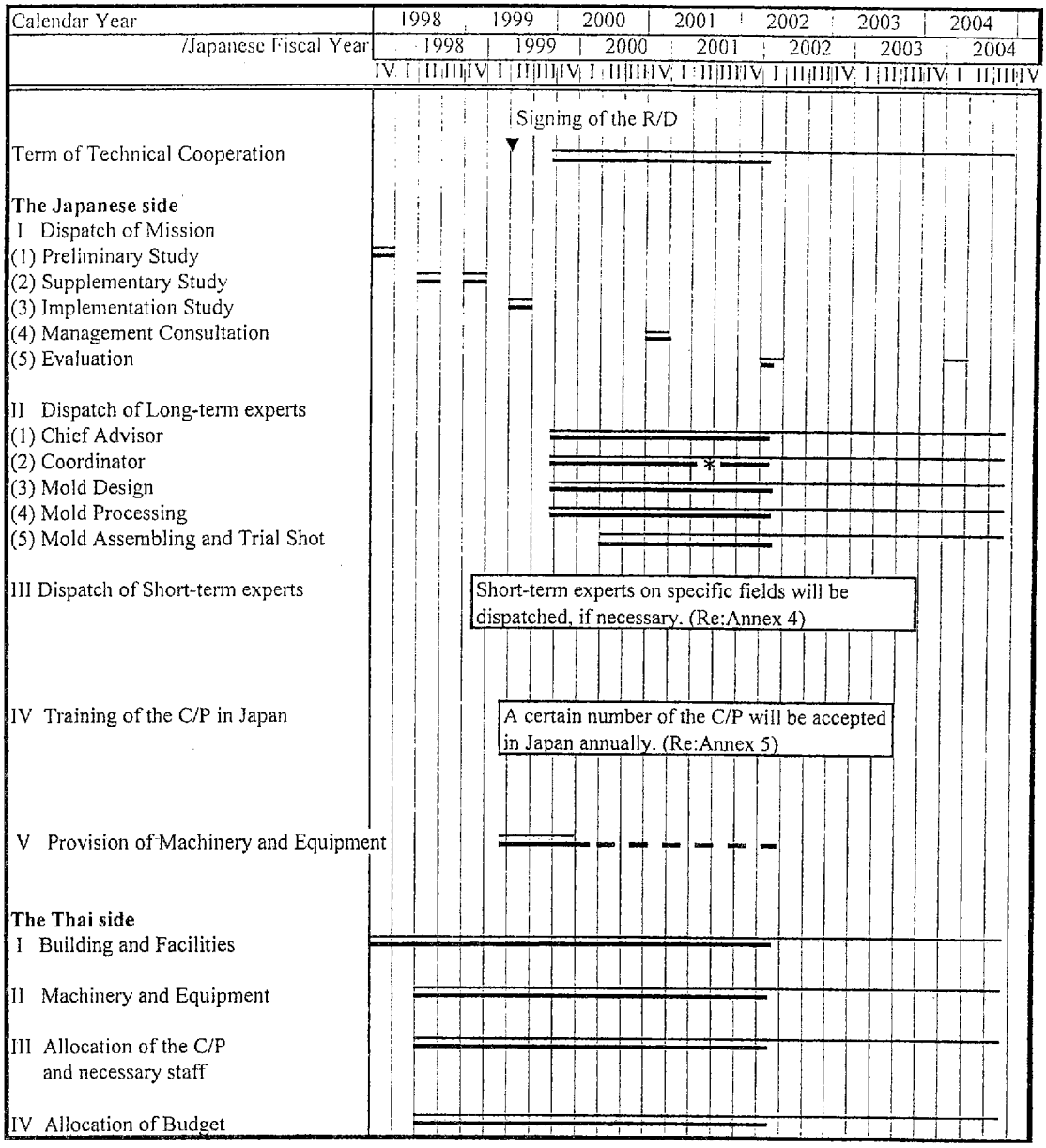
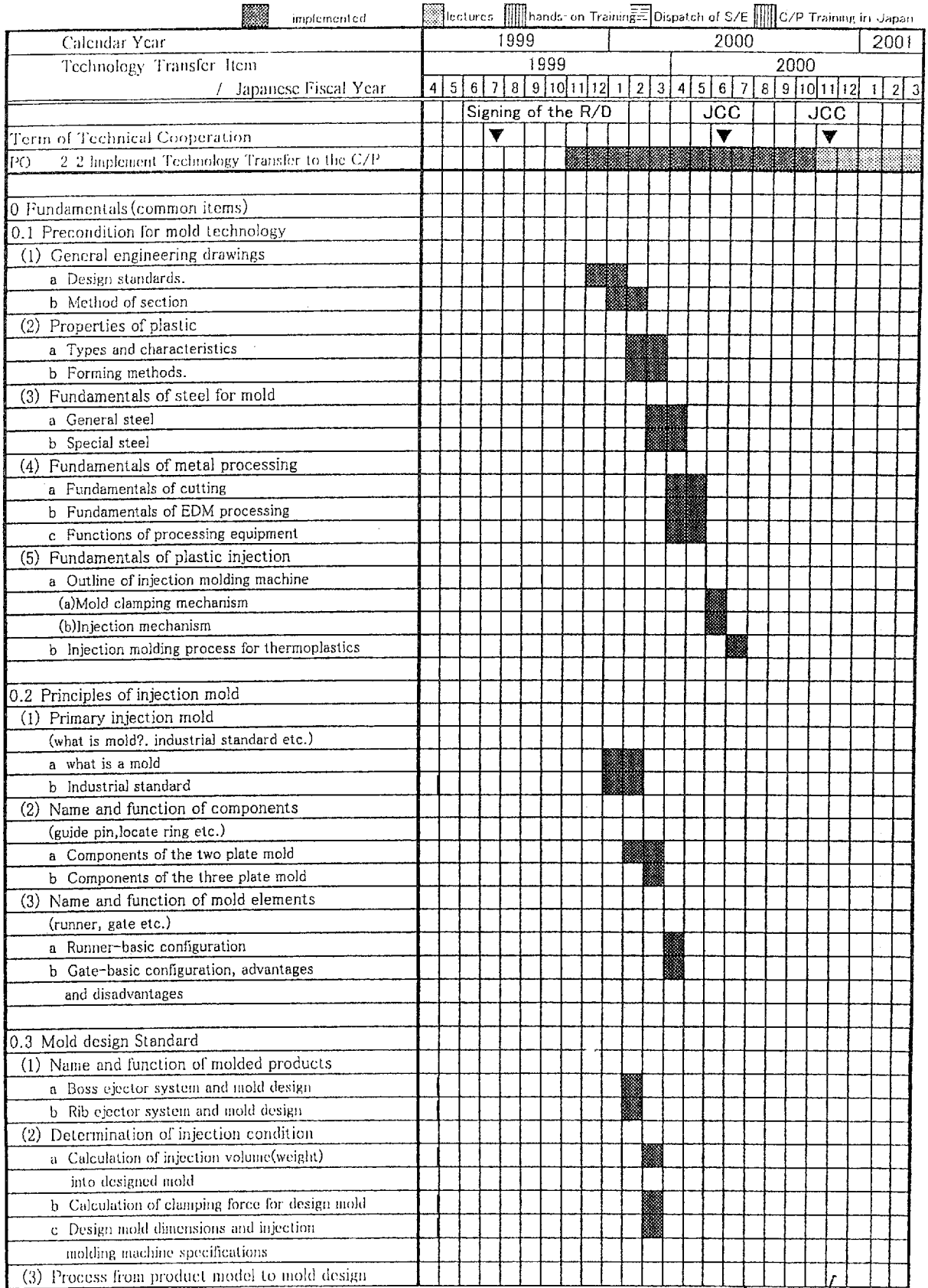
Unit.

Annex 13 Tentative Schedule of Implementation (TSI)



Plan
Implemented

Annex 14 Progress of Annual Technical Cooperation Program (ATCP) *1999～2000



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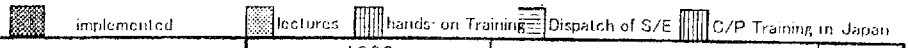
Annex 14 Progress of Annual Technical Cooperation Program (ATCP) *1999～2000



Calendar Year	1999												2000												2001		
Technology Transfer Item / Japanese Fiscal Year	1999												2000														
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
			Signing of the R/D											JCC					JCC								
Term of Technical Cooperation			▼											▼					▼								
PO 2-2 Implement Technology Transfer to the C/P																											
a Methods of product model design																											
b Reflecting study in mold design																											
(4) Layout of basic mold																											
a General design																											
b Special design																											
(5) Design of molded product																											
a Molded product design																											
(a)Undercut																											
(b)Draft angle																											
b Quality of manufactured goods																											
(a)Dimensional tolerance																											
(b)P.L code																											
(c)U.L code																											
c Mold shrinkage																											
(Thickness of forming material and																											
molded product)																											
d Plastics flow																											
(Fluid ratio [Length/thickness] at injection pressure P)																											
(6) Design of mold standard parts																											
a Standard parts																											
b Selection and design of standard parts																											
(7) Undercut																											
a Types of undercut method																											
b Selection of undercut method																											
(8) Fundamental design using target																											
product-1(pen tray)																											
a Required function of the product																											
b Specification mold design																											
0.4 Fundamentals of mold processing and																											
plastic injection molding																											
(1) Mold processing																											
a Mold processing methods																											
b Mold processing conditions																											
(2) Plastic injection molding																											
a Three factor of molding																											
(a)Mold																											
(b)Molding machine																											
(c)Material resin																											
b Three principles of molding																											
(a)Temperature																											
(b)Pressure																											
(c)Cycle																											
0.5 Fundamentals of computer																											
(1) Computer operation																									Follow-up		
(2) Operation of CAD, CAM and CAD/CAM																											

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Annex 14 Progress of Annual Technical Cooperation Program (ATCP) *1999～2000

implemented | lectures | hands on Training | Dispatch of S/E | C/P Training in Japan

Calendar Year	1999												2000												2001		
Technology Transfer Item / Japanese Fiscal Year	1999												2000														
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
			Signing of the R/D											JCC					JCC								
Term of Technical Cooperation			▼											▼					▼								
PO 2-2 Implement Technology Transfer to the C/P																											
1 Injection mold design																											
1.1 Fundamentals of mold design																											
(1) Usage of the applications for Mold layout																											
(2) How to design target product-1																											
(Pen Tray)																											
a Molded product																											
b Specification of mold design																											
(3) How to design target product-2																											
(Front Case for Alarm Clock)																											
a Molded product																											
b Specification of mold design																											
(4) Common use of parts and standardization																											
of common parts																											
a Objectives																											
b Specification																											
(5) Mold design based on prediction																											
a Predicted product defects																											
b Countermeasures for predicted product defects																											
1.2 Mold design by CAD/CAM																											
(1) Techniques of CAD,CAM and CAD/CAM																											
a CAD																											
b CAM																											
c Linking between CAD and CAM																											
(2) Guidance by each CAD/CAM software																											
makers for mold making																											
(3) Exchange of CAD/CAM network data																									follow-up		
(4) Computer programming																											
(5) CAD/CAM operation and mold design																											
(2-dimension/2.5D/3D)																											
a Specification of CAD/CAM operation																											
b Specification of CAD/CAM operation in																											
mold design																											
(6) Design of target product-1 by CAD																											
(Pen Tray)																											
a Molded product																											
b Specification of mold design																											
(7) Design of target product-2 by CAD																											
(Front Case for Alarm Clock)																											
a Molded product																											
b Specification of mold design																											
(8) Design of target product-3 by CAD																											
(Front Panel for Personal Computer)																											
a Molded product																											
b Specification of mold design																											
(9) Design of target product-4 by CAD																											
(Upper Case for Telephone)																											
a Molded product																											
b Specification of mold design																											

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Draft.

Annex 14 Progress of Annual Technical Cooperation Program (ATCP) *1999～2000

implemented | lectures | hands on Training | Dispatch of S/E | C/P Training in Japan

Calendar Year	1999												2000												2001
Technology Transfer Item / Japanese Fiscal Year	1999												2000												
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
			Signing of the R/D											JCC					JCC						
Term of Technical Cooperation				▼											▼					▼					
PO 2-2 Implement Technology Transfer to the C/P																									
(10) Design of target product-5 by CAD																									
(Camera Body)																									
a Molded product																									
b Specification of mold design																									
1.3 Design of prototyping molds (for																									
requirements of model companies etc.)																									
1.4 Solve problem after trial shot																									
(Problems and solution of injection																									
molding assembly)																									
(1) Comparing molded product dimensions with																									
design dimensions																									
(2) Comparing design dimensions with																									
mold component dimension																									
2 Injection mold processing																									
2.1 Fundamentals of processing																									
(1) Cutting theory																									
a Milling																									
b Lathe																									
c Grinding																									
(2) EDM Processing theory																									
(Edit of CAD/CAM/CNC data)																									
a Deisinking electric discharge machine													Follow-up												
b Wirecut electric discharge machine													Follow-up												
c Small hole EDM machine													Follow-up												
(3) Inspection and measurement																									
a 3D measurement data													Follow-up												
b General measurement data													Follow-up												
2.2 Operation and function of processing																									
machinery																									
(1) Operation and function of conventional													Follow-up												
machinery																									
(2) Operation and function of MC													Follow-up												
machinery																									
(3) Operation and function of CNC																					Follow-up				
machinery (EDM, WEDM etc.)																									
(4) CAM operation and programming													Follow-up												
(5) CAM/CNC operation and programming													Follow-up												
(6) Mold production technology																									
(Processing and tooling)																									
a Planning of processing process																									
b Tooling																									
c Processing conditions																									

K.T.

Annex 14 Progress of Annual Technical Cooperation Program (ATCP) *1999～2000

implemented | lectures | hands-on Training | Dispatch of S/E | C/P Training in Japan

Calendar Year	1999												2000												2001		
Technology Transfer Item / Japanese Fiscal Year	1999												2000														
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
			Signing of the R/D											JCC					JCC								
Term of Technical Cooperation				▼											▼					▼							
PO 2.2 Implement Technology Transfer to the C/P																											
(7) Processing of Provided mold parts																											
(Provided mold)																											
a Cavity making of target product-1																											
b Undercut pin fabrication for target																											
product-2 and the others core pins																											
2.3 Processing of target products																											
(1) Processing process planning																											
a Planning of processing process of																											
designing data																											
b Quality control																											
c Production control																											
(2) Processing of target product-1																											
a Preparations / setup																											
b Action confirmation based on NC data bus																											
c Machine processing																											
d Inspection																											
(3) Processing of target product-2																											
a Preparations / setup																											
b Action confirmation based on NC data bus																											
c Machine processing																											
d Inspection																											
(4) Processing of target product-3																											
a Preparations / setup																											
b Action confirmation based on NC data bus																											
c Machine processing																											
d Inspection																											
(5) Processing of target product-4																											
a Preparations / setup																											
b Action confirmation based on NC data bus																											
c Machine processing																											
d inspection																											
(6) Processing of target product-5																											
a Preparations / setup																											
b Action confirmation based on NC data bus																											
c Machine processing																											
d inspection																											
2.4 Processing of prototyping molds																											
2.5 Regular check and maintenance of machines																											
(1) Daily inspection													Follow-up														
(2) Periodic inspection													Follow-up														
2.6 Solving problems in processing and																											
mold repair																											
(1) Investigation causes																									Follow-up		
(2) Countermeasures																									Follow-up		

K.T.

Unit.

Annex 14 Progress of Annual Technical Cooperation Program (ATCP) *1999～2000

implemented | lectures | hands-on Training | Dispatch of S/E | C/P Training in Japan

Calendar Year	1999												2000												2001
Technology Transfer Item / Japanese Fiscal Year	1999												2000												
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
			Signing of the R/D											JCC					JCC						
Term of Technical Cooperation			▼												▼					▼					
PO 2-2 Implement Technology Transfer to the C/P																									
(3) Corrective processing																					Follow-up				
(4) Inspection																					Follow-up				
3 Mold assembling, maintenance and trial shot of injection molding																									
3.1 Fundamentals of finishing																									
(1) Lapping process																									
(2) Lapping standard of cavity side																					Follow-up				
(3) Lapping standard of core side																					Follow-up				
3.2 Fundamentals of mold assembly																									
(1) Mold assembling																									
a Comparison of mold base with mold assembling drawing																					Follow-up				
b Checking of standard parts and assembling components																					Follow-up				
(2) Trial shot process																									
a Mold fitting procedure																									
(a)Toggle mold clamp																					Follow-up				
(b)Direct pressure mold clamp																					Follow-up				
b Material replacement procedure																					Follow-up				
c Material drying conditions (temperature, time)																					Follow-up				
d Conversion of molding conditions (shot volume, injection pressure)																					Follow-up				
e Setting mold temperature by type of resin and cooling circuit																					Follow-up				
(3) Process of disassembling and assembling of standard parts																					Follow-up				
(4) Trial assembling																					Follow-up				
3.3 Trial shot of mold																									
(1) Preparation and check of mold specification (Comparison of mold dimensions with molding machine specification)																					Follow-up				
(2) Setting conditions according to sample data																									
(3) Moving check on mold attached to injection machine																									
a Setting of mold open stroke																					Follow-up				
b Setting of ejector stroke																					Follow-up				
c Confirmation of slide core action																					Follow-up				
(4) Assembling and trial shot of target product-1 and 2 (Provided mold)																									
a Sample molding																									
b Rust prevention																									

K.T.

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Annex 14 Progress of Annual Technical Cooperation Program (ATCP) *1999～2000

implemented | lectures | hands-on Training | Dispatch of S/E | C/P Training in Japan

Calendar Year	1999												2000												2001		
Technology Transfer Item / Japanese Fiscal Year	1999												2000														
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
			Signing of the R/D											JCC					JCC								
Term of Technical Cooperation				▼											▼					▼							
PO 2-2 Implement Technology Transfer to the C/P																											
c Mold inspection																											
(5) Assembling and trial shot of target																											
product-3 (Provided mold)																											
a Sample molding																											
b Rust prevention																											
c Mold inspection																											
(6) Assembling and trial shot of target																											
product-4 (Provided mold)																											
a Sample molding																											
b Rust prevention																											
c Mold inspection																											
(7) Assembling and trial shot of target																											
product-5 (Provided mold)																											
a Sample molding																											
b Rust prevention																											
b Mold inspection																											
(8) Mold evaluation																											
(9) Product evaluation																											
a Appearance (visual check)																											
b Dimension measurement of molded product																											
c Weight measurement of molded product																											
3.4 Assembling and trial shot of target																											
product manufactured under the project																											
(1) Assembling and trial shot of target																											
product-1																											
(Evaluation of mold and Products)																											
(2) Assembling and trial shot of target																											
product-2																											
(Evaluation of mold and Products)																											
(3) Assembling and trial shot of target																											
product-3																											
(Evaluation of mold and Products)																											
(4) Assembling and trial shot of target																											
product-4																											
(Evaluation of mold and Products)																											
(5) Assembling and trial shot of target																											
product-5																											
(Evaluation of mold and Products)																											
3.5 Assembling and trial shot of																											
prototyping molds																											
(1) Mold and product evaluation																											
3.6 Regular check and maintenance of																											
machinery																											
(1) Inspection of machinery startup																									Follow-up		
(2) Monthly regular inspections																									Follow-up		

K.T.

Visit.

Annex 14-1

Annex 14 Progress of Annual Technical Cooperation Program (ATCP) *1999～2000

implemented | lectures | hands-on Training | Dispatch of S/E | C/P Training in Japan

Calendar Year	1999												2000												2001		
Technology Transfer Item / Japanese Fiscal Year	1999												2000														
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
			Signing of the R/D											JCC					JCC								
Term of Technical Cooperation			▼											▼					▼								
PO 2-2 Implement Technology Transfer to the C/P																											
(3) Annual inspections																						Follow-up					
3.7 Solving problems in molding																											
(1) Problems stemming from the mold																											
a Investigation causes																											
b Countermeasures																											
c Prototype confirmation																											
(2) Problems stemming from molding conditions																											
a Investigation causes																											
b Countermeasures																											
c Prototype confirmation																											
4 Monitoring and necessary feedback																											
(Supplementary Technology Transfer)																											

K.T.

Uzuki

Annex 14-2 Annual Technical Cooperation Program (ATCP) *2000～2001

implemented | lectures | hands-on Training | Dispatch of S/E | C/P Training in Japan

Calendar Year	2000												2001												2002
Technology Transfer Item / Japanese Fiscal Year	2000												2001												
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
Term of Technical Cooperation																									
PO 2-2 Implement Technology Transfer to the C/P																									
0 Fundamentals (common items)																									
0.1 Precondition for mold technology																									
(1) General engineering drawings																									
a Design standards.													FINISHED												
b Method of section													FINISHED												
(2) Properties of plastic																									
a Types and characteristics													FINISHED												
b Forming methods.													FINISHED												
(3) Fundamentals of steel for mold																									
a General steel													FINISHED												
b Special steel													FINISHED												
(4) Fundamentals of metal processing																									
a Fundamentals of cutting				F									FINISHED												
b Fundamentals of EDM processing				F									FINISHED												
c Functions of processing equipment				F									FINISHED												
(5) Fundamentals of plastic injection																									
a Outline of injection molding machine																									
(a)Mold clamping mechanism													FINISHED												
(b)Injection mechanism													FINISHED												
b Injection molding process for thermoplastics													FINISHED												
0.2 Principles of injection mold																									
(1) Primary injection mold																									
(what is mold?. industrial standard etc.)																									
a what is a mold													FINISHED												
b Industrial standard													FINISHED												
(2) Name and function of components																									
(guide pin,locate ring etc.)																									
a Components of the two plate mold													FINISHED												
b Components of the three plate mold													FINISHED												
(3) Name and function of mold elements																									
(runner, gate etc.)																									
a Runner-basic configuration													FINISHED												
b Gate-basic configuration, advantages													FINISHED												
and disadvantages																									
0.3 Mold design Standard																									
(1) Name and function of molded products																									
a Boss ejector system and mold design													FINISHED												
b Rib ejector system and mold design													FINISHED												
(2) Determination of injection condition																									
a Calculation of injection volume(weight)													FINISHED												
into designed mold													FINISHED												
b Calculation of clamping force for design mold													FINISHED												
c Design mold dimensions and injection													FINISHED												
molding machine specifications													FINISHED												
(3) Process from product model to mold design																									
a Methods of product model design													FINISHED												

Annex 14-2 Annual Technical Cooperation Program (ATCP) *2000～2001

implemented | lectures | hands-on Training | Dispatch of S/E | C/P Training in Japan

Calendar Year	2000												2001												2002
Technology Transfer Item / Japanese Fiscal Year	2000												2001												
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
b Reflecting study in mold design													FINISHED												
(4) Layout of basic mold																									
a General design				F									FINISHED												
b Special design				F									FINISHED												
(5) Design of molded product																									
a Molded product design																									
(a)Undercut													FINISHED												
(b)Draft angle													FINISHED												
b Quality of manufactured goods																									
(a)Dimensional tolerance						F							FINISHED												
(b)P.L code						F							FINISHED												
(c)U.L code						F							FINISHED												
c Mold shrinkage																									
(Thickness of forming material and						F							FINISHED												
molded product)																									
d Plastics flow																									
(Fluid ratio [Length/thickness] at injection pressure P)						F							FINISHED												
(6) Design of mold standard parts																									
a Standard parts								F					FINISHED												
b Selection and design of standard parts								F					FINISHED												
(7) Undercut																									
a Types of undercut method													FINISHED												
b Selection of undercut method													FINISHED												
(8) Fundamental design using target																									
product-1(pen tray)																									
a Required function of the product												F	FINISHED												
b Specification mold design												F	FINISHED												
0.4 Fundamentals of mold processing and																									
plastic injection molding																									
(1) Mold processing																									
a Mold processing methods					F								FINISHED												
b Mold processing conditions					F								FINISHED												
(2) Plastic injection molding																									
a Three factor of molding																									
(a)Mold													FINISHED												
(b)Molding machine													FINISHED												
(c)Material resin													FINISHED												
b Three principles of molding																									
(a)Temperature													FINISHED												
(b)Pressure													FINISHED												
(c)Cycle													FINISHED												
0.5 Fundamentals of computer																									
(1) Computer operation													FINISHED												
(2) Operation of CAD, CAM and CAD/CAM													FINISHED												
1 Injection mold design													FINISHED												
1.1 Fundamentals of mold design																									
(1) Usage of the applications for Mold layout																									
(2) How to design target product-1																									

K.T

Annex 14-2 Annual Technical Cooperation Program (ATCP) *2000～2001

implemented ▒ lectures ▦ hands-on Training ▤ Dispatch of S/E ▥ C/P Training in Japan

Calendar Year	2000												2001												2002
Technology Transfer Item / Japanese Fiscal Year	2000												2001												
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
(Pen Tray)																									
a Molded product																									
b Specification of mold design																									
(3) How to design target product-2																									
(Front Case for Alarm Clock)																									
a Molded product																									
b Specification of mold design																									
(4) Common use of parts and standardization																									
of common parts																									
a Objectives													FINISHED												
b Specification													FINISHED												
(5) Mold design based on prediction																									
a Predicted product defects			F										FINISHED												
b Countermeasures for predicted product			F										FINISHED												
defects																									
1.2 Mold design by CAD/CAM																									
(1) Techniques of CAD,CAM and CAD/CAM																									
a CAD													Follow-up												
b CAM													Follow-up												
c Linking between CAD and CAM													Follow-up												
(2) Guidance by each CAD/CAM software																									
makers for mold making																									
(3) Exchange of CAD/CAM network data			Follow-up																						
(4) CAD/CAM operation and mold design																									
(2-dimension/2.5D/3D)																									
a Specification of CAD/CAM operation													Follow-up												
b Specification of CAD/CAM operation in													Follow-up												
mold design																									
(5) Design of target product-1 by CAD																									
(Pen Tray)																									
a Molded product													FINISHED												
b Specification of mold design													FINISHED												
(6) Design of target product-2 by CAD																									
(Front Case for Alarm Clock)																									
a Molded product																						F			
b Specification of mold design																						F			
(7) Design of target product-3 by CAD																									
(Front Panel for Personal Computer)																									
a Molded product																									
b Specification of mold design																									
(8) Design of target product-4 by CAD																									
(Upper Case for Telephone)																									
a Molded product																									
b Specification of mold design																									
(9) Design of target product-5 by CAD																									
(Camera Body)																									
a Molded product																									
b Specification of mold design																									
1.3 Design of prototyping molds (for																									

K.T.

Annex 14-2 Annual Technical Cooperation Program (ATCP) *2000～2001

implemented ▒ lectures ▒ hands on Training ▒ Dispatch of S/E ▒ C/P Training in Japan

Calendar Year	2000												2001												2002
Technology Transfer Item / Japanese Fiscal Year	2000												2001												
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
requirements of model companies etc.)													▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	
1.4 Solve problem after trial shot																									
(Problems and solution of injection molding assembly)																									
(1) Comparing molded product dimensions with design dimensions																					▒	▒	▒		
(2) Comparing design dimensions with mold component dimension																					▒	▒	▒		
2 Injection mold processing																									
2.1 Fundamentals of processing																									
(1) Cutting theory																									
a Milling													FINISHED												
b Lathe													FINISHED												
c Grinding													FINISHED												
(2) EDM Processing theory (Edit of CAD/CAM/CNC data)																									
a Dej sinking electric discharge machine	▒	▒	Follow-up																						
b Wirecut electric discharge machine	▒	▒	Follow-up																						
c Small hole EDM machine	▒	▒	Follow-up																						
(3) Inspection and measurement																									
a 3D measurement data	▒	▒	Follow-up																						
b General measurement data	▒	▒	Follow-up																						
2.2 Operation and function of processing machinery																									
(1) Operation and function of conventional machinery			Follow-up																						
(2) Operation and function of MC machinery	▒	▒	Follow-up																						
(3) Operation and function of CNC machinery (EDM, W-EDM etc.)	▒	▒	Follow-up																						
(4) CAM operation and programming	▒	▒	Follow-up																						
(5) CAM/CNC operation and programming	▒	▒	Follow-up																						
(6) Mold production technology (Processing and tooling)																									
a Planning of processing process				▒	▒	▒	▒	▒	▒	▒	▒	▒	FINISHED												
b Tooling						▒	▒	▒	▒	▒	▒	▒	FINISHED												
c Processing conditions						▒	▒	▒	▒	▒	▒	▒	FINISHED												
(7) Processing of Provided mold parts (Provided mold)																									
a Cavity making of target product-1				▒	▒	▒	▒	▒	▒				FINISHED												
b Undercut pin fabrication for target product-2 and the others core pins						▒	▒	▒	▒	▒	▒	▒	FINISHED												
2.3 Processing of target products																									
(1) Processing process planning																									
a Planning of processing process of designing data					▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	
b Quality control					▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	

K.T.

Annex 14-2 Annual Technical Cooperation Program (ATCP) *2000～2001

implemented | lectures | hands-on Training | Dispatch of S/E | C/P Training in Japan

Calendar Year	2000												2001												2002
Technology Transfer Item / Japanese Fiscal Year	2000												2001												
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
c Production control																									
(2) Processing of target product-1																									
a Preparations / setup				F									FINISHED												
b Action confirmation based on NC data bus					F								FINISHED												
c Machine processing						F							FINISHED												
d Inspection							F						FINISHED												
(3) Processing of target product-2																									
a Preparations / setup						F							FINISHED												
b Action confirmation based on NC data bus							F						FINISHED												
c Machine processing													F												
d Inspection													F												
(4) Processing of target product-3																									
a Preparations / setup													F												
b Action confirmation based on NC data bus													F												
c Machine processing																			F						
d Inspection																			F						
(5) Processing of target product-4																									
a Preparations / setup																								F	
b Action confirmation based on NC data bus																									
c Machine processing																									
d inspection																									
(6) Processing of target product-5																									
a Preparations / setup																									
b Action confirmation based on NC data bus																									
c Machine processing																									
d inspection																									
2.4 Processing of prototyping molds																									
2.5 Regular check and maintenance of machines																									
(1) Daily inspection				Follow-up																					
(2) Periodic inspection				Follow-up																					
2.6 Solving problems in processing and mold repair																									
(1) Investigation causes						Follow-up																			
(2) Countermeasures						Follow-up																			
(3) Corrective processing						Follow-up																			
(4) Inspection						Follow-up																			
3 Mold assembling, maintenance and trial shot of injection molding																									
3.1 Fundamentals of finishing																									
(1) Lapping process							F																		
(2) Lapping standard of cavity side								Follow-up																	
(3) Lapping standard of core side								Follow-up																	

K.T.

Annex 14-2

Annex 14-2 Annual Technical Cooperation Program (ATCP) *2000～2001

implemented | lectures | hands-on Training | Dispatch of S/E | C/P Training in Japan

Calendar Year	2000												2001												2002		
Technology Transfer Item / Japanese Fiscal Year	2000												2001														
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
3.2 Fundamentals of mold assembly																											
(1) Mold assembling																											
a Comparison of mold base with mold																											
assembling drawing																											
b Checking of standard parts and																											
assembling components																											
(2) Trial shot process																											
a Mold fitting procedure																											
(a)Toggle mold clamp																											
(b)Direct pressure mold clamp																											
b Material replacement procedure																											
c Material drying conditions																											
(temperature, time)																											
d Conversion of molding conditions																											
(shot volume, injection pressure)																											
e Setting mold temperature by type of																											
resin and cooling circuit																											
(3) Process of disassembling and																											
assembling of standard parts																											
(4) Trial assembling																											
3.3 Trial shot of mold																											
(1) Preparation and check of mold specification																											
(Comparison of mold dimensions																											
with molding machine specification)																											
(2) Setting conditions according																											
to sample data																											
(3) Moving check on mold																											
attached to injection machine																											
a Setting of mold open stroke																											
b Setting of ejector stroke																											
c Confirmation of slide core action																											
(4) Assembling and trial shot of target																											
product-1 and 2 (Provided mold)																											
a Sample molding																											
b Rust prevention																											
c Mold inspection																											
(5) Assembling and trial shot of target																											
product-3 (Provided mold)																											
a Sample molding																											
b Rust prevention																											
c Mold inspection																											
(6) Assembling and trial shot of target																											
product-4 (Provided mold)																											
a Sample molding																											
b Rust prevention																											
c Mold inspection																											
(7) Assembling and trial shot of target																											
product-5 (Provided mold)																											
a Sample molding																											
b Rust prevention																											
c Mold inspection																											

Annex 14-2 Annual Technical Cooperation Program (ATCP) *2000～2001

— implemented ▒ lectures ▒ hands-on Training ▒ Dispatch of S/E ▒ C/P Training in Japan

Calendar Year	2000												2001												2002
Technology Transfer Item / Japanese Fiscal Year	2000												2001												
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
(8) Mold evaluation						▒	▒						Follow-up												
(9) Product evaluation																									
a Appearance (visual check)						▒	▒						Follow-up												
b Dimension measurement of molded product						▒	▒						Follow-up												
c Weight measurement of molded product						▒	▒						Follow-up												
3.4 Assembling and trial shot of target product manufactured under the project																									
(1) Assembling and trial shot of target product-1 (Evaluation of mold and Products)															▒	▒	▒	F							
(2) Assembling and trial shot of target product-2 (Evaluation of mold and Products)																		▒	▒	▒	▒	F			
(3) Assembling and trial shot of target product-3 (Evaluation of mold and Products)																									
(4) Assembling and trial shot of target product-4 (Evaluation of mold and Products)																									
(5) Assembling and trial shot of target product-5 (Evaluation of mold and Products)																									
3.5 Assembling and trial shot of prototyping molds																									
(1) Mold and product evaluation																			▒	▒	▒	Follow-up			
3.6 Regular check and maintenance of machinery																									
(1) Inspection of machinery startup									▒	▒	▒	▒	Follow-up												
(2) Monthly regular inspections									▒	▒	▒	▒	Follow-up												
(3) Annual inspections									▒	▒	▒	▒	Follow-up												
3.7 Solving problems in molding																									
(1) Problems stemming from the mold									▒	▒	▒	▒	Follow-up												
a investigation causes																									
b Countermeasures																									
c Prototype confirmation																									
(2) Problems stemming from molding conditions									▒	▒	▒	▒	Follow-up												
a Investigation causes																									
b Countermeasures																									
c Prototype confirmation																									
4 Monitoring and necessary feedback (Supplementary Technology Transfer)																									

K.T.