マレイシア金属工業技術センター技術協力事業

アフターケア調査団報告書

昭和62年 5 月

国 際 協 力 事 業 団

序　　文

マレイシア国は中小金属工業の育成を目的に金属工業技術センターの設置を計画し，我が国に協力を要請してきた。

これを受けて我が国は，1978年8月「金属工業技術センター技術協力事業」に関する討議議事録（R/D）に署名し，延長を含め6年間にわたる協力を行い，1984年8月10日にマレイシア政府への引き継ぎを完了した。

その間，45名の専門家派遣，37名の研修員受け入れ，5億9千万円にのぼる機材供与を行った。

金属工業技術センターは，我が国の協力終了後も順調に進展し，マレイシア側により堅実に運営されており，地場中小金属工業の育成に寄与している。

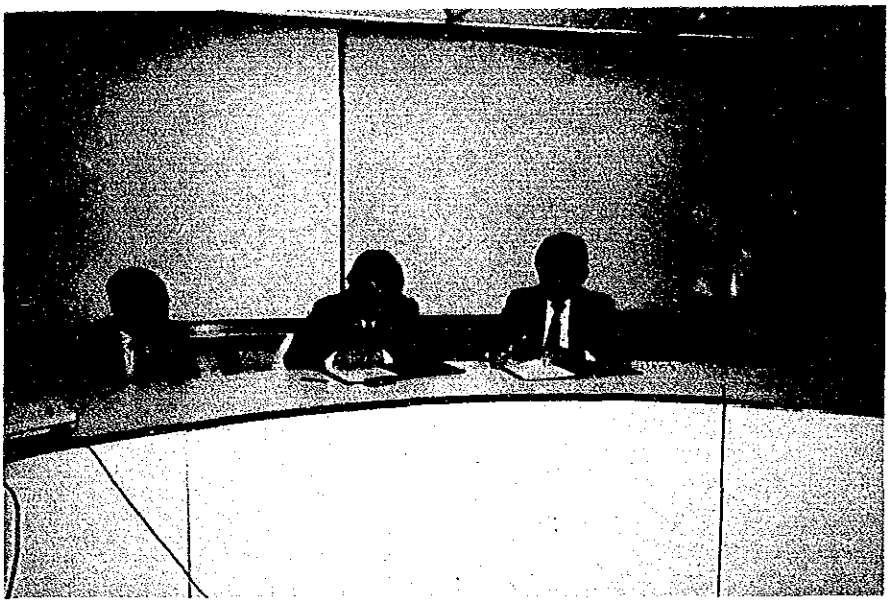
今回派遣したアフターケア調査団は，プロジェクト引き渡し後のマレイシア側運営状況について調査し，実績を評価するとともに，より円滑な運営に資するための補完的な機材供与並びに短期専門家の派遣について協議を行ったが，ここにその結果を報告書としてとりまとめる運びとなった。

ここに，今回の調査実施に御協力いただいた関係各位に対し，心から感謝の意を表する次第である。

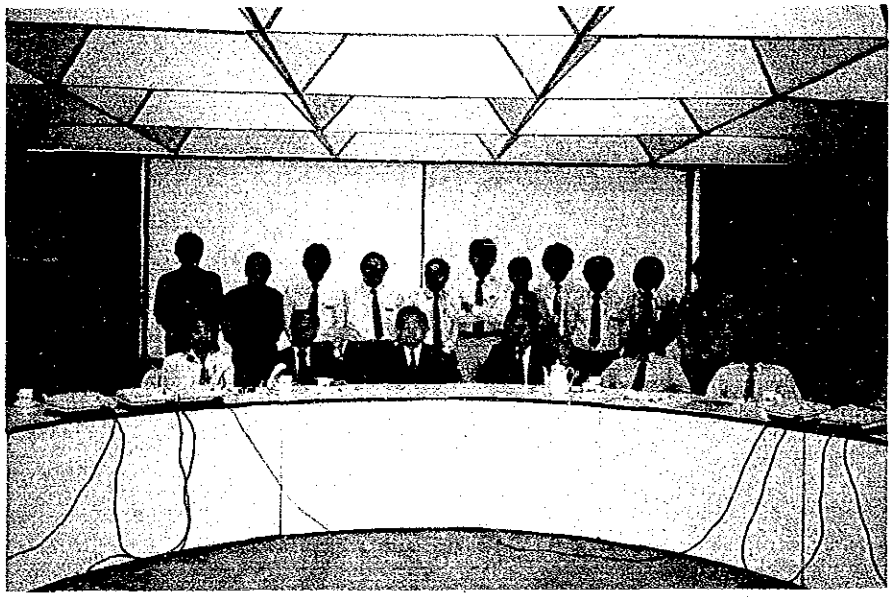
昭和62年5月

国際協力事業団

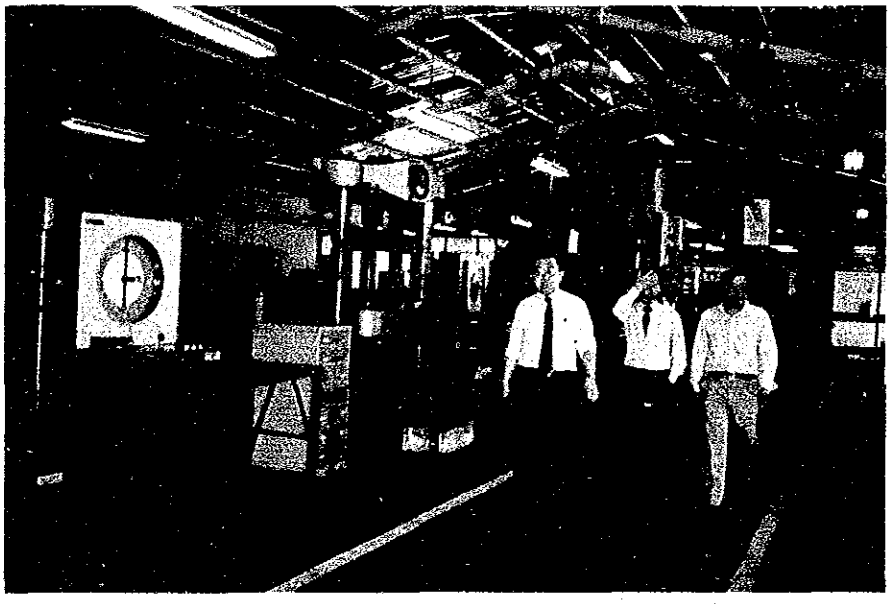
理事　古閑俊彦



SIRIM Controller,
Dr. Zaharudin との間の
ミニッツ署名交換



前列（左より）
三輪団員，野中団員，
冨田団長，Dr. Zaharudin
（SIRIM Controller），
Mr. Megat（MIDEC Acting
Head），Mr. Aziz（Head of
Public & Industrial
Affairs Unit，SIRIM）
後列（左より）
香川職員（JICAマレイシア
事務所）及びMIDECスタッフ



既供与機材活用・保守
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マレイシア金属工業技術センター技術協力事業
アフターケア調査団報告書

〔要旨〕

1. マレイシア金属工業技術センター（ＭＩＴＥＣ）は我が国とのプロジェクト方式技術協力終了のち約３年経過し，この間組織としてはMETAL INDUSTRY DEVELOPMENT CENTER(MIDEC)へ改編されているが，旧ＭＩＴＥＣの機能は十分に維持され，既供与機材の維持管理，ローカル中小企業への技術サービスなどの日常業務も可成りの水準で実施されていることが認められた。

2. しかしながら，既供与機材のなかには，定期点検，部品の交換，修理等を必要とするものがあり，さらにセンター業務の充実を図るためには，若干の機材の供与とともに専門家の短期派遣も必要であることが認められた。

3. マレイシア側は，このような時機に日本側がアフターケアを実施することに対し，深甚な謝意を表明した。従ってマレイシア側との協議は順調に推移し，アフターケア実施計画の大要については，別添Ｍ／Ｄの内容で合意した。

4. 適切なアフターケアの実施は，日マ関係の改善，発展に寄与するところが大であるとして，現地の日マ両サイドからも期待されており，今後は予算，専門家委嘱などの条件を勘案しつつ，可能な限り綿密にアフターケアを実施してゆくことが望ましい。

I. 調 査 の 概 要

1. プロジェクトの概要

(1) プロジェクト名

マレイシア金属工業技術センター技術協力事業（ＭＩＴＥＣプロジェクト）

(2) 実施又は協力機関

マレイシア側：科学技術環境省標準工業研究所（ＳＩＲＩＭ，ＭＳＴＥ）

日　本　側：通商産業省

(3) 協力期間

昭和53年8月11日～59年8月10日（ 6年間）

(4) プロジェクトの目的

マレイシアにおける機械金属工業のうち，金型，プレス，溶接，電気メッキの4分野について，中小企業育成を目指す技術指導センター（ＭＩＴＥＣ）を設立し，このセンターがマレイシア側スタッフによって運営可能となるように，カウンターパートへ必要な技術移転を行なうこと。

(5) 目的達成のための具体的活動内容

工場巡回指導，技術相談，試験検査，試作加工，情報提供，トレーニングコース，セミナー等のＭＩＴＥＣ業務を通じてのＯＮ　ＴＨＥ　ＪＯＢ　ＴＲＡＩＮＩＮＧ と直接技術指導（講義・実習など）による専門家からカウンターパートへの技術移転。

(6) 日本側の主要協力実績

- 専門家派遣：長期10名，短期35名
- 研修員受入れ：高級・準高級7名，一般30名
- 機材供与：5億9千万円
- 調査団派遣：11チーム延47名

(7) マレイシア側の対応

- 支出経費：1,200万Ｍ$
- 配置職員：56名

(8) 協力の成果

カウンターパートの経験年数が平均4年間であるため，全体としての技術習熟度は中級程度というのがＭＩＴＥＣプロジェクト終結時の現状であった。従って，一般的・標準的な課題に対してはＭＩＴＥＣスタッフのみで十分に技術サービスを提供できるが，特殊なケース，高度な技術，高品質を要求されるケースについては十分に対応できるとはいえない。

(9) 協力の効果

専門的な知識に乏しい工場に対しては，最も効果的であった。ある程度の専門技術知識を有する工場に対しては，MITECの機能が活用されている。

比較的高度な技術を有する工場は比較的高度な供与機材と専門家のノウハウを活用していた。

2. 調査団派遣の経緯と目的

MITECプロジェクトは当初目的をほぼ達成し，マレイシア側からも高い評価をえて終了したが，「協力終了時に残された課題とその後の対応」として，次の諸点が指摘されていた。

① MITECのハードウェアは一応，充実したが，ソフトウェアについてはまだ第一歩を踏み出したに過ぎない。

② 従って，トラブルシューティング能力は初歩的段階である。

③ 技術情報の供給と蓄積については今後の自助努力に負うところが大きい。

④ 機材の保守・修理体制とスタッフの技術研修体制についても同様である。

⑤ 今後はマレイシア側の自助努力を前提として，多角的な支援が内外から与えられることが望ましい。

⑥ JICAのアフターケアプログラムが今後，MITECプロジェクトに適用されれば，その効果は極めて大きい。

以上のような経緯もあり，本プロジェクトはすでに協力終結のち2年半を経過しているので，供与機材の整備・補修，部品等の機材供与，カウンターパートへの補完的技術指導等を行う必要があるとの見地から，昭和62年度事業として，アフターケアプログラムを実施することとし，アフターケア調査団を派遣することとなった。

本調査団の派遣目的は以下のとおりである。

① 本件協力に関するマレイシア側の現状を詳細に調査すること。

② マレイシア側関係機関と協議し，アフターケア協力計画を策定すること。

具体的な調査団の業務は以下のとおりである。

① MITECプロジェクトの現状並びにアフターケア協力実施に係るニーズ，受入れ体制等についての調査。

② マレイシア側関係機関との協議を通じてアフターケア協力計画を策定し，その大要をM/Dとしてとりまとめ，署名交換を行う。

③ 帰国後の実施手続きの迅速化を図るため，A_1 及び A_4 フォームのSIGNED COPYをとりつける。

④ 既供与機材の現状確認のち，調査団で対応可能な機材等については整備・修理を行うと

ともに，対応可能な範囲で部品・消耗品等については現地調達し，供与する。

3. 調査団の構成

氏　　名	担当業務	所　　属
冨田堅二	団長・総括	JICA専門技術嘱託
野中亮平	金属加工技術	シーテックインターナショナル有限会社
三輪徳子	業務調整	JICA鉱工業開発技術課

4. 調査日程

月	日	曜	AM/PM	主要日程	宿泊地
4	22	水	AM	成田発（JL721）	クアラルンプール
			PM	クアラルンプール着	
				JICAマレイシア事務所，（松崎所長，林次長，香川職員と打合せ）	
				在マレイシア日本大使館（後藤書記官と打合せ）	
	23	木	AM	JICA事務所	〃
				MIDEC（第1回協議，機材調査）	
			PM	旧MITEC（機材調査，第2回協議）	
	24	金	AM	旧MITEC（第3回協議）	〃
			PM	〃　（第4回協議）	
				団員打合せ（A／C協力計画案の作成）	
	25	土	AM	旧MITEC（第5回協議）	〃
	26	日		資料整理	〃
	27	月	AM	MIDEC（第6回協議）	〃
			PM	スペアパーツ等調達	
				JICA事務所（M／D案打合せ）	
	28	火	AM	SIRIM（M／Dへ署名交換）	〃
				スペアパーツ等調達	
			PM	JICA事務所（林次長へ経過報告）	
				大使館（後藤書記官へ経過報告）	
	29	水	AM	EPU（Madam Wong Peg Har, Dr. Abdullah と面談）	〃

4	29	水	PM	INTAN（国立電算機研修所視察） SIRIM(鋳造技術センタープロジェクト担当官と面談) JACTM（高野事務局長と面談）	
	30	木	AM	クアラルンプール発（MH092）	
			PM	成田着	

5. 主要面談者

＊Economic Planning Unit（EPU）

Mdm. Wong Peg Har, Principal Assistant Director, External Assistance Section

Ms. Wan Norma Wan Daud, Assistant Director, External Assistance Section

Dr. Abdullah Mohd Tahir, Director, Industry Section

Mr. Ong Yew Chee, Assistant Director, Industry Section

＊Standards and Industrial Research Institute of Malaysia（SIRIM）

Dr. Ahmad Zaharudin Idrus, Controller of SIRIM

Tuan Hj Abdul Halim Shah, Director of Administration & Finance

Dr. Mohamad Salleh Ismail, Director of Technology Transfer Centre

Mr. Abdul Aziz Mat, Head of Public and Industrial Affairs Unit

Mr. Asmadi Md. Said, Head of Planning, Development and Evaluation Unit

＊Metal Industry Development Centre（MIDEC）, SIRIM

Mr. Megat Ahmad Zaki, Acting Head of MIDEC

Mr. Look Tian Fook, Head of Metal Forming & Finishing Unit

Mr. Ahmad Zakaria, Acting Head of Machining Service Unit

Mr. Wan Hassan Wan Mohamad, Head of Industrial Unit

Mr. Helme Hashim, Head of Foundry Unit

Mr. Mohd. Fuad Isa, Research Officer（Die-Making）

Mr. Abdul Halim Abdul Rahman, Research Officer（Die-Making）

Mr. Ahmad Hj Yunus, Research Officer（Presswork）

Mr. Mat Noji B. Bedwan, Research Officer（Presswork）

Mr. Abdul Ghalib Tham, Research Officer（Welding）

Mr. Samsudin Bani, Research Officer（Welding）

Mr. Nor Rashid Ismail, Research Officer（Electroplating）

Mr. Mohd. Amin Hashim, Research Officer（Electroplating）

Mr. Azmi Idris, Research Officer（Test & Inspection）

Mr. Mohamad Soib Selemat, Research Officer (Information)

＊在マレイシア日本国大使館

二等書記官　後藤　健

＊JICAマレイシア事務所

所長　松崎孝雄

次長　林　典伸

副参事　香川敬三

浅野雄司

＊マレイシア日本人商工会議所

事務局長　高野時秀

＊Matsushita Electric Co., (M) BHD.

アドバイザー　杉山成昭

＊National Computer Institute, INTAN

チームリーダー　岩崎晋

コーディネーター　斉藤正史

Ⅱ. アフターケア協力計画の策定

1. 日本側対処方針

本件アフターケア協力に係る対処方針については各省会議（昭和62年4月6日開催）において，下記のとおりとすることで了承されている。

① 協力分野

- 既供与機材の整備補修並びに保守管理指導
- 既協力分野に係る補完的技術指導

② 機材供与

- 既供与機材に係る不足部品及び消耗品
- 補完的技術指導に係る既協力分野関連機材

③ 専門家派遣

- 機材保守修理及び既協力分野補完指導に関し短期専門家3名程度

④ 研修員受入れ

- 実施せず

⑤ 協力期間

- 昭和62年度

2. 協 議 内 容

本件アフタケア協力計画の策定に関するマレイシア側との協議はMIDECのACTING HEAD（MR. MEGAT）との間で2回，METAL FORMING & FINISHING UNITのHEAD（MR. LOOK）との間で4回にわたって実施された。その概要は以下のとおりである。

なお，今回の協議を通じ，マレイシア側が取り下げた要請の概要を表－6に示す。また，最終的なマレイシア側の要請は資料－4のとおりである。

2－1 機 材 供 与

機材供与に関するマレイシア側からの要請と，これに対する調査団の対応については，その概要を表1～3にまとめた。旧MITECの現状と我が方の予算規模，納期等を勘案した調査団の見解は表－7のとおりである。

表－7　機材供与計画（FOB）　　（千円）

区分＼部門	金属	プレス	溶接	メッキ	試験	情報	計
スペアパーツ・消耗品等	1,146	3,097	656	2,467	2,622	－	9,988
付属部品・装置	4,580	－	－	150	－	1,080	5,810
新規の機材	－	390	2,480	1,140	1,782	2,787	8,579
計	5,726	3,487	3,136	3,757	4,404	3867	24,377

2－2　専門家派遣

既供与機材の修理及び保全に関するマレイシア側からの要請とこれに対する調査団の対応については，その概要を表－4にまとめた。マレイシア側はさらに，補完的技術協力に関する要請を表－5に示すとおり要請しているので，これらの要請に対し，専門家委嘱の条件などを勘案すると，本件についての調査団の見解は表－8のとおりになる。

表－8　専門家派遣計画

区分＼部門	金型	プレス	溶接	メッキ	試験	情報	計
既供与機材の修理及保全	1名（14日）	1名(14日) 1名(21日)	—	1名（21日）	1名（14日）	—	84人日
補完的技術指導	1名(21日)（プレス兼務）		1名（21日）	1名（21日）	1名（21日）		84人日
計	35人日	35人日	21人日	42人日	35人日	—	168人日

表－1　既供与機材に対するスペアパーツ等供与の要請

部門	優先度	機材名	メーカー	スペアパーツ等	数量 要請	数量 調査団の対応	調査団見積額（FOB）千円	備考
金型製作	1	ジグボーラー（JBM40）	和井田製作所	マイクロスイッチ	5	5コ	5	
				マイクロボーリング用ツールビット（6種）	各5セット	5セット	25	
	2	放電加工機（DP20）	JAPAX	PCB（15種）	計17	17	693	
				オイルフイルタ	4			
	3	精密研削盤（PSG-63AN）	岡本工作機械	P C B	2	2	13	
	4	竪型フライス盤（RAZ）	遠州製作所	ミリングチャック	2	1セット	150	
	5	バンドソー（H250SA）	AMADA	バンドソーブレード	10	5セット	46	
	6	コンターソーマシン（VA400）	AMADA	ソーブレード	10	5コイル	214	

部門	優先度	機材名	メーカー	スペアパーツ等	数量 要請	数量 調査団の対応	調査団見積額 (FOB) 千円	備考
						(小計)	(1,146)	
プレス加工	B	150tプレス	川崎油工	光電安全装置用PCB	2	2	60	
	A	〃		主モータ用電磁コンタクター	1	1	150	
	A	45t クランクプレス	AMADA	クラッチ系用ソレノイドバルブ	1	1	110	
	A	ギャップシャリング	AMADA	カッティングブレード	2対	1対	94	
	B	〃		表示灯	1ダース	1ダース	20	
	A	油圧プレスブレーキ	AMADA	標準金型(5種)	計13	計13	1,203	
	A	110t トランスファープレス	AIDA	クラッチ系ソレノイドバルブ	1	1	100	
	A			マグネチッククランパー	20	8	560	
	A			真空サッカー(2種)	計40	16	800	
						(小計)	(3,097)	
溶接	A	プラズマ切断機 (KPC-25)	小池酸素工業	ブッシュオンキャップ	20	20	47	
				チップ	20	20	16	
				ガスディストリビュータ	5	5	2	
				電極	20	20	78	
	B	TIG溶接機	OTC	TIGトーチ	4	4	146	
	C	炭酸ガス溶接機	OTC	MIG/CO_2トーチ	5	5	146	
				ワイヤーフィーダ	—	1	96	
	D	プラズマ切断機	OTC	プラズマ切断トーチ (2種)		—	—	
	E	MIG溶接機 (MIG-135)	OTC	溶接ワイヤ(3種)	各10スプール	各10スプール	48	
	F			溶接チップ(3種)	計48	計40コ	15	
	G	TKアーク	日立	フラックスコアワイヤ	5リール	5	62	
						(小計)	(656)	
電気メッキ	A	ディジタルpH計 (HG-3)	電気化学計器	電極	6	6	60	
				溶液(pH4, 7)	各1ℓ	各1ℓ	6	
				DOコンバータ	1	1	80	
	A	凝固剤	奥野製薬	TOP CATCH400	500Kg	500Kg	75	
	A	バッフイングホイール	伊藤バフ製作	シサル麻	10箱	10箱	40	
		〃	〃	ルーズクロス	10箱	10箱	40	
	A	バッフィング剤	〃	グリーンルージュ	100コ	100コ	7	
	A	光沢剤	奥野製薬	サイアナイドカッパー (2種)	計100ℓ	計100ℓ	35	
			〃	アシドカッパー(3種)	計 90ℓ	計 90ℓ	155	
			〃	ブライトニッケル(3種)	計170ℓ	計170ℓ	97	
			エバラユージライト	〃 (5種)	計490ℓ	計490ℓ	748	
			ジャパンメタル	銀メッキ(3種)	計 42ℓ	計 42ℓ	111	

部門	優先度	機材名	メーカー	スペアパーツ等	数量 要請	数量 調査団の対応	調査団見積額 (FOB)千円	備考
電気メッキ	A	光沢剤	ジャパンメタル	金メッキ(6種)	計90ℓ	計90ℓ	165	
				〃 (2種)	計10Kg	計10Kg	40	
	A	剝離剤	奥野製薬	TOP RIP C	100Kg	100Kg	72	
	A	プラスチックメッキライン	奥野製薬	各種薬剤(3種)	計245ℓ	計245ℓ	298	
		公開試験・研究	奥野製薬	各種薬剤(5種)	計32Kg	計32Kg	89	
		開発用薬剤		〃 (3種)	計15ℓ	計15ℓ	32	
		アルミ及びアルミ合金用薬剤	奥野製薬	ウルトラボンドZn	20ℓ	20ℓ	12	
		無電解ニッケルメッキ用薬剤	奥野製薬	各種薬剤(3種)	計120ℓ	計120ℓ	88	
	A	脱イオン水製造プラント	日本錬水	サクションバルブ(2種)	計4	4セット	50	
	A	メッキ試験用溶液	大和鍍金試験機	CuCNメッキ用	4セット	4セット	70	
				ニッケルメッキ用	4	4	50	
				クロムメッキ用	4	4	44	
		フィルタ	SANSHIN	カートリッジ	5	5	3	
						(小計)	(2,467)	
試験検査	1	X線マイクロアナライザー (EMX-7)	島津製作所	4″ RAP結晶	1	1	620	
				フイラメント	10箱	8箱	144	
				拡散ポンプ用油	3鑵	1鑵	5	
				BIODENガススプレイ	6	6	7	
				記録紙	20ダース	2ダース	10	
	2	固定式X線装置 (WSi-250S)	島津製作所	X線管球	1	1	1,700	
	3	X線フイルム	富士フイルム	FUJI 100	6箱	6箱	136	
						(小計)	(2,622)	
						合計	9,988	

表－2　既供与機材に対する付属部品・装置供与の要請

部門	優先度	機材名	メーカー	付属部品・装置	数量 要請	数量 調査団の対応	調査団見積額 (FOB)千円	備考
金型製作	1	放電加工機 (EDMDP20)	JAPAX	電極ホールダー(I-435)	1	1	350	
				ハイチャック(D523) 又は(I-115-152)	1	1	200	
	2	精密旋盤 (LE-19K)	ワシノ機械	油圧倣い装置	1	1	1,240	
				ライトハンドカーバイト工具 (P20ST120)	5	5	1,320	
	3	投影研磨機 (GLS-125A)	ワシノ機械	角度割り出し装置 (121)	1	1	÷1,000	
	4	成形研削盤 (PFG-450)	岡本工作機械	パンチフォーマー (11)	1	1	470	

部門	優先度	機材名	メーカー	付属部品・装置	数量		調査団見積額 (FOB)千円	備考
					要請	調査団の対応		
						(小計)	(4,580)	
電気メッキ	A	厚み計	中央製作所	標準ゲージ	12	12	120	
		フィルター	日本フイルタ	カートリッジ	5	5	30	
						(小計)	(150)	
情報		パーソナルコンピュータ (APC-HD3C)	日本電気	モノクロムモニター (APC-SYS2MA)	1	1	≒ 420	M$ 7,000 (60円/M$)
				ビンライターブリンター (P56)	1	1	≒ 240	M$ 4,000 (60円/M$)
				ソフトウエア	3	3	≒ 420	M$ 7,000 (60円/M$)
						(小計)	(1,080)	
						合計	5,810	

表－3　新規機材供与の要請

部門	優先度	機材名	メーカー	数量		調査団見積額	備考
				要請	調査団の対応	(FOB)千円	
プレス加工	A	油圧トロリー (MTC 70×50 500)	大阪タイユー	2台	2台	390	
		数値制御付タレットパンチプレス	AMADA他数社	1式	—	—	必要性は十分に認められるが価格が2～6千万円となるので，対応は困難であるとした。
					(小計)	(390)	
溶接	A	蓄電式放電スポット溶接機	MIYACHI ELECTRONIC	1式	1式	≒ 570	M$ 9,500 (現地見積額) (60円/M$)
	B	ポータブルスポット溶接ガン 型式 X1260 〃 C1260	木村電熔機製作所	1式	1式	1,200	
	B	ポータブルTIG溶接機		1	1	710	
					(小計)	(2,480)	
電気メッキ	A	ポータブルハンドポリシングマシン	理研コランダム	1	1	60	
	A	デジタルpH計	電気化学計器	1	1	160	
	A	ミニバレル(B-75)	大和鍍金試験機	2	2セット	180	
		電流効率テストキット (B-90)	〃	1	1セット	180	
	A	ミニヒータ	〃	5	5	20	
		小規模硬化クロムメッキ用中型整流器	中央製作所	1	1	400	
		ハンディポンプ	三進製作所	1	1	80	

部門	優先度	機材名	メーカー	数量 要請	数量 調査団の対応	調査団見積額（FOB）千円	備考
電気メッキ		投入み式ヒータ	谷口製作所	5	5	60	
					（小計）	（1,140）	
試験検査		GMサーベーメータ（NSM-102）		2	2	1,050	
		測定テープ（X線用）	RICH SEIFERT	4	4	60	
		暗室用タイマー	RICH SEIFERT	2	2	12	
		X線用鉛スクリーン	PONY ATOMIC INDUSTRY CO. LTD.	20対	20対	120	
		超音波厚み計（FD-36）	三菱電機	2	1	540	
					（小計）	（1,782）	
情報		コピーマシン（FT5070）	リコー	1	1	≒1,740	M$29.000（現地見積額）（60円/M$）
		ビディオテープ（プレス加工，金型，溶接）	AVCC他	6	6	500	
		書籍		63冊	63冊		
		試験検査13冊				≒ 130	（推定）
		電気メッキ 3				≒ 30	定価US$ 200(150円/$)
		溶接47				≒ 387	定価US$2,582(150円/$)
					（小計）	（2,787）	
					合計	8,579	

表－4　既供与機材の修理及び保全に関する専門家派遣の要請

部門	優先度	機材名	メーカー	現状	マレイシア側の要請	調査団の対応	備考
金型製作	1	倣いフライス盤（YD-2E）（S/NO.1573）	米田鉄工所	良好	1."PICK"制御系のチェックと調整 2.キャリブレーション 3.PCBの交換（期間：2～3週間）	必要性は十分に認められるので，予算，専門家等の条件を勘案し，可能な限り対応したい旨，表明した。	
プレス加工	1	150t プレス	川崎油工	良好	1.定期点検調整 2.保守管理に関	同上	

部門	優先度	機材名	メーカー	現状	マレイシア側の要請	調査団の対応	備考
					する指導（油圧・電気・機械系故障修理対策）（期間：2～4週間）		
	1	45tクランクプレス	AMADA	良好	同上	同上	
	1	ギャップシャリング	AMADA	〃			
	1	油圧プレスブレーキ	AMADA	〃	（期間2～4週間）		
試験検査	1	X線マイクロアナライザー（EMX-7）	島津製作所	稼動しているが部分的に不良	1.RAP結晶交換 2.定期点検保守（期間2週間）	同上	
	1	固定式X線発生装置（WSI-250S）	島津製作所	故障	1.X線管球交換 2.定期点検保守（期間2週間）	同上	
電気メッキ	1	廃水処理装置及び廃ガス処理装置	中央製作所 硬化クロム㈱	十分に稼動できない	1.全面的な点検修理 2.運転操作法の指導	同上	

表－5　補完的技術協力に関する要請

部門	課題	要請の概要	調査団の対応	備考
金型製作	・数値制御による金型製作	・投影研磨機用自動加工片旋回装置に関するNC又はCNC技術の指導	・本件は左記装置が製造中止のため取り止めとなった。	
プレス加工	・数値制御によるプレス加工	・数値制御付タレットパンチプレスの導入により，プレス加工分野においても数値制御加工技術の育成を目指す。	・本件の必要性は十分に認められるが，機材供与について問題があり，対応はむつかしい旨，表明した。	
溶接	・抵抗溶接	・抵抗溶接に関する制御システムの設計（マルチスポット溶接，シーム溶接，抵抗突き合せ溶接など）	・本件に関し機材供与は不可能であるが，技術情報の提供などについては，	

部門	課題	要請の概要	調査団の対応	備考
			予算・専門家等の条件を勘案し，検討したい旨，表明した。	
	• 機械化溶接システム	• MIG／CO_2溶接制御システムの設計（とくに，電流，電圧，溶接速度のような溶接パラメータの制御）	• 本件に関しては適切な専門家が委嘱できれば，予算等の条件を勘案し，検討したい旨，表明した。	
電気メッキ	• 製品及びジグの設計		• 本件要請の大部分はアフタケア技術計画の範囲外と考えられるので，対応はむつかしい旨，表明した。	
	• ローコストオートメーション	• ローコストオートメーションの研究・開発		
	• 観光産業向装飾品の製造	• シルクスクリーニング，ホトエッチング，カラーエナメリング		
	• プラスチックメッキ			
	• 選択塗装			
	• 精密メッキ			

表－6　協議を通じマレイシア側が取り下げた要請

部門	区分	要請の概要	取り下げた理由	備考
金型製作	付属装置	• 投影研磨機用自動加工片旋回装置（ワシノ機械）	• 製造中止	
	新規	• 金型研磨機（AIDA）（700万円）	• 優先度が低い • 主としてプラスチック用	
プレス加工	付属装置	• トランスファープレス用自動金型締付け装置（AIDA）（420万円）	• 優先度が低い	
		• プレスブレーキ用NC装置	• 本体への後付け不可能	
	新規	• ハイスピードプレス（AIDA）（4,300万円）	• 高価なため	
		• ヘビースタンピングプレス（AIDA）（9,000万円）	• 高価なため	
溶接	修理	• OTC MIGの修理	• 現地代理店を紹介	
	付属装置	• 小型軽量切断トーチ	• 優先度が低い	
	新規	• 工業用溶接ロボット（700万円）	• 優先度が低い	
		• パルスミニTIG（89万円）	• 〃	
		• プラズマ溶射装置（900万円）	• 〃	
		• 磨擦溶接機	• 〃	
		• 抵抗突き合せ溶接機	• 〃	

部門	区分	要請の概要	取り下げた理由	備考
電気メッキ	修理	• バフ研磨機と収塵機	• マレイシア側でも対応可能	
		• 整流器	• マレイシア側でも対応可能	
		• メッキライン（メッキ槽，パイプ，フイルタ等）	• 〃	
		• 純水製造装置	• バルブは供与	
	新規	• 陽極酸化用整流器	• 新分野のため協力の範囲外	
		• ＣＯＤメータ	• 優先度が低い	
		• バレル研磨機	• 〃	
		• 電磁式厚み計	• 〃	
		• スポットメッキ装置	• 〃	
		• ハルセルテストキット	• 〃	
		• 工具セット（ハンドドリル）	• 〃	
		• ワードプロセッサー	• 〃	
		• バレルメッキ（亜鉛メッキ）装置	• 新分野のため協力の範囲外	
		• エナメリング設備	• 〃	
	スペアパーツ等	• 各種薬品，原材料（１７種類）	• マレイシア側でも対応可能	
試験検査	新規	• 腐蝕モニター装置（可搬式電気化学的試験システム）（１８０万円）	• 優先度が低い	
		• 渦電流試験装置	• 〃	
情報	新規	• オーバーヘッドプロジェクター	• 優先度が低い	
		• スライドプロジェクター	• 〃	
		• カラースライドメーカー	• 〃	
		• カメラ	• 〃	

２－３　実施スケジュール

本件アフターケア協力は昭和62年度末までに完了するスケジュールで実施されるという調査団の説明をマレイシア側は全面的に了承した。

２－４　協議結果

本件アフターケア協力に関する協議結果はMinutes of Discussionとしてとりまとめ，調査団長とＳＩＲＩＭ長官との間で署名交換を行なった。（資料－１参照）

M／Ｄの本文及びAttached Document は日本側原案のとおりでマレイシア側は了承した。またAnnex Ⅰ及びⅡについても同様である。Annex Ⅲについては，日本側の予算及び納期などの条件によって，今後，変更もありうることをマレイシア側は了承した。

２－５　スペアパーツ等の現地調達

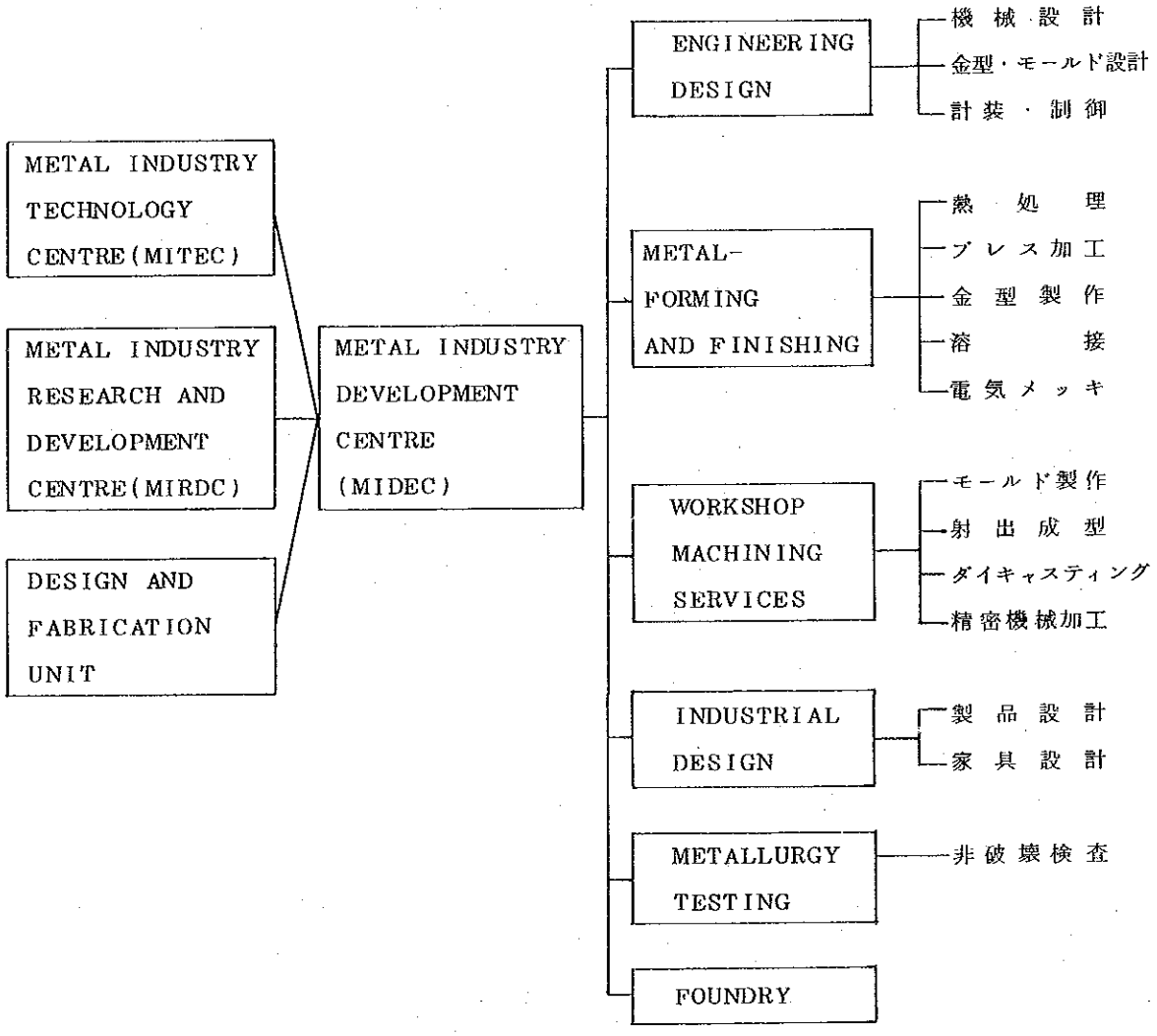
本件アフタケア協力の一環として，マレイシア側と協議の結果，総計65点（M$ 1,457.90）のスペアパーツ，消耗品等を現地で調達し，マレイシア側へ供与した。（資料－３参照）

Ⅲ. 調　査　結　果

1. MIDECの概要

1－1　組織・分掌業務

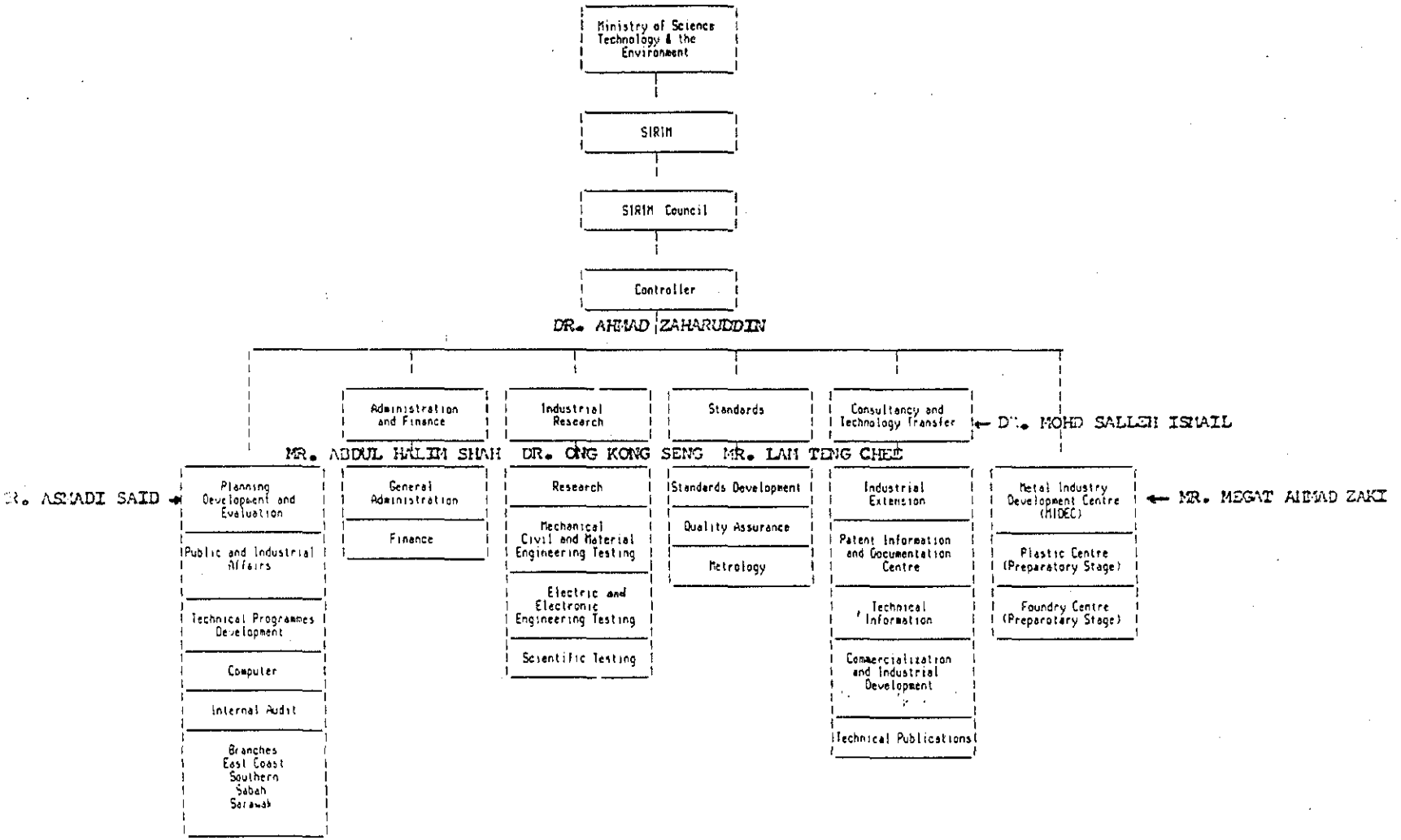
日本国政府がJICAを通じプロジェクト方式で技術協力していたMITEC（1981年9月公式開所）と個別派遣専門家で技術協力していたMIRDCは既存のDESIGN AND FABRICATION UNITとともに改編され，1986年4月に設立されたMIDECのなかに統合された。その概要は下記のとおりである。いずれもSIRIMに所属している。



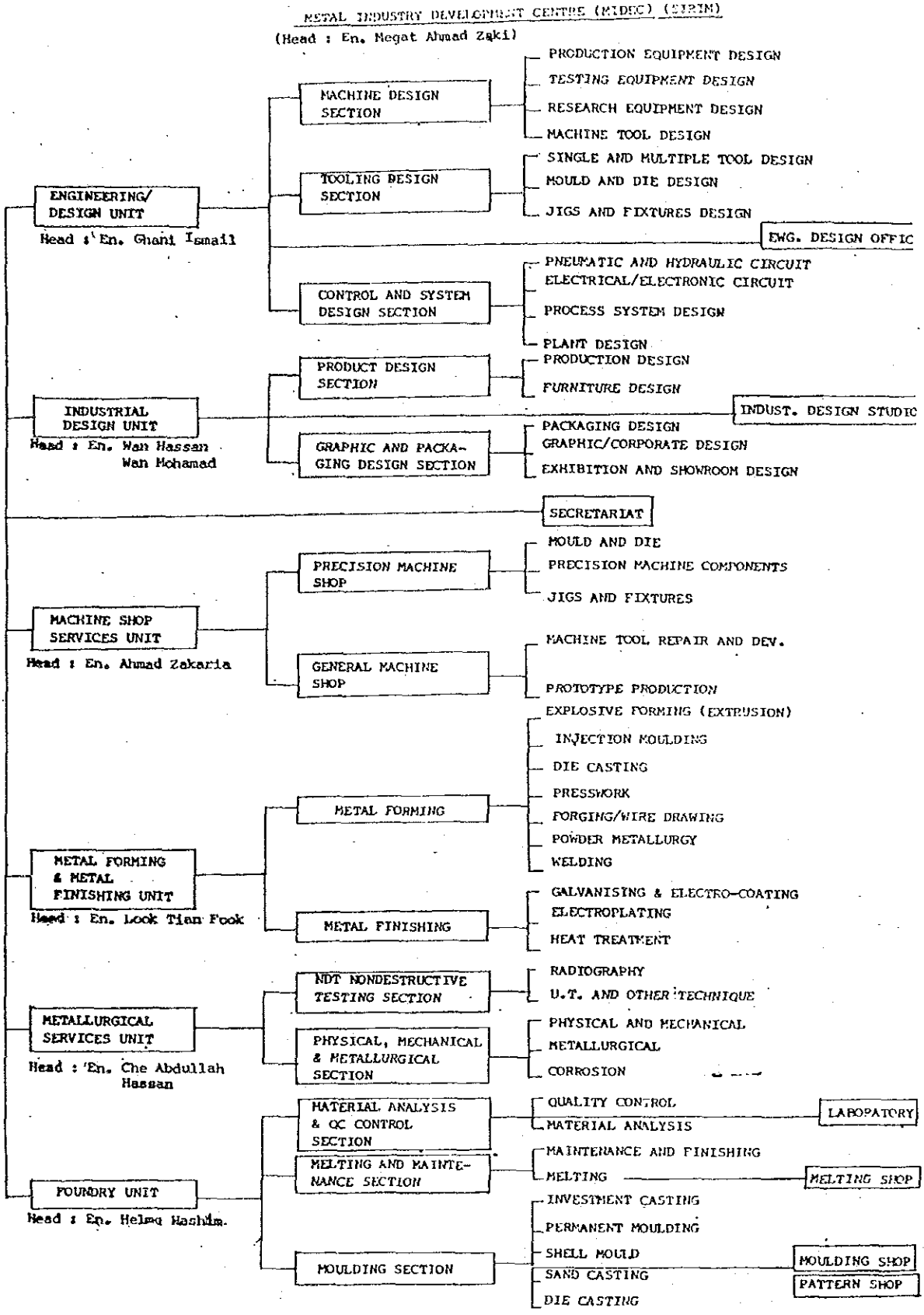
図－1にSIRIM組織図，図－2にMIDEC組織図を示す。

図－1　SIRIM 組織図

ORGANIZATION STRUCTURE



図－2　MIDEC 組織図


METAL INDUSTRY DEVELOPMENT CENTRE (MIDEC) (SIRIM)
(Head : En. Megat Ahmad Zaki)
ENGINEERING/ DESIGN UNIT
Head : En. Ghani Ismail
MACHINE DESIGN SECTION
PRODUCTION EQUIPMENT DESIGN
TESTING EQUIPMENT DESIGN
RESEARCH EQUIPMENT DESIGN
MACHINE TOOL DESIGN
TOOLING DESIGN SECTION
SINGLE AND MULTIPLE TOOL DESIGN
MOULD AND DIE DESIGN
JIGS AND FIXTURES DESIGN
ENG. DESIGN OFFIC
CONTROL AND SYSTEM DESIGN SECTION
PNEUMATIC AND HYDRAULIC CIRCUIT
ELECTRICAL/ELECTRONIC CIRCUIT
PROCESS SYSTEM DESIGN
PLANT DESIGN
INDUSTRIAL DESIGN UNIT
Head : En. Wan Hassan Wan Mohamad
PRODUCT DESIGN SECTION
PRODUCTION DESIGN
FURNITURE DESIGN
INDUST. DESIGN STUDIO
GRAPHIC AND PACKAGING DESIGN SECTION
PACKAGING DESIGN
GRAPHIC/CORPORATE DESIGN
EXHIBITION AND SHOWROOM DESIGN
SECRETARIAT
MACHINE SHOP SERVICES UNIT
Head : En. Ahmad Zakaria
PRECISION MACHINE SHOP
MOULD AND DIE
PRECISION MACHINE COMPONENTS
JIGS AND FIXTURES
GENERAL MACHINE SHOP
MACHINE TOOL REPAIR AND DEV.
PROTOTYPE PRODUCTION
METAL FORMING & METAL FINISHING UNIT
Head : En. Look Tian Fook
METAL FORMING
EXPLOSIVE FORMING (EXTRUSION)
INJECTION MOULDING
DIE CASTING
PRESSWORK
FORGING/WIRE DRAWING
POWDER METALLURGY
WELDING
METAL FINISHING
GALVANISING & ELECTRO-COATING
ELECTROPLATING
HEAT TREATMENT
METALLURGICAL SERVICES UNIT
Head : En. Che Abdullah Hassan
NDT NONDESTRUCTIVE TESTING SECTION
RADIOGRAPHY
U.T. AND OTHER TECHNIQUE
PHYSICAL, MECHANICAL & METALLURGICAL SECTION
PHYSICAL AND MECHANICAL
METALLURGICAL
CORROSION
FOUNDRY UNIT
Head : En. Helmi Hashim
MATERIAL ANALYSIS & QC CONTROL SECTION
QUALITY CONTROL
MATERIAL ANALYSIS
LABORATORY
MELTING AND MAINTENANCE SECTION
MAINTENANCE AND FINISHING
MELTING
MELTING SHOP
MOULDING SECTION
INVESTMENT CASTING
PERMANENT MOULDING
SHELL MOULD
SAND CASTING
DIE CASTING
MOULDING SHOP
PATTERN SHOP

1－2　予　　算

表－9　MITEC及びMIDEC予算の推移　　（M$）

年　次	1979～1983	1984	1985	1986	1987
組　織	MITEC	MITEC	MITEC	MIDEC	MIDEC
開発予算	5,070,530			900,000	(Pending)
経常予算	3,705,789	1,195,941	950,700	3,279,670	1,788,300*
計	8,776,319	1,195,941	950,700	4,179,670	

＊　職員俸給を含む管理経費を除く。

1－3　人員配置・カウンターパートの現況

表－10　MITECにおける人員配置の推移

部　門	職　種	1984	1985	1986
所　長		1	1	1
金　型	R．O．＊	3	3	3
	A．R．O ＊＊	1	1	1
	テクニシャン	4	4	4
	製　図　工	3	3	3
プ　レ　ス	R．O．	2	2	2
	A．R．O	1	1	1
	テクニシャン	2	2	2
溶　接	R．O．	2	2	2
	A．R．O．			1
	テクニシャン	3	3	6
電　気	R．O．	2	3	3
メ　ッ　キ	A．R．O．			1
	テクニシャン	4	4	4
	実　験　助　手	1	1	0
試　験	R．O．	1	1	1
検　査	A．R．O．	1	1	1
	実　験　助　手	2	2	3
情　報	R．O．	2	2	2
	A．R．O．			
	テクニシャン	2	2	2
	そ　の　他	2	2	2
庶　務		13	12	12
計		52	52	57

＊RO：RESEARCH OFFICER　＊＊ ARO：ASSISTANT RESEARCH OFFICER

表－11　MIDECにおける人員配置の現況

職種＼年次	1987
RESEARCH OFFICER	43
ASSISTANT RESEARCH OFFICER	19
テクニシャン	42
製図工	14
実習生	8
実験助手	4
倉庫係	3
速記者	2
書記	6
タイピスト	8
給仕	3
計	152

上記のデータで明らかなように，MITECプロジェクト終結のちもMITECの人員配置は変動せず，むしろ微増の傾向で安定的に推移していることがわかる。旧MITECのR.O.とA.R.Oの総数は18名で，MIDECに吸収，再編されたのちも，約30%を占めている。また，MITECプロジェクトにおいて我が国が受入れた研修員34名について，その現況を調査したところ，表－12のとおりである。

表－12　カウンターパートの現況

MIDECに継続して在勤中	14名	41%
SIRIMに在籍しているが留学中	5	15
MIDEC以外の部署でSIRIM，MSTEに在勤中	4	12
SIRIMを定年退職	1	3
SIRIMを中途退職（政府関係機関に再就職）	3	9
〃　（民間企業へ就職）	6	17
死亡	1	3
計	34名	100%

表－13　MITECプロジェクトで研修受入れたカウンターパートの現況

部門	NO.	日本で研修したカウンターパート	現況		
			MIDEC	SIRIM, MSTE	その他
管理	1	Abdullah Yusof			定年退職
	2	Foo Suan Thye		SIRIM部長	
	3	Sharifah Zainah		本省勤務	
	4	Abd. Rahim Bidin			退職(政府関係法人役員)
	5	Aziz Manan		英国留学中（ドクターコース）	
	6	Faisal Ismail			退職（会社役員）
金型	7	Cheng Toek Waa			退職（会社管理職）
	8	Ahmad Zakaria	○		
	9	Mohd Fuad Isa	○		
	10	Abd. Halim Rahman	○		
	11	Jalil Md. Noor	○		
	12	En. Namal Nasron	○		
プレス	13	Faisal Ismail			退職（会社役員）
	14	Look Tian Fook	○		
	15	Ahmad Yunus	○		
	16	Azahar Yahya	○		
	17	R. Kunasselan		SIRIM支局勤務	
溶接	18	Zubir Ralleh			PETRONAS（検査官）
	19	Abd. Ghalib Tham	○		
	20	A. Karunaneethi			退職（検査会社部長）
	21	Davet Hussein	○		
電気メッキ	22	Mustafar Sudin		英国留学中（マスターコース）	
	23	Mustaza Ahmadun		英国留学中（ドクターコース）	
	24	Nor Rashid Ismail	○		
	25	Zahri Sarbini		国内留学中（ITM）	
	26	Hamid Abd. Rahman	○		
試験検査	27	Ismail Hashim			退職（会社技師）
	28	Syed Hisham Warir			PROTON（管理職）
	29	Azmi Idris	○		
	30	Mohd. Akhir		英国留学中（B. Sc）	

部門	NO.	日本で研修したカウンターパート	現況		
			MIDEC	SIRIM,MSTE	その他
情報	31	Adam Abdullah			死去
	32	Aini Fawzia			退職
	33	Chen Saw Soon		SIRIM 広報担当職員	
	34	Mohmad Soib	○		

2. MIDECの活動状況

2－1 技術移転の現況

MITECプロジェクト終結のちの，ローカル中小企業への技術サービス業務の現況は以下のとおり。

(1) 工場巡回指導サービス

中小工場への巡回指導は定期的に続行されており，技術的問題点の克服にとどまらず，製造技術，生産プロセスの改善指導にまで及んでいる。

(2) 技術相談サービス

製品の品質向上を目指す新技術の導入やノウハウの移転などに関する技術相談が増加している。とくにF/Sや新製品の設計段階で既存企業や新規参入企業からの照会が多い。国産車プロジェクト，国産化率拡大計画，国営企業の民営化計画など政府関係プロジェクトに関連した技術相談もみられる。

(3) 試作加工サービス

メッキ，溶接，プレスなどの分野で，製品の原型製作あるいは試作加工の依頼が多い。金型部門では地場工場で生産を計画している新しい金型の設計と製作について技術サービスをしているが，今後はさらに試作加工サービスと機材のリースサービスを拡大することを計画している。

(4) 試験検査サービス

従前どおり，破壊及び非破壊検査，化学分析，金属組織分析などの試験検査サービスを実施している。

(5) トレーニングサービス

国内及び国外からの参加者に対して，各種のトレーニングコースを開催し，好評を得ている。第三国研修も着実に運営されており，第5回（メッキと溶接）は1988年2月15日から3月20日の開催を予定している。

(6) 情報サービス

図書室の利用，ビディオ・スライド・フイルムの借出し，定期刊行物の発行などのサ

ービスを続行している。各分野別のガイドブックも発刊している。

2－2　技術サービス実施状況

MITECプロジェクト終結後における各種技術サービスの実施状況は表－14のとおりである。順調に推移していることがわかる。

表－14　技術サービス実施状況

区　分	1979～1984	1985	1986
巡回指導 技術相談	332	65	106
情報サービス	550	93	103
試作加工 機材リース	126	25	100
トレーニング セミナー	22コース （260名）	10コース （173名）	13コース （410名）
試験検査	3,560試料	1,024試料	318試料

3. 既供与機材保守活用状況

既供与機材の保守活用状況は表－15に示すとおりである。全般的にみて良好ということがいえる。

ただ一部の機材については，破損のため修理が必要であり，さらにパーツ及び消耗品等の供与が適切とされる機材もある。工作機械はすべて旧MITECから旧MIRDCへ移設されているが，その他はすべて旧MITEC内に設置されており，紛失した機材はない。また，部品，消耗品などの管理も倉庫係によって適切に実施されている。

＊A　毎週使用
B　毎月〃
C　毎四半期使用

表－15　既供与機材保守活用状況

部門	供与機材名	設置場所			機材の整備・保守状況				活用状況	備考
		旧MITEC	旧MIRDC	その他	良好	対処すべき問題点がある				
						修理	パーツ	その他	＊	
金型製作	バンドソー		○		○		○	定期整備	A	
	コンタ－ソー		○		○		○		A	
	ヤスリ盤		○		○				A	
	精密表面研削盤		○		○			定期整備	A	
	旋盤		○		○		○		A	

部門	供与機材名	設置場所			機材の整備・保守状況				活用状況	備考
		旧MITEC	旧MIRDC	その他	良好	対処すべき問題点がある				
						修理	パーツ	その他	*	
金型製作	シェーパー		○		○				A	
	倣いフライス盤		○		○		○	定期整備	A	
	竪型フライス盤		○		○		○		A	
	ラジアルボール盤		○		○				A	
	成形研削盤		○		○		○		A	
	万能フライス盤		○		○				B	
	ダイスポットプレス		○		○				B	
	投影研磨機		○		○		○		B	
	工具研磨機		○		○				C	
	円筒研磨機		○		○				B	
	放電加工機		○		○		○		A	
	熱処理炉	○			○		○	定期整備	B	
	ジグボーラー		○		○		○	〃	A	
プレス加工	45tクランクプレス	○			○		○	定期整備	A	
	ギャップシャリング	○			○		○	〃	A	
	150t プレス	○			○		○	〃	A	
	110t トランスファープレス	○			○		○	〃	A	
	油圧プレーキ	○			○		○	〃	A	
	足踏プレス	○			○				A	
溶接	交流溶接機	○			○				A	
	炭酸ガス 〃	○			○				A	
	TIG 〃	○			○				A	
	直流アークエアガウジング	○			○				B	
	フレーム切断機	○			○				A	
	手動ガス切断機	○			○				A	
	溶接棒乾燥機	○			○				B	
	プラズマ切断機	○			○		○		B	
	半自動MIG溶接機	○				○			C	
	AC/DC TIG 〃	○			○				A	
	スポット 〃	○			○				A/B	
	浸透探傷機	○			○				B	
	エレクトロスラグ溶接機	○			○				C	
	シーム 〃	○			○				C	
	サブマージ 〃	○			○				B/C	

部門	供与機材名	設置場所			機材の整備・保守状況				活用状況	備考
		旧 MITEC	旧 MIRDC	その他	良好	対処すべき問題点がある				
						修理	パーツ	その他	*	
電気メッキ	ビニール溶接機	○				○	○		B	
	ピンホールテスタ	○			○				C	
	メッキ液試験器	○			○				A	
	pH メータ	○			○				B	
	ORP メータ	○			○				B	
	厚み計	○			○				B	
	ハルセル試験器	○			○				B	
	バーマスコープ	○			○				C	
	ディジタルダストメータ	○			○				C	
	スクラバー	○			○			定期整備	B	
	金メッキライン(実験用)	○			○				B	
	銅，ニッケル，クロムメッキライン	○			○		○	光沢剤の在庫なし	B	
	サポーティングライン	○			○				B	
	ポリシングライン	○				○	○	研磨材料不足	A	
	廃水処理システム	○			○		○	薬剤不足	B	
	イオン交換装置	○			○				C	
	硬化クロムメッキライン	○			○				B	
	銀メッキライン	○			○				C	
	金メッキライン	○			○		○	薬剤不足	B	
	クロム液精製装置	○			○				C	
試験検査	超音波探傷器	○			○				C	
	金属顕微鏡	○			○				B	
	高速切断機	○			○				B	
	試料乾燥器	○			○				B	
	試料埋込器	○			○				B	
	マイクロカッター	○			○				B	
	拡大投影機	○			○				B	
	万能試験機 30t	○			○				B	
	ポータブルX線装置	○			○				B	
	万能試験機 200t	○			○				B	
	シャルピー試験機	○			○				C	
	マイクロビッカース試験器	○			○				B	
	エリクセン深絞試験機	○			○				C	
	X線マイクロアナライザー	○				○	○	(RAP結晶)	A	

部門	供与機材名	設置場所			機材の整備・保守状況				活用状況	備考
		旧 MITEC	旧 MIRDC	その他	良好	対処すべき問題点がある				
						修理	パーツ	その他	*	
	固定式X線装置	○				○	○	(X線管球)		
情報	ビディオカセットシステム	○			○				C	
	スライドプロジェクタ	○			○				B	
	自動編集装置	○			○				C	
	サウンドミキサー	○			○				C	
	マイクロコンピュータ	○			○		○	ソフトウエア	A	

Ⅳ. 今後の留意事項

1. 本件アフターケア計画に対するマレイシア側の要請は多岐にわたっているので，その実施に際しては懇切丁寧な配慮をすることが望ましい。
2. 新規・スペアパーツを含めた機材の購送，各種機材の修理・調整に必要な短期専門家の派遣，補完的技術指導に必要な短期専門家の派遣に際しては，それぞれの段階において，前項で指摘したような配慮が望ましい。
3. 第三国研修（金属加工）は現地において好評を博しており，またMIDECの自立にも好結果を与えているので，今後とも継続して実施してゆくことが望ましい。

資料－1

MITECプロジェクトに対するアフタケアプログラム

に関する討議議事録

MINUTES OF DISCUSSION ON THE AFTERCARE PROGRAM FOR THE TECHNICAL COOPERATION PROJECT FOR THE METAL INDUSTRY TECHNOLOGY CENTER OF MALAYSIA

The Japanese Aftercare Survey Team (hereinafter referred to as "the Team") organised by the Japan International Cooperation Agency (JICA) and headed by Dr. Kenji Tomita, Special Technical Advisor, JICA, has visited Malaysia from April 22 to April 30 1987 to work out the details of the Aftercare Program for the Technical Cooperation Project for the Metal Industry Technology Center of Malaysia (hereinafter referred to as "the Program").

The Team has conducted a field survey and held a series of discussions with the authorities concerned of the Government of Malaysia on the desirable measures to be taken by both Governments for the successful implementation of the Program.

As a result of the survey and the discussions, the Team and the authorities concerned of the Government of Malaysia agreed to recommend their respective Governments the matters referred to in the document attached hereto.

Shah Alam, April 28, 1987.

富田堅二

(DR. KENJI TOMITA)
Leader, Aftercare Survey Team,
Japan International Cooperation
Agency.

(DR. AHMAD ZAHARUDIN IDRUS)
Controller,
Standards & Industrial Research
Institute of Malaysia,
Ministry of Science, Technology
and Environment, Malaysia.

THE ATTACHED DOCUMENT

I. COOPERATION BETWEEN BOTH GOVERNMENTS

1) The Government of Japan and the Government of Malaysia will cooperate with each other in implementing the Program, for the purpose of furthering the effect of Technical Cooperation Project for the Metal Industry Technology Center of Malaysia through the aftercare technical cooperation. The activities under this cooperation is geared towards developing management and technology in the metal industry in Malaysia.

2) The Program will be implemented in accordance with the Tentative Schedule of Implementation given in Annex 1.

II. DISPATCH OF JAPANESE EXPERTS

1) In accordance with the laws and regulations in force in Japan, the Government of Japan will take necessary measures through JICA to provide at its own expense services of the Japanese experts as listed in Annex II through the normal procedures under the Colombo Plan Technical Cooperation Scheme.

2) The Japanese experts referred to in 1 above will be granted in Malaysia the privileges, exemptions and benefits no less favourable than those accorded to experts of third countries working in Malaysia under the Colombo Plan Technical Cooperation Scheme.

III. PROVISION OF MACHINERY AND EQUIPMENT

1) In accordance with the laws and regulations in force in

Japan, the Government of Japan will take necessary measures through JICA to provide at its own expense such machinery, equipment and other materials (hereinafter referred to as "the Equipment") necessary for the implementation of the Program as listed in Annex III through the normal procedures under the Colombo Plan Technical Cooperation Scheme.

2) The Equipment will become the property of Malaysia upon being delivered c.i.f. to the Malaysian authorities concerned at the ports and/or airports of disembarkation, and will be utilized exclusively for the implementation of the Program in consultation with the Japanese experts referred to in Annex II.

IV. MEASURES TO BE TAKEN BY THE GOVERNMENT OF MALAYSIA

1) The Government of Malaysia should make necessary arrangement for requesting the dispatch of Japanese experts and the supply of the Equipment as mentioned above by submitting the application forms (A1 Form and A4 Form) as soon as possible through proper channel.

2) In accordance with the laws and regulations in force in Malaysia the Government of Malaysia should take necessary measures for tax exemption, custom clearance, and internal transportation of the above-mentioned Equipment as soon as it will arrive at the ports of embarkation.

3) The Government of Malaysia should allocate the necessary number of suitably qualified personnel corresponding to each Japanese experts to be dispatched by the Government of Japan as specified in Annex II for the effective and successful transfer of the technology under the Program.

4) The Government of Malaysia should make any other necessary arrangement to contribute positively to the convenience of the successful implementation for the program.

V. CLAIMS AGAINST JAPANESE EXPERTS

The Government of Malaysia undertakes to bear claims, if any arises, against the Japanese experts engaged in the Program resulting from, occurring in the course of, or otherwise connected with the discharge of their official functions in Malaysia except for those arising from the wilful misconduct or gross negligence of the Japanese experts.

VI. TERM OF COOPERATION

The technical cooperation for the Program mentioned in this Attached Document will be implemented before the end of March 1988 (within the Japanese fiscal year 1987).

(173)

ANNEX 1: TENTATIVE SCHEDULE OF IMPLEMENTATION

YEAR	1987									1988		
MONTH	4	5	6	7	8	9	10	11	12	1	2	3
DISPATCH OF THE SURVEY TEAM	—											
DISPATCH OF JAPANESE EXPERTS	..							———				
PROVISION OF THE EQUIPMENT			———			———						

ANNEX II: JAPANESE EXPERTS

In order to implement the Program, the following Japanese experts will be dispatched to render such technical guidance as follows:-

1. Short-term experts in the field of:

   (a) Repair and maintenance of the Equipment provided by the Government of Japan.

   (b) Complemental technical guidance in the field of metalworking technology.

2. Scope of technical guidance:

   (a) *Repair and maintenance:*

   To train Malaysian counterparts and transfer necessary technology for the operation, maintenance, check-up and repair of the Equipment provided by the Governemnt of Japan.

   (b) *Complemental Technical Guidance:*

   To train Malaysian counterparts and transfer necessary technology in the above field for complementing the technology transfer during the term of cooperation of the Technical Cooperation Project for the Metal Industry Technology Center in Malaysia.

ANNEX III: JAPAN'S PROVISION OF THE EQUIPMENT

The Equipment to be provided by the Government of Japan through JICA will be as follow:

(1) Equipment complete with necessary spare parts and accessories:

1) Hydraulic trolley
2) Fine spot welder
3) Portable inverter TIG
4) Mini heaters (Quartz)
5) Rectifier for small scale hard chrome plating
6) Cartridges for filters, Model 0-45
7) Handy pump
8) Immersion heaters
9) Photocopy machine
10) Ultrasonic thickness meter

(2) Spare Parts And Accessories for:

1) AMADA Bandsawing Machine, H250SA, S/N 354231
2) OKAMOTO Precision Surface Grinder, PSG-63AN
3) JAPAX Electrical Discharge Machine, DP 20 M/C No: 122-01-260
4) WAIDA Jig Boring & Milling M/C, JBM 40 M/C No: 548
5) ENSHU Vertical Milling Machine, RA2
6) AMADA Contour Sawing Machine, VA400
7) JAPAX Electrical Discharge Machine DP20
8) WASINO Precision Gap Lathe, LE-19
9) WASINO Optical Profile Grinding Machine, GLS-125A
10) OKAMOTO Form Grinding Machine, PFG-450
11) Hydraulic Deep Drawing Press (Kawasaki Yucoh Co. Ltd.) 150T
12) 45T Amada Torc-Pac Press (AMADA Company)
13) 110 Ton Aida Transfer Press C2-11(2)
14) Gap Shearing Machine, M-1245 (Amada)
15) Hydraulic Press Brake (Amada) (80T)

16) Koike Plasma Cutting Machine, KPC-25
17) OTC TIG Welding Machine
18) OTC MIG CO_2 Welding Machine
19) OTC MIG Machine, MIG 135
20) AC Flux cored welder, Hitachi TK-arc
21) Video , slides and books (metalworking technology)
22) Waste Water Treatment Plant (Koka Chrome)
23) Buffing Facilities, (NOMIZU Machining Work)
24) Plating Plant (brighteners, chemicals)
25) Laboratory facilities
26) Shimadzu Electron Probe Micro Analyser (EPMA) Model EMX-7
27) Shimadzu Industrial X-ray Machine, WSl-2505
28) Advanced Personal Computer (NEC)

The provision of the above Equipment may be changed subject to conditions of budget and delivery of the Equipment.

資料－２

専門家派遣要請書（Ａ１フォーム）

及び

機材供与要請書　（Ａ４フォーム）

UNIT PERANCANG EKONOMI
Economic Planning Unit
JABATAN PERDANA MENTERI
Prime Minister's Department
JALAN DATO' ONN
50502 KUALA LUMPUR
MALAYSIA

Telefon: 2300133/2933333
Cable: ECONOMICS
Telex: EPUPM MA 30098

Ruj. Tuan:
Your Ref:

Ruj. Kami: (6( )dlm.UPE(S)61/102/11
Our Ref: JILID:IV

Tarikh:
Date: 24 April 1987

URGENT/BY HAND

Mr.T. Goto,
Second Secretary,
Embassy of Japan,
11, Persiaran Stonor,
Off Jalan Tun Razak,
50450 Kuala Lumpur.

Dear Mr. Goto,

Request for Short-Term Experts and Equipment for Metal Industry Technology Centre, SIRIM

Further to the discussions held between the Aftercare Survey Team and SIRIM on the Metal Industry Technology Centre project from 22-30 April 1987, I am now officially writing to request for short-term experts and equipment as agreed upon by the mission for the project.

2. In line with the request, attached herewith please find copies of A1 form and A4 form for your perusal.

3. We trust that our request merits the favourable consideration by your Government and your continued assistance is greatly appreciated.

Thank you.

Yours sincerely,

(Wan Norma Wan Daud)
for Director General,
Economic Planning Unit.

c.c.

Mr. T. Matsuzaki,
Resident Representative,
Japan International Cooperation Agency,
25, Jalan Yap Kwan Seng,
50450 Kuala Lumpur.

WNWD/an.

Form A 1
(1962 *Revision*)

THE COLOMBO PLAN
COUNCIL FOR TECHNICAL CO-OPERATION IN ASIA AND THE PACIFIC

APPLICATION FOR EXPERT

By the Government of MALAYSIA to the Government of JAPAN

for an expert in METALWORKING TECHNOLOGY

Notes.—(*a*) This form has been devised for the general guidance of co-operating countries in order to facilitate the supply of *relevant information and data necessary to afford an adequate appreciation of the nature of the technical assistance* required. Full and accurate completion of this application form will avoid much reference back and lead to speedier action.

(*b*) The requisite number of copies of the Form A 1, including a copy for the Colombo Plan Bureau, duly endorsed by the appropriate Foreign Aid Department of the requesting government should be forwarded to the donor government concerned through the appropriate channels.

1. Background Information This section should show as *precisely* as possible the general nature of the project for which the expert is required, stating whether it comes within the Government's *development programme. It is important* to indicate whether the project is a new enterprise or whether it was started previously. In the latter case, any assistance received under other technical co-operation programmes (e.g. under United Nations auspices) should be stated. With *regard* to industrial enterprises, some impression of the size is important and the output and number of workers to be employed are useful indications. The type of process, make and age of industrial or scientific equipment with which the expert will be concerned should be specified. In the case of academic establishments, it is an advantage to know the number of annual intake of students, their level of *attainment, numbers and status* of existing staff and details of any research facilities and the level of research being undertaken. (Copies of brochures, annual reports, financial *statements, calendars*, syllabus of instruction, etc. should be attached where applicable).	The Metal Industry Technology Centre (MITEC) of Standards and Industrial Research Institute of Malaysia (SIRIM) was set up under bilateral technical cooperation with the Government of Japan. Under the Minutes of Discussion On The Aftercare Programme For the Technical Cooperation Project For MITEC, signed on 28 April 1987 between the two governments, further assistance will be provided by the Government of Japan through the despatch of short-term experts in the field of (a) Repair/maintenance of equipment provided by Government of Japan. (b) Complemental technical guidance in the field of metalworking technology.
2. Specification for the post:* (*a*) post title	Experts in metalworking technology.
(*b*) duties for which the expert will be responsible. These *should preferably be listed*, and it is important to give as much detail as possible	(1) Repair and maintenance of equipment provided by Government of Japan. (2) Complemental technical guidance in the field of metalworking technology.
(*c*) authority to whom expert will be responsible	Controller, Standards & Industrial Research Institute of Malaysia.
(*d*) qualification and experience required and approximate age limits	In the fields specified in the Minutes of Discussion.
(*e*) number of personnel required	Five to six experts
3. In the case of continuous projects, give name and particulars of understudy or counterpart who is to work with the expert	-
4. Terms and conditions of appointment : (*a*) duration	1-3 months
(*b*) actual place of employment, nearest town and post office	Shah Alam, Selangor
(*c*) if living accommodation to be *provided, state whether* furnished or unfurnished, and whether suitable for married man with family :	Exemption is requested from the Japanese Government due to budgetary constraints.
(i) daily allowance for food if accommodation only provided	- do -
(ii) daily rate for accommodation and food if neither are provided in kind	- do -

*It is essential that full particulars should be given. If the space provided is inadequate, particulars should be given on a separate sheet.

4. Terms and conditions of appointment—(*Contd.*) (*d*) daily and nightly rates of subsistence payable when away from base on duty	Not applicable
(*e*) are costs of internal travel paid or car provided?	-do-
(*f*) what leave arrangements are suggested?	As in General Circular no.1 of 1979
(*g*) extent to which free hospital and medical treatment is to be provided for the expert and his accompanying dependants, if any	-do-
(*h*) is expert free from income tax?	-do-
(*i*) will personal effects imported on first arrival be cleared free of custom duty?	-do-
(*j*) does host government undertake to indemnify expert in respect of damages awarded against him for actions performed in the course of his official duties?	Yes, unless due to wilful misconduct or gross negligence.
(*k*) approximate date on which the expert is required to arrive in receiving country	Between October 1987 - March 1988
(*l*) any other information	-
5. *Proposals for apportionment of* costs of salary and allowance and passages	-
6. *Previous steps, if any, to fill the post :* If any previous attempt has been made to fill the post under the Colombo Plan (including ICA) or from any external source (UN, Specialised Agency or other) please indicate:	None
(*a*) to whom application was addressed, with date	-
(*b*) result or present stage of negotiations	-
(*c*) are other experts working in this area in associated projects or have there been experts working in this field previously? If so, are any reports by these experts available?	None, except for the installation and commissioning of the equipment.
7. Correspondence : Name, postal and telegraphic address of official to whom correspondence regarding this application should be forwarded	Chief Secretary to the Government, Economic Planning Unit, Prime Minister's Department, Jalan Dato Onn, 50502 Kuala Lumpur. Telegraphic address: ECONOMICS KUALA LUMPUR Telex: EPU PM MA 30098

Signed: [signature]

Date: 29/4/87

on behalf of the Government of For The Chief Secretary to the ~~Goverment of Malaysia.~~

For use only by Donor Government

Application accepted/rejected/withdrawn

Date: _____

on behalf of the Department of _____

Form A 4.
(1962 *Revision*)

THE COLOMBO PLAN

COUNCIL FOR TECHNICAL CO-OPERATION IN SOUTH AND SOUTH-EAST ASIA

Equipment for Training or Research Institutes and for Equipment accompanying Experts

APPLICATION

By the Government of MALAYSIA

from GOVERNMENT OF JAPAN
(Country)

Notes.—(a) This Form has been devised for the general guidance of co-operating countries in order to facilitate the supply of relevant information and data necessary to afford an adequate appreciation of the nature of the technical co-operation required. The careful completion of this application form will avoid much reference back and lead to speedier action. Separate forms A4 should be used for requests for equipment for each individual institute or project.

(b) The requisite number of copies of the Form A4, including a copy for the Colombo Plan Bureau, duly endorsed by the appropriate Foreign Aid Department of the requesting government should be forwarded to the donor government concerned through the appropriate channels.

1. Background Information Please describe as concisely as possible the general outlines of the project for which the equipment is required, indicating whether the latter is (*a*) for use by an expert in the performance of his duties (*b*) for a training scheme or institution or (*c*) for a research institution. If either (*b*) or (*c*) please say whether the equipment is for the establishment of a new institution or the expansion or re-organisation of an existing one (e.g., by the provision of a new department, etc.). The name and exact location of the institution, its approximate cost and the authority responsible for it should be stated. Where appropriate details should be given of the availability of any services required for the operation of the equipment. This would include operation by electricity (i.e. type of current, periodicity, voltage and any variations, phases, frequency etc. and if D.C. is the only current available, please give full details), water reticulation or steam gas etc. Details of similar equipment already in use should be given.	The Metal Industry Technology Centre (MITEC) of Standards and Industrial Research Institute of Malaysia (SIRIM) was set up under bilateral technical cooperation with the Government of Japan. Under the Minutes of Discussion on the Aftercare Programme for the Technical Cooperation Project for MITEC, signed on 28 April 1987 between the two Governments, further assistance will be provided by the Government of Japan through the provision of equipment/machinery/accessories/spare parts.
2. Description of equipment required. Please give a full description of each item and general specifications where possible. The manufacturer and estimated cost of each item if known together with details of the proposed and use of item should be given. Where applicable, give details of any special packing or tropic proofing required and indicate whether handbooks or instruction data supplied in English will suffice. If appropriate, please indicate any required priorities or phasing of deliveries and advise whether adequate facilities exist for maintenance and servicing of the type of equipment requested. (If lengthy, detailed lists should be annexed; it would be convenient to have separate annexures for (*a*) films; (*b*) books and (*c*) other equipment.)	As in Annex III of the Minutes of Discussion.
3. Has this equipment request already been directed to any other Agency or Colombo Plan country and if so to whom was it addressed and with what result?	None
4. Has the list of equipment already been discussed with representatives of the supplying country/ies? If so, please indicate what stage the discussions have reached.	Yes, with the Aftercare Survey Team from 23/4 - 28/4/87.
5. Furnish full particulars in respect of— (*a*) Consignee; (*b*) Official to receive documents and enquiries; and (*c*) Clearing agent at port of entry.	Controller, Standards and Industrial Research Institute of Malaysia.
6. Where equipment is required for use by an expert Please indicate— (*a*) The country or agency from which the expert has been requested or obtained	-
(*b*) His duties and length of secondment (a reference to the relative Form A. 1 will suffice when the expert is being provided by the country to whom the equipment request is addressed)	-

(c) What use is proposed for the equipment when the expert's period of secondment terminates?	-
(d) By what date is the equipment required?	-
7. Where equipment is required for Training or Research Institutions Please indicate—	Research and development. Services (consultancy/trial production) for small and medium scale metal working industry.
(a) Nature and standard of training or research to be undertaken	
(b) Total number of students to be accommodated from within the country or from elsewhere in the Region, the qualifications for admission, the duration of courses, and the annual output of trainees	Local metalworking industry
(c) Whether there is already a similar institute(s) in existence in the country. If so, please give details.	-
(d) Whether buildings are already available. If not has construction started and *when is it expected* to be completed?	Available
(e) Whether qualified staff to handle the equipment has been recruited or is proposed to be recruited locally. *If not is it proposed:—* (i) to recruit foreigners under aid-programmes? (ii) to train locally recruited personnel abroad in handling equipment? (the reference numbers of any Forms A.1 or A.2 relating to such requests should be quoted)	Qualified local staff to handle the equipment.
(f) Taking into account the answers to (d) and (e) above, what is the date by which the equipment is required and the *date on* which training or research work is to commence	October 1982 - March 1988
(g) Whether any assistance in drawing up the Scheme has been obtained from outside experts? (Any specialist reports or Government surveys (e.g., Educational Committee Reports, &c.), bearing on the request should be provided if possible)	-
8. Correspondence Name, Postal and Telegraphic Address of official to whom correspondence regarding this application is to be forwarded	The Chief Secretary to the Government, Economic Planning Unit, Prime Minister's Department, Jalan Dato Onn, 50480 Kuala Lumpur. Telegraphic address: ECONOMICS KUALA LUMPUR Telex: EPU MA30098

Signed: _____
For The Chief Secretary to the Government of Malaysia.
on behalf of the Government of Malaysia

Date: 29/4/87

For use only by Donor Government

Application accepted/rejected/withdrawn

on behalf of the Department of _____

Date: _____

ANNEX III: JAPAN'S PROVISION OF THE EQUIPMENT

The Equipment to be provided by the Government of Japan through JICA will be as follow:

(1) Equipment complete with necessary spare parts and accessories:

1) Hydraulic trolley
2) Fine spot welder
3) Portable inverter TIG
4) Mini heaters (Quartz)
5) Rectifier for small scale hard chrome plating
6) Cartridges for filters, Model O-45
7) Handy pump
8) Immersion heaters
9) Photocopy machine
10) Ultrasonic thickness meter

(2) Spare Parts And Accessories for:

1) AMADA Bandsawing Machine, H250SA, S/N 354231
2) OKAMOTO Precision Surface Grinder, PSG-63AN
3) JAPAX Electrical Discharge Machine, DP 20 M/C No: 122-01-260
4) WAIDA Jig Boring & Milling M/C, JBM 40 M/C No: 548
5) ENSHU Vertical Milling Machine, RA2
6) AMADA Contour Sawing Machine, VA400
7) JAPAX Electrical Discharge Machine DP20
8) WASINO Precision Gap Lathe, LE-19
9) WASINO Optical Profile Grinding Machine, GLS-125A
10) OKAMOTO Form Grinding Machine, PFG-450
11) Hydraulic Deep Drawing Press (Kawasaki Yucoh Co. Ltd.) 150T
12) 45T Amada Torc-Pac Press (AMADA Company)
13) 110 Ton Aida Transfer Press C2-11(2)
14) Gap Shearing Machine, M-1245 (Amada)
15) Hydraulic Press Brake (Amada) (80T)

16) Koike Plasma Cutting Machine, KPC-25

17) OTC TIG Welding Machine

18) OTC MIG CO_2 Welding Machine

19) OTC MIG Machine, MIG 135

20) AC Flux cored welder, Hitachi TK-arc

21) Video, slides and books (metalworking technology)

22) Waste Water Treatment Plant (Koka Chrome)

23) Buffing Facilities, (NOMIZU Machining Work)

24) Plating Plant (brighteners, chemicals)

25) Laboratory facilities

26) Shimadzu Electron Probe Micro Analyser (EPMA), Model EMX-7

27) Shimadzu Industrial X-ray Machine, WSI-2505

28) Advanced Personal Computer (NEC)

The provision of the above Equipment may be changed subject to conditions of budget and delivery of the Equipment.

資料－３

現地で調達した機材リスト

INSTITUT PIAWAIAN DAN
PENYELIDIKAN PERINDUSTRIAN
MALAYSIA
Standards & Industrial Research Institute of Malaysia
Lot 10810, Peringkat 3,
Lebuhraya Persekutuan,
Peti Surat 35, 40700 Shah Alam, Selangor.

Surat kami: SIRIM 430/1/1-4

Surat tuan:

Bila menjawab, sila beri rujukan Institut ini.

28 April 1987

Dr. Kenji Tomita,
Leader of Aftercare Survey Mission,
JICA.

Dear Sir,

Ref: Expendables/Spare Parts

On behalf of SIRIM, I would like to express our thank and gratitude for your contribution of expendables and spare parts for the MIDEC of SIRIM.

Enclosed herewith is the list of expendables/spare parts mentioned above.

Thank you.

Yours sincerely,

(MEGAT AHMAD ZAKI)
Acting Head of MIDEC,
For Controller,
Standards & Industrial Research
Institute of Malaysia.

Kawat: SIRIMSEC Shah Alam • Telex: SIRIM MA 28672 • Telefon: 5592601 5591620

ITEM PURCHASED BY CASH

No.	Name of item	Specification	Cost/unit M$	Quantity	M$	Remarks
1.	Pressure Hose	0.018x1.012	3.00	12 m	36.00	Gong Yih Hardware Machinery Sdn. Bhd.
2.	Stickling	19519	15.00	1 set	15.00	Hub Hong Machinery & Instrument Sdn. Bhd.
3.	Wheel grinder	Ushio	3.90	4 pcs.	15.60	- do -
4.	Plastic container	Cat no. 104 Cat no. 108 Cat no. 905A	29.00 18.50 1.60	3 4 6	170.60	Lam Seng Plastic
5.	MEM 100L14 fuse link		7.70	4 pcs.	30.80	Kim Siah Elec. Co.
6.	S4 13A 4 WAY		15.00	1 pc.	15.00	
7.	40/193 x 3C wire		.80	10 yards	8.00	
8.	5A Class fuse		.20	5 pcs.	1.00	
9.	Extension roller		8.50	1 pc	8.50	
10.	Blind rivet	5/32" x 1/2"	3.50	500 pcs.	17.50	Gong Yih Hardware
		3/16" x 1/2"	4.50	200 pcs.	9.00	
		1/8" x 3/8"	2.50	500 pcs.	12.50	
11.	Hand operated pump		32.00	1 pc	32.00	
12.	Philip Test pen		3.00	3 pcs.	9.00	
13.	Sharpening stone		5.00	1 pc.	5.00	

No.	Name of item	Specification	Cost/unit M$	Quantity	M$	Remarks
14.	TIG Welding Glove (leather)	Leather	46.80	1 pair	46.80 ✓	PAN WELD SDN. BHD.
15.	TIG Tungsten 2.4	2% Thoriated	16.50	3 pcs.	49.50 ✓	
16.	Grinding Wheel Glove (leather)	Leather	25.00	2 pairs	50.00	Uniweld
17.	Tungsten	2% Thoriated	23.15	2 pcs.	46.30	
18.	Wire spool M16 - 308	SUS	20.00	1 pc	20.00	
19.	Grinding Wheel (for cutting groove)		2.20	17 pcs.	37.40	
20.	Polishing Wheel 'Ushio brand'	Type NSL	36.00	2 set	72.00 ✓	Hub Hong Machinery & Instrument Sdn. Bhd.
21.	Polishing wheel Mounted point type	'USHIO'	3.90	3 pcs.	11.70 ✓	- do -
22.	Flap wheel	Lukas W. German (40 x 20)	6.00	2 pcs.	12.00 ✓	- do -
	Flap Wheel	(60 x 20)	11.50	2 pcs.	23.00 ✓	- do -
23.	Flap Wheel	Lukas (60 x 40)	7.00	2 pcs.	14.00 ✓	- do -
24.	Misty toilet Roll		6.00	2 dozen	12.00 ✓	Syarikat Mega Enterprise
25.	Masking Tape	1½ in wide	4.45	4 rolls	17.80 ✓	- do -
		2" wide	6.75	2 rolls	13.50 ✓	- do -
26.	Coytap PV tape			20 pcs	8.00 ✓	Kim Siah Electric Company

No.	Name of item	Specification	Cost/unit M$	Quantity	M$	Remarks
27.	Fuse	MEM 32	2.40	5 pcs.	12.00	Kim Siah Electric Company
28.	Battery	National UM3	0.45	12	5.40	- do -
29.	Battery	National 9V	1.80	3	5.40	- do -
30.	Aeroxol spray paint		4.50	2 tin	9.00	Gong Yih Hardware Machinery Sdn. Bhd.
31.	China Padlock	40mm	12.00	3 pcs.	12.00	- do -
32.	Varnish		5.00	1 tin	5.00	- do -
33.	Brasso		4.50	1 tin	4.50	- do -
34.	Socket		12.00	2 pcs.	24.00	- do -
35.	3 core wire		1.00	10 m	10.00	- do -
36.	3 pin plug		1.80	1 pc	1.80	- do -
37.	Wood	6 x 8	1.20	1 pc	1.20	- do -
38.	Shallec Laker		2.00	1 pc	2.00	- do -
39.	Ilford 10 - 11	5 liter	11.20	3 bxs.	33.60	Ruby Photo Co. Sdn. Bhd.
40.	Ilford Bromopler	5 liter	12.00	3 bxs.	36.00	- do -
41.	Ilford fixer	5 liter	16.80	3 bxs.	50.40	- do -
42.	Photographic paper MG-1M	3½ x 5½	26.00	1 box	26.00	- do -

No.	Name of item	Specification	Cost/unit M$	Quantity	M$	Remarks
43.	Photographic paper MG 44-M	3½ x 5½	26.00	1 box	26.00	Ruby Photo Co. Sdn. Bhd.
44.	4 way switch socket	13A	15.00	1 pc.	15.00	Kim Siah Electric
45.	Flexible wire		0.80	6 ft.	4.80	- do -
46.	Plug Top	ANWA	1.20	2 pcs.	2.40	- do -
47.	Coytape PVC tape		0.40	10 pcs.	8.00	- do -
48.	Kodak Colour	Gold 135-36	6.80	8 pcs.	54.40	Kedai Gambar Star Foto
49.	Engineer's Kit	China No. 615	30.60	1 set	30.60	Gong Yih Hardware
50.	Rubicon Screw Driver		10.00	1 pc.	10.00	- do -
51.	Philip Test Pen		3.00	1 pc.	3.00	- do -
52.	Set square 56450	10A1	18.00	1 pc	18.00	Syarikat Mega Enterprise Petaling Jaya.
53.	Set square 56450	12A1	21.50	1 pc.	21.50	- do -
54.	Flexible curve		21.00	1 pc.	21.00	- do -
55.	Template	576251	14.00	1 pc.	14.00	- do -
56.	Template	57600	12.50	1 pc.	12.50	- do -
57.	Template	57610	21.00	1 pc.	21.00	- do -
58.	Stencil	0.3	3.20	1 pc.	3.20	- do -

No.	Name of item	Specification	Cost/unit M$	Quantity	M$	Remarks
59.	Stencil	0.6	3.70	1 pc.	3.70	Syarikat Mega Enterprise Petaling Jaya.
60.	Stencil	1.0	7.30	1 pc.	7.30	- do -
61.	Reform refograph		80.00	1 pc.	80.00	- do -
62.	Adjustable set square	564505A1	14.50	1 pc.	14.50	- do -
63.	Technical pen	0.35	12.50	1 pc.	12.50	- do -
64.	Technical pen	0.8	12.50	1 roll	12.50	- do -
65.	Binding Tape	1"	4.20	1 roll	4.20	- do -
				TOTAL	1457.90	

資料－４

アフターケアプログラムに対するマレイシア側からの要請リスト

DIVISION: DIEMAKING

DESCRIPTION OF EQUIPMENT, PARTS AND MATERIALS REQUESTED FROM MALAYSIAN SIDE (APRIL 1987)

No.	Name of Equipment	Specification 1) Type 2) Serial No. 3) Others	Qty.	Manufacturer	Parts And Materials			Priority	Remarks
					Item	Specification	Qty.		
1.	Jig Boring and Milling Machine.	JBM 40 M/C No: 548	1	WAIDA	a) Micro Switch (Lb)	OMRON ZC-Q2255 or HITACHI K11N-ER2 AC200 0.75 KW	5	1	
					b) Tool bit for micro boring bar	1) O1-4 2) C1 3) C2 4) C3 5) C4 6) C5	5 5 5 5 5 5		
2.	Electrical Discharge Machine.	DP20 M/C No: 122-01-260	1	JAPAX	a) Printed circuit board	PC1 PC2 PC3 PC4 PC5 PC6 PC7 PC8 PC11 PC12 PC23 PC24 PC26 PC27 PC20	1 1 1 1 1 1 1 1 1 1 1 1 1 2 2	2	
					b) Oil filter	-	4		
3.	Precision Surface Grinder	PSG-63AN	1	OKAMOTO	Printed circuit board	-	2	3	

DIVISION: DIEMAKING

DESCRIPTION OF EQUIPMENT, PARTS AND MATERIALS REQUESTED FROM MALAYSIAN SIDE (APRIL 1987)

No.	Name of Equipment	Specification 1) Type 2) Serial No. 3) Others	Qty.	Manufacturer	Parts And Materials			Priority	Remarks
					Item	Specification	Qty.		
4.	Vertical Milling Machine	RAZ	1	ENSHU	Milling chuck	SHA40-AS	1	4	
5.	Bandsawing Machine	H250SA S/N 354231	1	AMADA	Bandsaw blade	BB 01GLB	5	5	
6.	Contour sawing machine.	VA 400	1	AMADA	Saw blade	GLB 5 x 14	5	6	

(参考)

DIVISION: *DIEMAKING*

DESCRIPTION OF EQUIPMENT, PARTS AND MATERIALS REQUESTED FROM MALAYSIAN SIDE (APRIL 1987)

No.	Name of Equipment	Specification 1) Type 2) Serial No. 3) Others	Qty.	Manufacturer	Parts And Materials			Priority	Remarks
					Item	Specification	Qty.		
	SPECIAL ACCESSORIES								*Refer ANNEX*
1.	JAPAX Electrical Discharge Machine DP 20	JAPAX EDM DP 20		JAPAX	i) Combination electrode holder	I-435	1	1	ANNEX SA-1.1
					ii) Hi-Chuck	D523 or (I-115-152)	1	1	ANNEX SA-1.2
2.	Precision Gap Lathe	WASINO (LE-19K)		WASINO	i) Hydraulic Copying Attachment.		1	2	ANNEX SA-2.1
					ii) Right hand carbide tool	P20 ST 120	5	2	
3.	Optical Profile Grinder	GLS-125A		WASINO	i) Indexing device	121	1	3	ANNEX SA-3.1
4.	Form Grinder	PFG-450		OKAMOTO	i) Punch Grinding attachment (punch former).	11	1	4	ANNEX SA 4.1

ANNEX II: Japanese Experts

(a) Repair and maintenance of equipment (DIEMAKING)

No.	Name of Equipment	Scope of technical guidance	Duration of stay (proposed)	Proposed Japanese Expert (if known)
1.	YONEDA Copy Milling Machine. YD-2E s/No: 1573	1. Check and rectify 'pick' control problem. 2. Recalibration. 3. To replace some PCB's if necessary.	2 - 3 weeks	Mr. Nishimura from Yoneda Company.

DIVISION: PRESSWORK

DESCRIPTION OF EQUIPMENT, PARTS AND MATERIALS REQUESTED FROM MALAYSIAN SIDE (APRIL 1987)

No.	Name of Equipment	Specification 1) Type 2) Serial No. 3) Others	Qty.	Manufacturer	Parts And Materials			Priority	Remarks
					Item	Specification	Qty.		
1.	HYDRAULIC DEEP DRAWING PRESS (KAWASAKI YUCOH)	Type: 150 ton hydraulic Serial No:	1	KAWASAKI YUCOH CO. LTD.	1. Printed circuit board (PLB) for the Photo-Electric Safety Device.	RPL-CHN (4C 37)	2	B	
					2. Electro-magnetic Contactor for main motor.		1	A	
2.	45 TON AMADA TORC-PAC PRESS.	Type: Mechanical Crank Press Serial No:	1	AMADA COMPANY.	1. Solenoid Valve (for the clutch system)		1	A	
3.	GAP SHEARING MACHINE (Model: M-1245)	Type: Mechanical Serial No:	1	AMADA COMPANY.	1. Cutting blade		1 pair (Lower and upper)	A	
					2. Indicator Light (bulbs).		1 dozen	B	
4.	HYDRAULIC PRESS BRAKE.	Type: Hydraulic Serial No:	1	AMADA COMPANY.	1. Standard die.				Refer to Catalogue
					No: 127	Length (L) = 835mm	1 unit (Lower)	A	
					No: 109	L = 835mm	3 units	A	

DIVISION: PRESSWORK

DESCRIPTION OF EQUIPMENT, PARTS AND MATERIALS REQUESTED FROM MALAYSIAN SIDE (APRIL 1987)

No.	Name of Equipment	Specification 1) Type 2) Serial No. 3) Others	Qty.	Manufacturer	Parts And Materials			Priority	Remarks
					Item	Specification	Qty.		
					No: 123	L = 835mm	3 units	A	
					No: 4	L = 835mm	3 units	A	
					No: 13	L = 835mm	3 units	A	
5.	110 TON AIDA TRANSFER PRESS.	Type: Transfer Press (110 Tons) (2-11(2)) Serial No:	1	AIDA Engineering Company.	1. Solenoid Valve (for the clutch system)	Model: VA-26 (ROSS) - double valve	1	A	
					2. Magnetic clampers	KE-3A	8	A	
					3. Vacuum suckers	VCP-20	8	A	
					4. Vacuum suckers	VCP-30	8	A	
6.	HYDRAULIC TROLLEY (Minitale)	Model No: MTC 70 x 50 500 (Refer to catalogue)	2	OSAKA TAIYU					Manufacturer Tel No: Tokyo Branch: (03) 334-7744 Osaka Branch: (0727)29-2121

PRESSWORK DIVISION

Request for new equipment/machine (under consideration)

"NC TURRET PUNCH PRESS"

In line with the functions of MITEC, it is felt that there is a great need for the above-mentioned machine. This is due to the following reasons:-

Trial Production/Prototype Fabrication Service

i) Before making the real dies for new products, a few prototype samples are always required. This machine is very useful in fabrication of such samples to get accurate dimensions and to save die cost (using standard dies available) as well as time. Modification of dimension is also easy and faster.

ii) Many pressworking entrepreneurs who came for MITEC service are engaged in the production of various products in small lots. To fabricate toolings (dies) would not be economical. Therefore, a machine is needed for a flexible manufacturing system (FMS) such as no necessity of making toolings, very quick and highly precise in punching any number.

Training/Transfer of Technology Services

Along with the progress of pressworking technology, latest know-how such as Numerical Control Pressworking techniques (such as Numerical Control Pressworking) should be transfered/trained to local pressworking industries as well as to developing countries (through the Regional Training Program in Metal-working Technology Courses). The areas of training could be in the programming, operation and maintenance of such machines.

Advisory/Consultancy Service

It is expected in the future that more and more local pressworking industries will be utilising Numerical Control Machines for pressworking. By having such NC Machine (press), MITEC will be an ideal place for getting technical guidance and advices on this kind of modern technology through the advisory/consultancy services.

Others

MITEC is a centre where people from local industries as well as foreign countries (eg. the Regional Training Program participants) come to visit for services. Through demonstration, it is believed that it can create interest among them to promote to their management for the use of higher technology knowhow i.e. Numerical Control Pressworking.

It is also felt that MITEC has to go along with the modern trend in technology. For this reason, MITEC should have some of the Numerical Control Machines in addition to the conventional machines to at least at par with the level of pressworking industries in the country.

Specification

Refer to Catalogue (sample)

DIVISION: WELDING

DESCRIPTION OF EQUIPMENT, PARTS AND MATERIALS REQUESTED FROM MALAYSIAN SIDE (APRIL 1987)

No.	Name of Equipment	Specification 1) Type 2) Serial No. 3) Others	Qty.	Manufacturer	Parts And Materials			Priority	Remarks
					Item	Specification	Qty.		
1.	Koike Plasma Cutting	KPC-25		KOIKE SANSO KOGYO CO. LTD.	1. Push-on-cap. 2. Tip 0.059 10 amp. 3. Gas distributor. 4. Electrode	K84108 K84091 K84087 K84089	20 20 5 20	A A	Only the spare parts are required.
2.	OTC TIG Welding Machine			OTC	TIG torch for mechanised welding.	Current capacity. 300 Amp.	4	B	These torches are to be assembled to OTC TIG Welders eg. ACCUTIG/ARGO.
3.	OTC CO_2 Welding Machine			OTC	MIG/CO_2 torch for mechanised Welding with wire feeder and cables.	Current Capacity 300A	5	C	To be assembled to OTC CO_2/MIG Welders.
4.	OTC Plasma Cutting Machine			OTC	Plasma cutting torch. 1. Curved torch 2. Pencil torch (with cables).	 CT 0301 CTP 0301		D	Only the torches are required with torches.
5.	OTC (MIG-135)			OTC	Welding wires 1. Stainless steel ϕ 0.4mm 2. Mild steel ϕ 0.4mm 3. Aluminium ϕ 0.6mm.	 SUS 308	 10 spools 10 spools 10 spools	E	Only the welding wire.

DIVISION: WELDING

DESCRIPTION OF EQUIPMENT, PARTS AND MATERIALS REQUESTED FROM MALAYSIAN SIDE (APRIL 1987)

No.	Name of Equipment	Specification 1) Type 2) Serial No. 3) Others	Qty.	Manufacturer	Parts And Materials			Priority	Remarks
					Item	Specification	Qty.		
5.	OTC-MIG-135			OTC	Welding Tips			F	Only the tips are required.
					1. ϕ 0.4mm		20 pcs.		
					2. ϕ 0.6mm		10 pcs.		
					3. ϕ 0.9mm		10 pcs.		
6.	Hitachi TK arc			Hitachi Co. Ltd., or other suppliers.	Flux cored wire. ϕ 2.4mm	For AC flux cored arc welding.	5 reels	G	Only the wire is required.

DIVISION: WELDING

DESCRIPTION OF EQUIPMENT, PARTS AND MATERIALS REQUESTED FROM MALAYSIAN SIDE (APRIL 1987)

No.	Name of Equipment	Specification 1) Type 2) Serial No. 3) Others	Qty.	Manufacturer	Parts And Materials			Priority	Remarks
					Item	Specification	Qty.		
1.	MIYACHI CAPACITOR DISCHARGE SPOT WELDER.	a) Power Source: MC200NA INPUT : AC 200V ± 10% 50 HZ CAPACITY : 2 KVA CAPACITOR: 900 uF x 3 Blocks.	1	MIYACHI ELECTRONIC COMPANY.				A	
		b) Welding Transformer : MT 200N	1						
		c) Fine Spot Weld Head : MH-30	1						
2.	PORTABLE SPOT WELDING GUN	Model: X 1260	1	KIMURA DENYOKI LTD.				B	
		Model: C 1260	1					B	
		With welding tips	2 dozen each type						
3.	PORTABLE TIG WELDER	Inverter TIG One Phase, 220V, 50Hz	1					B	
4.	(a) REFERENCE BOOKS, INSTRUCTION BOOKS AND SLIDES.	See AWS catalogues (under Information Division).		American Welding Society.				A	
	(b) SLIDES AND VIDEOS ON FRICTION WELDING, TIG WELDING, PLASMA WELDING, RESISTANCE WELDING.	*(From Japan)*						A	

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ANNEX II: Japanese Experts

(b) Complemental Technical Guidance (WELDING SECTION)

No.	Field of Technology	Scope of technical guidance	Duration of stay (proposed)	Proposed Japanese Expert (if known)
1.	Resistance Welding	The design of control system for resistance welding. Like multi-spot welding, seam welding, resistance butt welding, etc.	1 month	
2.	Mechanised Welding System. (MIG/CO_2 Welding)	The design of control system for MIG/CO_2 Welding especially on controlling the welding parameters like current, voltage and welding speed.	1 month	

DIVISION: ELECTROPLATING

DESCRIPTION OF EQUIPMENT, PARTS AND MATERIALS REQUESTED FROM MALAYSIAN SIDE (APRIL 1987)

No.	Name of Equipment	Specification 1) Type 2) Serial No. 3) Others	Qty.	Manufacturer	Parts And Materials			Priority	Remarks
					Item	Specification	Qty.		
1.	DIGITAL pH METER.	Model: HG-3 See Catalogue 1	1	Denki Kagaku Keiki Co. Ltd.	Measuring electrodes.	Three In One # 6035.	6		
					Buffer solution.	pH 4 pH 7	1 l 1 l	A	
					DO-Converter	DOA-2	1		
2.	COAGULANT	Top Catch 400	500 kg.	OKUNO CHEMICALS				A	
3.	BUFFING FACILITIES								
	BUFFING WHEELS	Sisal Loose cloth	10 boxes 10 boxes	ITO Buff Manufacturing Company				A	
4.	BUFFING COMPOUND	Green rouge	100 pcs.	ITO Buff Manufacturing Company.				A	
5.	PORTABLE HAND polishing machine	See Catalogue 2	1	See Catalogue	Complete set with all accessories.			A	
6.	ACCESSORIES, SPARE PARTS AND ADDITIONAL EQUIPMENT AND CHEMICALS:-								
	a) BRIGHTENERS								
	i) Cyanide copper polishing	CR 1 CR 2	50 L 50 L	OKUNO CHEMICALS CO. LTD.				A	

DESCRIPTION OF EQUIPMENT, PARTS AND MATERIALS REQUESTED FROM MALAYSIAN SIDE (APRIL 1987)

No.	Name of Equipment	Specification 1) Type 2) Serial No. 3) Others	Qty.	Manufacturer	Parts And Materials			Priority	Remarks
					Item	Specification	Qty.		
	ii) Acid copper	TC Bright Mu TC Bright A TC Bright B	50 L 20 L 20 L	OKUNO CHEMICALS CO. LTD.				A	
	iii) Bright Nickel	ACNA Bl ACNA BL Safena BR	100 L 50 L 20 L	OKUNO CHEMICALS CO. LTD.					
		# 62 # 63 # 610 E 2N	150 L 150 L 100 L 50 L 40 L	EBARA-UDYLITE				A	
	iv) Silver Plating	Silver Glo TY Silver Glo 3 KBP 33 BP	2 L 20 L 20 L	JAPAN METALS				A	
	v) Gold Plating	364 strike make-up 364 strike replenishers Conductive salt	20 L 20 L 5 kg.	JAPAN METALS				A	
		75 make up 75 replenishers 75 Acid solution Auro Glo CL 75 Complexer salt	20 L 20 L 5 L 5 L 5 kg.	JAPAN METALS					
	b) CHEMICALS								
	Stripper Agent (Cyanide free)	Top Rip C	100 kg.	OKUNO CHEMICALS CO. LTD.				A	
7.	CHEMICAL REQUIRED FOR SERVICING PLASTIC LINE.	Catalyst A-30 TMP Electroless nickel TMP Stabilizer	80 L 150L 15 L	OKUNO CHEMICALS CO. LTD.				A	

DIVISION: ELECTROPLATING

DESCRIPTION OF EQUIPMENT, PARTS AND MATERIALS REQUESTED FROM MALAYSIAN SIDE (APRIL 1987)

No.	Name of Equipment	Specification 1) Type 2) Serial No. 3) Others	Qty.	Manufacturer	Parts And Materials			Priority	Remarks
					Item	Specification	Qty.		
	LABORATORY FACILITIES								
	Mini Barrel	Code B-75, 100V, 5 rpm	2 sets.	YAMAMOTO METKISHIKENSKI				A	
	Test Kit for Current Efficiency.	Code B-90	1 set	YAMAMOTO METKISHIKENSKI					
	Standard Gauge for Thickness Tester	Nickel on copper. t = 10.8 um (micron)	12	CHUO SEISAKUSHO				A	
	Chemicals for demonstration, services and R & D								
	Seal nickel powder	No 938F	10 kg.	OKUNO CHEMICALS					
		No 94	10 kg.						
	Conductive paste (for plating on non-conductive objects.)	Silver plaste SAG-046	2 kg.	OKUNO CHEMICALS					
	Catalyst paste (for plating on ceramics and glass).	CCP-4040	5 kg.	OKUNO CHEMICALS					
		CCP-1630	5 kg.						
	Top Etching resist	TER-100	5 L	OKUNO CHEMICALS					
	Top Plating resist	TPR-500	5 L	OKUNO CHEMICALS					
	Inorganic Top Layer Coating	CMS-003	5 L	OKUNO CHEMICALS					
8.	ADDITIONAL MACHINES, TOOLS, SPARE PARTS AND CHEMICALS FOR WORK-SHOP ACTIVITIES.							A	
	Mini Heater	100W, 100V (Quartz)	5 sets	YAMAMOTO METKISHIKENSKI					

DIVISION: ELECTROPLATING

DESCRIPTION OF EQUIPMENT, PARTS AND MATERIALS REQUESTED FROM MALAYSIAN SIDE (APRIL 1987)

No.	Name of Equipment	Specification 1) Type 2) Serial No. 3) Others	Qty.	Manufacturer	Parts And Materials			Priority	Remarks
					Item	Specification	Qty.		
	Medium size rectifier for small scale Hardchrome plating.	12V x 500 Amp - output 220V input	1 set	CHUO SEISAKUSHO					
	Cartridges for filters	Zero filter Model O-45	5 sets.	SANSHIN MFG. CO.					
	Handy pump	1 KW, 220V	1 set	SANSHIN MFG. CO.					
	Immersion Heater	L shape (Quartz), 2KW	5 sets	TANIGUCHI					
	Chemicals for Aluminium and Al-Alloys.	Ultra Bond Zn	20 L	OKUNO CHEMICALS.					
	Electroless nickel plating solution	Top NICORON No: 56 Mu Top NICORON No: 56 A Top NICORON No: 56 B	40 L 40 L 40 L	OKUNO CHEMICALS OKUNO CHEMICALS OKUNO CHEMICALS					
9.	REFERENCE TEXT BOOKS	1)Protective and Decorative Coatings for Metals. Author: H. Silman, G. Isserlis, A.F. Averill.	1 set (US $86)	METAL FINISHING BOOK CENTRE, 28, High Steet, Teddington, Middlesex, England, TW 118 EW.	See Catalogue 3				
	REFERENCE TEXT BOOKS	2)Phosphating of Metals Author: Gay Lorin	1 set (US $44)	METAL FINISHING BOOK CENTRE, 28, High Street, Teddington, Middlesex, England, TW 118 EW.					

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DIVISION: ELECTROPLATING

DESCRIPTION OF EQUIPMENT, PARTS AND MATERIALS REQUESTED FROM MALAYSIAN SIDE (APRIL 1987)

No.	Name of Equipment	Specification 1) Type 2) Serial No. 3) Others	Qty.	Manufacturer	Parts And Materials			Priority	Remarks
					Item	Specification	Qty.		
		3) Surface Finishing Systems. Author: George J. Rudzki	1 set (US $70)	METAL FINISHING BOOK CENTRE, 28, High Street, Teddington, Middlesex, England. TW 118 EW.					

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DIVISION: ELECTROPLATING

DESCRIPTION OF EQUIPMENT, PARTS AND MATERIALS REQUESTED FROM MALAYSIAN SIDE (APRIL 1987)

No.	Name of Equipment	Specification 1) Type 2) Serial No. 3) Others	Qty.	Manufacturer	Parts And Materials			Priority	Remarks
					Item	Specification	Qty.		
	NEW PROPOSALS (AS AGREED IN THE MEETING)								
1.	Suction Valve For Deioniser plant.								
	1. For HCl	Type: 1500	2 sets	NIPPON RENSUI CO. LTD.				A	
	2. For NaOH	Manufacturing No: 1509	2 sets						
2.	Digital pH Meter - includes electrodes and buffer solution	Model: HG-3	1	DENKI KAGAKU KEIKI CO. LTD.				A	
3.	Analysis Solution For Laboratory	CuCN Plating	4 sets.	YAMAMOTO METKISHIKENSKI				A	
		Nickel plating	4 sets	YAMAMOTO METKISHIKENSKI					
		Cr plating	4 sets	YAMAMOTO METKISHIKENSKI					

AFTERCARE PROGRAM : 1987 - 1988

A. Request for an expert:

The Electroplating plant of MITEC up-to-date faces no major problem. But the plant requires servicing to ensure good condition for the next few years. Minor servicing of plant such as servicing the filters, bus bars, anodes, tanks, polishing facilities, filter, etc. However, major servicing such as tank maintenance, wiring, piping, waste treatment plant, rectifiers, heaters and other related accessories are required. This could be carried out by the officer, but it is felt that an expert is required so as to establish for MITEC the proper techniques and sequence of maintenance of an electroplating plant.

As understood that the aftercare budget is limited, the requested expert should be able to handle all electroplating processes and provide finer technical know-how during his stay to the staff of the electroplating section.

The electroplating section is embarking into new areas and widening the scope to cater for the frequent request by the industries, government sectors, for the purpose of training and the Regional Training Programme. The fields intended are:

(i) Decorative plating and production of decorative items for tourist industries in Malaysia. Developing the techniques to be disseminated to the local small-scale metal-based handicraft enterpreneurs.

(ii) Acquisition of new fields such as plating on non-conductive objects such as for decorative items, production of printed circuit boards on epoxy resins and ceramics and other related parts such as glass, plastics, etc.

(iii) Acquisition of advanced technologies to upgrade the capability and competency of staff such as in the field of electroless plating, alloy plating (Zn-Ni, Fe-Ni, Sn-Co), manufacturing printed circuit board, plating on aluminium,

aluminium anodizing and colouring, metallizing of non-conductive objects, etc.

(iii) Other related techniques to go along with the above are silk screening techniques, application of photo resist, plating resist and photo etching.

The staff of Electroplating Section feel the urge to upgrade the technical capability to face the rapid development of the technology. As a metal technology centre, these techniques and know-how should be required as soon as possible. In order to keep abreast with the developing technologies and for the purpose of implementing successfully services to the country and conducting training of international level such as the Regional Training Programme.

The expert should then be able to bring in the processes and techniques through printed notes, samples and chemicals to try out during his stay here.

Proposed expert: From OKUNO
or
Ebara Udylite

DIVISION: TEST AND INSPECTION

DESCRIPTION OF EQUIPMENT, PARTS AND MATERIALS REQUESTED FROM MALAYSIAN SIDE (APRIL 1987)

No.	Name of Equipment	Specification 1) Type 2) Serial No. 3) Others	Qty.	Manufacturer	Parts And Materials			Priority	Remarks
					Item	Specification	Qty.		
1.	Electron Probe Micro Analyser	Shimadzu EMX-7	1	Shimadzu Corporation	1) 4" RAP crystal	P/N: 202-21153	1		The list of equipments are arrange in terms of priority.
					2) Filament		8 boxes		
					3) Oil for diffusion pump.		1 tin can		
					4) Bicden gas spray		6 containers		
					5) Recorder paper for analysis.		2 dozen		
2.	Shimadzu Industrial X-ray Machine	WSi-250S, Serial No: 500437.	1	Shimadzu Corporation	1) X-ray tube		1		
3.	GM survey meter		2	Fuji Electric					
4.	Measuring tapes	Tapes with buckle with inserted lead figures at distances 10 cm.	4	RICH SEIFERT & CO.					
5.	X-ray film	Fuji 100 Quantity 100/box.	6 boxes	Fuji Photo Film Co. Ltd.					
6.	KYOKKO X-RAY Industrial Intensifying Screen.	(3 1/3" x 12") LF 0.03	20 pairs	Kasei Optonix Ltd.					
7.	Wall Type Darkroom Timer	Nr 995002	2	RICH SEIFERT & CO.					
8.	Ultrasonic Thickness meter	FD-36	1	Mitsubishi Electric					

ANNEX II: Japanese Experts

(a) Repair and maintenance of equipment (TEST AND INSPECTION DIVISION)

No.	Name of Equipment	Scope of technical guidance	Duration of stay (proposed)	Proposed Japanese Expert (if known)
1.	Electron Probe Micro Analyser (EPMA) Shimadzu EMX-7	To replace the RAP crystal. Also to carry out the general servicing and calibration of the equipment.	2 weeks	Mr. Okura from Shimadzu Corporation.
2.	Shimadzu Industrial X-ray Machine Type WSP-250S	To replace the X-ray tube and to service the machine.	2 weeks	Mr. Uchida from Shimadzu Corporation.

TEST AND INSPECTION DIVISION

Report on the breakdown of the Shimadzu Industrial X-ray Equipment WSI 250S

The equipment was found to be not in operation since 1984. The faults occures suddenly after not in operation for about one month. We had tried to detect the cause of the breakdown but failed. On March 1986 SIRIM received an expert under the United Nation Development Programme (UNDP) to help Malaysia to have its own Qualification and Certification Scheme for NDT Personnel. During his stay in Malaysia SIRIM requested him to find the fault for the breakdown of the equipment. Knocking sound was heard when the X-ray on button was pressed. It was suspected that the x-ray tube was not functioning.
The fuse, and limit switch of the transformer had also been checked and was found to be in good condition. There is also no overheating of the cooling oil. The leakage of the transformer and the leakage of the winding cannot be checked due to inadequate appratus.

TEST AND INSPECTION DIVISION, MITEC

Report on the damage of the RAP crystal of the 3rd Scanner of the Electron Probe Micro Analyser (EPMA) Shimadzu EMX-7

At the moment the EPMA at MITEC cannot be fully utilised. The RAP crystal of the 3rd. Scanner is damage. This was realised when qualitative analysis was carried out on sample from a company. During the analysis it was found that the pen at the recorder for scanner No. 3 did not respond to the decrease of wavelength. It was suspected that the fault happened when Changing of crystal from PbSD to RAP. May be the crystal was not lock after the changing. Air was introduced into the main body to check on the crystal. Scratches was observed on the surface of the crystal.

DIVISION: INFORMATION

DESCRIPTION OF EQUIPMENT, PARTS AND MATERIALS REQUESTED FROM MALAYSIAN SIDE (APRIL 1987)

No.	Name of Equipment	Specification 1) Type 2) Serial No. 3) Others	Qty.	Manufacturer	Parts And Materials			Priority	Remarks
					Item	Specification	Qty.		
1.	Photocopy Machine	Type: RICOH Serial No: FD5070 - automatic enlargement/ reduction - with feeder and sorter - double side copying (see brochure attached RICOH FT5070).	1	RICOH					Local supplier: WYWY Sdn. Bhd., Price: MS29,000.00
2.					Videotape				
					Tapes for VHS/Betamax.	Tapes on Press/Diemaking from AIDA Engineering or other organisation.	6		
					Books for library				
					(Attached lists)				
					Accessories for Advanced Personal Computer APC-H03C Serial No: 3803486N				
					(a) Monochrome monitor	APC-SYS 2MA	1		MS7,000.00
					(b) Pinwriter printer	P56	1		MS4,000.00
					(c) Softwares				
					MS Pascal Compiler	Disk size 8"x8"	1		MS1,500.00
					RM Cobol Compiler	8"x8"	1		MS3,500.00
					Dbase III PLUS	8"x8"	1		MS2,000.00 Local supplier: Business Computer Sdn. Bhd.

INFORMATION DIVISION

Books requested under aftercare programme of MITEC

No.	Title	Publisher	Editor
	TEST AND INSPECTION BOOKS		
1	Classroom training handbook, Nondestructive testing CT-6-4, Ultrasonic testing.	General Dynamics Convair Division San Diego, California.	General Dynamics Convair Division San Diego, California.
2.	Classroom training handbook, Nondestructive testing CT-6-6, Radiographic testing.	"	"
3.	Classroom training handbook, Nondestructive testing CT-6-2, Liquid penetrant testing.	"	"
4.	Classroom training handbook, Nondestructive testing CT-6-3, Magnetic particle testing.	"	"
5.	Classroom training handbook, Nondestructive testing CT-6-5, Eddy Current Testing.	"	"
6.	Nondestructive testing handbook.	The American Society for Nondestructive Testing Columbus, Ohio.	Mc Master, R.C.
7.	Question and Answer book Ultrasonic Test method, Levels I, II, III.	The American Society for Non-destructive Testing.	The American Society For Non-destructive Testing.
8.	Question and Answer Book, Radiographic Test Method, Levels I, II, III.	"	"
9.	Question and Answer Book, Liquid penetrant Testing, Levels I, II, III.	"	"
10.	Question and Answer Book, Magnetic Particle Testing, Levels I, II, III.	"	"

No.	Title	Publisher	Editor
11.	Question and Answer Book, Eddy Current Testing, Levels I, II, III.	The American Society for Non-destructive testing	The American Society for Non-destructive testing.
12.	Basic Principles of Metallurgy, Vol. 2	American Foundrymen's Society Cast, Metals Institute.	Clyde B. Jenni
13.	Ultrasonic Flaw Detection For Technicians.	Unit Inspection Company, Tubes Division, British Steel Corporation.	J.C. Drury
	ELECTROPLATING BOOKS		
1.	Phosphating of Metals	Metal Finishing Book Centre, Middlesex, England.	Guy Lorin
2.	Protection & Decorative Coatings for Metals.	"	H. Silman, G. Isserlis, and A. F. Averill.
3.	Surface Finishing Systems	The American Society of Metals.	George J. Rudzki
	WELDING BOOKS		
1.	See AWS Catalogue (as attached)	American Welding Society.	

Welding Books (American Welding Society)

WPH **Welding Power Handbook.** A.F. Manz. 208 pp. 1973
An easy-to-follow basic discussion of welding power sources
Code: WPH Price: List $13.00 Member: $9.75

A1.1-80 **Metric Practice Guide for the Welding Industry.** 30 pp. 1980 I
Code: A1.1-80 Price: List $12.00 Member: $9.00

Welding Handbook, 7th Ed.

WHB-1 **Volume 1, Fundamentals of Welding.** 7th Ed., 373 pp. 1976
Covers the physics of welding, welding metallurgy, testing and evaluation of welded joints, and residual stresses and distortion in weldments
Code: WHB-1 Price: List $50.00 Member: $37.50

WHB-2 **Volume 2, Welding Processes — Arc and Gas Welding and Cutting, Brazing, and Soldering.** 7th Ed., 592 pp. 1978
Covers the major welding and allied processes used in manufacturing and construction operations such as shielded metal arc, gas tungsten arc, gas metal arc, flux cored arc, submerged arc, and plasma arc welding
Code: WHB-2 Price: List $50.00 Member: $37.50

WHB-3 **Volume 3, Welding Processes — Resistance and Solid-State Welding and Other Joining Processes.** 7th Ed., 459 pp. 1980
Second volume covering welding and allied processes, including resistance, electron beam, laser beam, friction, ultrasonic, high frequency, explosion, and diffusion welding; also thermal spraying, and adhesive bonding.
Code: WHB-3 Price: List $50.00 Member: $37.50

WHB-4 **Volume 4, Metals and Their Weldability.** 7th Ed., 582 pp. 1982
Covers the welding, brazing, and soldering of all metals and alloys commonly used in fabrication.
Code: WHB-4 Price: List $50.00 Member: $37.50

WHB-5 **Volume 5, Engineering, Costs, Quality and Safety.** 7th Ed., 460 pp. 1984
Covers design, symbols, quality, inspection, and safe practices for welding and brazing, economics and cost estimating, fixtures and positioners, codes and standards
Code: WHB-5 Price: List $50.00 Member: $37.50

D1.1-86 **Structural Welding Code — Steel.** 352 pp. 1986 I
Covers the welding requirements for any of the welded structures made from the commonly used carbon and low-alloy constructural steels. Section 1 through 7 and 11 constitute a body of rules for the regulation of welding in steel construction. Section 8, 9, and 10 contain additional rules applicable to specific types of structures; i.e., buildings, bridges, and tubular structures, respectively, and supplement the first seven sections. A Commentary on the Code is bound in the document after the Code
Code: D1.1-86 Price: List $52.00 Member: $39.00

D10.10-75 **Local Heat Treatment of Welds in Piping and Tubing.** 32 pp. 1975
Methods of preheating, controlling interpass temperature, and post heating by local application of heat to pipe welds are described. The reduction of stress and tempering of brittle microstructures are discussed.
Code: D10.10-75 Price: List $12.00 Member: $9.00

WI-80 ***Welding Inspection.*** *332 pp. 1980*
Source of reference information for the inspector and others who need to be familiar with welding inspection. Discusses all aspects including quality assurance, weld discontinuities, testing, and standards.
Code: WI-80 Price: List $30.00 Member: $22.50

BRM **Brazing Manual.** 309 pp. 1976
Principles and applications of brazing.
Code: BRM Price: List $36.00 Member: $27.00

ESW **Electroslag Welding and Surfacing.** B. E. Paton. 520 pp. 2 Volume set, 1983
Translated from the Russian – limited number of copies available. This is an update of the classic 1962 work (Code EW) on electroslag welding.
Code: ESW Price: List $36.00 Member: $27.00

FW **Friction Welding of Metals.** V. I. Vill, 144 pp. 1962
First book published in English on the use of friction heat to weld metals — based on R&D at the USSR's Scientific Research Institute of Welding Equipment. (Limited no. of copies – suggested as a collector's item for the welding library.)
Code: FW Price: List $20.00 Member: $15.00

PMP **Plasma Arc Metalworking Processes.** R. L. O'Brien. 160 pp. 1967
Discusses plasma arc welding, cutting, and surfacing.
Code: PMP Price: List $10.00 Member: $7.50

SBB **Source Book on Brazing and Brazing Technology.** 428 pp. 1980
More than 50 articles selected from the literature.
Code: SBB Price: List $48.00 Member: $36.00

C1.1-66 **Resistance Welding, Recommended Practices for.** 115 pp. 1966
Code: C1.1-66 Price: List $20.00 Member: $15.00

TS **Thermal Spraying: Practice, Theory, and Application.** 185 pp. 1985
Hard Cover
Code: TSH Price: List $64.00 Member: $48.00
Soft Cover
Code: TSS Price: List $48.00 Member: $36.00

WM1 **Metallurgy, Welding, Carbon and Alloy Steels, G.E. Linnert, 3rd Ed.**
Volume 1 — Fundamentals. 474 pp. 1965
Information necessary to understand welding as a major tool for steel fabrication.
Code: WM1 Price: List $28.00 Member: $21.00

WM2 **Volume 2 — Technology.** 675 pp. 1967
Information to apply the basic knowledge from Volume 1 to the satisfactory performance of weldments.
Code: WM2 Price: List $32.00 Member: $24.00

WS **Steels, Weldability of, Fourth Edition, by Professor R. D. Stout.** 450 pp. 1987 (Available April 1987)
NEW Basic steel metallurgy and extensive welding procedure recommendations for carbon and low alloy steels.
Code: WS Price: List $40.00 Member: $40.00

CWP **Current Welding Processes**
Discussion of shielded metal arc, gas metal arc, gas tungsten arc, submerged arc, plasma arc, electroslag, electrogas, and oxyacetylene welding processes.

CWP-T **Text.** 144 pp. 1964
Code: CWP-T Price: List $16.00 Member: $12.00

CWP-M **Instructor's Manual**
Code: CWP-M Price: List $4.00 Member: $3.00

CWP-P **Slides.** (159)
Code: CWP-P Price: List $140.00 Member: $105.00

FWI **Welding Inspection, Fundamentals of**
A set of 13 modules that provide a basic knowledge for the inspection of weldments including welding fundamentals, codes and standards, and quality assurance.

13 Modules in Three-Ring Binder. 1980
Quantity discount when you buy more than 5.
FWI-TA 1-5 Code: FWI-TA Price: List $100.00 Member: $75.00
FWI-TB 1-10 Code: FWI-TB Price: List $80.00 Member: $60.00
FWI-TC 11 & up Code: FWI-TC Price: List $72.00 Member: $54.00

FWI-M **Instructor's Guide.** 1980
Code: FWI-M Price: List $20.00 Member: $15.00

IWM **Welding Metallurgy, Introductory**
Introduction to the basic metallurgy weldability and heat treatment of steel

IWM-T **Text,** 148 pp. 1968
Code IWM-T Price List $16.00 Member $12.00

IWM-M **Instructor's Manual**
Code IWM-M Price List $4.00 Member $3.00

IWM-P **Slides,** (92)
Code IWM-P Price List $140.00 Member $105.00

MJP **Modern Joining Processes**
Discussion of electron beam, laser beam, friction, and resistance welding, brazing, soldering and other joining processes

MJP-T **Text,** 146 pp. 1966
Code MJP-T Price List $16.00 Member $12.00

MJP-M **Instructor's Manual**
Code: MJP-M Price List $4.00 Member $3.00

MJP-P **Slides,** (136)
Code: MJP-P Price: List $140.00 Member $105.00

FWT ✓ **Fundamentals of Welding Technology**
Provides a fundamental understanding of the applications of welding technology for fabricators, supervisors, designers, and technicians. Particular emphasis is placed upon welding processes, power sources, electrodes and consumables, specification and blueprint reading, and welding safety and health. Course materials include a 12 module workbook (947 pp), quizzes, practical problems, and tutorial assistance as needed. (Offered in cooperation with the Welding Institute of Canada.)
Code FWT Price: List $235.00 Member $175.00

IQCC ✓ **Welding Inspection and Quality Control**
Provides training in inspection and quality control for persons involved in welding design and fabrication. Course material includes 14 workbooks (350 pp), The Welding Handbook, Vol. 2, and Welding Inspection. (Developed in cooperation with American Society for Metals.)
Code IQCC Price: List $300.00 Member $225.00

WSH ✓ **Welding Safety and Health**
Provides a basic understanding of the origins of welding health hazards, fumes, gases, radiation and noise, and examines each in terms of nature and magnitude, methods of control, effects of the hazard on the human body, and the permissible levels of exposure. Contains applicable basic welding information to be of use to the industrial hygienist, safety officer, and human resources manager as well as the industrial, manufacturing and welding engineer. Course material inclues a 5 module study text companion workbook with exercises, and tutorial assistance as needed.
Code WSH Price List $235.00 Member $175.00

CM-80 ✓ **Certification Manual for Welding Inspectors, 2nd Ed.,** 329 pp. 1980
Self-study manual for personnel preparing for AWS welding inspector examinations.
Code CM-80 Price, List $35.00 Member $26.25

DBPP ***Diffusion Bonding As A Production Process,*** 40 pp. 1979
Code: DBPP Price: List $15.00 Member: $15.00

DWF ***Distortion In Welded Fabrications, Control of,*** 73 pp. 1976
Code: DWF Price, List $26.00 Member $26.00

DIIWP ***Developments and Innovations for Improved Welding Production,*** 322 pp. 1984
Code: DIIWP Price List $64.00 Member: $64.00

EFWP **Exploiting Friction Welding Production.** 80 pp. 1979
Code: EFWP Price: List $26.00 Member $26.00

EMWD **Exploiting MIG Welding Developments.** 38 pp. 1983
Code: EMWD Price: List $15.00 Member $15.00

EXW **Explosive Welding.** 48 pp. 1976
Code: EXP Price: List $19.00 Member $19.00

RPW ✓ **Pipeline Welding, Recent Developments in.** 82 pp. 1979
Code: RPW Price: List $50.00 Member: $50.00

002 **Welding Print Reading.** by John R. Walker. 208 pp. 1986
Published by Goodheart-Wilcox Co.
Self-study course progressing from basics to specialized coverage of welding symbols and notations
Code: 002 Price: $12.00

ELBW **Electron and Laser Beam Welding.** 370 pp. 1986
Contains the text of 22 papers together with 23 posters presented at the 1986 International Conference, and the Houdremont Lecture
Limited copies available.
Code: ELBW Price: List $75.00 Member $75.00

005 ✓ **Titanium Technology: Present Status and Future Trends**
A compilation of 17 previously published articles, and an introduction. The articles give an up-to-date concise review of titanium technology, with major references. The "Historical Perspective" article stresses current applications of titanium and future trends
Code: 005 Price: $19.95

006 ✓ **Design of Weldments.** 464 pp. Published by The James F. Lincoln Foundation
Contains 923 illustrations, nomographs and charts. Theoretical analysis, problem solution examples, and case history studies explain how to design welded steel machine components for manufacturing economies and performance improvement. Its 8 sections comprise a system that reduces weight and cost, and improves production, and product performance: Load and Stress; Special Design Conditions; Stationary-Member Design; Rotating Member Design; Design Approach; Joint Design and Production; Design Formulas and Miscellaneous tables
Code: 006 Price: $7.00

007 ✓ **Design of Welded Structures.** 832 pp. Published by The James F. Lincoln Foundation
Contains 966 drawings, 28 nomographs, 163 tables, 190 charts and 145 photographs. Seven "working tables" contain detailed analysis and practical examples that show how to create more efficient design for economical fabrication. Introduction to Welded Construction; Load and Stress Analysis; Column-Related Design; Girder Related Design; Welded-Connection Design; Miscellaneous Structure Design; Joint Design and Production; Reference Design Formulas
Code: 007 Price: $9.00

資料－５

アフターケアプログラムに関するマレイシア側への質問書

QUESTIONNAIRE ON THE AFTERCARE PROGRAM FOR THE TECHNICAL COOPERATION PROJECT FOR THE METAL INDUSTRY TECHNOLOGY CENTER OF MALAYSIA

March 30, 1987

To: the Authority Concerned of the Government of Malaysia
(MIDEC, SIRIM, MSTE, EPU)
From: the Authority Concerned of the Government of Japan (JICA)

I. Aftercare Program

Aftercare Program is the program implemented for the purpose of furthering the effect of already finished JICA project by the supplemental technical cooperation within the following scope:

1. Aftercare for the machinery and equipment provided by Japan.
   ① dispatch of short term experts for the repair and maintenance
   ② provision of necessary spare parts and expendables

2. Complemental technical cooperation for the themes which were not fully transferred during the project period.
   ① dispatch of short term experts
   ② provision of machinery and equipment necessary for the technology transfer in the field

3. Training of counterparts in Japan is not included within the scope of Aftercare Program.

4. The duration of Aftercare Program is one Japanese fiscal year.

The Government of Japan plans to implement the Aftercare Program for the Technical Cooperation Project for the Metal Industry Technology Center of Malaysia (hereinafter referred to as " the MITEC Project ") in the Japanese fiscal year 1987 and to send the Aftercare Survey Team in the beginning of May 1987, which is to conduct a survey on the present situation of the MITEC Project and to work out the detail of the Aftercare Program

based on the results of the survey and the discussions with the Malaysian authorities concerned.

It would be greatly appreciated if such relevant data and information for the implementation of the Aftercare Program for the MITEC Project as stated below are kindly prepared by the Malaysian authorities concerned and sent to the Japanese authorities concerned as the earliest possible time so that the Japanese authorities concerned can fully prepare before the actual dispatch of the Aftercare Survey Team.

II. Questions on the Implementation of the Aftercare Program for the MITEC Project

1. Request for the Aftercare Program from the Malaysian Side

(1) Request for the aftercare of the machinery and equipment provided by Japan

a. Names of the machinery and equipment provided by Japan which require repair by the Japanese experts, their present condition, need of replacement parts and other information necessary for their repair

b. Names of spare parts, expendables etc. which require additional provision

(2) Request for complemental technical cooperation

a. Themes which need complemental technical cooperation through the dispatch of short term Japanese experts and their contents in detail

b. Names of machinery and equipment to be provided for the implementation of the technical cooperation for those themes

c. Perspective of securing counterparts for the Afterecare Program (Number of counterparts, name and position of candidates, their qualification)

2. Implementation Organization

(1) Organizational chart, function of the organization and the staff allocation of the Metal Industry Development Center (MIDEC, SIRIM) which was founded absorbing the former Metal Industry Technology Center (MITEC, SIRIM)

(2) The present organization and activities of those divisions which carry out the functions corresponding to the former MITEC

Note: The technical cooperation in this Aftercare Program is toward those divisions executing corresponding functions of the former MITEC.

3. Other Related Items

(The following items are to be surveyed during the vist of the above mentioned Aftercare Survey Team in Malaysia.)

(1) Budgetary condition of MIDEC and perspective of its defrayal of local cost expenses for the implementation of Aftercare Program. (e.g. expenses for the internal transportation of the machinery and equipment to be provided by Japan; expenses for the supply of machinery , equipment and other materials necessary for the Aftercare Program other than those provided by Japan; and other running expenses for the Aftercare Program.)

(2) Present position and activities of the former counterparts of the MITEC Project

(3) Utilization, maintenance and management of the machinery and equipment provided by Japan including practice of regular inspection, management of tools and spareparts, and the way of purchasing expendables

(4) Activities of the MIDEC in the field of technological dissemination services toward small and medium size metal-working industries since the end of the MITEC Project

a. factory visit

b. technical consultancy service

c. test and inspection service

d. prototype fabrication/technical project service

e. training course and seminars (number of participants)

f. information services (exibition/publication/others)

(5) Other informative items relevant to the implementation of the Aftercare Program

資料－6

MITECプロジェクト終結のちの経過報告書

A Report on "MITEC Project" Progress in Conjunction With The Visit of JICA Aftercare Survey Team to SIRIM

23rd. April, 1987.

1. BACKGROUND OF METAL INDUSTRY TECHNOLOGY CENTRE (MITEC)

1.1 Introduction

The Metal Industry Technology Centre (MITEC)was set up under the Standards and Industrial Research Institute of Malaysia (SIRIM) through a bilateral aid programme with the Government of Japan. Efforts to establish the Centre commenced after the signing of the Record of Discussion on 11 August 1978 between the Governments of Japan and Malaysia.

The primary concern of the Centre is to upgrade and develop the existing level of technology of the metal industries particularly the small and medium scale supporting firms.

Hence the establishment of this Centre is a most timely event as it coincides with the implementation of programmes for industrialization stressed in the New Economic Policy and Industrial Master Plan To niche into the thrust of our industrial development MITEC Has programmed various technological dissemination services to be extended to the local industries. Its services cater for four specialised areas of the metal industries, viz diemaking, presswork, welding and electroplating all of which are the basic and fundamental activities of the metal-working industries.

In line with its objectives and functions as a technology dissemination centre, MITEC has its own workshops and testing laboratories which are facilitated with modern machinery and equipment. Most of the research officers have been sent to Japan for a one year or half a year training in their respective fields. This pool of expertise is further augmented with the attachment of Japanese Experts who are specialised in the relevant technical fields.

1.2 Organisation of the project

The Centre's operations have been grouped under seven major divisions which best reflect its objectives and functions. The divisions are diemaking, presswork, welding, electroplating, test and inspection, information and administration. The four main divisions which are in direct contact with the metal working industries are the die making, presswork, welding and electroplating divisions. As agreed under the Records of Discussions for this bilateral project, the government of Japan provided the technical experts in MITEC. This team of experts was led by a Chief Adviser, who was in turn responsible to the Japan International Cooperation Agency (JICA) under the Government of Japan. MITEC is one of the technical centres established under SIRIM, SIRIM itself is a statutory body under the Ministry of Science, Technology and the Environment of the Government of Malaysia, and is responsible for promoting and encouraging the technological development of industries through standardisation, research and technology transfer.

The project organisation chart was shown as follows.

1.3 MITEC'S Objectives

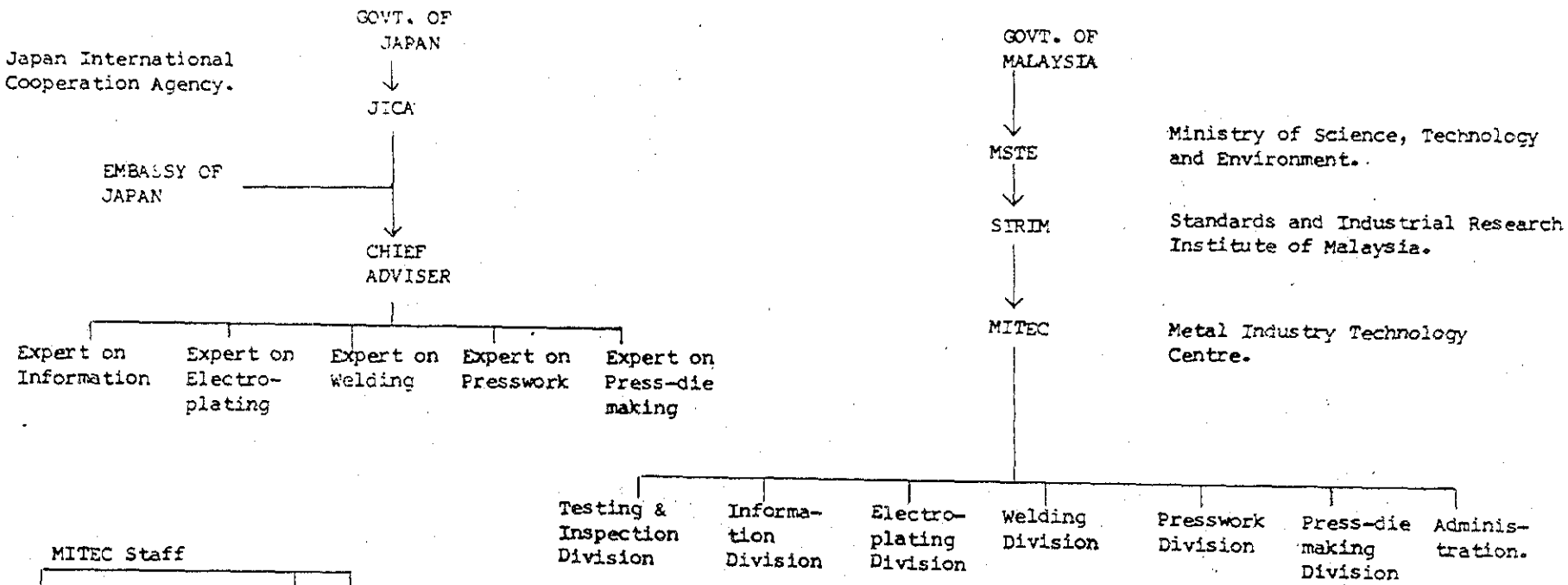
Broadly, the objectives towards which MITEC is working include:

(a) Uplifting the existing technological level of our metal industries in the field of diemaking, presswork, welding and electroplating with special emphasis on the small and medium scale entrepreneurs to improve on product quality.

(b) Expanding and diversifying our metal industries so as to increase their export potential and complement the nation's industrialisation efforts.

MITEC PROJECT ORGANIZATION AND ADMINISTRATION

ORGANISATION OF THE MITEC PROJECT



MITEC Staff

Head	1
Research Officer	13
Asst. Research Officer	3
Technician	22
Others	15
Total	54

Valid Till: August 1984 (Japan side) & 16th. April, (Malaysian side) 1986.

1.4 Functions of MITEC and its 'SIX Divisions'

The brief desciption of main features of divisions of MITEC is as in Appendix 1.

1.5 Calender of event in Project implementation

PERIOD	EVENTS
11 Aug. 1978	Signing of Record of Discussions on MITEC Project between Japan and Malaysia.
5 Nov. 1978 - 1 April 1979	Arrival of long term JICA Experts and Chief Adviser. Intake of Malaysian Counterparts. Commenced planning of building renovation and specification of machine.
1 April 1979 - 2 Sept. 1981	MITEC commenced technical advisory services to local metal industries with the help of Japanese experts. Round-the-country factory survey. Renovation of building and installation of machines.
3 Sept. 1981	Official Opening of Centre by Prime Minister of Malaysia.
Sept. 1981 - July 1984	Diverse services rendered to the local metal industries in the field of diemaking, presswork, welding electroplating and test and inspection.
August 1984	Completion of project. Return of JICA Experts to Japan.
Sept. 1984	Self-reliance stage.
16 April 1984	Formation of MIDEC (Metal Industry Development Centre).

1.6 Budget borne by Malaysian Government

Value in (M$)

Item \ Period	1979-1983 (MITEC)	1984 (MITEC)	1985 (MITEC)	1986 (MIDEC)	1987 (MIDEC)	Total
Development Budget	5,070,530	-	-	900,000	R & D Budget in lieu (Pending)	5,970,530
Operating Budget	3,705,789	1,195,941	950,700	3,279,670	*1,788,300	10,920,400
Grand Total						16,890,930

* Excluding staff emolument, EPF and other administration expenses.

1.7 Provision of machinery/building by the Government of Malaysia

value = Malaysia Ringgit (M$)

Items	Amount
Machinery/equipment	1,844,840
Expenditure for building renovation	2,246,700
Total	4,091,540

1.8 Provision of machinery/equipment by the Government of Japan

value = Yen (¥)

Division	Amount
Diemaking	142,665,250
Presswork	92,609,390
Welding	28,589,371
Test and Inspection	121,289,650
Information	24,586,652
Spare parts	23,733,090
Total	592,070,468

Notes : (1) Valid till 31 December 1986

(2) JICA provided counterpart training in Japan for a total of 40 officers and technicians.

1.9 Counterpart training of MITEC staff

MITEC staff	Education Background	Training/Experience
Head	Mechanical Engineer	1 year technical training in Japan. Understudied JICA experts in MITEC for the past 5 years. Factory visit.
Research Officers	11 Mechanical Engineers 1 Chemical Engineer. 2 Scientists.	1/2 to 1 year technical Training in Japan. Understudied JICA experts in MITEC from 2-5 years. Factory visit.
Assistant Officers	3 with Diploma in Mechanical Engineering.	1/2 year technical training in Japan. About 3 - 5 years workshop experience.
Technician	22 (mostly with vocational institute and polytechnic certificates.)	1/2 year technical training in Japan About 3-5 years workshop experiences.

2. OPERATIONAL RECORDS AFTER THE PROJECT COMPLETION

After the completion of the Project in August 1984 and the subsequent departure of JICA long term experts from MITEC, the officers continued to provide the following services, specifically in the area of diemaking, presswork, welding and electroplating.

2.1 Activities of Centre

(a) Advisory services

On site advisory services to overcome technical problems as well as proposals to improve on manufacturing techniques and production processes are provided by officers during their regular visits to local factories.

(b) Consultancy services

Technical assistance required in the adaptation of new technology to upgrade product quality as well the transfer of know-how in the technological fields stated above. This kind of service provided has been very popular among the local existing and new entrepreneurs, particularly in the area of project feasibility study and product design development. Some of the entrepreneurs who seek the help of the officers are involved in the various Government projects such as National Car Project, Local Content Programme, Privatisation, etc.

(c) Prototype fabrication services

In product development, the Centre assists the metal industries by undertaking prototype product fabrication and try-out of manufacturing processes such as plating and welding and stamping. Diemaking Division undertakes to design and fabricate some of the dies which are now being used for production purposes in the local factories. However, the Centre plans to venture into more trial production activities and lease of machine time in order to increase the utilization of its facilities.

(d) Test and Inspection services

This handles a wide range of testing and analytical work, among them, destructive and non-destructive testings, chemical analysis, metallurgical analysis at the micro level and precision measurements.

(e) Training

The Centre has been particularly active in providing training and development services for the local as well as overseas participants. Since 1984, MITEC places more emphasis on the special training programmes which are specially tailored to the specific needs and request of the interested companies or factories. 5th Regional Training Programme In Metalworking Technology Welding and Electroplating Technology) is scheduled to be held on the 15th February to 20th March 1988.

(f) Information services

Through its library, the Centre makes available to the manufacturers technical information on manufacturing techniques, processes, equipment manuals and host of the relevant technical subjects related to the metal fields. Video tapes, slides and films on technical subjects are also used frequently. MITEC Bulletins are also published periodically and distributed to the metal industries.

2.2 Record of services as at 31st December 1986

No	Types of services	1979-1984	1985	1986	Total	Remark
1	Advisory/consultancy services	332	65	106	503	Appendix 2 (1986)
2	Information services	550	93	103	746	
3	Prototype fabrication, trial production, lease of equipment	126	25	100	251	Appendix 3 (1986)
4	Training/ seminar	22 courses (260 participants)	10 courses (173 participants)	13 courses (410 participants)	45 courses (participants)	Appendix 4
5	Test and Inspection	3560 samples	1024 samples	Appendix 6		Appendix 5 (1979 - 1985)

Note : Till April 1987, 4 Regional Training Programs (3rd country training) had been successfully implemented by JICA/MITEC.

2.3 Technological assessment

(a) The Centre is adequately equipped to carry out its functions. However, it needs to upgrade some of its machine capability such as the CAD-CAM in order to keep pace with the modern technological advancement. Overall, the machines and equipment in the Centre are in good operating conditions and periodically maintained. There are occasionally minor breakdown of some of the equipment but these problems can be overcome with local resource. Continual support from JICA in providing the additional spare parts and equipment would be most welcomed.

(b) The Centre has been successfully established as the first of its kind in the country with the technical cooperation of the Government of Japan. The majority of its technical

staff had been trained in Japan for a period of 1/2 to 1 year as well as by the JICA long-term and short-term experts in MITEC.

(c) The contribution on the part of Japan towards the establishment and growth of the Centre has been significant and substantial. On the hardware side, the facilities/equipment donated are appropriate and sufficient. Regarding the software side, it had prepared and transfer a fair amount of valuable knowledge and experience to the Malaysian counterparts through its despatch of long and short term experts.

(d) Overall, in all aspects, the Centre has achieved a certain level of success in its efforts to serve the local metal industry within its own resources. However, there is still a lot of room for improvement in upgrading the capabilities of the Centre and hence quality of the services rendered to the industry.

(e) For the betterment of the Centre, its is felt that:

(i) The technical staff of the Centre needs to be continously trained and developed to keep pace with the rapid advancement of technology.

(ii) The equipment have to be upgraded, in the future, it not at the moment, especially in the area of precision machining and design of tool and dies.

(iii) The Centre has to be in close rapport with the local manufacturing industries and other concerned government agencies in order to achieve objectives outlined in the Industrial Master Plan (IMP).

(iv) It will be appreciated if JICA could continue to follow-up and assist in providing technical aids to SIRIM in the form of equipment/spare parts, counterparts training and despatch of experts.

2.4 Aftercare Technical Cooperation Program

It is hereby a recommended that an Aftercare Program be implemented for the MITEC Project for the purpose of furthering the effect of the already finished Project by the means of the supplemental cooperation within the following scope.

(a) Aftercare for the machinery and equipment provided by JICA.

- Dispatch of short term experts for the repair and maintenance.
- Provision of necessary spare parts and expendables.

(b) Complemental technical cooperation for the themes not fully transferred during the project period

- Dispatch of short term experts
- Provision of machinery and equipment necessary for the technology transfer in the field.

(c) Training of counterparts in Japan in specified areas where it is not available locally and in conjuction which the item (2.4) (b).

(d) Duration of Program can be one fiscal year and subject to subsequent renewal upon further discussion.

2.5 The request for the Aftercare Program from SIRIM and Complemental Technical Cooperation

To be submitted and discussed with the Aftercare Survey Team from 23rd April till 29th April 1987.

It is proposed that the Minute of the Discussion on the Implementation of Aftercare Program be signed by the concerned parties after the visit of the Aftercare Survey Team.

3. METAL INDUSTRY DEVELOPMENT CENTRE (MIDEC) (1986)

Under the directive from the SIRIM Council, Metal Industry Technology Centre (MITEC), Metal Industry Research & Development Centre (MIRDC), Design and Fabrication Unit (D & F) and Foundry Centre (F.C.) of SIRIM were merged to form Metal Industry Development Centre (MIDEC) on the 16th April 1986.

3.1 SIRIM Management decided on the formation of MIDEC with the following objectives in mind

(1) Centralization of activities of the various Centres and Units in SIRIM which render similar services to the manufacturing sector, particularly metalworking industry, such as research and development, testing and inspection, consultancy, training and prototype fabrication and trial production.

(2) Centralization of all available similar equipment/machines and personnel under a common set-up so as to optimise the utilization of SIRIM limited resources.

(3) Development of a pool of experts in the existing and new metalworking technologies under MIDEC.

(4) Improvement of overall productivity of people and machine.

3.2 Organization of MIDEC

Appendix 7 and 8.

3.3 Services rendered by the six Units of MIDEC are as follows:

Advisory/consultancy services
Prototype fabrication and trial production
Design and development
Training
Research and development

Testing and inspection

Information dessimination.

These activities are similar to those carried out by MITEC previously with the addition of Research and Development.

3.4 Staff of MIDEC are as follows :-

Technical staff

43 Research Officers (Majority are Engineers)
19 Assistant Research Officers
42 Technicians
14 Draughtsman
8 Apprentice
4 Laboratory Assistant

Subtotal : 130

Non technical staff

3 Storekeepers
2 Stenographers
6 Clarks
8 typists
3 Office boys

Subtotal : 22

Grandtotal : 152

The former staff of MITEC are not affected much as they are still working within the same areas of activities, same facilities and staff, and similar job functions. The only change is administrative.

Appendix 1

1. Die making Division

The die making Division is equipped with one of the most advanced machining facilities available in Malaysia featuring sophisticated equipment like Jig-borer, the Copy Milling Machine which is capable of machining 3 dimensional complex shapes, the Die Spotting Press for die repairs which is so designed to contain an adjustable table and a movable clapper enabling very accurate and precise matching of the upper and lower dies, Such salinet features have qualified it to be placed among the rare equipment list available in the country presently. Other facilities in this division which are also toilored specifically for the requirements of the die making industry include the Drip Feed Heat Treatment Furnace which can be programmed according to the time set, the Electric Discharge Machine (EDM) and the Optical Profile Grinding Machine which has the capacity to produce high precision dies such as those required for electronic components and cannot be produced by ordinary machining.

Aside from its normal consultancy services and training programmes to impart the die making know-how, this division also specialises in the manufacture of prototype sheet metal stamping dies for in-plant studies.

2. Presswork Division

To upgrade the presswork technology through project studies such as carrying out trial productions using prototype dies are among the major activities of this division that should interest metal entrepreneurs in this field. This division has been sufficiently equipped to carry out most of the presswork operations known, as well as to initiate research interests into the areas of safety, and increased efficiency along production lines.

Consonance with the demand for small-lot productions aimed at achieving reasonable inventories of blanks, semi-finished and finished goods and space saving arrangements, technology has come up with the transfer press machine which is able to cope with the above requirements such as replacement and adjustment of dies. The Transfer Press, among the first of its kind to be imported into the country had been installed in the Presswork Workshop.

The versatile 46 ton Pneumatic Clutch Power Press capable of performing a wide variety of operations ranging from blanking, forming, shallow drawing to deep drawing and equipped with a photo sensor safety device, are among the facilities that have been systematically built up in the division.

The 150 ton Hydraulic Press ideal for deep to very deep drawing with adjustable speeds and time lengths is another of the huge structured machine located here.

3. Welding Division

The welding techniques as witnessed in this country has much room to work on for the present traditional practices were found inadequate to keep pace with the demands for quality, lasting welded products. The welding section offers a range of training courses in arc welding particularly that of shielded metal arc welding and CO_2 arc welding for untrained welders and any personnel directly involved with welding production and inspection. The course content has been so designed as to be equivalent to the level and expectations set by welding international authorities. The training is industry - oriented and well balanced with lectures on up-to-date welding know-how.

A wide selection of welding facilities is made available in MITEC and they include the common shielded metal arc welding, semi-automatic CO_2 arc welding, semi-automatic MIG arc welding, TIG arc welding, arc air gouging, resistance spot welding and resistance seam welding, submerged arc welding, oxy acetylene gas cutting, automatic plasma arc cutting and electroslag welding.

Besides being the training ground for basic and advanced welding techniques and the normal technical consultancy services on welding processes and productions, the welding division also caters for enquiries on welding design and fabrication facilities for welding works on trial manufacturing basis.

4. Electroplating

To instill technological development in electroplating would necessitate the introduction of modern equipment, plating facilities and chemicals currently being used in metal finishing industries of advanced industrilized nations. This projects one of the outstanding role of this division in its effort to help in the production of quality plated products.

Of paramount importance to aid in its technology transfer is the regular training courses where participants are exposed to complete, sophisticated plating process inclusive of copper-nickel-chromium, zinc, chrome treatment, nickel barrel, tin, plastics (ABS), silver, gold and industrial hard chrome platings.

To comply with the future implementation of government regulation whereby all electroplating plants must be equipped with a waste disposal system, a sophisticated waste treatment system consisting of ion exhangers and filter presses that is capable of detoxicating cyanide, acid and alkali residues has been installed in the Centre. There is also a scrubber for toxic gas treatment.

Besides plant facilities, this division is also supported by an analytical laboratory where up-to-date testing facilities are available. The acquisitions include the digital pH meter for fast and accurate PH measurements, an anemometer that detects the dispersion distance of toxic gases liberated during plating processes, smoke indicator which is used widely for concentration control in a room where dust is generated, and control devices for ventilation and air-purification. Also acquired is the portable thickness tester, BOD & COD meters, and Hull Cell test facilities to determine the stability of the plating solutions, the range of plating conditions and brightness of the contents.

Among the plant facilities installed are 3 types of 550 Amp rectifiers with electronic ampere hour meters for dull nickel plating, tin nickel plating and bright nickel plating. Coupled with these are 2 pieces of 300 ampere rectifiers for decorative chromium plating and hard chrome plating. The capacity of the biggest tank reads 3000 litres making it feasible to cope with a sizeable range of plating articles.

5. Test and Inspection

The activities of this division is integrated into the other four major divisons of MITEC by providing the testing facilities specifically used in the metal working fields.

The equipment available are catagoriese according to the type of testing required namely non-destructive and destructive testings at the macrolevel as well as analytical work at the micro level.

Facilities already in acquisition under non-destructive testing include the ultrasonic flaw detector and the X-ray radiography of 200 KV, both of these equipment are used to detect internal

defects in welded products. Also available are the Dye Penetrants for surface defects and the Magnetic Practicle Tester for sub-surface defects of ferrous materials. These ranges of testing facilities are further built up with the acquisition of a Profile Measuring Instrument which has the ability to trace profiles magnified 200 times in the vertical and horizontal axis. A Profile Projector for surface observation up to 10 times magnification is available too.

The equipment catering for destructive testing are the Universal Tensile Testing Machine capable of withstanding loads up to a maximum of 300 tons, a Charpy Impact Tester, Rockwell and Microvickers Testers for the hardness test and a Metallurgical Microscope with a magnification of 1000 times.

The laboratory is now equipped with a sophisticated Electron Probe Micro Analyser (EPMA) for spectriometric qulitative and quantitative analysis. The latter is restricted to the standard samples of metals available, e.g. Mn, Ni, Cr and Si. It is applicable to all elements up to Boron in the periodic table for qualitative analysis.

6. Information Division

This division provides up-to-date technological information on a wide range of subjects of interest to the metal entrepreneurs. The technological dissemination services available include the services of a technical library which houses a host of reference books pertaining to specialised metal working fields of the Centre as well as other relevant topics covering factory management, organisations, safety, pollution control and quality control. Other sources of reference materials at hand include journals published by

world wide prominent associations and institutions, technological bulletins, standards and operational manuals on equipment related to the metal industries. Efforts are also being geared towards accumulating the appropriate documents that will enable guidance to any inquiries on the purchase of tools, materials, machineries or the setting up of a particular metal industry.

MITEC also has an audio visul library facilitated with an editing and dubbing machine, slide projector, film projector, overhead projector and video tape recorders. MITEC is also equipped with a collection of appropriate technical video tapes and slides that will furnish interested parties with up-to-date information on the metal technology advancements already in the grasp of the highly industrialised countries of the world.

A quarterly bulletin 'Berita MITEC' and information brochures keeps the industrialists informed of the activities and development of the Centre.

Appendix 2

Consultancy/Advisory Serviees to the local metal industries

(1986)

YEAR 1986

(01) ADVISORY/CONSULTANCY SERVICE

No.	Company/organisation	Date of Report	Service provided
01	Pernas Daikin Sdn. Bhd.	January/86	Production processes and cost estimation of pressed air conditioner components.
02	Projass Sdn. Bhd.	January/86	Working paper on LPG cylinder production.
03	Bank Pembangunan	January/86	Working paper for stapler production.
04	Kamewah Sdn. Bhd.	January/86	Heat treatment of technique on punch and die
05	Mahira Engineering Sdn. Bhd.	January/86	Finishing process on cost aluminium sample
06	Syarikat STJ	February/86	Pierching of polythene bag.
07	Perbadanan Kemajuan Iktisad Negeri Terengganu	February/86	Working paper on 200 litre steel drum production.
08	Quality Coat Engineering	February/86	Design and production of 200 units of dog house roof.
09	Aluminium Ware Factory (Burma)	February/86	Deep drawing process.
10	Kejuruteraan Emas Sdn. Bhd.	February/86	Rear speaker board production for Proton Saga.
11	Jabatan Kimia	February/86	Repair of Resistor Heating Element Component by welding process.
12	Koksyop Perkilangan Angkatan Tentera	Mac/86	Jig for hard chrome on measurement instruments.
13	Primer Platers Sdn. Bhd.	Mac/86	Design and problem solving for hospital trolley welding process. T joint welding demonstration in workshop.

No.	Company/organisation	Date of report	Service provided
14	Behn Meyer	Mac/86	Gravity welding.
15	Nam Fatt Engineering	Mac/86	Welding for thin sheet metal. MIG welding and welding selection.
16	Syarikat Howard	Mac/86	Parameter for flux cored wire to obtain bead and reduction of 'spatter'.
17	Malaysia Explosive	Mac/86	Black oxide coating on Metal product
18	LLPPKK	Mac/86	Translation of electroplating course syllabus
19	Cheong Mah	Mac/86	Waste disposal/discharge of plating waste.
20	Kraftangan Malaysia	Mac/86	Technical guidance on plant set up for nickel-chrome, nickel-gold and nickel silver plating.
21	Aluminium Company of Malaysia, Kelang.	April/86	Problem of extrusion die decarburization. Heat treatment by salt bath and hardness/microstructure analysis of dies.
22	Syarikat Masaku Trading Sdn. Bhd.	April/86	Costing for production of 50,000 pieces of badges.
23	Syarikat Metal Formers Sdn. Bhd.	April/86	Problem of achieving 90° bend for bending dies.
24	Syarikat Litany Metal & Stamping Bhd.	April/86	Plating process and selection of material for rack and barrel and checking of composition of Nitric Acid on the surface of the product.

No.	Company/organisation	Date of report	Service provided
25	Syarikat Primer Platers Sdn. Bhd.	April/86	Welding technique for hospital ward screen and beds. Cu-Ni-Cr plating on 500 units of hospital trolleys and acid pickling & phosphating procedure.
26	Syarikat Rahim & Company	April/86	Brazing technique of cutting tool on the cylindrical cutter welding jig design.
27	Unit Senireka & Seni-logam, ITM	April/May/ Jun 1986	Follow-up technical guidance on design and set up of plating workshop. Provided support on plating try out, solution analysis, jig, testing and commissioning of the plant. Conducted lectures for the staff of ITM.
28	Syarikat Gombak Iron Works Sdn. Bhd.	May/86	Use of welding jigs and fixtures. Problem of diesel engine exhaust and rust on welded steel.
29	Syarikat Besikraft Engineering & Construction	May/86	Procedure and qualification of welder for pipe welding project in Shah Alam.
30	Syarikat Double Rhoom	June/86	Machine/equipment layout and production and QC of welding processes.
31	Syarikat Toong San, Kelang	June/86	Welding processes and Q.C.
32	Kilang Wang, Bank Negara.	June/86	Copper electroforming process on die made of plaster of paris for old coin duplication
33	Syarikat Litany Metal Coat & Stamping	June/86	Costing for nickel plating.
34	Unit Tenaga Nuklear, Jabatan Perdana Menteri	June/86	Costing for pipe and plate fabrication for welding specimen.
35	Syarikat Chee Sin Engineering Works, Kelang	June/86	Welding processes and QC

No.	Company/organisation	Date of report	Service provided
36	LLPPKK	June/86	Lecture notes for level II NDT trade certificates.
37	Syarikat Sinar Timor Sdn. Bhd.	April/86	Working paper on galvanising dnd plating.
38	Syarikat Ferro Chem Industries.	June/86	Production of steel bed.
39	LLPPKK	June/86	Assessment and testing of gas and arc welding.
40	Syarikat Spare East Timor Sdn. Bhd., Kuantan.	June/86	Working paper on set up of a Ni-Cr plating shop.
41	Syarikat Kameweh Sdn. Bhd.	June/86	Costing for gas cutting of steel plate.
42	Syk. Ferro Chem Industries	July/86	Workshop layout, production and training of plating personnels.
43	Syk. Rohanza Jewellry	July/86	Costing for gold plating of souvenir items.
44	Syk. Bakarim Kreaktif	July/86	Costing for gold plating on TUDM badges.
45	Syk. GEC.	July/86	Problems of scaling of heating element of kettles.
46	Syk. Tan Lan Industries Ipoh.	July/86	Nickel plating both analysis, making of anode bag and standard solution.
47	Syk. Armstrong Cycle Parts (T. Pinang)	July/86	Problem of blue chromate 'turning' yellow after zinc plating.
48	Syk. Metal Formers	July/86	Bending processes for cabinet fixing to washing machine (with drawing).
49	Syk. Sat Heet Technology	July/86	Forming process for water meter cover and press machine capacity.
50	Syk. Intan-ocean Sdn. Bhd. Kuala Trengganu	July/86	ESSO off-shore platform construction(interpretation of technical drawing, materia selection, costing and welding techniques)

No.	Company/organisation	Date of Report	Service provided
51	Oriental Metal Bhd.	July/86	Analysis of surface defect problem on aluminium product (CKNS projects)
52	Syk. East West Technology	July/86	Deep drawing problems Die setting on site.
53	Syk. Kimpalan Mahar (Kota Bharu)	July/86	Production of telephone coin box.
54	Syk. Perdagangan & Industries KBBS (Kelantan)	July/86	Door hinges production process.
55	Unit Tenaga Nuklear	July/86	Sealing technique for aluminium radiation can.
56	Allied Auto Parts Bhd.	July/86	Hard chrome plating on die and thickness control.
57	Syk. Tan Lan Industries	July/86	Brighteners making process.
58	Syk. Ashari, Kota Bharu	Sept./86	Welding technique and QC.
59	Syk. Mulpha Engineering	Sept./86	Solar water heater design and fabrication.
60	Syk. Interbumi Metal Sdn. Bhd.	August/86	Production process for slotting on coin meter gauge.
61	Syk. Esikon Engineering Bhd,	August/86	Modification process for welding work.
62	Syk. East Engineering Malaysia.	August/86	Design and fabrication of press machine safety devices (drawing and video shows).
63	Syk. Airod Sdn. Bhd.	Sept/86	Spot welding of aluminium.
64	Syk. Lien Steel Works.	Sept/86	Design and fabrication of hand pull safety system of press machine.
65	Syk. Iron Gombak Works.	Sept/86	Production processes and QC for steel bed.
66	Syk. Teck See Plastic	Sept/86	Plastic plating processes and plastic platers in Malaysia.

No.	Company/organisation	Date of Report	Service provided
67	LLPPKK, Kementerian Buruh	Sept/86	Scope and syllabus for trade certificate examination on gas and arc welding.
68	Jabatan Kimia	Sept/86	Repair of 10 units of rice grading sieve.
69	Chong Mah Sdn. Bhd.	Sept/86	Waste treatment of plating and factory layout.
70	Dewan Bandaraya, Kuala Lum Lumpur.	Sept/86	Welding (repair) for Sulaiman Bridge (Kuala Lumpur)
71	Syk. Brimal Strampress.	Oct/86	Seam welding on bullet casing product (factory visit)
72	LLPPKK	Oct/86	Assessment on examination question on gas and arc welding (Trade Certificate, middle and advanced level).
73	Sykt. Masjuta (Trengganu)	Oct/86	Welding procedure and qualification for atainless steel pipe.
74	Syk. Markon(M) Sdn. Bhd.	Oct/86	Brazing of hydraulic tubing component (factory visit).
75	Syk. Aroline Sdn. Bhd.	Nov/86	Procedure testing for electrode (MS) and qualification procedure of welders.
76	Syk. Maintenance Engineering Sdn. Bhd.	Nov/86	Design and selection of welding joint pipe & weldment strength evaluation.
77	Syk. Time Engineering	Nov/86	Welding process for kettle (Stainless steel).
78	Syk. Central Wire Mesh	Nov/86	Repair of cast iron drum.
79	Syk. Paris Advertising Sdn. Bhd.	Nov/86	Use of MIG Welding machine.
80	Syk. Airod Sdn. Bhd.	Nov/86	Costing on spot welding process welder competency test.
81	Syk. Diecasting Sdn. Bhd.	Nov/86	Problem solving of satin nickel plating (chemical solution analysis).

No.	Company/organisation	Date of Report	Service provided
82	Syk. Nike Sdn. Bhd.	Nov/86	Plant layout of hard chrome process.
83	Proton	Nov/86	Selection of plating process for ash tray. Costing provided.
84	Syk. Sugiyasu Sdn. Bhd.	Nov/86	Problem of burrs on the flange after blanking process.
85	Syk. Kimiatex Sdn. Bhd.	Nov/86	Process design and equipment selection for plating waste disposal system.
86	Power Electrobrite Plating Centre.	Nov/86	Plating process and chemical solution analysis.
87	Unit Perusahaan Kecil, Kementerian Perdagangan & Perindustrian	Nov/86	List of metal products for development of small scale enterprise. Production techniques involved.
88	Selection of electrode for TIG welding	Nov/86	Selection of electrode for TIG welding.
89	Jabatan Kimia	Nov/86	Costing for production of indented rice grading tray.
90	Syk. Diecasting Products Sdn. Bhd.	Nov/86	Solution analysis of decorative chrome. Problem of high sulphate content and low trivalence chrome.
91	Syk. Marcon Sdn. Bhd.	Nov/86	Zinc and chrome plating thickness.
92	Syk. Harom LPG Sdn. Bhd.	Nov/86	Temperature measurement of tank.

No.	Company/Organization	Service provided
93.	Leong Jin	Subzero treatment theory (application and implementation)
94.	Kamewah	Warping prevention during drawing of square boxes.
95.	University of Technology Malaysia	Mosquito coil die (progressive die)
96.	IKM (Malacca)	Set up of die making shop
97.	Kejuruteraan Emas	Die repair for rear speaker board of automobile.
98.	Makasar Industries Corp.	Methods of hardening HSS.
99.	Yew Teong Sdn. Bhd.	Carburizing of steels equipment/ procedure.
100.	Howard Rotovator	Production of stamped components.
101.	Sykt. Imac	Die design of meter cover.
102.	Techno Engineering	Machining of Manganese steel.
103.	Swedish Business	Tool and die in Malaysia.
104.	American Dynamics	Machining of spot welding electrodes.
105.	UTM	Die design and making (general).
106.	Malaysia Explosive	Model - making for dies.

Appendix 3

Prototype Fabrication/Trial Production/
Lease of Machinery for the local
metal industries.

(02) PROTOTYPE FABRICATION/TRIAL PRODUCTION/LEASE OF MACHINERY

No.	Company/Organisation	Date of Report	Service provided
01	Sedar Sdn. Bhd.	Jan/86	Cu-Ni-Cr on mild steel sheet metal (samples).
02	Rohanza Sdn. Bhd.	Jan/86	Trial production of gold bracelets.
03	Lamont Trading Sdn. Bhd.	Jan/86	Trial production of F and L types of fuse.
04	Brimal Stampress Sdn. Bhd.	Jan/86	Letter opener production.
05	Brimal Stampress Sdh. Bhd.	Jan/86	Hard chrome of side support.
06	Syk. Kamewah dan Syk. Seri Intan.	Jan/86	Bending and cutting of steel parts.
07	Metal Formers Sdn. Bhd.	Jan/86	Spot welding of brackets (100 units)
08	Quality Coat Engineering	Feb/86	Samples fabrication for dog house roof.
09	Kejuruteraan Kuari, Galian dan Binaan Sdn. Bhd.	Feb/86	Sample fabrication and costin for round and square disc tags
10	Prime Plater Sdn. Bhd.	Mac/86	30 units of dustbin fabrication.
11	Woksyop Perkilangan Angkatan Tentera	Mac/86	Fabrication of jigs for hard chrome plating of artillery part and anodising aluminium.
12	STJ Sdn. Bhd.	Mac/86	Trial production of piercing polyurethane bag.
13	Sabara Sdn. Bhd.	Mac/86	Fabrication of sample brackets and costing.
14	Montfort Boys Town	Mac/86	Sample fabrication of light cover reflector panel Costing for 2000 units of production.

No.	Company/Organisation	Date of Report	Service provided
15	Gah Hup Seng Sdn. Bhd.	Mac/86	Carburizing of sprocket gear (80,000 units)
16	Ang Aik Choo Sdn. Bhd.	Mac/86	Carburizing of 450 kg screws.
17	Brimal Stampress Sdn.	Mac/86	Hardening of 5000 pieces of safety belt tongue.
18	Yew Teong Sdn. Bhd.	Mac/86	Trial Production (carburizing) of clutch plates.
19	Maplin Sdn. Bhd.	Mac/86	Trial production of plastic components.
20	Mahera Engineering Sdn. Bhd.	Mac/86	Die casting of ceiling device.
21	Quality Coat Engineering	Mac/86	Die try out.
22	Gah Hup Seng Sdn. Bhd.	April /86	Heat treatment of 5000 pieces of sprocket gear.
23	Syarikat Ang Eng Choo	April/86	Heat treatment of 7 kg of screws.
24	Syk. Bakarim Kreaktif	April/86	Gold plating of 200. pieces of logo (copper)
25	Syk. Kejuruteraan Emas Sdn. Bhd.	April/86	Bending work for combustion testing chamber component.
26	Syarikat Kamewah	April/86	Try-out of mould for plastic bottle.
27	Syk. Metal Industries (M) Sdn. Bhd.	April/86	Try out of deep draw dies.
28.	Syk. Liteny Metal Coat & Stamping.	May/86	Plating thickness testing and salt spray test costing for Cu-Ni-Cr products.
29	Syarikat Kamewah Bhd.	May/86	Try out with resin (Hp & Lp) for fabrication of mould for plastic bottles.
30	Syarikat Kamewah	May/86	Fabrication of 15 units of brackets and 20 units of window of panes for land rove

No.	Company/Organisation	Date of Report	Service provided
31	Syk. Litany Metal Coat & Stamping.	June/86	Try out and sample preparation for Ni-Cr, plating for brake and front bracket and rear holder for motorcycle.
32	Syarikat Boshi Saw Chain	June/86	Thickness testing of chrome plating on 6 units of cutters by chemical process. Deplating and stripping process are carried out.
33	Syk. Uni-Telko Malaysia.	June/86	Thickness testing for 3 sets of gold plated sockets, cords and plugs of telephone.
34	Syk. Edaran Sdn. Bhd.	June/86	9 sets of the above (33)
35	Syk Litany Metal Coat & Stamping.	July/86	Fabrication of sample and plating of Ni-Cr for brake, front bracket and rear holder of motorcycle.
36	Unit Tenaga Nuklear, JPM	July/86	Sample fabrication of 5 units of pipe and 2 units of plate specimens.
37	Syk. Kamewah Sdn. Bhd.	July/86	Gap shearing of 200 pieces of stainless steel vane cover.
38	Syk. Uni Telko	July/86	Thickness testing of gold plated plug and socket of telephone.
39	Syk. Premium Communication Engineering	July/86	Thickness testing of gold plated plug and socket of telephone.
40	Syk. Kamewah Sdn. Bhd.		Blank production for male post frame for steel beds (hospital).
41	Syk. Litany Metal Coat & Stamping.	July/86	9950 pieces of Ni-Cr plating for metallic device.

No.	Company/Organisation	Date of Report	Service provided
42	Unit Tenaga Nuklear.	July/86	Production of 1000 set of radiation cans.
43	Syk. Shin Daito Bhd.	July/86	Thickness testing of gold plated samples.
44	Syk. Kamewah Sdn. Bhd.	July/86	Buffing of 120 pieces of stainless steel shafts.
45	Syk. Kejuruteraan Kuari Galian & Binaan Sdn. Bhd.	Aug/86	Fabrication of 3 sets of 80-pigeon-holes letter boxes (aluminium).
46	Syk. Primatic Components	Aug/86	Heat treatment of 500 kg of phosphor bronze.
47	Syk. Erricson Bhd.	Aug/86	Testing of thickness of 2 units of miniature, 2 units of plug and 2 units of socket.
48	Syk. Electrotac Ent. Bhd.	Aug/86	Zinc plating of 335 kg bolts and nuts.
49	Syk. Prime Platers	Sep/86	Hard chrome of 291 pieces of sliding shaft for hospital beds.
50	Syk. Brimal Stampress	July/86	Heat treatment of 7300 units of safety belt tongues.
51	Syk. Mashur Industrial Corp.	July/86	Heat treatment of forging dies (spectacle frame)
52	Syk. Electrotac Ent. Bhd.	Sept/86	Rainbow chromate plating of 320 kg of bolts and nuts.
53	Syk. Gah Hup Seng	Sept/86	Heat treatment of 9515 pieces of sprocket gears and 3 sets of dies.
54	Syk. Syalinpae.	Sept/86	TIG welding (welder qualification test).
55	Syk. Edgames Sdn. Bhd.	Sept/86	Thickness testing of plating (miniature plug).

No.	Company/Organisation	Date of Report	Service provided
56	Chong Mah Sdn. Bhd.	Sept/86	Cu-Ni-Cr plating on zinc die castings.
57	Syk. Rohanza Wang	Sept/86	Bright Nickel gold plating of brass jewelry items (36 nuts).
58	Syk. Rohanza Wang	Oct/86	Bright Nickel gold plating of 36 units of brass rings.
59	Unit Tenaga Nuklear (PUSPATI)	Oct/86	Production lf 1400 set of radiation can.
60	Syk. Pneumatic Components	Oct/86	Heat treatment of 10,000 units of fuse holders.
61	Syk. Kamewah Sdn. Bhd.	Oct/86	Pressworking of brass sheets.
62	En. Chan Siew Loon	Oct/86	Try out of shoe eyelet (progressive dies).
63	En. Haladin bin Bonto	Nov/86	Fabrication of 5 units of iron gates.
64	Pipeline Engineering Ltd.	Nov/86	Repair of electrical system of welding machines.
65	Syk. Proton	Nov/86	Cu-Ni-Cr plating and zinc plating on ash tray (try out)
66	Syk. Metal Formers	Nov/86	Thickness testing of zinc plating (galvanised plate).
67	Syk. Brimal Stampress	Nov/86	Heat treatment of 200 kg of seat belt torque.
68	Syk. Gan Hup Seng	Nov/86	Heat treatment of 300 units of sprocket gear.
69	Syk. Berjaya Corporation	Nov/86	Welding specimen preparation with MIG machine.
70	Syk. Engineering Aids Sdn. Bhd.	Nov/86	Plate cutting with photo-tracer machine.
71	Jabatan Kimia	Nov/86	Fabrication of 20 units of rice grading plates.

No.	Company/Organisation	Date of Report	Service provided
72	Syk. Paris Advertising Sdn. Bhd.	Nov/86	MIG welding.
73	Syk. Samsel Iron Works	Nov/86	Structure fabrication fo of press machine.
74	Power Electrobrite Plating Sdn. Bhd.	Nov/86	Thickness testing of zinc plating of 4 nuts bolts and 5 nuts of washers.
75	Syk. Rohanza Wang	Dec/86	Gold plating of jewelry items.

No.	Company/Organisation	Quantity	Service provided
76.	STJ Sdn. Bhd.	2	Plastic bag perforating dies.
77.	Press Technique	2	Washing Machine Top Rear Cover Dies.
78.	Rohanza Wang	1	Die for Jewellery holder.
79.	Lamont Trading	4	Progressive dies for fuse holder P and L.
80	Goh Hup Seng	1	Blanking die for motorcycle.
81.	Islah Edar	4	Multi Tooth Rattan trimmer.
82.	HIFA Engineering	2	EDM of mould cavity for shampoo bottle.
83.	Kamewah	2	EDM for die opening.
84.	Kamewah	4 sets	Cylindrical grinding and EDM.
85.	Kayaba	4	Profile grinding of precision punch.
86.	Allied Auto Parts.	Lease	Vertical milling surface grinding of components.
87.	Praco Precision Engineering	Lease	Surface grinding.
88.	Hong Leong Yamaha	Lease	Radial Drill.
89.	Kejuruteraan Emas	1	Die for dash board (Proton Saga).
90.	Syarikat Metal Industries	1 set	Punch and die components for door hinges.
91.	RRIM	1	Die for tensioning device.
92.	Syarikat Pembuat Rotan Damansara.	1	Rattan cutting machine.

No.	Company/Organisation	Quantity	Service provided
93.	Maplin Plastik Industries	1	Repair of mould.
94.	Die Casting Product Sdn. Bhd.	1	Die for function box.
95.	ASPA Engineering	1	Crusher cutter.
96.	Metal Formers.	1	Die for Ice Box.
97.	Syarikat Mashur	4	Die for watch straps.
98.	Syarikat Metal Industries of Malaysia.	1	Die for watch straps.
		1	Shaft guard die
		1	Collar joint bottom
		1	Shaft cover
		1	Shaft (punch only)
99.	Syarikat Fung Yee Eng.	5	Draw dies.
100.	Syarikat Son Tong Seng Mould Sdn. Bhd.	1	Copper milling (motorcycle handle)

Appendix 4

Metal Technology Development
(Training)

No.	Course Title	Sponsor	Quantity	Date	Participants	
					Sub total	Total
1.	General Training Course I (Diemaking, presswork, Welding, Electroplating)	- SIRIM (MITEC)	1	5-17/10/1981	13	
						13
1.	General Training Course II (Diemaking, presswork, welding, Electroplating)	- SIRIM (MITEC)	1	11-23/1/1982	15	
2.	Plating Technology Seminar	- SIRIM (MITEC) - JICA	1	4-5/2/1982	51	
3.	General Training Course III (Diemaking, presswork, welding, electroplating)	- SIRIM (MITEC)	1	19-30/4/1982	22	
4.	CO_2 Arc Welding Course	- SIRIM (MITEC)	1	23-26/8/1982	7	
5.	General Training Course IV (Diemaking, presswork, welding electroplating)	- SIRIM (MITEC)	1	6-18/9/1982	19	
						114

No.	Course Title	Sponsor	Quantity	Date	Participants	
					Sub total	Total
1.	Zinc plating Technology Course	- SIRIM (MITEC)	1	10-11/1/1983	23	
2.	General Training Course V (Diemaking, presswork, welding, electroplating)	- SIRIM (MITEC)	1	28/2/1983 - 12/3/1983	27	
3.	Design and operational aspects of progressive dies.	- SIRIM (MITEC)	1	11-16/4/1983	8	
4.	Nickel-Chrome plating course	- SIRIM (MITEC)	1	20/21/4/1983	8	
5.	Heat treatment of tool steel	- SIRIM (MITEC)	1	9/14/5/1983	12	
6.	General training Course VI (Diemaking, Presswork, welding, electroplating)	- SIRIM (MITEC)	1	30/5/1983 - 11/6/1983	24	
7.	Seminar on Waste Water Treatment for electroplating plant	- SIRIM (MITEC)	1	3-4/8/1983	24	
8.	Welding Inspection Seminar	- SIRIM (MITEC)	1	8-10/8/1983	24	
9.	Heat treatment course	- SIRIM (MITEC)	1	20-21/9/1983	9	
10.	Hard Chrome plating course	- SIRIM (MITEC)	1	22/9/1983	5	
11.	Gold and Silver plating course	- SIRIM (MITEC)	1	12-13/10/1983	14	
12.	General Training Course VII (Diemaking, presswork, welding, electroplating)	- SIRIM (MITEC)	1	14-26/11/1983	24	
						202

No.	Course Title	Sponsor	Quantity	Date	Participants	
					Sub total	Total
1.	Principles and application of EPMA	- SIRIM (MITEC)	1	26/1/1984	15	
2.	1st Regional Training Programme in Metalworking Technology (Welding and Electroplating)	- SIRIM (MITEC) - JICA	1	20/2/1984 - 24/3/1984	22	
3.	General Training Course VIII (Diemaking, Presswork, Welding, Electroplating)	- SIRIM (MITEC)	1	27/2/1984	10	
4.	Design and operations of deep drawing dies.	- SIRIM (MITEC)	1	9-10/3/1984	11	
						260
1.	2nd. Regional Training Programme (Diemaking and Presswork)	- SIRIM (MITEC) - JICA	1	14/1/1985 16/2/1986	20	
2.	Construction, operation and maintenance of press machine.	- SIRIM (MITEC)	1	12-13/3/1985	10	
3.	General Training Course IX (Diemaking, presswork, welding, electroplating)	- SIRIM (MITEC)	1	1-13/4/1985	25	
4.	Design and operational aspects of progressive and transfer dies.	SIRIM (MITEC	1	6-9/5/1985	11	
5.	Design and operational aspect of deep drawing dies.	- SIRIM (MITEC)	1	8-9/7/1985	9	
6.	Seminar on Introduction to metal working	- SIRIM (MITEC) - Bank Pembangunan	1	22-24/7/1985	50	
7.	Hard Chrome Plating	- SIRIM (MITEC)	1	5-6/8/1985	10	

No.	Course Title	Sponsor	Quantity	Date	Participants	
					Sub total	Total
8.	Fine blanking course	- SIRIM (MITEC)	1	7-8/8/1985	7	
9.	Heat Treatment Course	- SIRIM (MITEC)	1	9-12/9/1985	7	
10.	Course on Metalworking Technology under the Malaysian Technical Cooperation Programme (Diemaking, presswork, welding and electroplating)	- SIRIM (MITEC) - JPA	1	1-30/11/1985	24	
						433
1.	3rd. Regional Training Programme (Welding and Electroplating)	- SIRIM (MITEC)	1	6/1/1986 - 8/2/1986	15	
2.	Introduction to Welding Technology Course	- SIRIM (MITEC)	1	22/2/1986	30	
3.	Seminar On Current Welding Technology	- SIRIM (MITEC - UPPKK - PKM	1	22/4/1986	40	
4.	Regional Seminar on Production Technology for small and medium scale manufacturing industry	- SIRIM (MIDEC) - UTM - UNESCO - Committee of Science and Technology in Development Countires.	1	23-25/6/1986	51	
5.	Metal Manufacturing Technology Seminar	- SIRIM (Unit Bimbingan Perindustrian MIDEC)	1	9-12/7/1986	50	

No.	Course Title	Sponsor	Quantity	Date	Participants	
					Sub total	Total
6.	Surface treatment for metal (for National Mint)	- SIRIM (MIDEC)	1	11-12/8/1986	8	
7.	Hard Chrome course for National Mint.	- SIRIM (MIDEC - Bank Negara	1	13-14/8/1986	9	
8.	Metal Manufacturing Technology Seminar	- SIRIM (Unit Bimbingan Perindustrian) (MIDEC)	1	25/8/1986	50	
9.	Seminar on Entreprenear Development	- Kementerian Pertahanan (Sg. Buloh) - SIRIM (MIDEC)	1	18/9/1986	50	
10.	Seminar on Welding Productivity	- SIRIM (MIDEC) - LLPPKK - MWS	1	1-2/10/1986	50	
11.	Workshop on small scale industry technology (Jenka, Pahang)	- Pihak kerajaan negeri Pahang - SIRIM (MIDEC)	1	16/10/1986	10	
12.	Course on Design and manufacturing of precision machine components)	- SIRIM (MIDEC)	1	6-9/10/1986	29	
13.	Training course on Industrial Radiography for Intermediate Grade (Level II) NDT personnel, Sector: Welded Construction	- SIRIM (MIDEC)	1	3-17/11/1986	18	
						843

JUMLAH BESAR

Appendix 5

Test and Inspection Services Conducted At MITEC During 1981-1985

Year	Number of samples tested						
	Tensile Bend Test	Charpy Impact	EPMA	X-ray	Dimensional measurement	Others	Total
1981 (From Sept)	38	4	0	0	2	1	45
1982	491	77	2	156	78	470	1274
1983	846	46	26	134	88	126	1266
1984	532	30	44	52	155	162	975
1985	558	32	46	55	163	170	1024

NOTE

Other test conducted are as follows :-

1. Hardness test
2. Macro and micro analysis
3. Surface roughness test
4. Fracture analysis
5. Erichsen test
6. Dye penetrant test
7. Magnetic particle test

Appendix 6

TEST AND INSPECTION SECTION

(1986)

Start from the year 1986 the activities of the section are base under the following subactivities:-

		Time allocation
a)	Research and Development	40%
b)	Technical services	20%
c)	Information, consultancy and Advisory services.	10%
d)	Technique development	15%
e)	Training	10%
f)	Report writing	5%

Base the above time allocation the achievement of the section for the year 1986 are listed below:-

NO.	SUBACTIVITY	QUANTITY
1.	Research	6
2.	Information, consultancy and advisory services.	9
3.	Failure analysis	4
4.	Testing and analysis (Dimensional measurement also included)	318 samples.
5.	Training	47 trainees
6.	Technique development	2.
7.	Others	3

Details of the activities of the section are given in Appendix A.

Activities of the Test and Inspection Section for the year 1986

NO.	SUBACTIVITY	DESCRIPTION
1.	Research	i) To conduct the carburizing process of sprocket gear and its relationship to the Hayes VSQ vacuum furnace. ii) To study the structure and composition of the investment casting. iii) To study on the extruded aluminium samples using EPMA. iv) To study on the failure of the propeller of a ship and also the material of the artificial anode. v) To improve and develop alfin piston.
2.	Information, consultancy and advisory services.	i) Information given on the metal for making metal stamp for Mesimmel Sdn. Bhd. ii) Advice on the equipment for the metallography laboratory for Southern Iron and Steel Works Sdn. Bhd. iii) Information given to Komplek Kewangan on the flattening of pipes during hending operation connectors and pipes fittings for hose assembly. iv) Information given to Fuji Trading Agency on the a) Purchasing of furnace b) Process to obtain pure tin from the black tin taken from battery. v) Information given to Harom LPG Industries Sdn. Bhd. on the chemical analysis on material for LPG cylinder.

NO.	SUBACTIVITY	DESCRIPTION
	Information, consultancy and advisory services.	vi) Information given to ALCOM on the ductility of the die and the changes due to the heat treatment process. vii) Information given to Sin Soon Hoe Foundary Eng. Works on the material and the failure of artificial anode. viii) Provide information to University Sains Malaysia on the course content and Metallurgy practical training. ix) Provide information to Universiti Teknologi Malaysia on the practical training for production Engineering Student.
3.	Failure analysis	i) On worm gear shaft for Perbadanan Kilang Felda, Temerloh Pahang. ii) On extrusion die component for ALCOM. iii) On wire rope for session court, Ipbh. iv) On propeller of ship for Sin Soon Hoe Fohdary Eng. Work.
4.	Testing and analysis (Dimensional measurement also included)	The testing that are conducted by the section are : i) Tensile. ii) Micro structure. iii) Hardness. iv) magnetic particle v) Plating thickness measurement. vi) Cupping. vii) X-ray radiography viii) Bending The analysis that were done are by using the Electron probe micro Analyser (EPMA)

NO.	SUBACTIVITY	DESCRIPTION
5	Training	i) Training course on Industrial Radiography for Intermediate Grade (Level II) NDT Personnel. This course is for the National Certification Scheme in the Trade of NDT. Basic grade (Level I) course on Industrial Radiography was also held under the NDT group. ii) Practical training for the Art and design Student of the MARA Institute of Technology. iii) Practical training for the Engineering Student of the Politeknik Ungku Omar. iv) Practical training for the College Tunku Abdul Rahman.
6	Technical development	i) Develop a technique to determine the element in the metal with the use of KOSLOW General ID Lab 1599. The equipment was given to the unit without proper instruction manual. ii) Technique to confirm the inter face compound between aluminium and cast iron of the piston.
7	Others	i) Working paper on "upgrading Metallography in SIRIM" was prepared by the section. ii) To study the technology capabilities in Indonesia through visit organise by SIRIM. iii) Working paper on proposal of Personel Computer Loan Scheme for SIRIM staff.

In the year 1986 three of the Section's staff were sent for training in the field of Non-Destructive testing.

a) Abroad

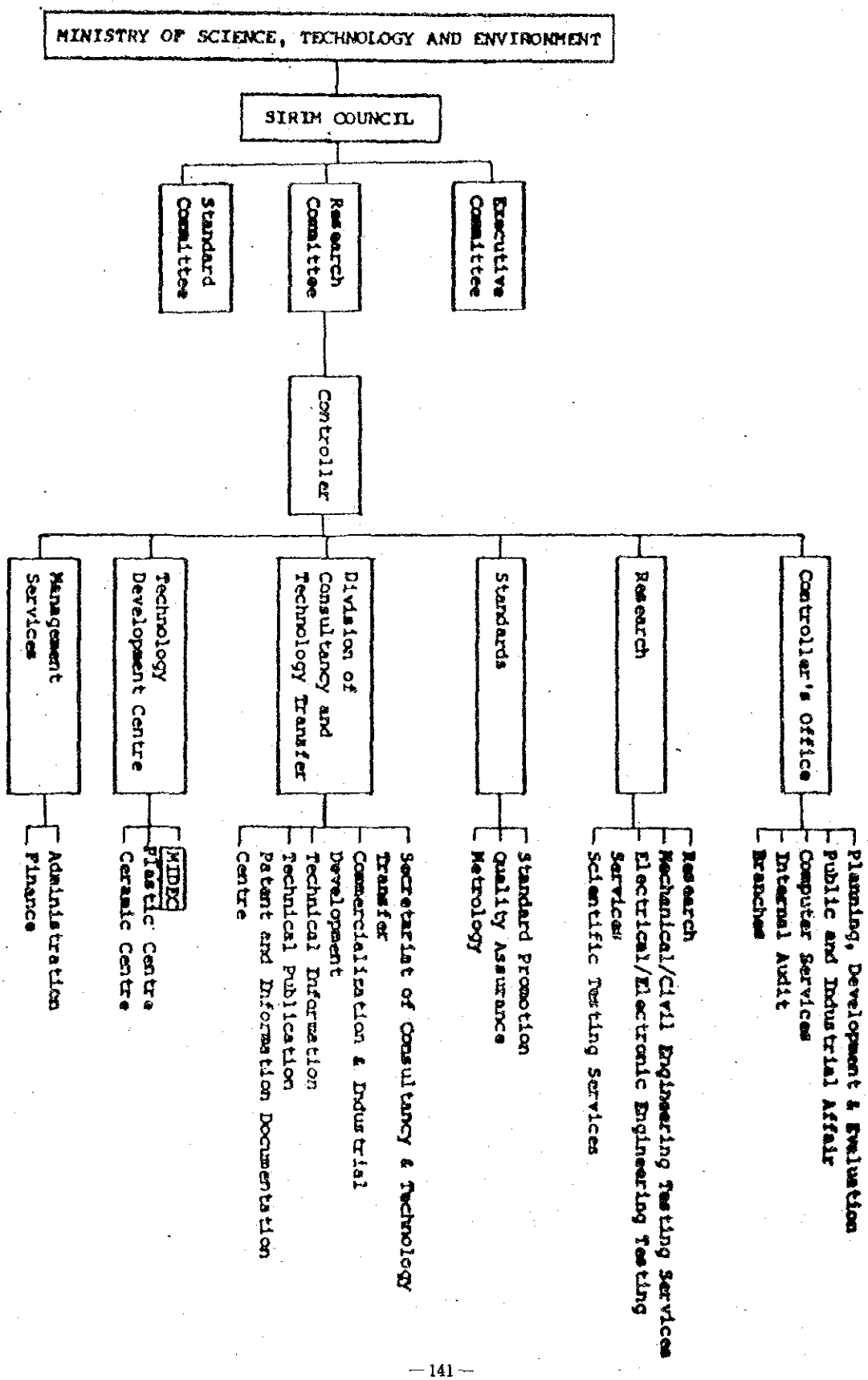
Name	Place	Duration
i) En. Azmi Hj Idris	Japan	4 weeks.

b) Locally

i) En. Afandi Kasan	Nuclear Energy Unit, Bangi	2 weeks.
ii) En. Salleh Hj Jalil	SIRIM	2 weeks.

Appendix 7

SIRIM Organization Structure



APPENDIX V : METAL INDUSTRY DEVELOPMENT CENTRE (MIDEC) (SIRIM)