b) 中小工業開発庁（ＳＩＤＯ）鋳造開発センター

アティラ・ソゲット副所長、ディララ企業コンサルタント（帰国研修員）等に面談、討論、見学。

各種の化学分析器、金属顕微鏡、鋳物砂試験機類を揃え、アンカラ地域にある約170社の鋳造工場（トルコ全土で約4,000社ある、国家企画庁調べ）に対して、依頼試験、技術指導等を実施。スイスからの専門家と共同で鋳造方案のコンピューター化について研究中。

写真２９　同所の建物

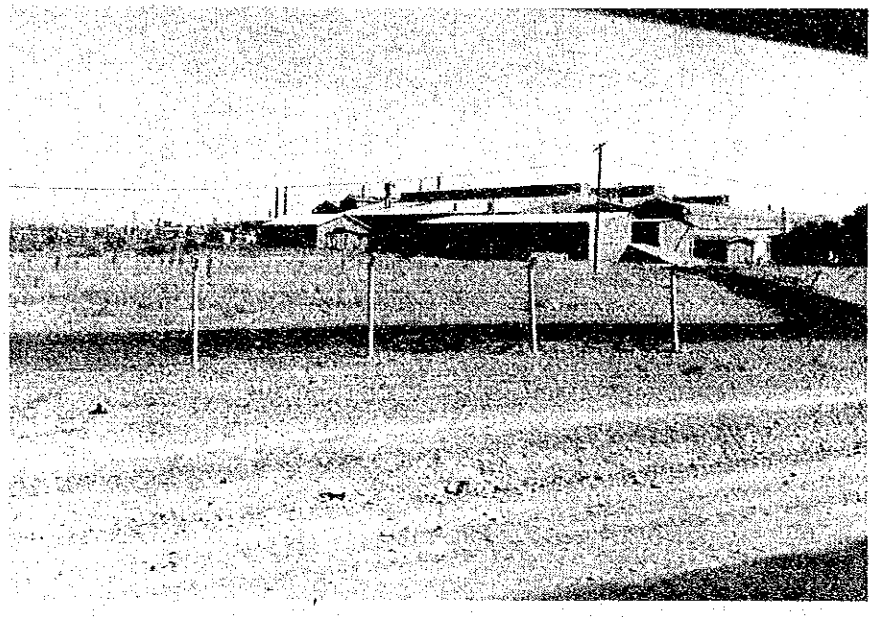
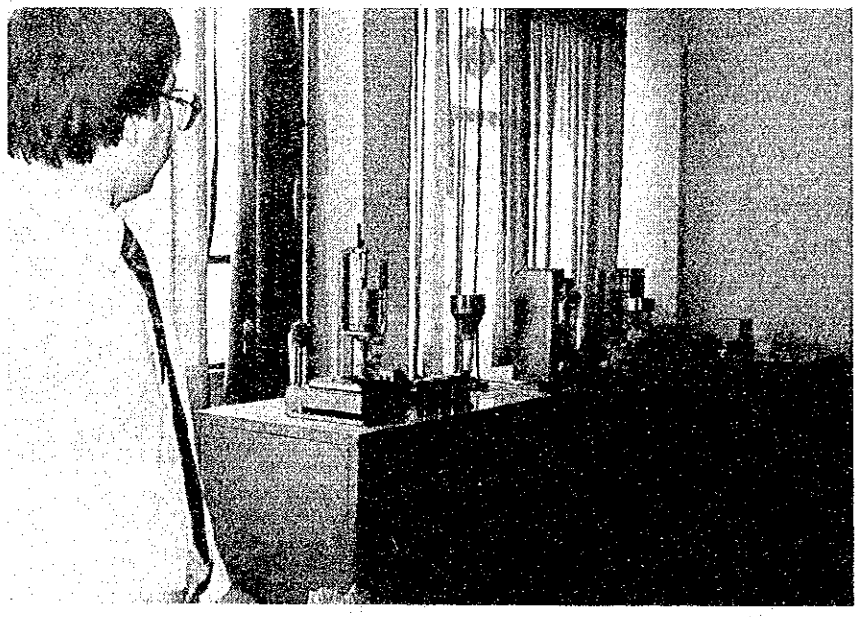


写真３０　同所副所長から説明を受ける

写真３１　同所鋳物砂試験機類



c） ＥＬＴＥＭ社

当国の民間大手企業であるＥＣＡグループの一社であるＥＬＴＥＭ社の最高責任者であるオズデン氏（帰国研修員）と面談、討論。

当社は、従業員８５名（ＥＣＡ全体で4,000名）

溶解炉 ： ディーゼル油式るつぼ炉、電気誘導炉、夫々200kg

材 質 ： ＪＩＳ、ＡＤＣ、ＡＣに相当 ダイカストマシン７台

用 途 ： 自動車用ホィール、ピストン

エンジンブロックは低圧鋳造機を使用

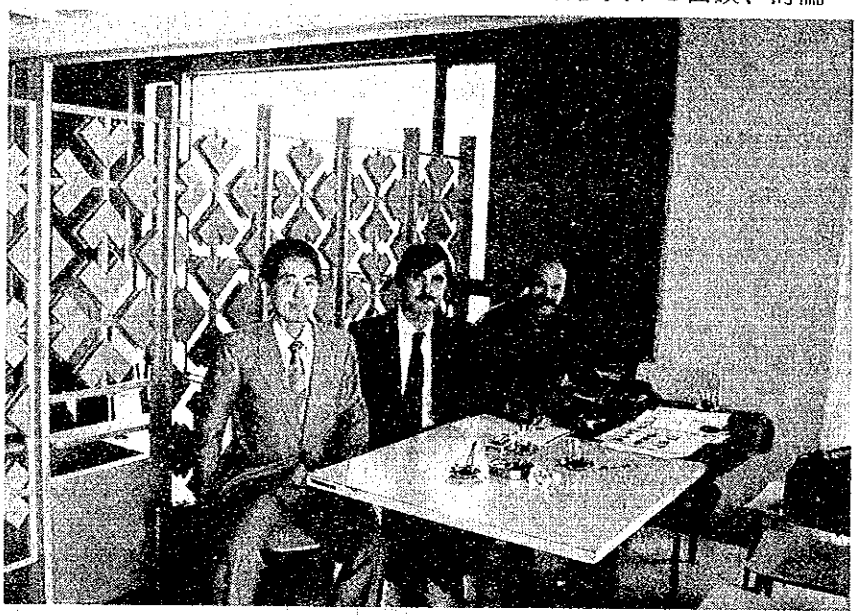
必要に応じ熱処理を実施

管 理 ： 原子吸光分析機、ビデオ付顕微鏡、硬度計等

近々、分光分析機、引張り試験機、衝撃試験機等購入予定

設備拡大に伴い低圧鋳造機等日本から購入したいようである。

写真３２ ＥＬＴＥＭ社オズデン氏（帰国研修員）と面談、討論



(2) 帰国研修員について

当該コース帰国研修員１７名中９名に面談（うち２名民間企業へ転職、１名国立研究所へ転職）、１名は出張中（アンカラから約600キロで面談不能）、６名民間企業へ転職（住所不明につき面談不能）、当該コース帰国研修員外帰国研修員１０名（溶接、熱処理、金属表面処理、電気製鋼、中小企業）に面談（面談者記録参照）。

① 国家企画庁 鉄鋼担当官 Mr. Engin Oruc（６０年度電気製鋼帰国研修員）（窓口機関）鋳造を含め基幹産業部門の責任者であり、当該部門の研修員派遣に直接かかわっている。トルコにおいて現在製鋼工場の設備近代化が進行中（日本のＮＫＫ等が実施中）ならびに、銑鋼一貫工場（新日鉄・名古屋とほぼ同規模）（約２兆円規模）の新設を計画しており、わが国に協力要請中。また２万～５万トン（将来）（需要1987現在１０万トン）の遠心鋳鉄管工場の新設を計画、わが国の関連メーカーへ打診済である、なかなかの活躍である。なお、ＪＩＣＡ同窓会設立に関する質問状を帰国研修員に日本大使館から送付し、その中300名から設立賛成の回答を回収。上述のMr. Engin が名古屋グループ（帰国研修員約103名）の長、製糖公社のMr. Ibrahim（６１年度溶接）が夫々引受の意志を表明。

② ＭＫＥＫのMr. Orhan 及びMr. Hikmet、前者アンカラ本社工場次長、後者は同品質管理部長で、両人は当チーム当国全期間中同行した。前者は押ボタン電話器付国産自動車（世界中即時に通話可能）で活躍。

ＭＫＥＫのMr. Sinan アンカラ本社工場次長（鋳造部門担当責任者）は現在鋳造工場の設備改築に多忙中であった。

ＭＫＥＫのMr. Mustafa Oguzは製造部次長として活躍中。

③ ＭＫＥＫを退職したMr. Ahmet Ozalp（当人の兄は国家企画庁長官）は現在ＭＩＴＡを経営、特殊金型を設計製作しＭＫＥＫ等へ納入している。

④ 国営製鉄所を退職したMr. Noyan は現在国立研究所で鋳造等素材部門の研究開発で活躍中。

⑤ ＭＫＥＫを退職したMr. Mustafa Ozden は現在ＥＬＴＥＭの最高責任者として活躍中（上述訪問機関の項参照）。

窓口機関における研修員選考等について

上述の国家企画庁が関係しているが、研修コースの分野別に担当官がおり、コースの内容を可成り的確に把握しており、人選も当該コースにおいては的確であり、研修員のレベル及び資質は高い（当国における当該分野の技術レベルはヨーロッパに近接しており鋳物の下請等活発であることからも判断できるが可成り高く、近い将来当該部門はヨーロッパを追越すことが充分考えられる）。

当国はハイテク産業の研修コースに興味が高く、当該コース及び電気製鋼コースは希望者が多いので複数の受入れを要望された。

帰国研修員のＪＩＣＡへの要望について

① 技術文献（特にテクノクラート等）の供与が大である。（８０％）

② 再研修の希望が大である。（８０％）

(3) トルコ共和国の総評

農産物は世界の５大輸出国の一つで、有効利用可能な土地は極めて広大で飛行場等の建設用地にかかる問題は考えられない。当国人の気質は日本人に極めて類似しており、武士道気質が見られ、者乞いのいあやらしさがない。自力本願的な要素が可成り各所で見られ、また資源の面においても、近年タングステンが可成り埋蔵されているようであり、クロームは以前から採掘されているので同系列であるモリブデンも可能性がある。

アメリカは当国をアジアの極東の日本同様、アジアの極西のトルコを極めて重要視しているのが覗える。わが国の財界は余り現在迄関係が薄過ぎると云え、残念ながら自動車産業は出遅れの感が強い。

最後にチームは当国においてトルコ政府、関係機関、帰国研修員並びに日本大使館の皆様に一方ならぬお世話になり、謝意を表して報告を終えさせて戴きます。

(4) 帰国研修員一覧表

1. トルコ（Republic of Turkey）

金属加工コース（Metal Works & Engineering Course）

No.	Name of the ex-participants	Post at the participated year	Year participated	Present post	Home address	Remarks
1	Mr. Tarik Hazneci 退職　住所不明	Chief Engineer, Investment Design, T.S.F.A.S. Eskisehir Makina Fab. Eskisehir	1973. 1. 7 ~ 1973.12.20	不　明		
2	Mr. Noyan Yucetin 退職　住所不明	Chief Engineer, Industrial Engineering Dept., MKEK Pirinc Fabrikasi Kirikale	1974. 1, 6 ~ 1974.12.19	不　明		
3	Mr. Bekir Yilmaz 退職　住所不明	Chief, Reparing & Maintenance Dept., Steel Factory, MKEK Kirikale	1975. 1, 5 ~ 1975.12.18	不　明		
4	Mr. Ahmet Ozalp Q回収 面談　退職　会社社長	R & D Manager, MKEK Gas Mask Factory, Ankara	1977. 1. 6 ~ 1977. 9.30	会社社長	PK 123 Yeni Sehir Ankara	refer to *(1)
5	Mr. Osman Durak Q回収　面談	Loader Construction Chief, Construction Machinery Factory, MKEK Ankara	1978. 9.21 ~ 1979. 8.31	Director, R. & D. (Promoted)	Demirkapi Sok 11/9 Ankara	
6	Mr. Oguz Mustafa Q回収　面談	Chief Engineer, MKEK, Tandogan Ankara	1979. 9.27 ~ 1980. 8.31	Asst. Director, Production (Promoted)	Dikmen Cad Lise Selin Apt 9 Ankara	
7	Mr. Hikmet Tekmen Q回収　面談	Manager, Quality Control, MKEK Ankara	1983. 9.22 ~ 1984. 7. 1	Manager, Q.C. Dept.	MKE Gazmask Fb Loj Yildiz B D 13	
8	Mr. Orphan Buyukbay 面談	Asst. Director, MKEK Tandogan, Ankara	1984. 9.27 ~ 1985. 7. 1	Asst. Director, Ankaraari	Gazmask Lojmanlari Yildiz Block Daire	
9	Mr. Sedat Karsli 出張中	Senior Mechanical Engineer, KUSGET (SIDO)	1985. 9.26 ~ 1986. 6.30	Same post	Cakmak Mahallesi Eski Sikak 31 Gaz.	
10	Mr. Abdullah Altinsoy Q回収　面談	Deputy Director, Machine Industry Section, Ministry of Industry & Trade, Tandogan, Ankara	1986. 9.25 ~ 1987. 6.28	本年6月帰国	Muretip Sok 25/3 Basinevler	

備考：No. 4 の Mr. Ahmet Ozalp は現在 General Manager, Makina Sanavii Ticaret Ltd., Saglik Sok No.17/20 Sihhiye, Ankara 自宅住所は同じ

2. トルコ（Republic of Turkey）

鋳造コース（Foundry Engineering Course）

No.	Name of the ex-participants	Post at the participated year	Year participated	Present post	Home address	Remarks
1	Mr. Mustafa Ozden 面談	Chief Engineer, Arc Furnace & Casting, MKEK, Kirikale	1972. 1.10 ~ 1972.12.18	Director, ELTEM (Promoted)		see (1) 退職
2	Mr. Sinan Kalyoncu 面談	Production Manager, MKEM Tandogan, Ankara	1975. 4.24 ~ 1975.12.25	Asst. Director, Ankara (Promoted)	Tepebasi Fatih Cad Cad 115/7 Keciroren	
3	Mr. Ihsan Gursoy Q回収	Foundry Chief Engineer, Top Automotive MKEK, Ankara	1976. 5.13 ~ 1976.12.25	Asst. Director, (Promoted)	MKE Lojmanlari 15 B 10 Kirikale	
4	Mr. R. Cahit Dogan 退職　住所不明	Chief Engineer of Foundry, MKEK	1977. 7.28 ~ 1978. 3.31	民間企業へ転職		
5	Mr. Ozman Sisman 退職　住所不明	Chief Engineer, Steel Foundry, Karabok Works, Turkish Iron & Steel	1978. 7.20 ~ 1979. 3.31	民間企業へ転職		退職
6	Mr. Osman Yazaroglu 退職　住所不明	Chief, Foundry, MKEK, Tandogan, Ankara	1980. 5. 8 ~ 1981. 2.23	民間企業へ転職		
7	Mr. Ergin Noyan Q回収　面談	Project Engineer, Turkish Iron & Steel Works, Bukulum Sokak 22/16 Kukuke Sat Ankara	1979. 7.26 ~ 1980. 3.31	国立研究所へ転職	Culseren Sokak 22/3 Multepe Ankara	

備考：Remarks *(1) No. 1の Mr. Mustafa Ozden は現在 Director, ELTEM Ltd.,

3. トルコ (Republic of Turkey)

その他関係コース (Other Trining Courses at NITC)

No.	Name of the ex-participants	Post at the participated year	Year participated	Present post	Home address	Remarks
1	Mr. Suleyman Ceylan 面談	Engineer, Forging & Heat Treatment, MKEK, Kirikkle	1986. 1. 7 ~ 1986. 6.30	Heat Treatment Technology	Ovacik Mah. Zafer Cad. No.91/27 Kiri.	
2	Mr. Hakki Gumussoy 面談	Chief Engineer, Kirikkale Steel Plant, MKEK	1987. 1. 8 ~ 1987. 6. 7	Electrical Steel Making	Ulubatli Hasan cad No. 22 Kirikkable	
3	Mr. Mustafa Utas 面談	Production Engineer, General Directorate, MKEK Brass Plant	1986. 4. 3 ~ 1986. 9.28	Metal Finishing Engineering	Acirti Koyu Felahy Kayseri	
4	Mr. Igde Nihat	Manager, Machine Production Dept., MKEK Kirikkale	1981.10. 1 ~ 1982. 1.29	Tooling & Production	Yenimahalle Fabri Ebleri 16 B A5	
5	Mr. Gundiz Guler 面談	Quality Control Engineer, MKEK Kirikkale	1982. 1.21 ~ 1982. 7. 2	Heat Treatment Technology	Ovacik mah 908 Sok No. 13 Kirikkale	
6	Mr. Ferruh Inan	Chief Engineer, in Production, MKEK Kirikkale	1973. 1. 7 ~ 1973.12.20	Metal Finishing Engineering		
7	Mr. Semih Kirkizoglu	Chief Engineer, Machine Shop, MKEK Kirikkale	1979. 6.28 ~ 1980. 1.28	Welding Technology	MKEK Muhendiz Kirikkale	
8	Mr. Mehmet Yaman	Engineer, Welding Construction Workshop, MKEK Ankara	1981. 6.25 ~ 1982. 1.29	Welding Technology	Hale Sokakl 9/10 Maltepe Ankara	
9	Mr. Cengiz Senyen 面談	Production Engineer, MKEK Ankara	1982. 6. 3 ~ 1982.12.27	Welding Technology	Yidiz Blokari A/3Y enimahalle Ankara	
10	Mr. Ahmet Oney 面談	Chief Engineer, Steel Construction Work Shop MKEK Ankara	1983. 4. 1 ~ 1983.12.26	Welding Technology	Oba Sok Guven Apt. 8/17 Iccebeci Ank.	
11	Mr. Basri Akcasoy 面談	Welding Engineer, MKEK Kirikkale	1984. 4. 3 ~ 1984.12.27	Welding Technology	MKE Muhendisier Kirikkale	
12	Mr. Ergun Ataman 面談	Q. C. Engineer, MKEK Kirikkale	1987. 4. 9 ~ 1987. 8.28	Metal Finishing Engineering	Musrutiyet Cad. 49/13 Kirikkale	

(5)

SUMMARY REPORT OF THE TECHNICAL FOLLOW-UP TEAM FOR JICA EX-PARTICIPANTS IN METAL WORKS & ENGINEERING AND FOUNDRY ENGINEERING COURSES

1. Introduction

Being dispatched by the Japan International Coopperation Agency as part of its technical follow-up programme for the ex-participants in Metal Works & Engineering and Foundry Engineering courses, the team consisting of three members headed by Dr. Mitsuo Ninomiya,Senior Research Officer,Government Industrial Research Institute,Nagoya arrived in Ankara on 11th,October,1987 and conducted its follow-up activities for a period of 6 days.

The team has the pleasure to submit a summary report on the results of its study for the purpose of reference by the officials and engineers of the authorities concerned in the Government of The Republic of Turkey.

2. Team Members

(1) Team Leader,Technical Advisor,Foundry:	Dr.Mitsuo Ninimiya Senior Research Officer, Government Industrial Research Institute,Nagoya
(2) Technical Advisor, Metal Works & Engineering:	Mr.Yoshihiro Tanizawa Senior Research Officer, Industrial Research Institute, Aichi Prefectural Government
(3) Coordinator:	Mr. Kanji Takeuchi Senior Training Officer Nagoya International Training Center,JICA

3. Objectives

The dispatch of the team is primarily aimed at reviewing,assessing and evaluating the fruits of the training in Japan by visiting the organizations to which ex-participants belong, as well as through personal interview with ex-participants and their superiors.

The second aim of the team is to have a technical discussion meeting in order to find out the needs,effectiveness and evaluations of the training programme, and to make further improvements for the training courses.

4. Summary of the follow-up Activities & General Impression

We conducted;

- interview with responsible officials of the government organization for selection of participants'nominating department,
- interview with managers of the participants sending organizations,
- interview with ex-participants,
- seminar with ex-participants and their superiors, responsible engineers and staffs and also officials related to these fields.

Out of our discussion and observation,we could confirm the following;

(1) The concerned personnel interviewed highly ebaluate the results of the training in Japan, expecting at the same time the possible future further improvements of the training.

(2) Major reassons for figh evaluation of the training programme are;

a) not only top level plants of metal works and foundry but also smaller plants of them are included in the curriculum,

b) plant maintenance including spare parts and necessary parts production techniquess are included in the curriculum.

(3) Basic policy of candidate participant'selection has been made in Republic of Turkey:

a) high level engineers have been nominated,

b) nomination has been made ewxclusively to the people related to metal works and foundry,

c) such peersonnel in the position can give multiplier effect to metal works and foundry industries in the country.

We consider that the applicant selection (nomination) has properly and effectively been made in this country.

(4) Ex-participants are requested, upon their return to the country, to report about the contents of the training to their sending organization, and their knowledge and techniques obtained are appreciated.

(5) The organization selecting participants'nominating department considers that the follow-up activities of this time are significant

(6) All the ex-participants we interviewed have been trying their best for betterment of metal works and foundry by the use of obtained knowledge and techniques in the training in Japan.

(7) All participants we interviewed like to have technical information about the metal works and foundry in Japan.

(8) Metal works and foundry industries in this country is starting a lot of difficulties and problems have been under solution as Japan had before and great efforts is made in the past and for future. The team consider that these industries of this country will be in good expansion by thes peoples' efforts in near future.

Finally, the Team would like to express sincere appreciation of the Government of the Republic of Turkey,the organizations the team visited, the Embassy of Japan .

The 16th of October, 1987.

Mitsuo Ninomiya

Dr. Mitsuo Ninomiya
The Leader, the Follow-up Team for
ex-participants of the Metal Works
and Foundry courses

8. 参 考 資 料

(1) 面談者記録

(2) 訪問先でのスナップ

(3) フォローアップチーム派遣に係る研修事業部長書簡及び質問状

(4) 現地でのセミナー英文資料

(1) 面談者記録　　注：○印は当該コース帰国研修員、( )は他のコース

尚、記録不充分のため若干の記録もれあり。

No.	氏　　名	役　　職　　等
1	Mr. Saburo Tanaka	Minister, Embassy of Japan
2	Mr. Shogo Takeuchi	1st Secretary, 〃
3	Mr. Nobuo Toita	Director, JICA Tanzania Office
4	Mr. Shunsuke Iizuka	Deputy Director, 〃
5	Mr. Musoffe	Local staff, 〃
(6)	Mr. Charles Kazuka	Chairman, JICA Alumnai Ass.
(7)	Ms. D. Bantu	Ambassador & Director of Asia & Austrasia Div., Ministry of Foreign Affairs
8	Mr. M. Mwamanenge	Foreign Service Officer, 〃
(9)	Mr. Y. Mwailolo	General Manager, Tanzania Shoe Co.
10	Mr. N. Tumbo	Director, Manpower Dev. 〃
11	Ms. M. Mtalo	Senior Training Officer, 〃
⑫	Mr. A. Yassin	Workshop Sptd., 〃
⑬	Mr. R. Mwakalukwa	Senior Workshop Foreman, 〃
14	Mr. I. Kabogo	Social Affairs, 〃
15	Mr. A. Shirato	Social Affairs, 〃
16	Mr. C. Shah	Divisional Manager, Pipeco Div., Aluminum Africa
17	Mr. H. Simba	Personnel Officer, 〃
⑱	Mr. W. Ndunguru	Maintenance Officer, 〃
19	Mr. S. Gowrishankar	Works Manager, Steelcast Div., 〃
20	Mr. P. Maheshwary	General Manager, 〃
㉑	Mr. T. Ngonyani	Senior Production Engineer, 〃
22	Mr. Godric Matitu E. L.	Instructor, SIDO, Mbeya
23	Mr. S. A. Tuma	Regional Manager, SIDO, Moshi
24	Mr. Abbas M. Kimario	Asst. Foundry Manager, SIDO, Moshi
25	Mr. A. B. N. Tatunji	R. T. O., SIDO, Moshi
26	Mr. C. M. Njige	Manpower Development & Administ. Manager, Ubungo Farm Implements Co.
㉗	Mr. C. J. S. Massawe	Workshop Engineer, 〃
28	Mr. P. Mwambu	Senior Maintenance Engineer, 〃
29	Mr. S. Sapi	Workshop Engineer, 〃

No.	氏　　名	役　　職　　等
30	Mr. J. Kaganda	Production Engineer, Ubungo Farm Implements Co.
31	Mr. C. Moshi	Manpower Dev. Officer, 〃
32	Mr. M. Mwaiseje	Maintenance Engineer, 〃
33	Mr. M. Wima	Design & Dev. Engineer, 〃
34	Mr. E. Masanja	Design & Dev. Engineer, 〃
35	Mr. A. M. Semaya	Chief, Manpower Development, 〃
36		Tanzania Railways Corporation
(37)	Mr. S. Ulaya	Manpower Dev. Manager, 〃
38	Mr. M. Kabipe	Asst. Chief Mechanical Eng., 〃
㊴	Mr. W. A. Riwa	Workshop Manager, 〃
㊵	Mr. E. T. Rwamuyagaza	Instructor, Metal Technology, Zambia Railway Authority
㊶	Mr. Mwakatumbula N. Charles	Project Implementation Engineer,
42		National Dev. Corporation
㊸	Mr. M. Omari Jingili	Asst. Consultant Grade I., Indust. Studies & Consulting Organization
44	Mr. N. S. Mwakifulefule	Mechanical Engineer, 〃
45	Mr. H. H. Iddi	General Manager, State Motor Corp.
㊻	Mr. Leodegar Tenga Chilla	Operation Officer, 〃
㊼	Mr. Lazaro Semindu	Head of Mechanical Eng. Dept., Ministry of Comm. & Works
48	Mr. Mitsuo Kinjo	Director, KIDC
49	Mr. Akihiko Noguchi	Coordinator, KIDC
50	Mr. Masayasu Iimori	Expert (Factory Management) KIDC
51	Mr. Tetsuo Fujisaki	Expert (Forging), KIDC
52	Mr. Toshio Nomura	Expert (Foundry), KIDC
53	Mr. Hiroyoshi Yokota	Expert (Machining), KIDC
54	Mr. Katsuhisa Okuda	Expert (Machining), KIDC
㊺	Mr. N. S. Materu	Director, KIDC Counterpart
56	Mr. Elijohnson Mchome	Accountant,
㊼	Mr. Edward Mfinaga	Chief Machine Shop, 〃
㊽	Mr. Casper Makiluli	Deputy Chief, Machine 〃
59	Mr. Ally S. Nwashi	Foundry Shop
60	Mr. Zambin Nghungulwa	Ceramic Workshop
61	Mr. Peter Mushi	Chief, Briquette Shop, 〃
62	Mr. Nakamura	Member, JOCV (Surveying)

No.	氏　　名	役　　職　　等
63	Mr. Itakura	Member, JOCV (Underground Cable)
64	Mr. Tokaji	Member, JOCV (Telephone)
65	Mr. Ozawa	Member, JOCV (Automoblie Servicing)
66	Ms. Aoyagi	Member, JOCV (Coordination works)
67	Ms. Yamaji	Member, JOCV (Medical Inspection)
68	Mr. Morioka	Member, JOCV (Rice cultivation)
69	Ms. Itagiri	Member, JOCV (Rehabilitation)
70	Mr. Suzuki	Member, JOCV (Tel. exchange) TPCD
71	Ms. Inoue	Member, JOCV (Medical service)
72	Mr. Ichikawa	Member, JOCV (Tel. exchange) TPCD
73	Mr. Itoh	Teacher, Japanese students
74	Mr. Katoh	Staff, C. Itoh
75	Mr. Michio Hamano	Minister, Embassy of Japan
76	Mr. Toru Kieuchi	1st Secretary, 〃
77	Mr. Atsushi Fukasawa	1st Secretary, 〃
78	Mr. Baros Gokova	Local Attanche, 〃
(79)	Mr. Engin Oruc	Steel Sector, SPO
80	Mr. Gunay Gungen	Deputy General Director, MKEK
81	Mr. Burlan Ersan	Director, MKEK Ankara
㊽	Mr. Sinan Kalyoncu	Asst. Director, 〃
㊾	Mr. Orhan Buyukbay	Asst. Director, 〃
㊿	Mr. Hikmet Tekmen	Q. C. Manager, 〃
(85)	Mr. Osman Durak	Engineer, 〃
86	Mr. A. Selquk Akata	Enginerr, 〃
(87)	Mr. Cengiz Senyen	Engineer, 〃
(88)	Mr. Ahmet Oney	Engineer, 〃
89	Mr. Zager Cumharcu	Engineer, 〃
90	Mr. Ahmet Suat Bozdemir	Engineer, 〃
91	Mr. Behcet Elbistanlioglu	Engineer, 〃
92	Mr. Kebir Mango	Engineer, 〃
93	Mr. Rahmi Aydin	Engineer, 〃
(94)	Mr. Mustafa Oguz	Engineer, 〃
(95)	Mr. Ahmet Ozalp	President, MITA
96	Mr. Nusret Tekmen	Engineer, Asil Cerik

No.	氏　　名	役　　職　　等
(97)	Mr. Ergin Noyan	Research Officer, National Instit.
98	Mr. Atilla Sogut	Deputy Director, Foundary Center, SIDO
(99)	Ms. Dilara Yusei	System Maintenance Specialist, 〃
100	Mr. Mehmet Yilmaz	Engineer, MKEK Kirikkale
(101)	Mr. Hakki Gumissoy	Engineer, MKEK 〃 (Steel Plant)
102	Mr. Nimet Dogan	Head, Cr Plating, 〃
103	Mr. Sahim Gshbulut	Incharge, Finishing, 〃
(104)	Mr. Mustafa Udas	Head Eng., Production 〃
105	Mr. Iihan Tozendemir	Engineer, 〃
106	Mr. Osman Buyukkopru	Engineer, 〃
107	Mr. Suleyman Bulut	Engineer, 〃
(108)	Mr. Gunduz Guler	Engineer, 〃 (Steel Plant)
(109)	Mr. Ergun Ataman	Q. C. Engineer, 〃
(110)	Mr. Mustafa Ozden	Director, ELTEM
111	Mr. Mitsuhiro Ohtani	Deputy General Manager, Marubeni
112	Mr. Birant Canselen	Machinery Dept., 〃

(2) 訪問先でのスナップ

写真1　タンザニア外務省（窓口機関）にて

Ms. D. Bantu, Ambassador & Director of Asia & Austrasia Div. 他と面談（帰国研修員、東京、写真正面）

写真2　トルコ国家企画庁（窓口機関）鉄鋼部門担当官Mr. Engin Oruc（帰国研修員、名古屋）と面談（左から2人目）

写真３　ダレスサラームにてセミナーを実施

（於、Institute of Finance Management の Council Chamber ）

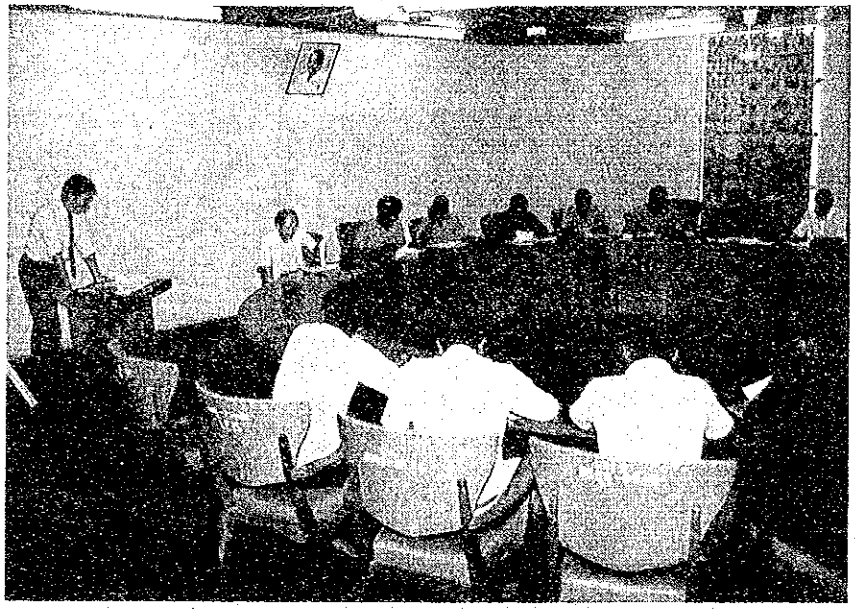


写真４　ダレスサラームにてセミナーを実施

（於、Institute of Finance Management の Council Chamber ）

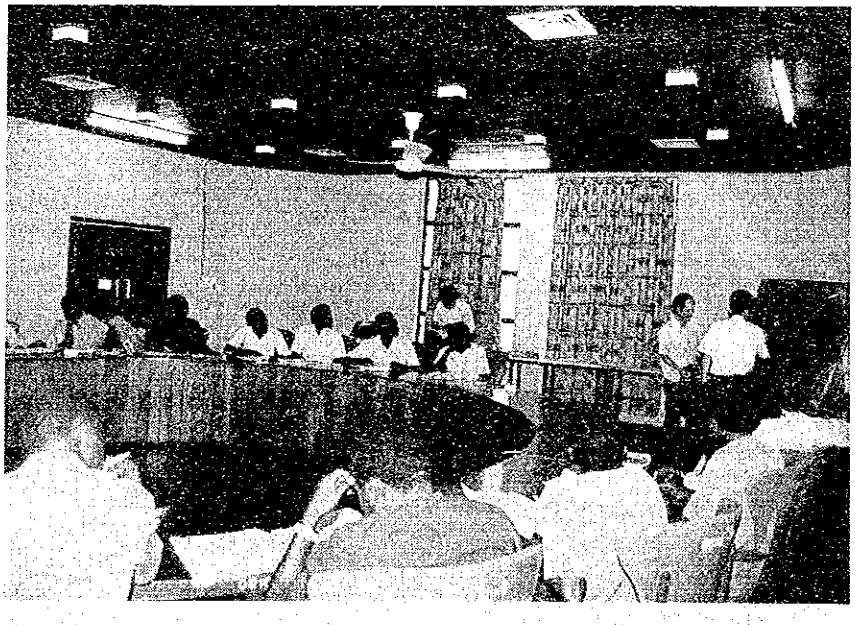


写真５　モシのＫＩＤＣにてセミナーを実施（出席者１０名）

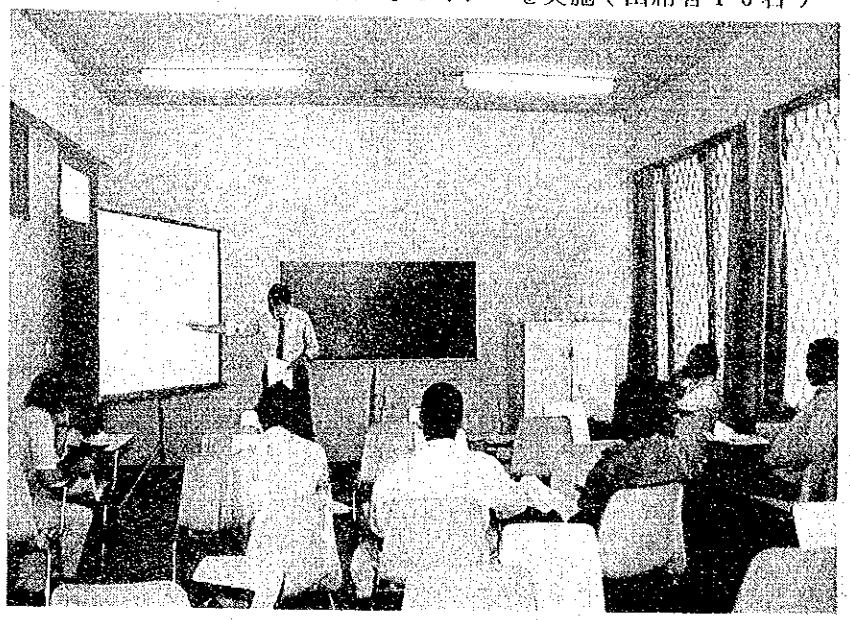


写真６　モシのＫＩＤＣにてセミナーを実施

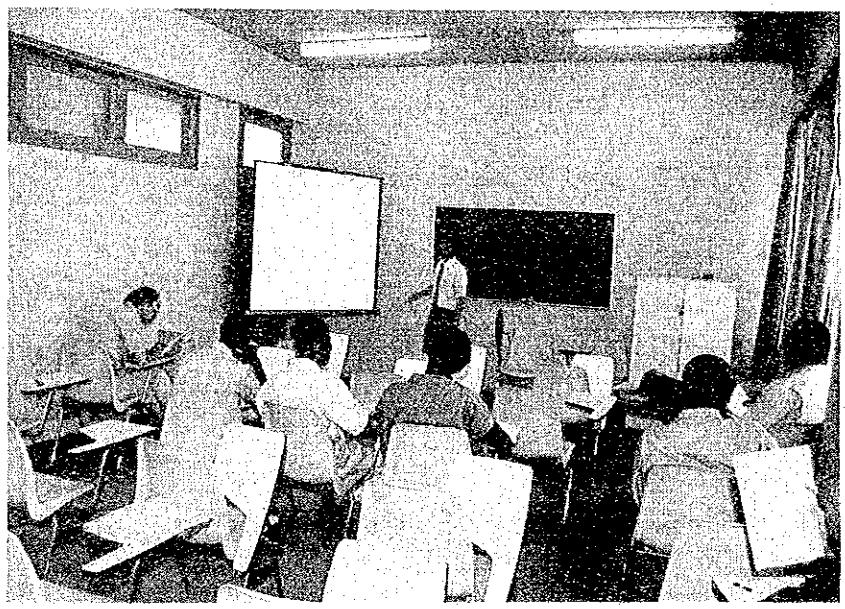


写真７　ＭＫＥＫアンカラ本社にてセミナーを実施（出席者約２０名）

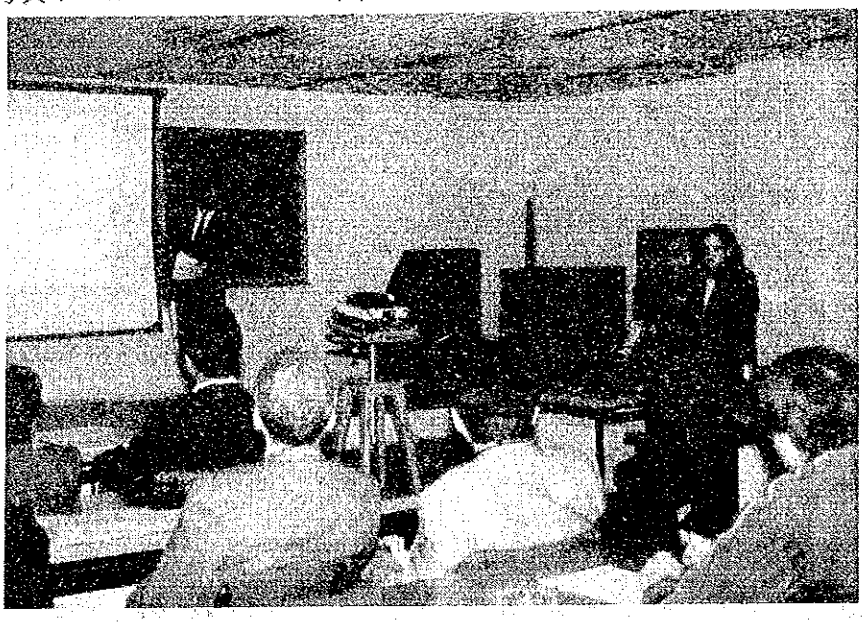


写真８　ＭＫＥＫアンカラ本社にてセミナーを実施（出席者約２０名）

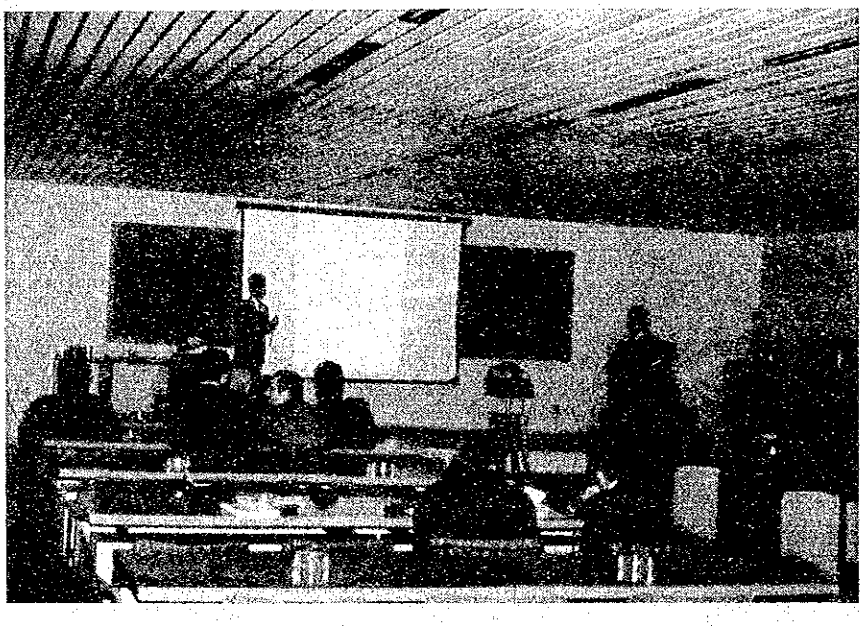


写真９　ＭＫＥＫクルカレ工場にてセミナーを実施（出席者約２７名）

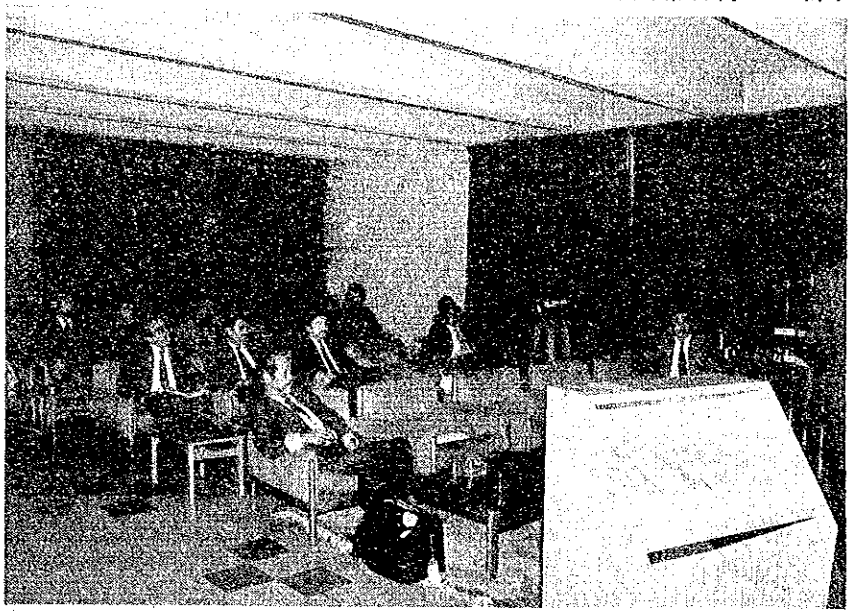


写真１０　ＭＫＥＫクルカレ工場にてセミナーを実施（出席者約２７名）

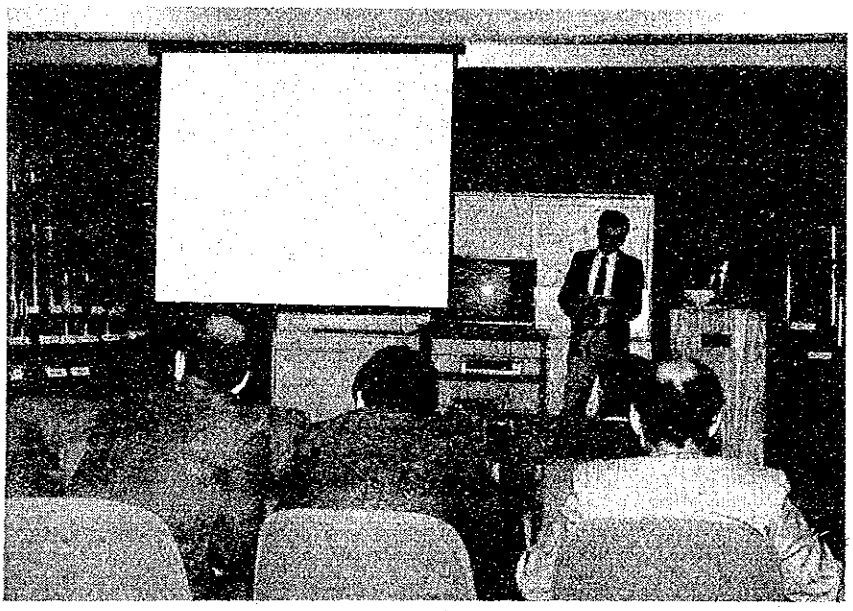


写真１１　ＪＩＣＡ協力隊員、タンザニア事務所所長宅にて

写真１２　同ＪＩＣＡタンザニア事務所宅にて（戸井田所長挨拶）

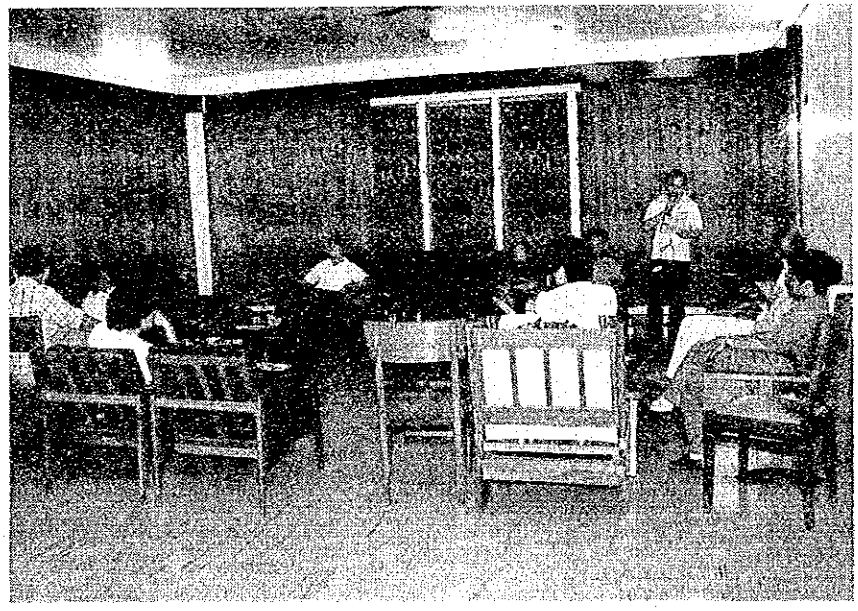
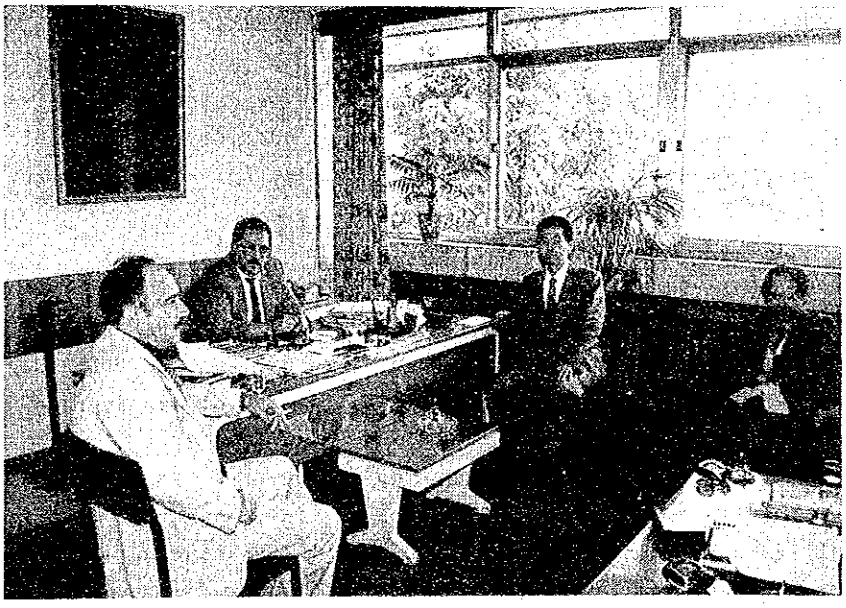


写真１３　在トルコ日本大使館（池内一等書記官右手前、深沢一等書記官左手前）

写真１４　ＭＫＥＫ副理事長（中央）アーメット社長（帰国研修員、左手前）



(3) フォローアップチーム派遣に係る研修事業部長書簡及び質問状

JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)
P.O.Box 216 MITSUI BLDG
2-1,Nishi-Shinjuku,Shinjuku-Ku Tokyo
160 JAPAN

Date: July 28 ,1987

Dear Sir,

I am writing to you with the hope that you are actively engaged in your work in excellent health and in high spirits since you returned to your country after training in Japan.

It is a pleasure for me to inform you that the Japan International Cooperation Agency is doing utmost efforts to expand and improve its technical training program yeaar after year. We hhave accepted a total of 57,942 participants from developing countries during the period of 1954 —March 1986. In fiscal 1987,we plan to accept about 4,500 participants and conduct 226 group training courses and seminar.

In programming future training course, we endeavour to place emphasis not only on increasing the number of participants to meet the augmenting requests from developing countries but also on improving the quality of training programs.

For this purpose we would like to know how and to what extent the ex-participants in your training courses/seminars are making use of knowledge and technology acquired in Japan and to bear what suggestion and recommendation they have for the betterment of our courses.

It is also important to brush-up and up-grade what you leaned in Japan.Therefore,JICA dispatches technical follow-up team to participating countries every year to provide you with information on latest developments in your field of activity.

This year JICA has decided to send to your country a follow-up team in the field of your experience. Details of its schedule and the questionaire are enclosed herewith.

We shall be grateful if you could extend your kind cooperation to our visiting team during its stay in your country.

We are really looking forward to seeing you.

Yours sincerely,

for H. Wakatsuki

Kazuo Okabe,
Director,
Training Affairs Department,
Japan International Cooperation Agency

FOLLOW—UP SURVEY AMONG GRADUATE OF TRAINING PROGRAMS

at

NAGOYA INTERNATIONAL TRAINING CENTRE (NITC)

JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)

No.73,2—chome Kamenoi,Meito —ku,Nagoya 465

Japan

Q U E S T I O N A I R E

I. Personal Data:

1. Name in Full: _____ Age_____

(Please underline family name)

2. Name of institution wherre currently employed:_____

_____

Adress:_____

(Street and Number) (City) (State/Country)

_____

(Zip code) (Cable/Telex) (Telephone)

3. Current home adress:_____

(Street and Number) (City)

_____

(State/Country) (Zip code) (Telephone)

4. Maritus status:_____single____married_____others,specify_____

Age and sex of children_____

II. Educational data:

5. Education/Training(Degree/non-degree)Before attending training at JICA

Name, education/ training inst.	Location of instituion	Years attended from～to	Certificate/Diploma/ Degree & Major in

6. Education/Training(Degree/non-degree)after attending training at JICA

Name, education/ training inst.	Location of instituion	Years attended from～to	Certificate/Diploma/ Degree & Major in

III. Employment/Work Experience:

7. Current position and responsibility: Please describe briefly your current position and responsibility:

8. Nature of present job: Indicate by an(x)mark in the corresponding box.

Activities	Full aprox. 85%	Major aprox. 75%	Partly aprox. 50%	Slightly aprox. 25 %
Research				
Instruction				
Extension				
Administration				
Others, specify				

9. To what extent were you aware of the purpose and the training course before you came to Japan?

Purpose	Full aprox.85%	Major aprox.75%	Partly aprox.50%	Slightly aprox. 25 %	Non 0%
Program					
Instruction					

10. To what extent did the training program correspond to your initial expectation(s)?

	Full aprox.85%	Major aprox.75%	Partly aprox.50%	Slightly aprox. 25 %	Non 0%

Please explain your answer briefly

11. To what extent can you apply the knowledge/skills etc. acquired through the JICA training to your present job?

	Full aprox.85%	Major aprox.75%	Partly aprox.50%	Slightly aprox. 25 %	Non 0%

Please explain your answer briefly

12. If there is any personal improvement in your job/work after JICA trasining, please indicate below;

_____(no) improvement

_____(yes) improved

If,yes,please check below where applicable;

_____ work conditions

_____ responsibility

_____ for future prospects

_____ salary wise

_____ for otherzbetter)Job

_____content of work

_____professional recognition

_____international contanct

Please explain briefly:

13. To what extent the JICA training could contribute to the improvement mentioned in the previous question;

_____ a lot _____ somewhat ____ not at all

Please explain briefly:

14. Which part of your training at JICA was most useful to you in relation to your subsequernt position and responsibility?

15. What do you consider to be the most important obstacles in the performance of your present job?

Check 4 or less in each row below;

Lack of

_____ trained personnel
_____equipment
_____funds
_____foreign experts
_____research facilities
_____career perspective
_____support of supervisor
_____technical literature
_____markets
_____national training institutes
_____transport facilities
_____foreign currency

_____ other,specify;

_____

Various constraints:

____economic situation
____poor management
____too much foreign influence
____political situation
____energy crises
____brain drain
____promotion structure
____no in seervice- training
____poor maintenance of equipment

_____ other,specify;

_____

15. Request or suggestion to JICA,if any;

_____Retraining

_____JICA publication

_____Technical informations

_____others,please mention below;

Thank you very much for your cooperation.

This is a questionaire for getting an idea of foundry and machining industry condition in your country and your kind cooperation for giving the team a reply would be very much appreciated.

I.General information in your country

1. No. of foundry plants and production amount per annum

a) big scaler(employee:more than 100) _____ in number

b) medium (30 to 100) _____ in number

c) small (less than 30) _____ in number

	No. of plants	production/year
cast iron		
cast steel		
non-ferrous		

2. Demand & supply condition of castings

a) demand is more than supply_____

b) demand is less than supply_____

c) demand & supply is balanced_____

3. Governemnt development plan on basic metal industries and role of foundry

_____

_____

4. Number and names of national or local government institute for research and development in foundry field:

a) name & organization you use

b) function & services of the above

c) instruments & facilities(melting,molding,testing etc.)

d) research theme and training programme

5. Your organization is getting technical know how etc. from overseas?

YES_____ NO_____

also technical experts from overseas yes_____ no_____

6. Average price of materials and products in your country if possible

cast iron _____ per ton
cast steel _____ per ton
Cu-alloy casting _____ per ton
Al-alloy casting _____ per ton
pig iron _____ per ton
steel scrap _____ per ton
Cu-alloy scrap _____ per ton
Al-alloy scrap _____ per ton
foundry sand _____ per ton
bentonite _____ per kg
water glass _____ per kg
CO-2 gas _____ per kg
furan resin _____ per kg
phenol resin _____ per kg
coke _____ per kg
diesel oil _____ per kg
gasolin _____ per l
electric power _____ per KWH
salary of engineer(average) _____ /month
wage of ordinary worker _____ /month
food expense per man per month _____
rate of currency _____ to US 1 dollar

II Detal despription of your organization

1. chart of your organization (please use other paper)
2. number of employees

	No. in total	Np. in foundry
engineers		
workers		
others		

3. Type ofcasting and production capacity(ton/year)

	capacity	actual
cast iron		
cast steel		
Cu alloy		
Al alloy		
others		

4. Melting equipment and condition

cupola _____ inner diameter _____ ton/hr___ units

coke ratio__% blast volume___m3/min blast pressure__mmAq

induction furnace _____ No. of units

capacity_____ KW_____ frequency_____

lining materials_____ and life_____

electric arc furnace _____ No. of units

capacity_____ power_____ KVA_____ tap to tap_____

lining_____ roof _____ wall_____ bed

(materials and life)

crucible furnace_____ No. of units

capacity_____ fuel_____ life_____

other furnace

5. charging ratio_____%steel scrap_____%pig iron_____%others

6. molding sand,molding method

deposit area of molding sand_____

grain size of sand _____

molding process(green,selfhardening,etc.) hand/machine molding

7. tapping and pouring temperature of each metal

8. yield ratio of each metal(=product weight/total pouring weightx100

9. testing and inspection for daily production(yes or no)

sand strength_____ hardness_____ permeability_____
moisture_____ clay content_____ others_____
inspection of casting
mechanical testing_____ microscopic_____
chemical analysis_____ non destructive _____
others_____

10. casting defects(type of defects and their ration%

11. major problems in your shop and their background

	conditions	major reasons
technical		
materials		
equipments		
markets		
personnel		
others		

12 type of machine tools you have

machine tool	No. of units	year made & maker	worker /unit
drilling			
lathe			
milling			
NC attachment			
machining center			
CAD systems			
CAM system			

13 kind of cutting tool material you have

tool material	high speed steel	carbide tool	others	total
%	%	%	%	100 %

14 major problems in your shop and their background

	conditions	major reasons
machine tool		
cutting tool		
work material		
personnel		
others		

15 any others

Thank you very much for your cooperation

(4) 現地でのセミナー英文資料

Seminar Material of JICA Follow-Up Team (Foundry Engneering)

" RECENT MOLDING TECHNIQUES "

by Dr. Mitsuo NINOMIYA

Senior Research Officer
Foundry Engineering Division
Government Industrial Research Institute, Nagoya
Agency of Industrial Science and Technology
Ministry of Internatinal Trade and Industry
JAPAN

APPEARANCE OF MAIN MOLDING PROCESSES

	Past	→ 1960 (Mass)	→ 1970 (Quality)	→ 1980 (Enviroment)	→ Future
Small :	Naturally bonded sand	→ Synthetic green sand	→ High pressure molding	→ V-process F-process *	
Medium : & Large	Dry sand mold	→ Inorganic self-hardening mold	→ Organic self-hardening mold *		
Core :	Oil sand	→ CO_2 sand	→ VRH-process *		
		Shell sand	→ Cold box process *		
Precision :	Lost wax process	→ Ceramic solid process			
		Full mold	→ Evapolative pattern casting *		

Tabl 1. Mixing Ratio of Frozen Sand Mold

Material	Sand	Water	Additive	Liquid Nitrogen(-196°C)
wt. part	100	4	0 ~ 2	30 ~ 50

Table 2. Mold Properties at Room Temperature

Mold	Green		Frozen	
Bentonite(%)	2	6	0	2
Hardness	50	80	94	96
Comp. Strength (kgf/cm^2)	0.1	0.5	35	45
SSI (%)	50	75	92	94
Permeability	130	120	180	170

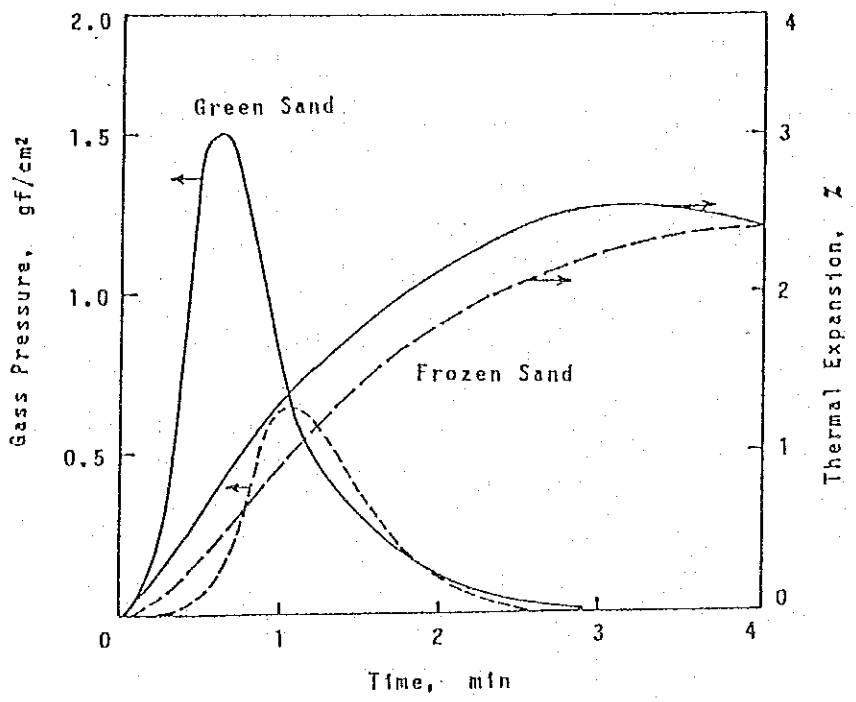


Fig 1. Mold Properties of Frozen and Green Sands at High Temperature

Table 3. Composition of Self-hardening Molds

Process	Binder	Hardener	Catalyst	Remark
Furan	Furan resin 1	Acid 0.5	---	Alkaline Impurities Collapsibility in Al
Linocure	Alkyd resin 1.5	Isocianate 0.3	Co-Naphthenate 0.08	Smell
Pep-set	Phenol resin 1.2	Isocianate 1.2	Amine Solution 0.2	Smell
Alpha-set	Phenol resin 2	Ester(1) 0.5	---	No S,P (Low Strength)
Ester	Water glass 3	Ester(1) 0.5	---	Poor Collapsibility

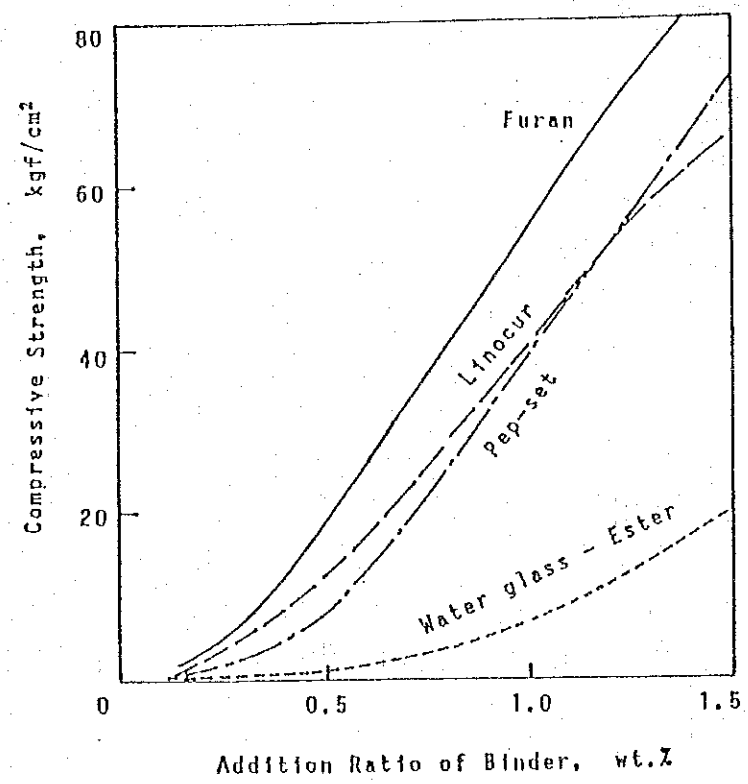


Fig 2. 24hr-Strength of Selfhardening Molds

Table 4. Ratio of Retained Strength of Self-hardening Molds Dipped in Solution for 5 Seconds

Process	Water	Methanol
Furan	82%	50%
Linocure	40%	10%
Pep-set	79%	45%
Water glass	38%	98%

Table 5. Composition of Cold Box Processes

Process	Binder	Catalyst	Gas	Remark
Isocure	r-Phenol resin 1	Isocianate 1	TEA 0.1	Neutralization (with acid)
Hardox	Furan resin 1	Peroxide 0.5	SO_2 0.5	Neutralization (with alkali)
Beta-set	r-Phenol resin 2	---	Ester(g) 0.5	Neutralization (with acid)
Lime	r-Phenol resin 3	$Ca(OH)_2$ 3	CO_2 3	

Table 6. Composition of CO_2 and VRH Processes

Process	Water glass	CO_2 gas	Atmosphere
CO_2	5	5	Air
VRH	2.5	1	Vacuum

VRH = Vacuum Replace Hardening

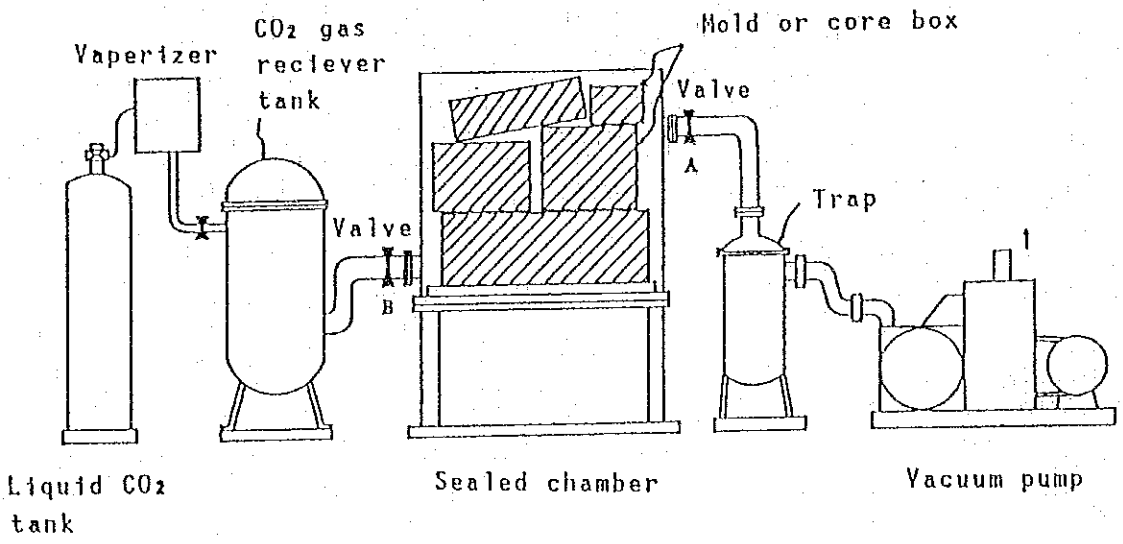


Fig 3. System of VRH Process

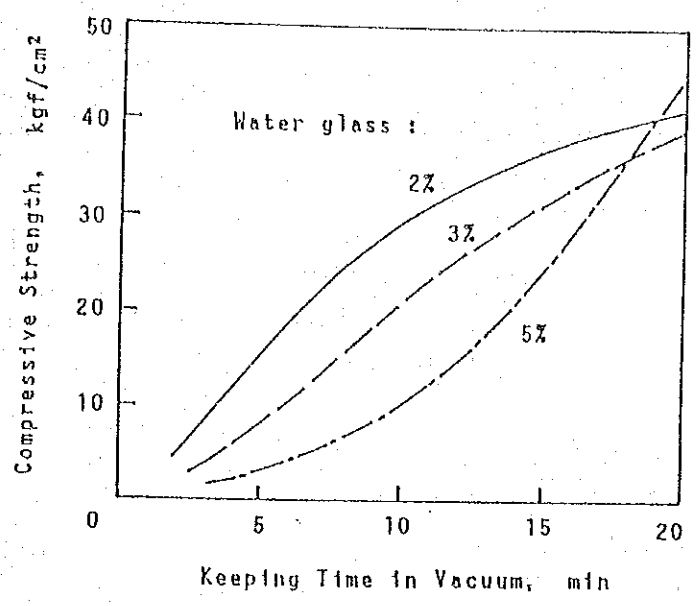


Fig 4. Effect of Keeping Time in Vacuum (20 Torr) on the Strength of Water glass bonded Sand Molds

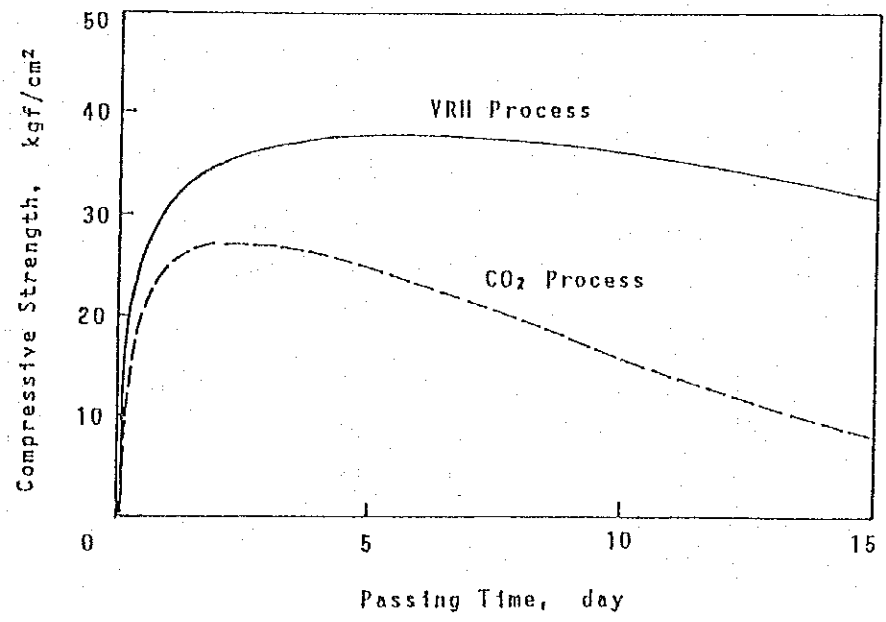


Fig 5. Strength Change after Leaving in Air Atmosphere

Full Mold Process

1958 H.F. Shroyer (Polystyrene Pattern)

1964 Dr. A. Wittomoser (Magnetic Process)

1980 ~

G.M. (Lost Form Process)

Ford (EPC Process)

Teksid, Fiat (Poli Cast Process)

Table 7. Density of Foamed Polystyrene Pattern

Metal	Temperature(°C)	Density(g/l)	Expansion(times)
Aluminum	800~700	24~26	40
Cu-Alloy	1250~1050	20~22	45
Gray Iron	1450~1350	18~20	50
Steel	1650~1590	16~18	55

Shrinkage of the Foamed Pattern = 0.4 ~ 0.5 %

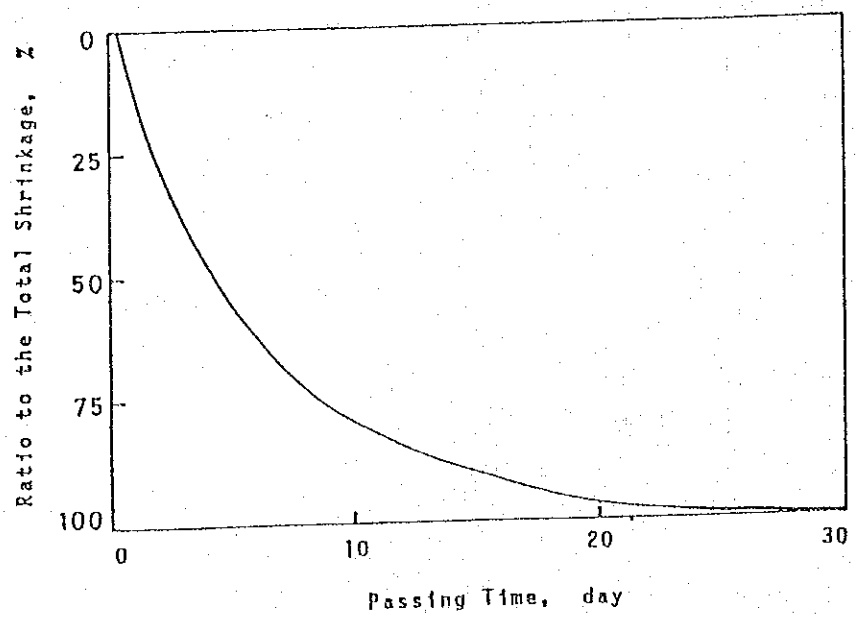


Fig 6. Dimentional Change of Foamed Polystyrene Pattern

Evaporative Pattern Casting (EPC) Process

1. Pattern Coating

Silica Flour(270 mesh), Water Solvent, Enough Permeability,

Brushing or Dipping, Drying(Air or Oven:60°C X 3 h)

2. Molding Sand

Dry Sand, No Binder, Vibration or Floating,

Vacuum Suction (Mold is sealed with Plastic Film)

3. Casting Design

Top Pouring, Larger Ingate, Smaller Riser,

Thickness of Casting = 5 mm ~ 1 m

4. Pouring

Higher Pouring Temperature,

Fast and Smooth Pouring

Modified EPC Process

1. Replicast Process

Steel Castings Research And Trade Association, UK

Foseco International Ltd.

1) Replicast FM

Similar to EPC Process but no Plastic Film during

Vacuum Suction

2) Replicast CS

Similar to Lost Wax Process,

Polystyrene Pattern is burned in a Furnace(1000°C)

before Pouring Metal

2. Polylok Process

John Deere Co., USA

Combination of Polystyrene Pattern and Sand Core

Recent Improvement of Cutting Technology in Japan

October 1987

Follow-up Team for Ex-Participants of the Group Training Courses
of Metal Works & Engineering and Foundry Engineering

Yoshihiro Tanizawa
Senior Research Officer
Mechanics & Electronics Department
Industrial Research Institute,
Aichi Prefectural Government

1 Introduction

Machining consists of major elements, peripheral instruments, and engineering. The relationship among those elements is illustrated in Fig 1.

The major elements and peripheral instruments are visible and purchased. (They are called "Hard Ware".)

However, engineering can not be seen and purchased. They are called "Soft Ware".

Sometimes technical data are presented by cutting tool manufacturers, but those data are obtained under the optimum conditions. Usually, we don't perform machining work under the optimum conditions and there are different machine specifications or dimension of work materials. Therefore we can not use those data for actual practice.

Those data ought to be used as a goal or as reference for cutting deciding conditions.

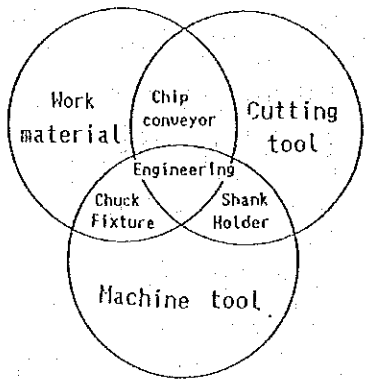


Fig 1 Constitution of Machining Technology

-Work material-

Harder materials are more often used as work materials in order to improve strength. The selection of work materials is made under the authority of a designer.

Then, it is an important work by machining engineers that the selected materials are processed efficiently with the required accuracy.

-Cutting tool-

In general, hardness it is desirable that of cutting tools is three times more than that of work materials. And many kinds of tool materials have been introduced.

-Machine tool-

Machine tools have been improved and developed for the purpose of upgrading accuracy, rigidity and productivity.

Especially in Japan, Numerical Control machines have been brought into common use lately.

As mentioned above, productivity increases very much and advanced technology leads to reduce machining cost.

Trend of machining cost with ratio by turning is shown in Table 1.

The depreciation of machine tool increases and cutting tool cost decreases.

Labor cost and the others (material cost etc.) change very little.

These are clearly understood from the table.

Now, I would like to introduce a few typical examples about the progress and feature of those elements in Japan.

Table 1 Trend of Machining cost ratio by Turning

Year / Factor of Cost	'55 %	'70 %	'75 %	'85 %
Cutting Tool (include regrinding)	30	10	5	3
Depreciation of Machine Tool	20	40	45	50
Labor (direct, & indirect)	35	35	35	34
others (Material, Electric power, etc.)	15	15	15	13
Total	100	100	100	100

2 Progress of cutting tool

The development of tool materials makes it possible to cut harder work materials at faster cutting speed. Fig 2 shows the transition of tool materials and permissible cutting speed.

The seven kinds of tool materials are ordinarily used in Japan.

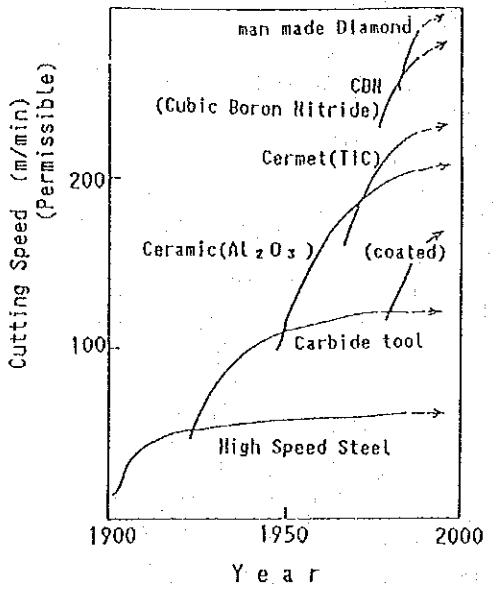


Fig 2 Advancement in tool materials

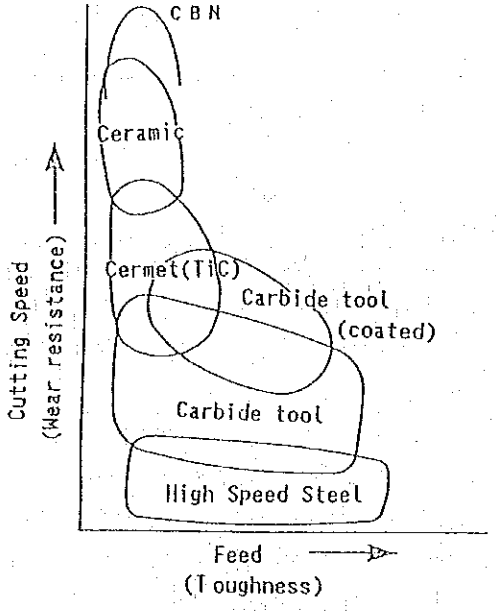


Fig 3 Cutting tool materials and there Cutting conditions

In general, those cutting tools on the come into practical use some years later than the year of development. For instance, carbide tools were practically introduced around 1950.

Fig 3 shows the relationship between cutting condition and cutting speed.

In general, harder tool materials are excellent on wear resistance. However, those materials are not good for toughness.

Selection of tool materials is made in view of work material hardness, machine tool specifications (dynamic accuracy, rigidity, No. of revolution), requirements of machined accuracy and cutting condition.

Table 2 shows the trend of proportion in cutting tool materials used for turning operation. One should note that the use of carbide tools remarkably increases. Relatively, the use of high speed steels greatly decreases.

Coated tools by ceramics(TiC) have been increasing recently to improve wear resistance by coating on the surface of carbide tool or high speed steel.

Recently, man-made diamond for light-duty cutting for non-ferrous metals

Table 2 Ratio of Cutting Tool Materials used for Turning

Year / Tool Material	'65 %	'80 %	'85 %
Carbide tool	59	45	41
// coated	—	28	33
Ceramics Al_2O_3	—	20	20
Cermet TiC	—	2	3
High Speed Steel	37	5	2
CBN, man made Diamond	—	—	1
others	4	—	—
Total	100	100	100

and cubic boron nitride (CBN) for quenched steel have been used harder than HRC 60. The annual production of cutting tools in year of 1985, in Japan is shown in Table 3. High speed steel is used for drill, end-mill, gears cutter, sawing blade and etc., because those machining works are operated at lower cutting speed. Man-made diamond and CBN are utilized for grinding wheel and it shows a rapid rate of increase.

Table 3 Total Production of Cutting Tool ('85 in Japan)

Tool Material	Production billion Yen	Tool or Machining
Carbide, Ceramics Cermet	153 (46.2%)	Turning Face milling
High Speed Steel	103 (31.1%)	Drill, Broach Gear cutter etc.
man made Diamond, CBN (include grinding wheel)	75 (22.7%)	Grinding wheel (throw away tip)

3 Progress of machine tool

Machine tools have been improved in the sense of accuracy, rigidity and higher revolution of spindle, with the improvement of cutting tools and the utilization of capable new tool materials.

The latest trend is the increase of NC machines. The proportion of NC machines to conventional machines in production is about 65% to 35%.

Since, NC machine is expensive, the number of NC machines is less than 30%.

Today, factory automation (FA) is a topic in Japan.

Computer aided design system (CAD) and computer aided manufacturing system (CAM) have been used very often lately and also industrial robots have been used in production lines.

Table 4 shows the comparison of five countries, productions in factory auto mation machines.

Table 4 Production of Factory Automation's Machine

Machine Element country	N.C.Machine Tool	Industrial Robot	CAD/CAM	Total
U.S.A.	11.4 (31.3) (30.1)	3.3 (9.1) (26.8)	21.7 (59.6) (68.9)	36.4 (100) (44.6)
Japan	14.8 (54.4) (39.1)	6.5 (23.9) (52.8)	5.9 (21.7) (18.7)	27.2 (100) (33.3)
F.R. German	6.2 (65.3) (16.4)	1.3 (13.7) (10.6)	2.0 (21.1) (6.3)	9.5 (100) (11.6)
United Kingdom	2.6 (57.8) (6.8)	0.6 (13.3) (4.9)	1.3 (28.9) (4.1)	4.5 (100) (5.5)
France	2.9 (70.7) (7.7)	0.6 (14.6) (4.9)	0.6 (14.6) (1.9)	4.1 (100) (5.0)
Total	37.9 (46.4) (100)	12.3 (15.1) (100)	31.5 (38.6) (100)	81.7 (100) (100)

unit : 100 million $ (U.S.A.), (%)

Factory automatic machines are manufactured as shown in Table 4 and it's proportion of U.S.A. to Japan and to E.C. is 45% to 33% to 22%.

In the production of CAD/CAM systems, U.S.A. accounts for about 70% of the gross and Japan produces more than 50% of total industrial robots manufactured in 5 countries.

4 Progress of peripheral instruments

The above-mentioned development and improvement, increase productivity and machining accuracy. The machining process composes three types of operations.

The first is actual cutting operation.

The second is relative operation, which composes handling of work materials (chucking, unchucking and transfer), checking dimensions, and tool exchange with alignment. Thirdly, there is the other operation, such as meeting, waiting (material or tool) and loss. These operations require a certain time.

Not only machine tools but also peripheral equipments are essential for higher productivity by shortening such operation time.

Hydrauric pneumatic chucks cut down the time of work material handling. Also quick-chuck reduces the time of cutting tool exchange and alignment. A lot of NC machines have automatic tool changers. Auto-loader, and industrial robots also save material handling time.

In general, oparation time of a day by turning work with a conventional lathe in Japan gives such a time ratio; 25% for net cutting time, 45% for relative operation and 30% for the other operation.

Table 5 shows net cutting time and years of introducing each instrument.

Table 5 Trend of net cutting time by turning
(conventionl lathe)

year	net cutting time (min.)	introduction of instrument	notice (reduction of time)
'55	→60	Scroll Chuck	chucking, unchucking work alignment
'65	→80	built in Brake	idle running
'75	→100	centrized grinding of cutting tool	regrinding loss time
'85	→120	Throw away Tip	tool exchange tool alignment

Work time is 480 min./day

5 Advancement in machining technology

Machining technology is closely related to improvement of those elements as previously mentioned. Improvement of cutting tools leads to faster cutting and it is necessary to obtain improvement of machine tools as well.

The other operation time is reduced by the manegement control techniques such as production, tooling, quality, process and inventory.

There has been much demand for higher accuracy of machining since before Fig 4 shows year and achievable accuracy of machining.

The scope of today's precision machining will be classfied into ganeral machining in the future.

That is clearly seen from the figure.

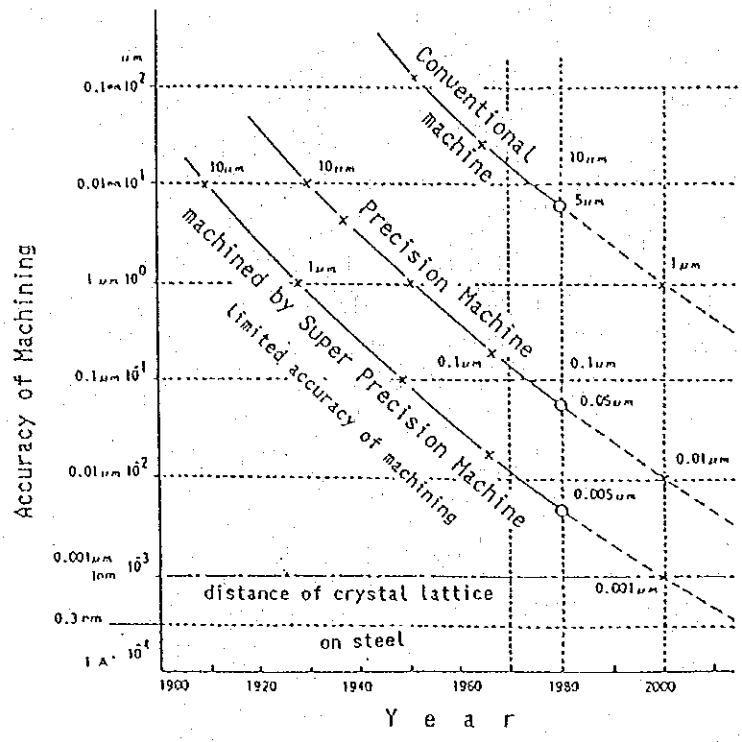


Fig 4 Year and Achievable machining accuracy

6 Conclusion

I wish to mention briefly the important items among these.

(1) Machine tools with cutting tools have been rapidly developed for the purpose of improvement of accuracy and productivity. In order that the function is effective, development of machining engineering is important.

(2) Improvement of peripheral instruments(or attachments) is also important for machining process.

(3) Tomorrow's accuracy of general machining will be accuracy of precision machining at the present time.