

7. Current Status of R & D Organizations and Universities

Current status of research and development

1. Situation of research organization

The Standards and Industrial Research Institute of Malaysia (SIRIM; Shah Alam)

SIRIM was founded in 1975 when the Standards Institute of Malaysia (SIM) and National Institute of Scientific and Industrial Research (NISIR) were merged. Its main objective is to provide raise the level of the technology of the manufacturing industry widely under the Ministry of Science, Technology and Environment (MOSTE). It consists of four divisions, three units are service-oriented, the other is performs research.

The division which performs research is Research and Technological Development Department and it consists of four centres further.

Materials Technology Centre

- Ceramics Technology
- Metal Technology
- Plastics Technology

Advanced Manufacturing Technology Centre

- Assembly Technology
- Circuit and Electronic Systems Design
- Manufacturing Systems
- Mechatronics
- Software Development

Product and Machine Development Centre

- Machine Development
- Packaging Development
- Product Development
- Production Tooling
- Prototyping Services

Chemical and Biotechnology centre

- Biotechnology
- Chemical Technology
- Energy Technology
- Environmental Technology

In the other three divisions, various services are provided, such as measurement, testing, information quality assurance, engineering and training. Moreover, the help of establishing the enterprise included the capital side, or various backups are taken.

There are 1,074 staffs and a third are scientists and engineers.

SIRIM has six regional offices in the whole country, Pulau Penang, Johor Bahru, Kuala

Terengganu, Kuching, Kota Kinabalu, Ipoh and a headquarters.

- Advanced Material Research Centre (AMREC)

SIRIM will gain the 2ha land in Kulim Hi-Tech Industrial Park and this site will be used for the construction of AMREC. Initially, AMREC will be with SIRIM, but the long term objective is to make it an autonomous institute.

The content of business is now investigating. The area of study is electronics and Nano level materials.

Malaysian Institute of Microelectronics Systems (MIMOS; Kuala Lumpur)

MIMOS was established under MOSTE in 1985. It aims to improve electronics industry, which is the major manufacturing in Malaysia to the world-class. Six areas are being addressed: semiconductor technology, IC (VLSI design), computer systems, telecommunications, machine intelligence and product development. Moreover, information services, a consultancy services, technical intelligence and product development services, training and the seminar, are provided to general enterprises. Especially, to support the small and medium-sized enterprise, the introduction of several programs such as demonstrations, joint research projects and consultancy arrangements organized.

The Joint Advance Research Integrated Networking Group (JARING) is constructed. This is not only linked to many research organizations and universities but also to government agencies and private organizations in Malaysia. Moreover, it links to the research organization in all over the world through the internet. The information service can be provided to a region away by using this.

-MIMOS (KHTP)

MIMOS will gain the 5ha land in Kulim Hi-Tech Industrial Park and this site will be used for the construction of its branch.

This branch covers the demand of northern Malaysia region, the branch will only do a part of PCB design and provide information service by the network with the headquarter. But basically, it has no facilities to research and only the reception for consulting about JV R&D. In the case of conducting JV R&D, they will be planned to go to the headquarter and do R&D.

Malaysia-Science and Technology Information Centre (MASTIC; Kuala Lumpur)

MASTIC was established in 1992 under MOSTE, to collect and analyze science and technology information in Malaysia. The concept is to link the three major groups of players in Malaysian science and technology system: the policy makers and research funders; the researchers themselves; and the users and developers of research results.

Concretely, MASTIC build the data base related the science and technology, and the network with various data bases, provides the consulting services, publications and reference services.

Rubber Research Institute of Malaysia (RRIM ; Sungai Buloh)

RRIM is the Research organization which was established in British colony age and belongs to Ministry of Primary Industries. The cultivation method of natural rubber, the taking method of the milky lotion, and the product have been developed. Recently, catheter and the parts for aeroplane are produced.

The number of scientists are 160 and most of them are upper stream of R&D. The researcher who conducts experimental development are wanting.

It provides testing service of rubber product such as tire. The needs of testing are about 100 times a month from small or medium sized company. Some of them come from Thailand or Indonesia.

As the laboratory of which the field of study is so rare even in the world and the level of the study, technical guidance, the consulting, the examination, and training are served to other country and enterprises which tries to do the rubber industry and the natural rubber industry.

In future, main area of research is biotechnology, pharmacology and chemically and RRIM is expected to develop a new product connected with High-Tech.

Forest Research Institute Malaysia (FRIM; Kuala Lumpur)

FRIM was establish in 1918, in the British colony age. It has 500 staffs, including 110 researchers. The area of research is about cultivation of forest, making use of forest resources, improvement of technology of wood and furniture manufacture.

The testing services which provides are furniture and protection of fire, and these are agent of certification testing for SIRIM.

The Timber Technology Park is planned to be built in the current site, and now the concept is being examined by consultant.

Palm Oil Research Institute of Malaysia (PORIM ; Kuala Lumpur)

PORIM was independent of MARDI in 1979 and belongs to Ministry of Primary Industries. The area of R&D is so unique and the level of it are high. The R&D such as cultivation of palm oil, refinement, logistics, purchase and consumption, possibility of development to new area is conducted.

The number of researcher is about 50. There are totally 7 stations, which locate in the palm oil product region, in Malaysia. PORIM conducts various information services and guidance of cultivation of palm oil.

Malaysian Agricultural Research and Development Institute (MARDI ; Kuala Lumpur)

MARDI was established in 1969, and belongs to Ministry of Agriculture. Main business is R&D activities about agriculture except palm oil and natural rubber, and providing services such as information on palm oil, guidance of cultivate technique.

It has State branches all the states but Sabah, besides a couple of station are located in each state of west Malaysia. R&D activities are conducted in headquarter only.

The number of researcher is around 450, including 90 Ph.D.

MARDI is supplied most allocation by IRPA and conducts most project of all R&D organizations.

2. Situation of universities

Universiti Kebangsaan Malaysia (UKM ; Bangi)

UKM was established as a National university in 1970. It has one laboratory and 3 centres and there are 14 faculties. Staffs are about 1,300 and students are about 2,000. It is the first University which uses Malaysian as main language.

Bureau of Consultancy & development was established in 1979, and it provides services for the customers outside university.

*Bureau of Consultancy & Development

It has 1,600 expertise and 11 staffs. There are three centres, or human resource development, consultant, innovation. The client is from all over Malaysia.

At innovation centre, requested research is conducted. This centre has patent of processing compost waste.

Human Resource Development Centre is conducted in response to the request.

Consultant Centre consists of 5 units. The environmental unit conducts monitoring based on environmental assessment and laws. The ability of this area is the top of Malaysia, especially clarifying the waste including heavy metals. Some clients to the are of petrochemical and petrorefine come from Thailand and Australia.

Universiti Malaya (UM ;Kuala Lumpur)

UM is the University which established in 1949 and is the oldest in Malaysia. It has 13 faculties. Opt-electronics and the plasma research, etc. are done besides the research concerning the natural resource of Malaysia is active.

In 1995, the new centre concerning environment is planned to be established. This is one of the UM strategy that plays a main role of research wetland. This centre is conducting research and consulting about water or wetland environment.

Universiti Pertanian Malaysia (UPM ; Serdang)

890 academic staffs are employed. The main areas of research is production of food through biotechnology, environmental conservation, sustained use of resources, and the increase use of automation and electronics in industry. In *the Sixth Malaysian Plan*, the research budget tripled.

Universiti Sains Malaysia (USM ; Georgetown, Ipoh)

USM established as the second university in Malaysia in 1969. It consists of 17 faculty such as construction, management, computers, medicine and pharmacology. Moreover, it has nine research centres. At the research centre, environmental science, pharmaceutical studies and information technology are mainly studied. The engineering is located in Ipoh.

Innovation Consultancy Centre*, which is one of nine centres, was established for the purpose that the industry may use a material, intellectual resource of the university. It provides services for the industry.

Information Technology Centre which locates in KHTP is the same name that one of above nine centres has. However ITC in KHTP is led by USM, this shows neither a branch of ITC in USM nor the move of ITC in USM. While, ITC in KHTP is planned to be linked with ITC in USM. As a result, ITC in KHTP is indirectly connected with all over the world by way of ITC in USM.

Various movement is about to be conducted for operation of ITC in KHTP. The strategic facilities which is equipped with are settled CAD/CAM. The preparation for data base is from October to December, advertisement is in December. Nevertheless, ITC has the difficulty in recruiting the staff, as the image of Kulim is not good for the ordinary people. Techno Centre is expected to change the image.

* Innovation Consultancy Centre

ICC was set up in 1991 and conducts requested research, testing and measuring service and incubation.

This centre has no expertise, equipments nor facilities by itself, and borrow expertise, facilities and equipments from each faculties and centres in response to needs. The fee is so cheap, but there is restriction that those facilities can be borrowed only out of students and teachers using. The result of research from the faculty or centre is partly supplied as an information.

When the requested research is conducted, the centre contracts with the expertise whose research area is in accordance with the needs of customer. The researchers can gain the another revenue, revenue as a professor.

There is much demand for testing and measurement and the customer come from as far as Kuala Lumpur and Sungai Petani. The customer must be a member and now 800 enterprises are registered. The area of research which is the most demand is polymer, and chromatography and electromicroscope are used most often.

For incubation, the laboratory is prepared in the campus. The technical staff is acted by the Ph.D.

Universiti Teknologi Malaysia (UTM ; Johohr Bahru, Kuala Lumpur)

UTM was established in 1975 and has 9 faculties.

The Institute of Noise Vibration is the centre of research and development for the study of

industrial acoustics, noise and vibration, which is applied to the car, the pipeline, etc. In a Business Advanced Technological Centre, it trains managers, graduates, doctors of engineering in the intricacies of modern manufacturing management and technology.

8. The similar Facilities and Functions of Kulim Techno Centre in the world



1. Techno Center in JAPAN

(1) Scale of Techno Center

Scale of Techno Center in japan

		Number of Samples	Plottage (m2)	Building Lot (m2)	Total Floor (m2)	Capital (Thousand Yen)	Building-to-land ratio (%)	Floor-to-land ratio (%)
Metropolitan Area	Average	5	21,516	9,357	75,703	2,989	45.3	351.9
	Maximum	-	55,362	20,676	162,660	5,710	70.5	853.4
	Minimum	-	5,203	2,844	6,100	602	97.5	425.5
Regional Area	Average	16	14,562	2,942	8,096	2,038	20.2	55.6
	Maximum	-	42,000	6,140	25,552	5,720	26.7	53.1
	Minimum	-	1,970	467	885	50	11.9	18.4
Total/Average		21	16,218	4,469	24,193	2,265	27.9	160.2

Labour Structure of Techno Center's Project Organizer in japan

		Employee	Permanent/temporary		Full-time / Part-time		Permanent Ratio (%)
			Permanent	Temporary	Full-time	Part-time	
Metropolitan Area	Average	19.3	9.3	10.0	18.6	0.7	48.2
	Maximum	14.0	12.0	26.0	2.0	26.0	54.5
	Minimum	6.0	5.0	11.0	0.0	11.0	36.8
Regional Area	Average	13.2	5.2	8.0	12.9	0.3	39.2
	Maximum	22.0	17.0	36.0	2.0	38.0	70.0
	Minimum	1.0	2.0	4.0	0.0	4.0	8.3
Total/Average		14.0	5.7	8.3	13.7	0.3	41.0

Note : 1) Unit (Person)
2) Object of Techno Center

Metropolitan Area	Prefecture
Tokyo Fashion Town	Tokyo
KSP	Kanagawa
Toyohashi Science Core	Aichi
Senri Life Science Center	Osaka
Research Incubate Center in Amagasaki	Hyogo
Regional Area	
Eniwa Research Business Park	Hokkaido
Intelligent Plaza in Hachinohe	Aomori
21st Century Plaza Center	Miyagi
Tokuba Research Center	Ibaragi
Research Incubate Center in Nagaoka	Niigata
Kitakyusyu Techno Center	Fukuoka
Kurume Research Park ,etc.	Saga

(2) Function of Techno Center

CITY	KAWASAKI CITY (1,000)	KYOTO CITY (1,000)	SENDAL CITY (800)	OITA CITY (400)	KUMAMOTO CITY (500)
NAME	KANAGAWA SCIENCE PARK (KSP)	KYOTO RESEARCH PARK (KRP)	IZUMI PARK TOWN	OITA PREFECTURAL SOFT PARK	KUMAMOTO TECHNO-RESERACH PARK
FACILITIES	KANAGAWA SCIENCE PARK BUILDING,ETC.	SCIENCE CENTER BUILDING,ETC.	21ST CENTURY PLAZA	SOFT PARK CENTER BUILDING	KUMAMOTO TECHNOLPOLIS CENTER
PROJECT ORGANIZER	MULT	MULT	SINGLE	MULT	SINGLE
R&D SUPPORTING FUNCTIONS	KANAGAWA HIGH TECHNOLOGY FOUNDATION (KTF)	- KYOTO MUNICIPAL INSTITUTE OF INDUSTRIAL RESEARCH - ADVANCED SOFTWARE TECHNOLOGY&MECHATRONICS RESEARCH INSTITUTE(STEM) - KYOTO PREFECTURAL COMPREHENSIVE GUIDANCE CENTER FOR SMALL&MEDIUM ENTERPRISES - KYOTO RESEARCH PARK CORP (KRP CORP)	TECHNO PLAZA MIYAGI CORP (TPM)	REGIONAL INSTITUTE FOR ADVANCED TECHNOLOGY	KUMAMOTO TECHNOLPOLIS FOUNDATION (APPLIED ELECTRONICS CENTER)
INCUBATOR FUNCTIONS	KANAGAWA SCIENCE PARK INC (KSP INC)	KRP CORP.			
HUMAN RESOURCE DEVELOPMENT FUNCTION	- KANAGAWA ACADEMY OF SCIENCE AND TECHNOLOGY (KAST) - KSP INC.	SCIENCE CENTER INTERNATIONAL CORP. (SCI CORP)	- TPM - TECHNOLPOLIS FOUNDATION	REGIONAL TECHNOLOGY PROMOTION FOUNDATION (HUMAN RESOURCE DEVELOPMENT CENTER)	KUMAMOTO TECHNOLPOLIS FOUNDATION
EXCHANGE FUNCTION	KSP INC.	SCI CORP.	- TPM - TOHOKU INDUSTRIAL TECHNOLOGY DEVELOPMENT FOUNDATION BRANCH OF TECHNO-MART	REGIONAL TECHNOLOGY PROMOTION FOUNDATION	KUMAMOTO TECHNOLPOLIS FOUNDATION
INFORMATION FUNCTION	KTF	- SCI CORP. - KYOTO INFORMATION TECHNOLOGY CENTER		- REGIONAL ECONOMIC INFORMATION CENTER - REGIONAL TECHNOLOGY PROMOTION FOUNDATION	KUMAMOTO TECHNOLPOLIS FOUNDATION

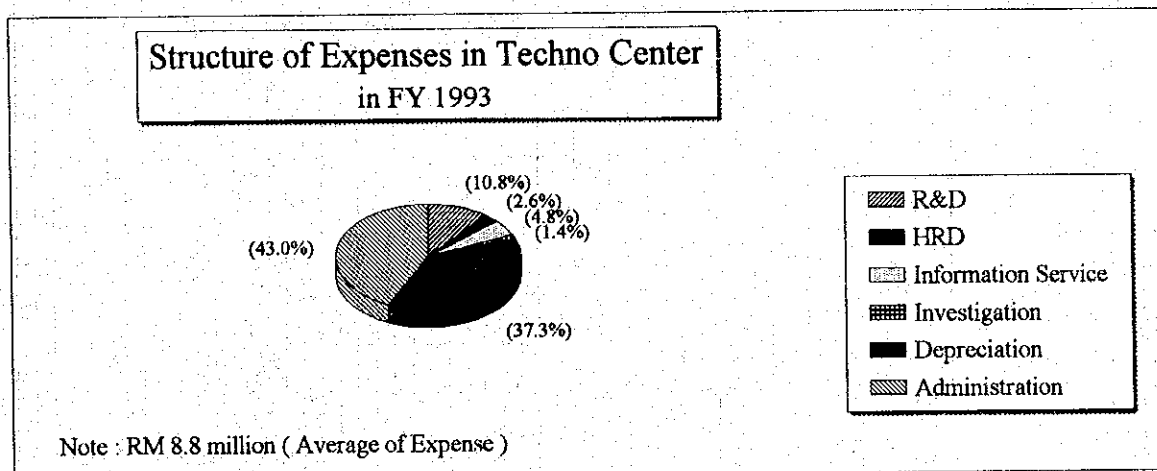
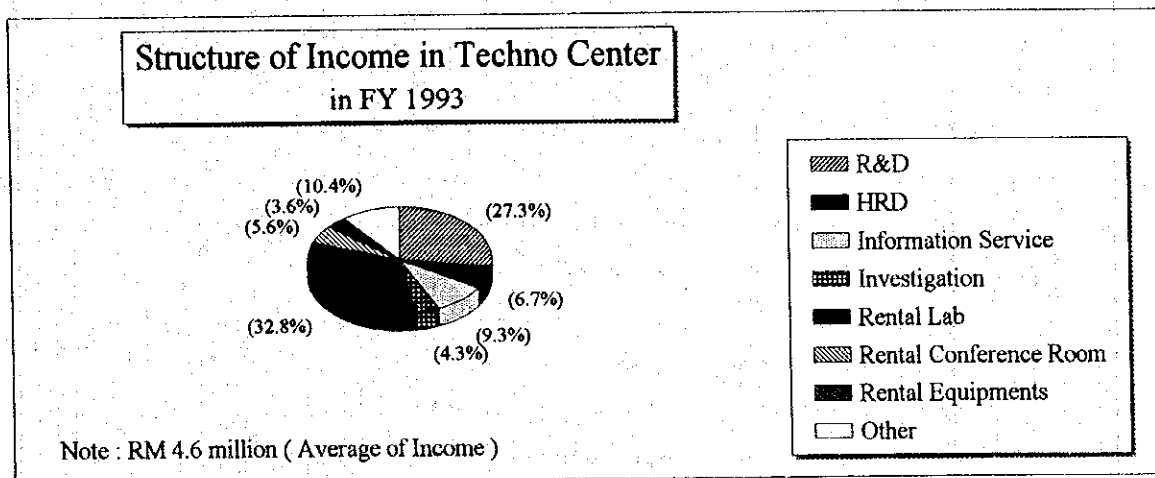
OTHER SERVICE	-HOTEL- HOTEL KSP CULB CORP -HEAT SUPPLY- KSP HEAT SUPPLY CORP -OTHER- CONSULTANT (LAW,FINA- NCE, MANAGEMENT) - KSP INC. - KSP COMMUNITY CORP.	-HEAT SUPPLY- KRP CORP. -ELECTRICITY & TELECOMMUNICATION- KRP CORP. - KRP CORP. - SCI CORP.	TPM. - RESIDENCIAL FACILITIES - COMMERCIAL FACILITIES	REGIONAL TECHNOLOGY PROMOTION FOUNDATION - KYUSU COMPUTER SCHOOL - IVY SCHOOL OF COMPUTER AND INTERIOR - OFFICE BUILDING	RESTRAINT
MANAGEMENT MAINTENANCE IN FACILITIES	- KSP INC. - KSP COMMUNITY CORP.	- KRP CORP. - SCI CORP.	- RESTRANT & BAR - SWIMMING POOL	KUMAMOTO TECHNOPOPLIS FOUNDATION COOPERATIVE RESEARCH CENTER KUMAMOTO KUMAMOTO UNIVERSITY	
OTHER SERVICE IN THE PARK	-RENTAL OFFICE SPACE				

Remark () : Population / Unit (Thousand)

(3) Organization of Major Techno Centers

NAME	DEVELOPMENT ORGANIZATION ON PARK	MAJOR INSTITUTIONS IN TECHNO CENTER, TECHNO PARK	ORGANIZATION	CAPITAL/ FUND (Mil Yen)
KANAGAWA SCIENCE PARK	KSP INC TOBISHIMA CONSTRUCTION	- KANAGAWA SCIENCE PARK INC - KANAGAWA HIGH-TECHNOLOGY FOUNDATION (KTF) - KANAGAWA ACADEMY OF SCIENCE AND TECHNOLOGY (KAST)	Public & Private Public Public	4,500 1,200 4,000
KYOTO RESEARCH PARK	OSAKA GAS CO.,LTD	- KYOTO RESEARCH PARK CORP - KYOTO MUNICIPAL INSTITUTE OF INDUSTRIAL RESEARCH - ADVANCED SOFTWARE TECHNOLOGY&MECHANICS RESEARCH INSTITUTE(ASTEM) - KYOTO PREFECTURAL COMPREHENSIVE GUIDANCE CENTER FOR SMALL&MEDIUM ENTERPRISES	Public Government Public Public	2,000
21ST CENTURY PLAZA	MITSUBISHI REAL ESTATE CORP	- TECHNO PLAZA MIYAGI CORP	Public & Private	3,555
OITA PREFECTURAL SOFT PARK	OITA PREFECTURAL GOVERNMENT	- REGIONAL INSTITUTE FOR ADVANCED TECHNOLOGY - REGIONAL TECHNOLOGY PROMOTION FOUNDATION - REGIONAL ECONOMIC INFORMATION CENTER	Public Public Private	391 831
KUMAMOTO TECHNO- RE-SEARCH PARK	KUMAMOTO PREFECTURAL GOVERNMENT	- KUMAMOTO TECHNOLIS FOUNDATION - COOPERATIVE RESEARCH CENTER KUMAMOTO UNIVERSITY	Public Government	4,000 -

(4) Structure of Revenue and Expenditure



	City		Capital (RM Mil)
		Population	
Intelligent Plaza in Hachinohe	Hachinohe	160,000	39.17
Comprehensive Information Center	Toyama	300,000	49.71
Hamanako International Intelligent Center	Hamamatsu	500,000	71.43
New Industrial Creation Center	Tottori	160,000	50.26
Techno Plaza in Hiroshima	Higashi Hiroshima	350,000	76.71
Kita Kyusyu Techno Center	Kita Kyusyu	1,000,000	63.42
Kagoshima Intelligent Center	Kokubu	80,000	38.89
Tropical Techno Center	Gushikawa	60,000	36.63


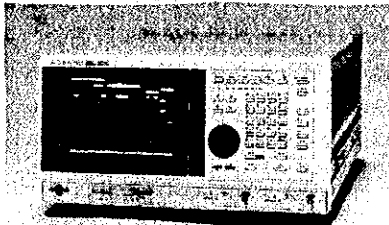
Note : Without Receivable Interest, Interest Expense and Other Profit & Loss
 Note : 1 RM = 35.00 Yen

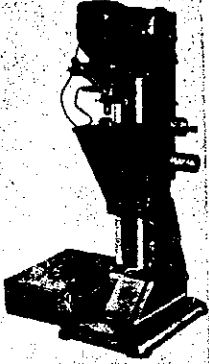
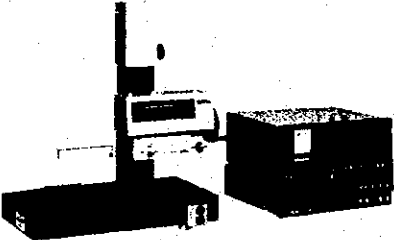
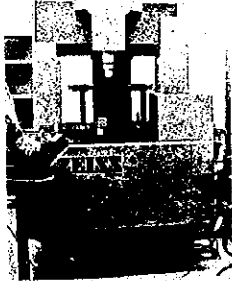
2. The Similar Facilities in U.S. and European Countries


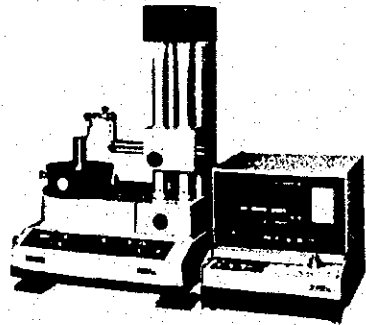


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
	BELGIUM			GERMANY												
	SCIENCE PARK ANDERL-ECHE	SCIENCE PARK EVERE	NIVELLES SCIENCE PARK	BIG	TIP	TECHNOLO GIEPARK BRAUN-SCHWEIG	TECHNOLO GIEPARK DORTMUNT	TECHNOLO GIEPARK FREIBURG	TECHNOLO GIEPARK HANNOVER	TECHNOLO GIEPARK HILDESHEIM	UNTERNEH MENS-PARK KASSEL	TECHNOLO GIEPARK SIEGEN	TECHNOLO GIEPARK SYKE	TECHNOLO GIEPARK ULM	TECHNOLO GIEPARK ULM AACHEN	
Organization	Start to Operating	1,985	1,978	1,983		1,984	1,985	1,985	1,983	1,983	1,983	1,985	1,984	1,985	1,984	
	Private	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	University/Government	1,905	3,468	612	5,950	731	850	540		1,020	17	281		196	255	
	Account of total investment (million Yen)	100	100	95	100	100	100		100	100		100				
	Government			15												
	Private			30												
Management	Account of administration (million Yen)	11	15	34	60	34		13	34	34	60			21	68	
consultant	Establishment of company	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Plan of Business	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Technology	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Finance	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Inspection of account	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Law	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Processing of account	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Marketing	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Secretary	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Telephone Exchange	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Service	Telex/Fax	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Reception	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Conference Room	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Photocopy	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Word Processor	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Computer	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Rental Work Shop	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Rental R&D Facilities	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Access to DataBase	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Capital Investment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Finance	Venture Capital	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Loan	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Grant(Subsidy)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Capital Investment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Venture Capital	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Loan	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Grant(Subsidy)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Capital Investment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Venture Capital	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Loan	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Scale of Facilities (m ²)	Service Center	(1500)	1,500	350	500	100	170	100	6,000	1,100	350	480	1,000	1,500	2,500	
	Incubator	6,000	6,000	4,600	5,000	2,100	630	630	2,000	2,000	200	200	2,000	2,000	3,350	
	Rental Space	10,000	39,000	2,500	45,000	4,000	4,000	1,200	6,000	4,200	9,000	9,000	2,500	2,000	3,350	
	Land sale Space	10,000	46,500	4,500	50,500	2,200	4,800	1,300	6,000	5,500	9,000	1,480	2,150	3,600	3,600	
	Total															
	Service Center			26	9	9	9	9	3	3	15	47	13	13	13	
	Incubator			3	3	9	3	3	3	3	3	1	1	1	1	
	Rental Space			1	12	1	1	1	1	1	1	1	1	1	1	
	Land sale Space			1	15	2	2	2	2	2	2	2	2	2	2	
	Total			(25)	25	7	5	3	2	3	3	4	4	3	3	
Service Center				141	29	29	29	29	29	29	200	200	32	40		
Incubator				18							80					
Rental Space				280	1,250	40					200					
Land sale Space				280	1,775	65					200					
Total				166	410	32	170	X	215	83	200	X	36	X	45	

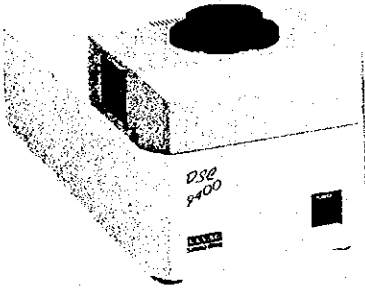

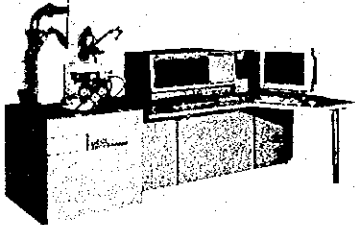
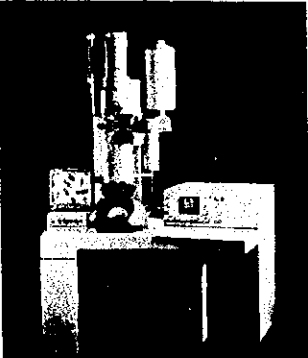
9. Outline of Selected Equipment


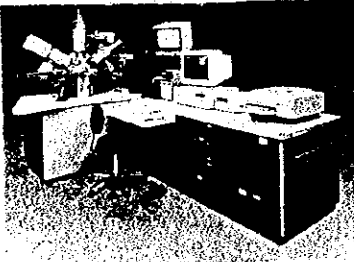

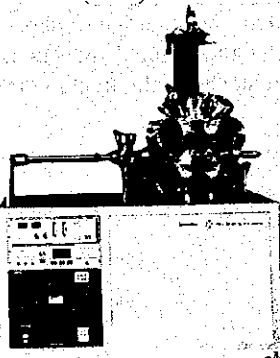
Outline of Selected Equipment

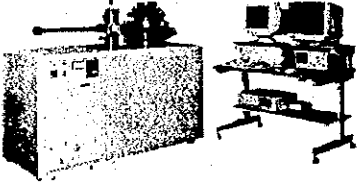
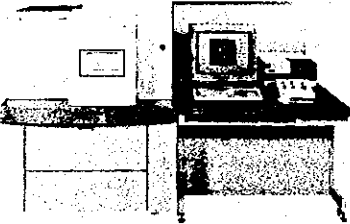
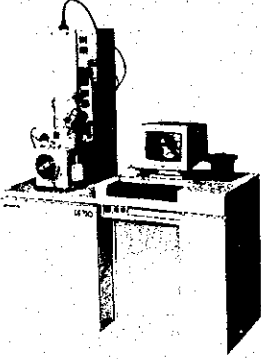

	Main Usage	Function
HIGH TEMP & HUMIDITY BURN-IN TEST SYSTEM	Endurance examination of package of IC and device	Device which inspects defective generation condition and reliability of product putting temperature and pressure
DIGITAL MULTIMETER 	Measurement of voltage and current	Device which measures voltage and current and displays digitally
OSCILLOSCOPE 	Observation of development with early time change without being mechanically chased	Device it to be possible to look straight at signal crimp on cathode-ray tube
DYNAMIC MICRO HARDNESS TESTER	Measurement of hardness of metallic organization, minute parts, thin layers, minute needles, and nonmetal materials	Device which measures hardness of sample from the load which is indicated to press against sample with steel ball of constant diameter by load of 1 kg or less


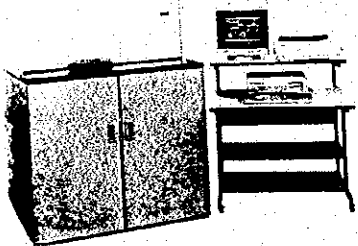

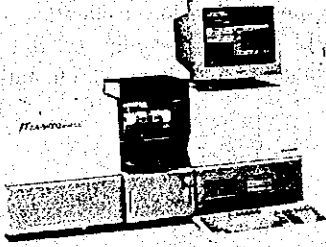
	Main Usage	Function
BRINNEL HARDNESS TESTER 	Examination of hardness of metallic material	Device which measures hardness of sample from size of hollow and load which results to press constant load against sample by steel ball of constant diameter
SURFACE ROUGHNESS TESTER 	Measurement of surface roughness of the products in order to improvement of size accuracy, fatigue strength, and corrosion resistance of parts	Device which measures surface roughness by converting vertical motion of stylus 2.5-12.5 μ m radius of curvature to trace surface into amperage
THREE DIMENSIONAL PROFILER 	Measurement of size of sample three dimensionally	Device which has measurement axis of X, Y, and Z squarely arranged and reads orthogonalization coordinates values of three dimensions by probe installed at bottom of Z axis
TORQUE TESTING MACHINE	Testing for resistance power and elastic coefficient to torsion of material	Device which rotates a part of sample by power and shows torsion moment and torsion rigidity etc. to another edge

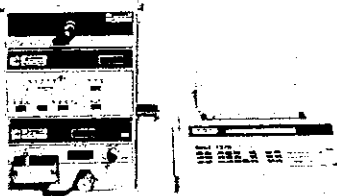
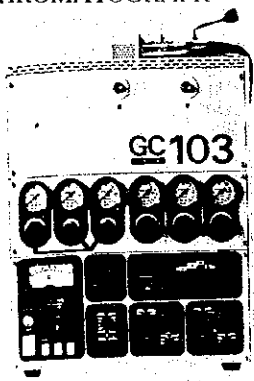
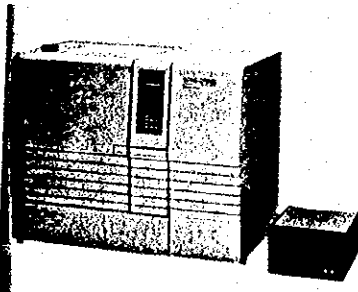
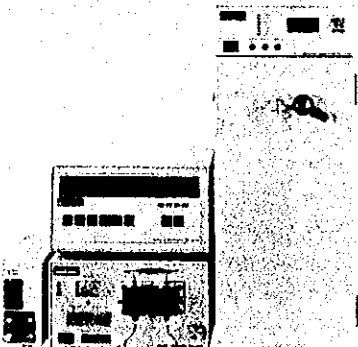
	Main Usage	Function
<p>IMPACT TESTING MACHINE</p> 	<p>Testing for ductility and brittleness etc. of material</p>	<p>Machine which measures ductility and brittleness of materials against the impact</p>
<p>TRUE CIRCLE TESTER</p> 	<p>Measurement of roundness of the parts</p>	<p>Tester which measures roundness through estimating the difference of radius or diameter by parallel degree of straight degree of axis line and generatrix con-fronted</p>
<p>UNIVERSAL MATERIAL TESTING MACHINE</p> 	<p>Testing for strength, ductility, brittleness, etc. of materials by traction, compressing, bending, etc.</p>	<p>Testing machine which tests strength and deformation of materials through loading stress by oil pressure or motor with traction, compression, bend, etc.</p>
<p>ULTRASONIC SCANNING MICROSCOPE(SUM)</p> 	<p>Nondestructive inspection for metal and semiconductors etc.</p>	<p>Device which appropriates supersonic wave to solid material, detects the reflection wave, and shows appearance in material</p>

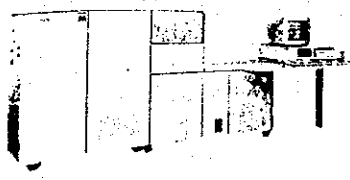

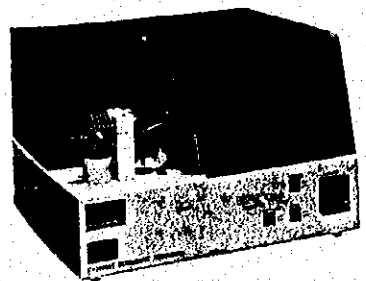
	Main Usage	Function
DIFFERENTIAL SCANNING CALORIMETER 	Analysis of purity of sample by scanning the heat of fusion, heat of transition, heat of decomposition, heat capacity, etc	Device which measures energy necessary to give equal calorie to sample and reference material and to keep the temperature difference to 0 and analyzes calorie and sample purity
DIFFERENTIAL THERMAL ANALYZER 	This fixed equal quality control of material by melting point and making of state chart, etc.	Device which rise or lowers temperature of sample and detects absorption and discharge of heat by melt etc.
ELECTRON PROBE X-RAY MICROANALYZER(EPMA/EDS) 	Surface and state analyses of materials such as element composition, element concentration, element distribution, etc.	Analyzer which observes the surface condition and state analyses by detecting of secondary electron or characteristic x-ray which are reflected by irradiation of fast electron to sample
TRANSMISSION ELECTRON MICROSCOPE(TEM) 	Surface observations such as metal, ceramics, plastic, etc.	Microscope which magnifies and visualizes of material surface through the object lens to be led scattered wave and penetrate wave from sample resulted by irradiating electron to collop or minute decentralized body sample with capacitor lens, magnifying power are between several hundred and several million times


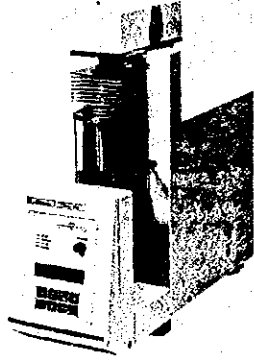

	Main Usage	Function
<p>X-RAY PHOTOELECTRON SPECTROSCOPE(ESCA)</p> 	<p>Surface analyses such as metal, ceramics, and semiconductors.</p>	<p>Device which irradiates X rays to sample, analyzes energy of photoelectron generated from surface (0-2nm) of pole, and measures kind of element on surface and state of chemical uniting</p>
<p>SECONDARY ION MASS SPECTROMETER(SIMS)</p> 	<p>Analyses of impurities of various solid materials, profile measurement such as polar, depth, direction, and density of elements, etc.</p>	<p>Device which analyze the surface of the solid materials through the discharged the second mass of the ion generated by collision of first ion with the material surface</p>
<p>SCANNING AUGER ELECTRON SPECTROSCOPE(AES)</p> 	<p>Quantitative element analyses and detection of solid material surface such as thin film material, semiconductors, etc.</p>	<p>Device which measures element composition on surface of solid material detecting Auger electron generated from surface of pole (Depth:0-2nm) when electronic beam is irradiated to surface of sample</p>
<p>SCANNING PROBE MICROSCOPE(SPM)</p> 	<p>Observation of high resolution at element level, measurement of preciseness and roughness, control of the state of minute surface</p>	<p>The structure of main body can exhaust of the vacuum, and head change is easy. It offers a variety of observation environment through heating and cooling of samples and gas introduction, etc.</p>

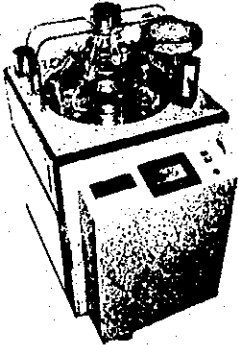
	Main Usage	Function
SCANNING TUNNELING MICROSCOPE (STM) 	Observation of surface structure of metal, semiconductors, superconductor, and organic compound, and measurement of the surface roughness of ultra precise processing, etc.	
FOCUSED ION BEAM SYSTEM 	Precise processing and observation of semiconductor	Device which irradiates ion beam and electronic beam to slight area on surface of sample and does the scene observation of processing section processing slight section.
SCANNING ELECTRON MICROSCOPE (SEM) 	Surface observations such as metal, ceramics, plastic, and living things	Device which observes minute shape on surface detecting the second electrons which is irradiated electronic beam to sample and generated from surface
RAMAN SPECTROPHOTOMETER 	Structure determination of molecular, identification of unknown materials, determination of second structure of biopolymer, etc.	Equipment which identifies and determines of energy level of material through scattered light generated by being irradiated of monochromatic light to the sample

	Main Usage	Function
<p>FOURIER TRANSFORM INFRARED SPECTROMETER</p> 	<p>Qualitative and quantitative analyses of materials</p>	<p>Device which obtains spectrum from the synthetic light of two luminous flux by irradiating light to sample and dividing the reflection light into two luminous flux and measures number of waves.</p>
<p>X-RAY FLUORESCENCE SPECTROMETER</p> 	<p>Element determination of solid and liquid samples, etc.</p>	<p>Spectrometer which determines element of the samples by spectrum x-ray wavelength generated x-ray fluorescence by irradiating x-ray to sample</p>
<p>X-RAY DIFFRACTOMETER</p> 	<p>Quantitative and qualitative decomposition, etc. of material. A small amount is not suitable for the element analysis.</p>	<p>Equipment which identifies and determines of materials by measuring of diffract angle of irradiating constant wavelength x-ray beam</p>
<p>ATOMIC ABSORPTION SPECTROPHOTOMETER</p> 	<p>Quantitative analyses of metallic and nonmetallic elements at PPM level of various samples including water quality</p>	<p>Spectrophotometer which determines elements by measuring absorption. Atomized samples by absorption flame photometry or flameless atomic absorption spectrometry absorb the specific wavelength light radiated from the same element.</p>

	Main Usage	Function
<p>ION CHROMATO ANALYZER</p> 	Control of river water, rain water, cooling water for power generation, and water for semiconductor manufacturing and other element analyses	Device which detects and analyzes of the sample separated by difference of ion exchange
<p>GAS CHROMATOGRAPH</p> 	Analyses of inorganic gas, low hydrocarbon, and organic compound	It is a device in the mobile phase using the gas and the stationary phase using solid or liquid which analyzes the element by the process by which the sample is distributed between these two pairs.
<p>GAS CHROMATOGRAPH MASS SPECTROMETER(GC/MS)</p> 	Determination of unknown elements especially multi element mixture sample and covering various fields.	Device which combined gas chromatograph capable for separation of element and mass spectrometer capable for determination (Refer to Gas Chromatograph and Secondary Ion Mass Spectrometer)
<p>HIGH PERFORMANCE LIQUID CHROMATOGRAPH(HPLC)</p> 	Element analyses of soluble samples such as biochemistry sample, environmental sample etc.	Device which separates and analyses of samples by moving between mobile phase using liquid and stationary phase using solid or liquid. Separation speed of liquid chromatgraph is much lower than that of gas chromatograph. HPLC has a capability of 100-1000 times higher speed than ordinary liquid chromatgrph.

	Main Usage	Function
INDUCTIVITY COUPLED PLASMA MASS SPECTROMETER 	Analysis of PPT(parts per trillion) level of sample element	Device which makes to ion and analyzes mass by rolling inductive coil in the quartz glass, adding high frequency electric power, and generating plasma
INDUCTIVITY COUPLED PLASMA SPECTROMETER metallic sample 	Qualitative and quantitative analyses of various samples such as metals	Device which analyzes sample heating atomized samples by generated plasma
ULTRASONIC NEBULYSER 	Concentrate of treatment of respiratory organ disease, humidifying, and sample for analysis and atomization	Device which makes aerosol through liquid minute particle by using compression wave energy dispatched supersonic wave
O.D METER	Examination of pollution degree of water quality	Device which determines molecule oxygen in the solution by titrimetric analysis

	Main Usage	Function
SPECTROPHOTOMETER 	Determination of inorganic and organic elements at PPM level of samples such as water quality, atmosphere, and food, etc.	Device into which light from tungsten lamp or hydrogen electrical discharge is assumed to be width of wavelength with narrow prism or diffraction fixed lattice, exists in sample solution, and penetrating light is converted with photocell photoelectron two times etc.
CONSTANT TEMPERATURE HUMIDITY CHAMBER	Rescarches such as physical properties measurements and reactions	Device which keeps constant temperature and constant humidity for a long time.
THERMOGRAVIMETER 	Measurement of pyrolysis temperature and quantity of inorganic and organic compound	Device which traces weight change as function of time putting sample at constant temperature and the mass change as function of temperature under constant temperature rise speed
TOTAL ORGANIC CARBON ANALYZER 	Monitoring of water quality on river, lakes, sea, waste water, etc. and evaluation of waste water treatment equipment, and control of organic impurities	Equipment which measures and detects for total organic carbon by oxidation using photochemical catalyst reaction

	Main Usage	Function
<p data-bbox="97 277 469 309">TOTAL NITROGEN ANALYZER</p> 	<p data-bbox="544 277 826 398">Measurement of total amount of nitrogen which becomes one index of eutrophication in water</p>	<p data-bbox="831 277 1414 338">Device which detects and measures total nitrogen by catalyst oxidation conversion</p>

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