

EKE-72-30

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August 17, 1972

THE PLAN FOR THE ESTABLISHMENT AND
OPERATION OF RUBBER PROCESSING TECHNOLOGY LABORATORY

June, 1972

THE KOREA INSTITUTE OF SCIENCE AND TECHNOLOGY

THE PLAN FOR THE ESTABLISHMENT AND OPERATION
OF RUBBER PROCESSING TECHNOLOGY LABORATORY OF THE INSTITUTE

1. Purpose:

The importance of our rubber industry is recognized due to diversified usages and their significant nature. The rubber processing technology in Korea at present still remains in a conventional stage of technology. Such aspect can be fully proved comparing ratio of natural rubber consumption with synthetic rubber consumption.

In the advanced countries, the consumption rate of synthetic rubber which carries various advantages in price and nature accounts for 60-80 percent of the total rubber consumption. But in Korea where there are scarce resources of natural rubber, the proportion of synthetic rubber consumption is merely about 30 percent of the total rubber consumption due to the lagging rubber processing technology. (see attached Table)

For this reason, the Institute is planning to establish Rubber Processing Technology Laboratory within the Institute so as to intimately promote rubber processing industry in Korea by means of pertinent technical collaboration with advanced countries, and self research and development efforts. That is to enhance technological standard of rubber industry, raise the proportion of synthetic rubber consumption in Korea, and to strengthen competitive potentials in the international market for the development of Korean industry.

As a part of petrochemical industry, the Korea Synthetic Rubber

Company now under construction at Ulsan is scheduled to be dedicated in April, 1973 with the annual capacity of 25,000 tons. In parallel with its dedication, it is considered that it will become necessary to plan and establish Rubber Processing Technology Laboratory at the Institute so as to match with the construction period of the said company.

2. Research activities to be performed by Rubber Processing Technology Lab.:

Rubber Processing Technology Laboratory will conduct test for processing various rubbers and characteristics of the products in order to develop new processing technology and rubber products with a purpose to raise technological standard of the prevailing rubber industry, which is unable to compete with international rubber industry because of the backwardness of rubber technology. The specific activities of this laboratory are as follows:

- 1) To carry our research work to meet the needs of the Government and rubber enterprises.
- 2) To perform sponsored research to develop rubber processing technology, raw materials, additives, and process improvement.
- 3) To conduct chemical and physical testings of raw materials and products.
- 4) To provide technological consultation for rubber processing enterprises.
- 5) To carry out basic research for manufacturing new rubber in the future.

3. Effectiveness:

As the rubber industry expands the requirement for rubber has increased and its quality requirements are being gradually diversified. To meet these needs, various synthetic rubbers have been developed and produced.

As shown in attached table, to see the ratio between natural rubber consumption and synthetic rubber consumption in foreign countries, the share of synthetic rubber consumption accounts for 60 to 80 percent of the total requirement. This is attributed to the fact that the quality of synthetic rubber material is superior to those of natural rubber. And those synthetic rubber products are being produced at lower prices than the natural rubber products. Especially, according to its various sorts, synthetic rubber carries with various superior properties such as strong cold proof, heat proof, wear and tear resistance, and oil resistance which cannot be expected from natural rubber. In view of these facts, the requirement for synthetic rubber is to be largely increased.

However, the process of synthetic rubber production needs highly intricate and advanced technique, as compared with that of natural rubber. The proportion of synthetic rubber consumption in Korea, therefore, remains only 30 percent of the total rubber consumption, since our rubber industry has lagged behind in terms of technological standard.

Through engineering and technological guidance over pertinent industry, we expect that the laboratory could thereby bring out developed production stage at reasonable expense.

This will result in the various advantages as follows:

- 1) Production cost of rubber will be reduced and management of rubber business enterprises will be rationalized.
- 2) Quality of rubber product will be enhanced.
- 3) The imports of raw-rubber and rubber products will be reduced followed by an effectiveness of import substitution.
- 4) An increase of rubber products export will contribute to the Government's export policy.

4. Summary of Rubber Processing Technology Laboratory:

Rubber Processing Technology Laboratory will become a part of chemistry & chemical engineering fields in the Institute and carry out pertinent R & D in collaboration with the existing Chemical Analysis Lab., Material Testing Lab., Polymer Lab., and Synthetic Resin Lab.

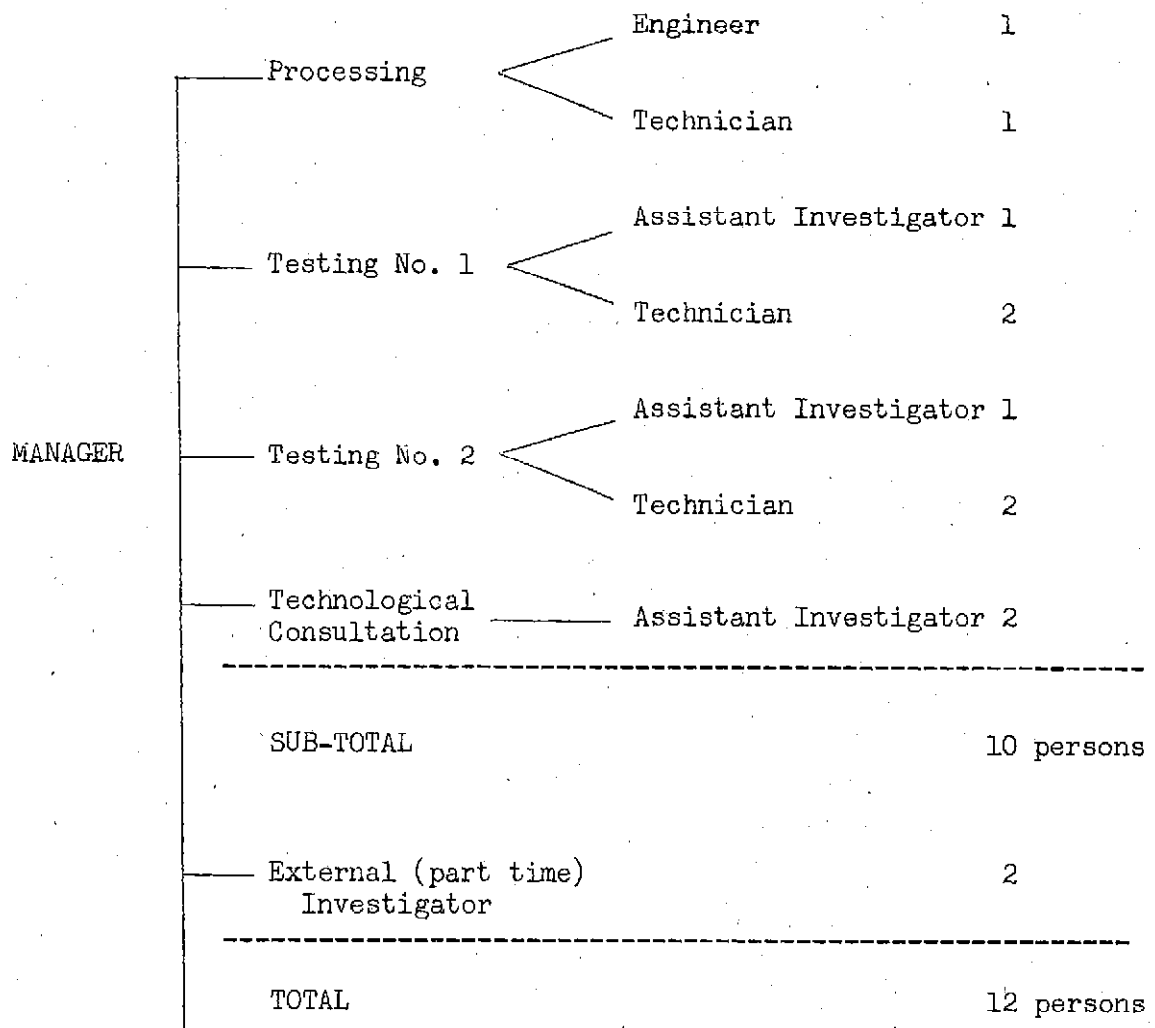
The features of the Rubber Processing Technology Lab. will include the following:

a. Area requirement for installation of machinery and equipment

Banbury Lab.	30m ²
Process Experimentation Lab.	80m ²
Vulcanizing Room	50m ²
No. 1 Physical Testing Lab.	60m ²
No. 2 Physical Testing Lab.	100m ²
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TOTAL	320m ²

b. Organization

Rubber Processing Technology Lab. will be organized as follows:



c. Machinery and Equipment Requirements

Refer to the attached paper.

d. The Schedules for the Procurement of Research Equipment

	1972					1973	
	6.20	6.30	7.10	7.30	9.30	3.30	9.30
Presentation of the Proposal to (MOST)
	
Request for the fund to Japanese Embassy in Korea	
	
Request the said fund to the Japanese Government Ministry of Commerce	
	
Reflection on the budget of the Japanese Government for 1973	
	
Execution of the appropriation for 1973	
	
Provision of the budget	
	
Procurement of research equipments	

Attachment 1.

MACHINERIES AND EQUIPMENTS REQUIRED FOR
THE BUILD-UP OF RUBBER PROCESSING TECHNOLOGY LAB. AND
THEIR PRICES

1) RUBBER PROCESSING MACHINERY

(Unit: ¥1000)

10 inch mixing roll (variable speed)	2	7,300
6 inch mixing roll	2	4,800
Banbury mixer for testing	1	7,750
6 inch three-roll calender	1	2,960
2 inch extruder	1	4,515
20" x 20" three-stage press	2	3,200
20" x 20" hydraulic oil unit	2	600
20" x 20" lifting table	2	800
Temperature control, recording, piping	2	5,200
Hand press (small type)	1	520
55ø x 75 curing furnace	1	461
Piping for curing furnace		34
Transportation and installation fee		75
760ø x 240 air receiver	1	131
760ø x 240 5 HP. Compressor		250
1 oz injection molder		500
3 oz "		1,500
10 oz "		2,000

Super mixer		1,500
Vacuum Injection molder		2,500
Pelletizer		1,500
100 Ton 3 stage press		1,500
Vulconizer		1,000
SUB TOTAL		50,396

2) RUBBER TESTING MACHINERY

Mooney-viscometer (Main body)	2	1,860
" " automatic controller	2	1,300
" " " recorder	2	600
" " spare rotor	8	48
" " recording paper etc		140
Curastometer (Main body)	1	1,750
Spare parts for cure-last meter		150
High press type flow tester (Main body)	1	1,500
Spare parts for flow tester		100
Tackmeter	1	205
Rapid plastometer	1	670
Punch unit for test piece	1	275
Dum bell No.3 cutter	3	60
Dum bell No.1 cutter	1	20
Shearing cutter B type	2	60
" " A "	1	30
Cutter for sponge	1	120
Thickness gauge, vertical type	2	35

Hardness tester for rubber, constant load type	2	50
" " for sponge	1	30
" " for rubber	1	18
Leveling unit for hardness tester	1	20
Tensile strength tester, ZWICK TYPE	1	4,100
Autoclave (Tensile strength tester)	1	6,000
High-low temperature vessel for Autoclave	1	1,500
Attachements for autoclave	1	500
Bending tester, ZWICK type	1	1,200
Pemching unit, " "	1	30
Bending tester, LOSS	1	350
Good-rich flexometer	1	2,450
Permanent elougation tester	1	120
Rubber compression tester	1	80
JIS elastometer	1	230
Akron type abration tester	1	340
Abrasion tester, Williams type	1	460
" " , Picco type	1	2,800
Geman Tester	1	340
Critical temperature pyrometer	1	440
Thermose bottle for dry ice	1	30
Aging tester, gear type	2	960
Aging tester, test tube type	2	880
Sun-shine weather meter	1	3,100
Ozone weather meter	1	1,700

Automatic recording ozone weather moter	1	1,400
Voltage-proof specific resistance measuring	1	3,000
SUB TOTAL		41,051

3) GENERAL MACHINERY

Direct Reading Balance	1	300
Top Pan Balance	1	230
Balance for powder	2	120
Samister temperature recorder	1	280
Portable temperature indicator	1	35
Roll surface thermometer	1	38
Biological microscope	1	280
Special camera for microscope	1	180
35mm Camera	1	85
Attachment for 35mm camera		50
Universal projector and attachments	1	460
Constant temperature vessel, Hot-air type	1	350
Raw rubber cutter	1	320
SEIKO electronic calculator	1	820
" card puncher	1	130
CASHIO electronic calculator	1	110
SUB TOTAL		3,788

4) TOOL

Various mold (Details)	20	965
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For tensile, ASTM	6	420
For abrasion, Akron	1	60
For " , Picco	1	30
For " , Williams	1	45
Bending, De Mattia	1	60
" LOSS	1	60
Compression	1	40
For sponge	1	20
" "	1	20
" "	1	20
Mold with step	1	30
For rubber sheet of shoe	1	50
For heel of shoe	1	30
Heat generation (Grid lip)	1	40
For bead wire	1	40
Working table (Stainless plate) (for roll, banbury, curing area)	16	640
Table for physical testing machine	16	480
Movable Shelter for rubber sheet (with wheel)	2	160
Locker for rubber storage	2	160
Container and shelter for filler		200
SUB TOTAL		2,605

5) LATEX PROCESSING RESEARCH

Viscometer, B type	1	240
PH meter	1	90

Stability tester malon type	1	180
Mechanical Stability tester of latex	1	300
Surface tension meter	1	90
Top pan balance	1	230
Wiper agitator	1	350
Okes 4M	1	2,600
Ball Mill	1	400
Labo stirrer	1	60
Mold	15	120
Open steam curing furnace	1	100
Dewatering Machine	1	40
Form rubber repeating compression tester	1	450
Sponge compression tester	1	170
Top pan balance	1	230
Balance	1	50
Autoclave, P-100 type	1	1,650
Dryer	1	400
Vacuum dryer (with pump)	1	190
Laboratory table	6	180
Storage shelter for chemical compounds	1	110
Polymerizer		2,500
Centrifuge		1,000
SUB TOTAL		11,830

6) CHEMICAL ANALYSIS

Gas chromatograph	1	1,100
Recorder for gas chromatograph	1	300
Micro Balance	1	550
Top Pan balance	1	230
Vacuum dryer, large size	1	250
" pump, "	1	100
	1	900
	1	400
"	1	350
CHN Printer	1	1,100
Electric furnace (with transformer)	1	950
Water bath	1	35
Glass wares		1,800
Laboratory table	6	240
Super Centrifuge		1,500
Atomic Absorption Spectrophotometer		6,000
IR Spectrophotometer		4,500
Elements Analyzing Apparatus		3,000
SUB TOTAL		23,305

DRY RUBBER PROCESSING RESEARCH

(Unit: ¥)

Rubber processing Machinery	50,396,000
Rubber Testing Machinery	41,051,000
General Machinery	3,788,000

Tool	2,605,000
TOTAL	97,840,000
<u>LATEX PROCESSING RESEARCH</u>	
TOTAL	11,830,000
<u>CHEMICAL ANALYSIS</u>	
TOTAL	23,305,000
<u>CHEMICALS AND EXPENDABLE GOODS ETC .</u>	
	5,000,000
<u>BOOKS AND TECHNICAL JOURNAL</u>	
	5,000,000
<u>CONTINGENCY</u> (Other miscellaneous)	7,025,000
GRAND TOTAL	¥150,000,000 (\$500,000)

Attachment 2.

CONSUMPTION OF NEW RUBBER PRODUCTS AMONG MAJOR COUNTRIES

(SOURCE : RUBBER INFORMATION PRESS IN JAPAN)

<u>Country</u>	<u>New rubber consumption</u>	<u>Ratio of Synthetic rubber</u>	<u>Per capita rubber Consumption</u>
U. S. A.	2,516,918	77.42 %	13.11 kg
Japan	779,000	63.67	6.78
W. German	558,812	64.08	8.84
England	461,800	59.25	8.06
France	409,190	61.80	7.43
Italy	310,000	63.55	5.27
Canada	186,082	72.80	8.48
Brazil	122,093	69.91	1.17
India	118,279	-	-
Australia	82,927	54.21	6.71
Austria	-	59.64	3.78
R. O. K.	38,677	29.98	1.13

Attachment 3.

NEW RUBBER CONSUMPTION IN JAPAN

(SOURCE : JAPANESE RUBBER BUSINESS ENTERPRISES)

<u>Year</u>	<u>Natural Rubber</u>	<u>Synthetic Rubber</u>	<u>Total</u>	<u>Ratio of Synthetic Rubber Consumption</u>
1960	168,400	61,600	230,000	26.8 %
61	178,800	85,200	264,000	32.3
62	193,000	106,000	299,000	35.5
63	195,000	127,500	323,000	39.5
64	206,000	162,000	368,000	44.0
65	201,500	175,500	377,000	46.6
66	216,000	222,000	438,000	50.7
67	243,000	273,000	516,800	52.9
68	265,000	348,000	603,000	57.7
69	268,000	426,000	694,000	61.4
70	283,000	496,000	779,000	63.7
71	292,000	515,000	807,000	63.8

Attachment 4.

NEW RUBBER CONSUMPTION IN KOREA

(SOURCE : MINISTRY OF COMMERCE AND INDUSTRY, ROK)

<u>Year</u>	<u>Natural Rubber</u>	<u>Synthetic Rubber</u>	<u>Total</u>	<u>Ratio of Synthetic Rubber Consumption</u>
1964	10,023	2,729	12,752	21.4 %
65	12,661	5,442	18,103	30.1
66	15,646	4,384	20,030	21.9
67	18,210	6,163	24,373	25.3
68	24,897	6,330	31,227	20.3
69	27,427	9,848	37,275	26.4
70	27,080	11,597	38,677	30.0
71	33,100	15,600	48,700	32.0