



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 out 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 these 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 our 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

Barbery Lab.	30m <sup>2</sup>
Process Experimentation Lab.	80m <sup>2</sup>
Vulcanising Room	50m <sup>2</sup>
No.1 Physical Testing Lab.	60m <sup>2</sup>
No.2 Physical Testing Lab.	100m <sup>2</sup>
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TOTAL	320m <sup>2</sup>

b. Organization

Rubber Processing Technology Lab. will be organized as follows :

MANAGER	Processing	Engineer	1	
		Technician	1	
	Testing No.1	Assistant Investigator	1	
		Technician	2	
	Testing No.2	Assistant Investigator	1	
		Technician	2	
	Technological Consultation	Assistant Investigator	2	
	SUB-TOTAL			10 persons
		External (part time) Investigator		2
	TOTAL			12 persons

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
Presentation of the Proposal to (NOST)	⇒					
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

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 calendar	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
550 x 75 curing furnace	1	461
Piping for curing furnace		34
Transportation and installation fee		75
7600 x 240 air receiver	1	131
7600 x 240 5-HP. Compressor		250
SUB TOTAL		38,596

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
Curastomstar (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
Tachmeter	1	205
Rapid plastometer	1	670
Punch unit for test piece	1	275
Dum ball No3 cutter	3	60
Dum ball No1 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
Attachments for autoclave	1	500
Bending tester, ZWICK type	1	1,200
Punching unit, " "	1	30
Bending tester, LOSS	1	350
Good-rich flexometer	1	2,450
Permanent elongation tester	1	120
Rubber compression tester	1	80
JIS elastometer	1	230
Akron type abrasion tester	1	340
Abrasion tester, Williams type	1	460
" " , Pisco type	1	2,800
Cement 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
Ozon weather meter	1	1,700
Automatic recording ozon weather meter	1	1,400
Voltage-proof specific resistance measuring	1	3,000
<b>SUB TOTAL</b>		<b>41,051</b>

3) GENERAL MACHINERY

Direct Reading Balance	1	300
Top Pan Balance	1	230
Balance for powder	2	130
Sensistar temperature recorder	1	280
Portable temperature indicator	1	35
Roll surface thermometer	1	35
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		3,768

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

Viscosimeter, B type	1	250
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 4k	1	2,400
Ball Mill	1	400
Labo stirrer	1	60
Mold	13	120
Open stress curing furnace	1	160
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	1,850
Dryer	1	400
Vacuum dryer (with pump)	1	190
Laboratory table	6	180
Storage shelter for chemical compounds	1	110
SUB TOTAL		8,330



LATEX PROCESSING RESEARCH

Total 8,330,000

CHEMICAL ANALYSIS

Total 7,305,000

CHEMICALS AND EXPENDABLE GOODS ETC

3,000,000

BOOKS AND TECHNICAL JOURNAL

5,000,000

CONTINGENCY

36,377,000

Grand Total

Y150,000,000 (\$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	538,812	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. G. 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	322,000	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	516,000	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	15,546	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