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19128

Final Report

Vietnam. Repair and Maintenance
Centre and Spare Parts Production
for Rice Mills in Vietnam.
Final Report.

CONTRUCT NO. 88/12

between

THE UNITED NATIONS INDUSTRIAL DEVELPMENT ORGANIZATION

(U N I D O)

and

MIZUUCHI RUBBER FACTORY CO.,LTD.

UNIDO Project No. DP/VIE/82/004

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1. Program of Services in the Project Area

1-1. Duration of Dispatch of Specialists

We dispatched a total of three (3) Specialists to the Project Area, Hanoi in Vietnam, from January 6, 1989 to April 14, 1989 and carried out a total of four (4) man-months of services under contract.

The following is a list of the names and duration of each Specialist.

name	project function	duration
Kenji Shibata	Chemical Specialist	one (1) month
Shuichi Okuyama	Chemical Specialist	one (1) month
Shunji Kirino	Mechanical Specialist	two (2) months

1-2. Itinerary of Dispatch

January	6	Departure from Osaka, Japan by TG621
	7	Arrival at Hanoi, Vietnam by TG682
	8	Services begin
February	14	Temporary interruption of Services
	15	Departure from Hanoi by TG683
	16	Return to Japan by TG622
Stay in Japan during this term		
March	16	Departure again from Osaka by TG621
	17	Acquire Vietnamese Visa at Bangkok, Thailand
	18	Arrival at Hanoi, Vietnam by TG682
	19	Services Resume
April	14	Services End
	15	Departure from Hanoi by TG683
	16	Return to Japan by TG622

1-3. Schedule of Service Activities

1-3-1. Briefing and De-briefing in the Project Area

1-3-1-1. Briefing and exchange of views on Junuary 9, 10 and March 20

1-3-1-2. De-briefing upon completion of Services on April 12, 13 and 14

1-3-2. Introduction of New Equipment

1-3-2-1. Unpacking Inspection on January 11 and 12

1-3-2-2. Installation and Test-run
from January 12 to January 20
(except test-run for Hydraulic Press which will be done on January 28)

1-3-2-3. Operation Guidance and Training
starting January 20

1-3-3. Analysis of existing mixed rubber based on Natural Rubber
starting January 23

1-3-4. Introduction of the new formula based Natural Rubber

1-3-4-1. Introduction of the newly improved Composition
from March 22 to March 30

1-3-4-2. Trial manufacturing from March 25 to March 31

1-3-4-3. Test at Rice Mill from March 29 to April 3

1-3-4-4. Test result check on April 7

1-3-5. Introduction of the new formula based on Synthetic Rubber

1-3-5-1. Introduction of the new Composition
from January 13 to February 3

1-3-5-2. Trial manufacturing
from January 23 to Februaru 3

1-3-5-3. Test at Rice Mill from March 22 to March 28

1-3-5-4. Test result check
on March 27 (SBR) and March 30 (NBR)

1-3-6. Establish Test Procedures for testing of rubber specimens

1-3-6-1. Establish tensile test starting January 18

1-3-6-2. Establish abrasion test starting January 23

1-3-7. Test of newly developed rubber rolls

1-3-7-1. Trial manufacturing
from January 23 to February 10

1-3-7-2. Test at Rice Mill from April 4 to April 6

1-3-7-3. Test result check on April 7

Schedule table is shown in Tab.1 on page 3.

Tab. 1 SCHEDULE TABLE OF SERVICE PROGRAM

SERVICE		DATE
SERVICE ITEM	ACTIVITY	JANUARY 1989 / FEBRUARY 1989 / MARCH 1989 / APRIL 1989
Arrival at HANOI		
1. Briefing and De-briefing at Project Area	1-1. Briefing and Exchange of View	
	1-2. De-briefing upon Completion	
2. Introduction New Equipment	2-1. Inspection of Unpacking	
	2-2. Installation and Test-run	
	2-3. Operation Guidance and Training	
3. Analysis of current Fomula based on Natural Rubber		
4. Introduction of New Formula based on Natural Rubber	4-1. Introduction of improved Composition	
	4-2. Trial Manufacture	
	4-3. Rice Mill Test	
	4-4. Test Result Check	
5. Introduction of New Formula based on Synthetic Rubber	5-1. Introduction of new Composition	
	5-2. Trial Manufacture	
	5-3. Rice Mill Test	
	5-4. Test Result Check	
6. Establishment of Procedure for rubber specimen testing	6-1. Procedure for Tesile Test	
	6-2. Procedure for Abrasion Test	
7. Testing of newly developed rubber roll	7-1. Trial Manufacture	
	7-2. Rice Mill Test	
	7-3. Test Result Check	
Departure for JAPAN		
Special Holidays on Traditional TET in VIETNAM		
Stay in JAPAN		

2. The prensent situation in Yen My Rice Mill (Project Area)

The following is the present situation on the Rubber Roll Section in Yen My Rice Mill.

2-1. The existing Equipment at Rubber Roll Section

2-1-1. The existing Equipment for production

2-1-1-1. 26-inch Mixing Roll — two (2) set
This is used in the Mixing Process and for heating rubber for the Winding Process.

2-1-1-2. 14-inch Mixing Roll — one (1) se
This is used for the Winding Machine and for making ebonite sheets.

2-1-1-3. Vulcanizing Auto-clave — two (2) sets
This is used for vulcanizing rubber rolls.

2-1-1-4. Jib Crane — one (1) set
This is used for carrying rubber rolls which are assembled the metal molds for vulcanizing.

2-1-1-5. Screw-type Press Machine — one (1) set
This is used for assembling and disassembling the metal mold.

2-1-1-6. Lathe — one (1) set
One is used for the surface treatment of cast iron drums. Another is used for finishing rubber rolls.

2-1-1-7. Balance for 100Kg and 5Kg — one (1) set each
This is used for weighing rubber and chemicals for the Mixing Process.

Layout of Rubber Roll Shop is shown in Fig. 1 on page 6.

2-1-2. The existing Testing Machine

2-1-2-1. Vulcanizing Press with electric heater — one (1) se
This is used for vulcanizing test pieces.

2-1-2-2. Tensile Tester — one (1) se

2-1-2-3. Abrasion Tester — one (1) se

2-1-2-4. Chemical Balancer — one (1) se

2-2. Production Process

Flow Chart of current Production Process of the Rubber Roll is shown on page 7.

2-3. Durability of the Rubber Roll

We hear that most of the rubber rolls used in Vietnam are 14-inch rubber rolls and that the durability of a pair of them is 80~90tons at operating without any trouble.

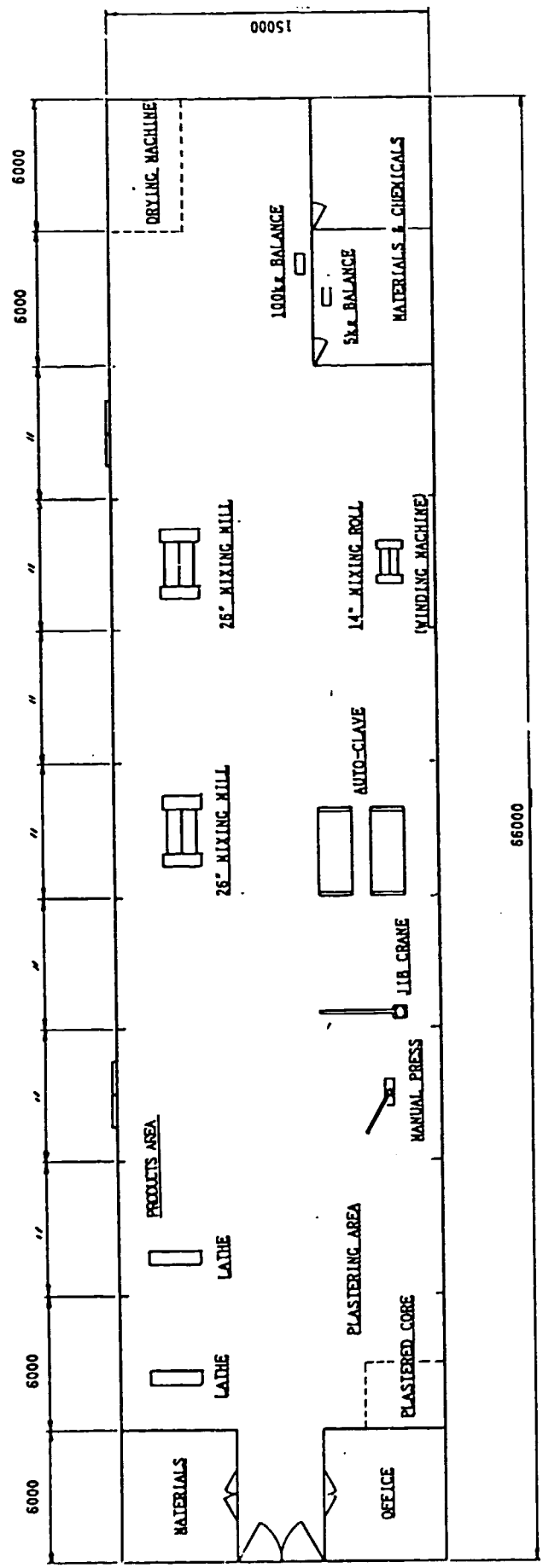
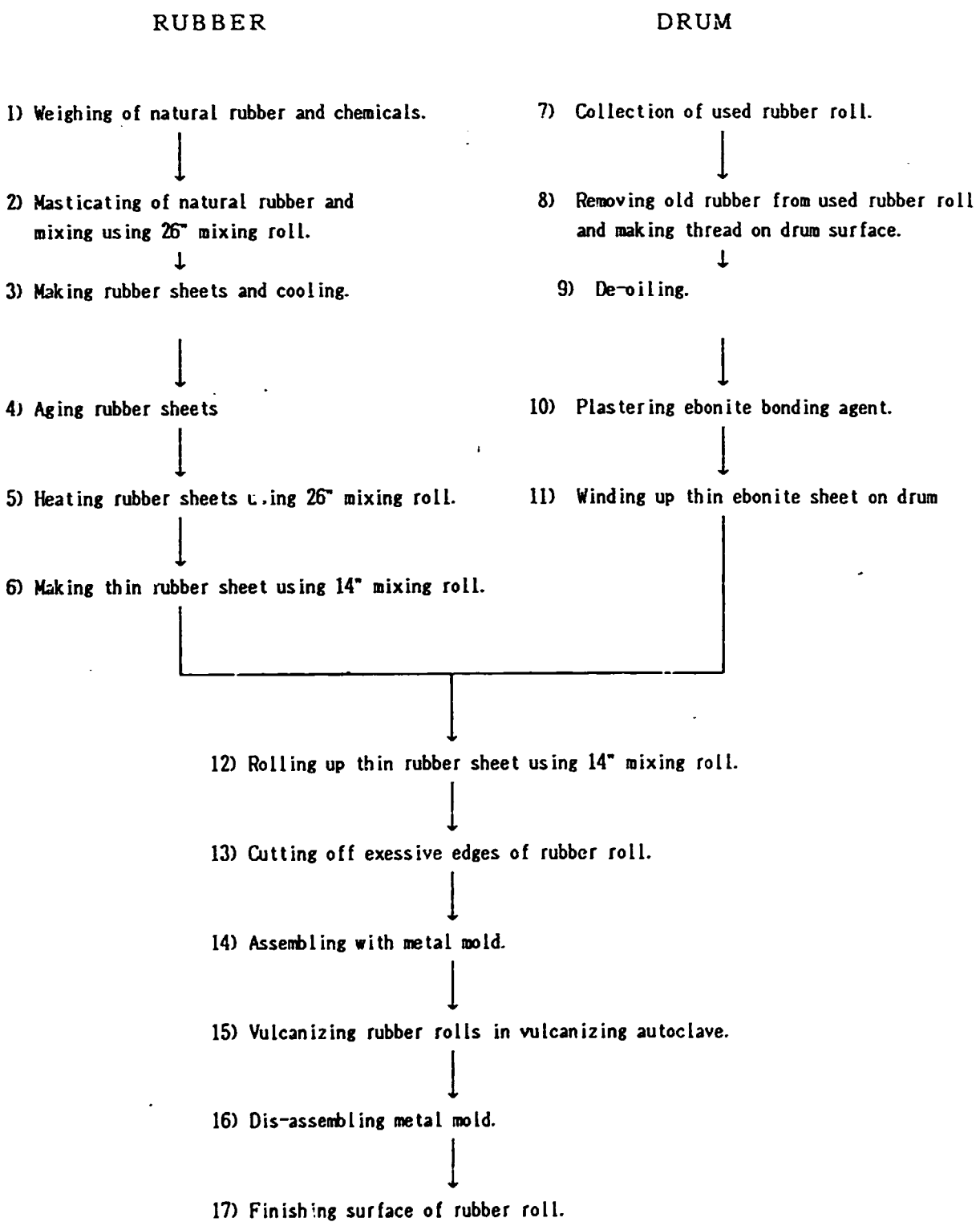


Fig. 1 LAYOUT OF EXISTING EQUIPMENT FOR RUBBER ROLL SHOP

FLOW CHART OF CURRENT PRODUCTION PROCESS OF RUBBER ROLLS



3. Service Activities

3-1. Introduction of New Equipment

3-1-1. Unpacking Inspection

3-1-1-1. All packages which contained the Equipment were placed inside the factory in good condition and there was no damage done to the surface of the packages.

3-1-1-2. Opening of the packages was carried out by the factory staff on our sight. The representative of the factory and two of our personnel made an examination of the contents of the packages by referring to the packing list concerned.

3-1-1-3. As a result, both parties agreed that the contents of the packages were correct in quantity and that the condition was also good.

3-1-2. Installation and Test-run

3-1-2-1. Installation, leveling works and wiring works were carried out without any trouble.

3-1-2-2. Test-run was also smoothly performed as soon as the above-mentioned works were completed.

3-1-3. Operation Guidance and Training

3-1-3-1. We explained the structure, maintainance and operation methods of the New Equipment to the factory staff.

3-1-3-2. We continued to guide and train them to operate the New Equipment by themselves durin, the trial manufacturing.

3-1-3-3. We discussed the design of the Workng Table with the factory staff and they made one unit for trial under our guidance. Then, they designed and made the suitable tables to the factory by themselves.

3-1-4. Effect of New Equipment

3-1-4-1. New Winding Machine

(1) It is possible to wind the rubber sheets continuously.

(2) The tackiness between the rubber sheets can be improved by giving the rubber sheets a strong pull and by pressing them with the air cylinder during winding time.
(3) Labor is saved.

3-1-4-2. Hydraulic Press without heater for fastening mold

Labor and working time is decreased.

3-1-4-3. Shot Blasting Machine

(1) It is expected that the adhesion between rubber and drum is better than the current one

(2) Time is saved in the surface treatment of the drum.

3-1-4-4. Working Table

This has good effects on quality control.

3-1-4-5. Plastering Machine with ebonite bonding agents

(1) The drum is uniformly plastered with ebonite bonding agents.
(2) The labor and plastering time is decreased.

Layout after installation of New Equipment is shown in Fig. 2 on page 10.

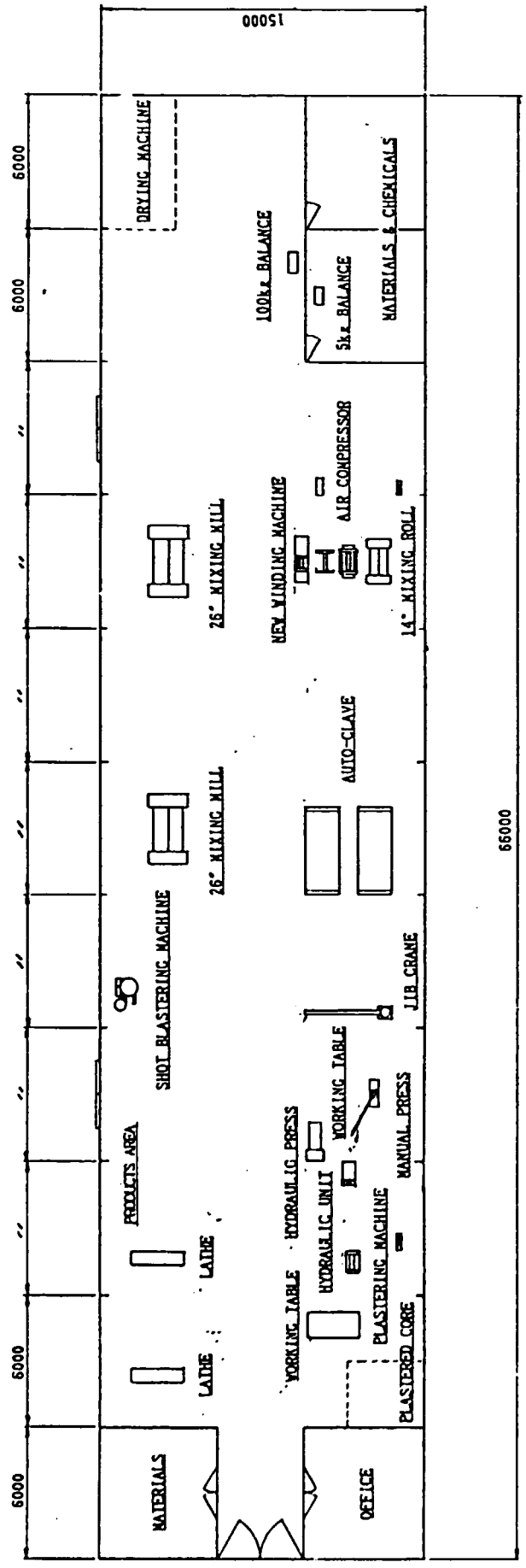
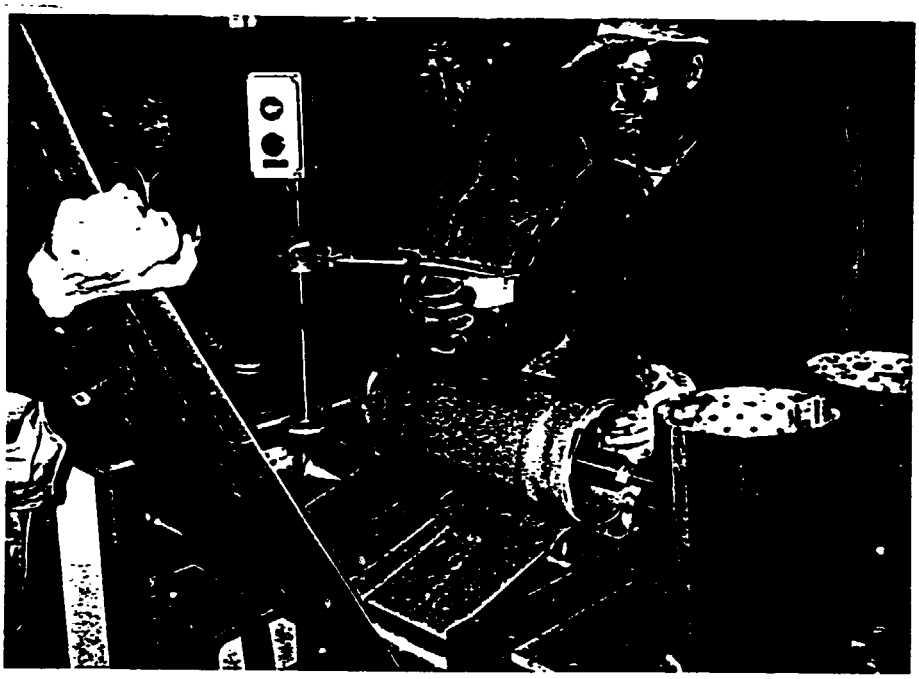
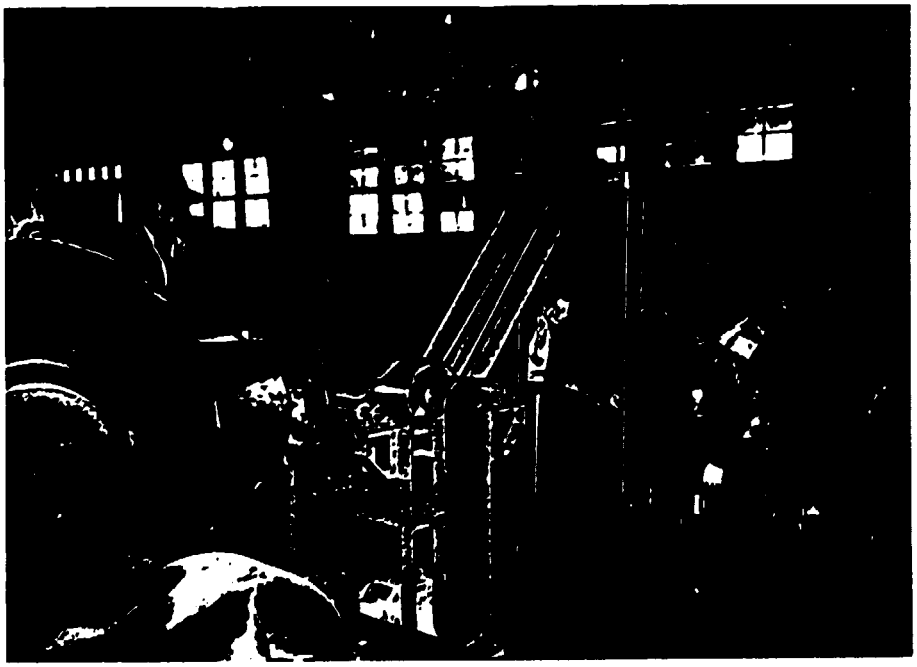


Fig. 2 LAYOUT OF NEW EQUIPMENT AFTER INSTALLATION

New Equipment in operation

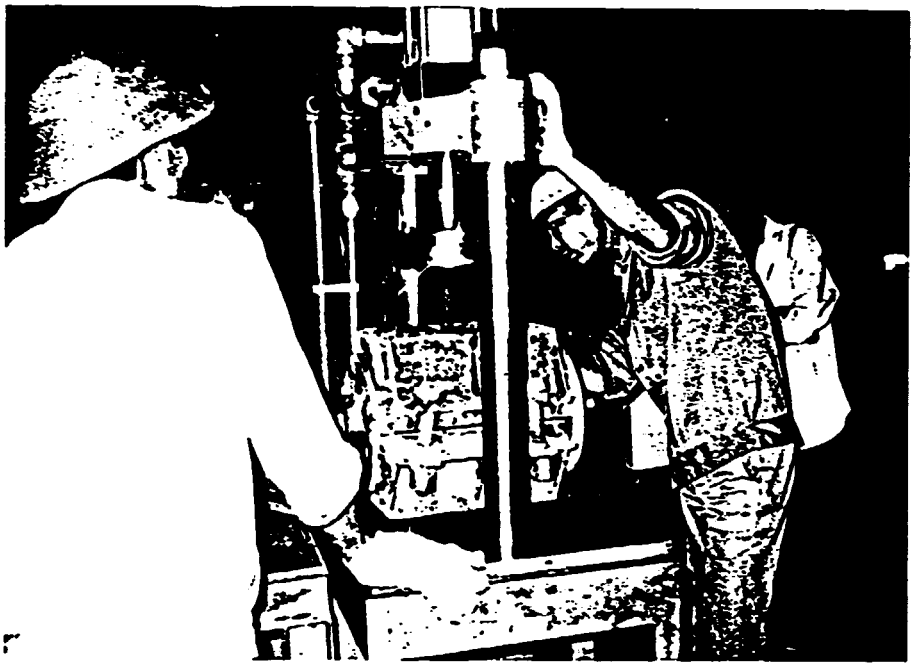
NEW WINDING MACHINE



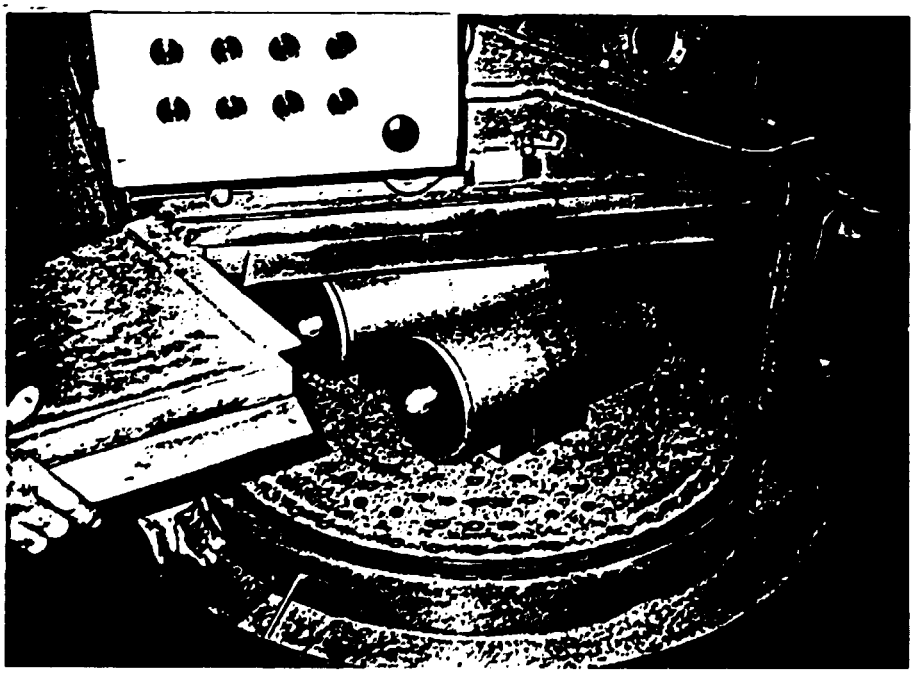


New Equipment in operation

HYDRAULIC PRESS without heater for fastening molds



SHOT BLASTING MACHINE



New Equipment in operation

PLASTERING MACHINE with ebonite bonding agents

3-2. Analysis of existing mixed rubber based on Natural Rubber

3-2-1. Composition and Physical Properties

We obtained the information and data on the chemicals and the Composition of the existing mixed rubber and examined the Physical Properties of that by using the existing Testing Machines.

Composition is shown in Tab. 2 and Physical Properties are shown in Tab. 3 on page 15 and in Fig. 3 on page 16.

3-2-2. Conclusions on examination results

3-2-2-1. The Composition is typical, however it seems that the Sulfur ratio is high and the Carbon Black ratio is low. So the rubber is hardened by the sulfur and the vulcanized rubber becomes something similar to ebonite. This leads to poor elongation elasticity and also to a high ratio of broken rice.

3-2-2-2. Because the rubber is similar to ebonite, it is impossible to get a fine surface on the rubber roll in the Finishing Process. Therefore, the commercial value goes down.

3-2-2-3. To improve Physical Properties in the future, some new chemicals should be introduced, such as High-styrene Rubber and other vulcanization accelerators.

3-2-2-4. Judging from the capacity of the 26-inch Mixing Roll, a composition with 63kgs per is too much to mix on the Mixing Roll. This leads to poor dispersing and deterioration of Physical Properties.

3-2-2-5. For greater abrasion resistance, Carbon Black ratio is increased and the ratio of inorganic fillers is decreased as much as possible. However, the composition cost goes up.

3-2-2-6. As brown rice is blackened by Carbon Black, there is no choice but to substitute it for White Carbon so as not to blacken the rice.

Tab. 2 COMPOSITION OF EXISTING MIXED RUBBER BASED ON NATURAL RUBBER

	Quantity Kgs / Batch
Natural Rubber	30.000
Resin	0.600
Antioxidant (D)	0.300
Vulcanization Accelerator (D)	0.200
Stearic Acid	0.750
Zinc Oxide	2.250
Magnesium Oxide (MgO)	1.500
Calcium Carbonate ($CaCO_3$)	0.800
Aluminium Silicate (Al_2O_3, SiO_2)	5.000
Carbon Black (HAF)	17.000
Sulfur	4.800
Total	63.200

Tab. 3 THE PHYSICAL PROPERTIES

PHYSICAL PROPERTIES		Vulcanization Time		
		1 Hour	2 Hours	3 Hours
Tensile Strength	Kg/cm^2	160	134	136
Tensile stress at 100% Elongation	Kg/cm^2	64.4	121	—
Elongation	%	312	108	88
Hardness (JIS-A)	°	85	95	96

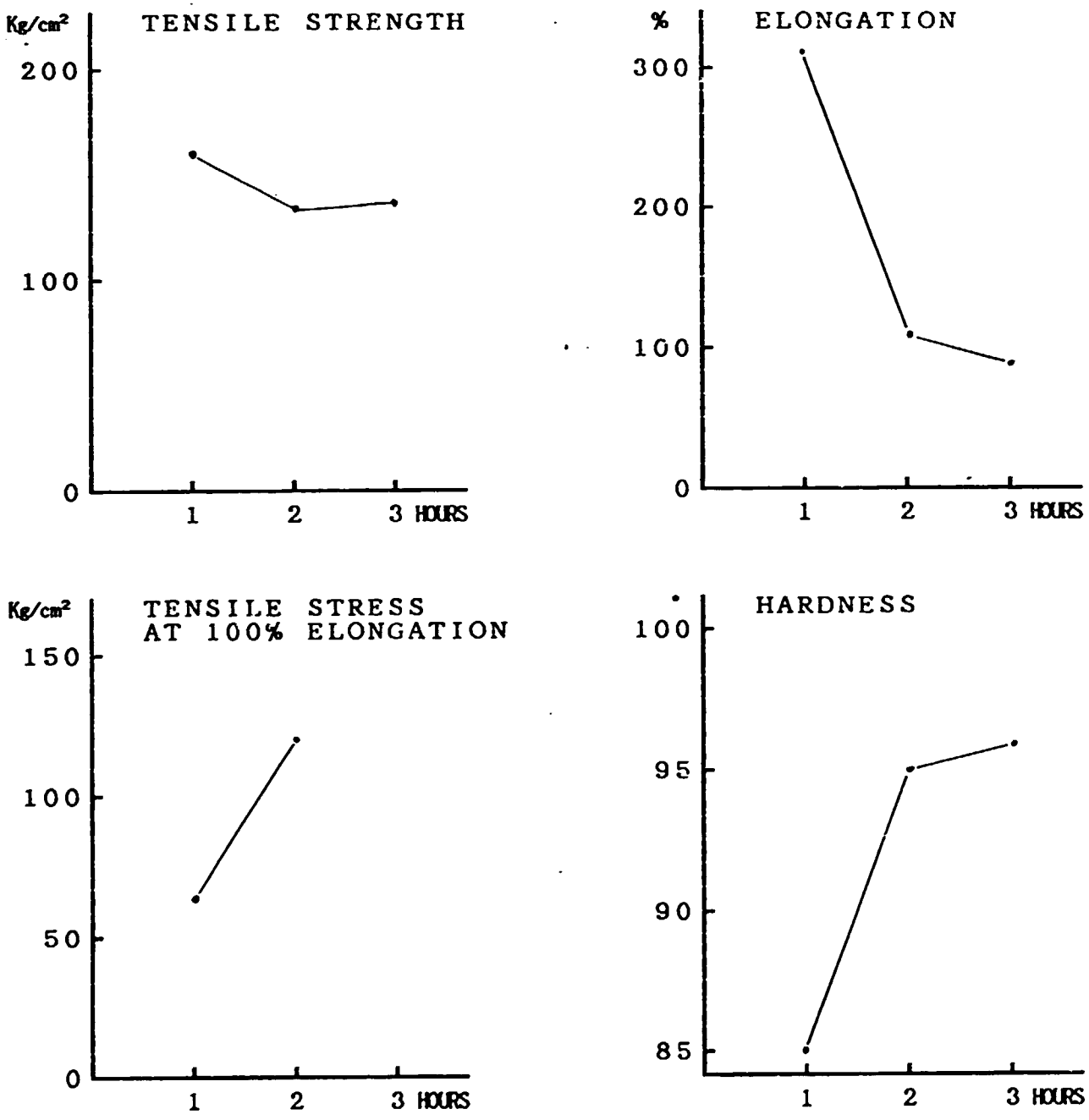
Remarks ; Vulcanizing temperature at 153℃
Specific gravity (g/cm^3) 1.3181

FIG. 3

RELATION

BETWEEN

PHYSICAL PROPERTIES AND VULCANIZATION TIME



3-3. Introduction of the new formula based on Natural Rubber

As a result of analysis, we introduced the improved composition, ran a trial manufacture and tested it at the rice mill.

3-3-1. Introduction of improved Composition

Composition is shown in Tab. 4 on page 18 and Mixing Procedure and Time is shown in Tab. 5 on page 18. We tried to mix according to this composition, but the rubber tended to scorch. Therefore, the Composition and Procedure was partially amended.

The New Composition is shown in Tab. 6 on page 19 and the Mixing Procedure and Time is shown in Tab. 7 on page 19. We tried again to mix according to the New Composition and we finally got good mixed rubber.

3-3-2. Trial Manufacture

Five (5) rubber rolls were manufactured for a test at the rice mill by using 14-inch drums. We also guided and trained the factory staff to mix by themselves.

3-3-3. Rice Mill Test

Two (2) pairs of rubber rolls were tested at the rice mill for five (5) days and the average durability of one (1) pair was 167tons. The Summary of Test Result and the Physical Properties of mixed rubber are shown in Tab. 8 and 9 on page 20. For detailed data of test result, please refer to the data forms on pages 21 to 23.

Tab. 4

IMPROVED COMPOSITION
BASED ON
NATURAL RUBBER

	Quantity Kgs / Batch
Natural Rubber	30.000
Resin	0.600
Antioxidant (D)	0.300
Vulcanization Accelerator (D)	0.210
Stearic Acid	0.750
Zinc Oxide	3.000
Aluminium Silicate (Al_2O_3, SiO_2)	5.000
Carbon Black (HAF)	21.000
Sulfur	2.400
Total	63.260

Tab. 5

MIXING PROCEDURE AND TIME

TIME (MINUTE)	
0	Natural Rubber + Resin (Mastication)
10	Stearic Acid + Zinc Oxide + Antioxidant (D) + Aluminium Silicate
15	Carbon Black (HAF) (Mixing)
30	Vulcanization Accelerator (D) + Sulfur (Mixing)
40	Mixed

Tab. 6

FINAL COMPOSITION BASED ON NATURAL RUBBER

	Quantity Kgs / Batch
Natural Rubber	25.000
Resin	0.500
Antioxidant (D)	0.250
Vulcanization Accelerator (D)	0.150
Stearic Acid	0.250
Zinc Oxide	2.500
Aluminium Silicate (Al_2O_3, SiO_2)	4.000
Carbon Black (HAF)	15.000
Sulfur	4.000
Total	51.650

Tab. 7

MIXING PROCEDURE AND TIME

TIME (MINUTE)	
0	Natural Rubber + Resin
	(Mastication)
13	Stearic Acid + Zinc Oxide
	+ Antioxidant (D)
18	Carbon Black (HAF) + Aluminium Silicat
	(Mixing)
33	Cut off mixed rubber
	Cool the rubber
0	Vulcanization Accelerator (D) + Sulfur
	(Mixing)
10	Mixed

Tab. 8 THE SUMMARY OF TEST RESULT

Total of Input Paddy	Tons	288.764
Total of Rubber wear	Kgs	24.6
Average Durability	Tons/one Kg Rubber	11.738
Average Rubber Weight	Kgs/one pair	14.2
Average Durability	Tons/one pair	166.8
Milling Efficiency	%	78 ~ 80
Hardness (JIS-A)	°	90 ~ 92

Tab. 9 THE PHYSICAL PROPERTIES

Tensile Strength	Kg/cm^2	128
Tensile stress at 100% Elongation	Kg/cm^2	——
Elongation	%	90 at broken
Hardness (JIS-A)	°	93
Abrasion Resistance	cc/1000 rev.	0.4223
Specific Gravity	g/cm^3	1.2720

Remarks ; Vulcanizing for 120 minutes at 150℃

TEST FOR DURABILITY OF RUBBER ROLLS

FINAL REPORT

NATURAL RUBBER TYPE

(According to Final Composition)

Pair No. (Hardness)	A: Starting Weight (Kg)	B: Finishing Weight (Kg)	C: A−B (Kg)	D: Total Input Paddy (Kg)	E: D/C
11 (92°)	18.200	12.000	6.200		
12 (92°)	20.300	14.000	6.300		
13 (90°)	18.600	12.500	6.100		
14 (92°)	20.300	14.300	6.000		
		Total	24.600	288,764	11,738

Average 11.738 tons/one kg rubber

DATA FORM OF TEST
FOR DURABILITY OF RUBBER ROLLS

PAIR NO. 11, 12, 13, 14

DATA		MILLING TIME			MOISTURE OF PADDY (%)	KIND OF PADDY	QUANTITY (kg)		EFFICIENCY OF MILLING (%)
DATE	HUSKER	START	FINISH	HOURS			INPUT PADDY	OUTPUT RICE	
29 Mar	No. 1	7:50	14:50	7.00	13	MOC TUYEN IR-203			
	No. 2	8:00	14:50	6.83					
	No. 1	23:30	6:30	7.00					
	No. 2	23:30	6:30	7.00					
			Total	27.83			77,350	56,500	73.05
30 Mar	No. 1	7:30	14:20	6.83					
	No. 2	7:30	14:20	6.83					
	No. 1	23:10	7:00	7.83					
	No. 2	23:10	7:00	7.83					
			Total	29.32			83,350	58,500	70.19

DATA FORM OF TEST
FOR DURABILITY OF RUBBER ROLLS

PAIR NO. 11, 12, 13, 14

DATA		MILLING TIME			MOISTURE OF PADDY (%)	KIND OF PADDY	QUANTITY (kg)		EFFICIENCY OF MILLING (%)
DATE	HUSKER	START	FINISH	HOURS			INPUT PADDY	OUTPUT RICE	
31 Mar	No. 1	7:15	14:30	7.25	13	MOC TUYEN IR-203			
	No. 2	7:15	14:20	7.08					
	No. 1	23:30	6:50	7.33					
	No. 2	23:30	6:40	7.16					
			Total	28.82			81,694	62.300	76.26
1 Apr	No. 1	7:15	14:00	6.75					
	No. 2	7:15	14:00	6.75					
			Total	13.50			36,100	32,300	89.47
3 Apr	No. 1	7:30	9:30	2.00					
	No. 2	7:30	9:30	2.00					
			Total	4.00			10,270	8,620	83.93
		Grand Total		103.47			288,764	218,220	Average 75.57

3-4. Introduction of the new formula based on Synthetic Rubber

At present, it is said that the rubber rolls for the paddy husking machine are manufactured from only Natural Rubber. However, in the future, it will definitely be necessary to introduce Synthetic Rubber to obtain a high quality product.

So, we introduce two (2) kinds of Synthetic Rubber. One is SBR (Styrene Butadiene Rubber) and another is NBR (Acrylonitrile Butadiene Rubber).

3-4-1. Introduction of the Composition based on SBR and NBR

The Composition is shown in Tab. 10 for SBR and Tab. 12 for NBR on pages 25 and 27. The Mixing Procedure and Time is also shown in Tab. 11 for SBR and Tab. 13 for NBR on pages 26 and 28.

3-4-2. Establishment of the Production Process based on Synthetic Rubber

3-4-2-1. Mixing Process

We guided and trained the factory staff to weigh the rubber and chemicals according to the Composition and to mix them according to the Procedure.

3-4-2-2. Manufacturing Process

We also guided and trained the factory staff to manufacture by using new and existing equipment during the trial manufacture.

3-4-3. Trial Manufacture

Each of twenty (20) rubber rolls were test manufactured at the rice mill by using 14-inch drums.

3-4-4. Test at Rice Mill (Yen My Rice Mill)

Each two (2) pairs of rubber rolls were tested at the rice mill for four (4) days on SBR and two (2) days on NBR. The average durability of one pair is 239tons on SBR and 339tons on NBR. The Summary of Test Result and the Physical Properties of mixed rubber is shown in Tab. 14 and 15 on page 29. For detailed data of test result, please refer to the data forms on pages 30 to 34.

Tab. 10

COMPOSITION BASED ON SYNTHETIC RUBBER (SBR)

	Quantity Kgs / Batch
Synthetic Rubber (SBR #1502)	10.500
Master Batch A	14.133
Master Batch B	0.210
Zinc Oxide	1.050
Stearic Acid	0.420
White Carbon	12.810
Hi-Styrene (Duranit #15S)	2.520
Triethanolamine	0.420
Peptizing Agent (Renacit #7)	0.420
Coumaron	0.630
Vulcanization Accelerator (DOTG)	0.084
Sulfur	1.260
Total	44.457

This is the typical composition for rubber rolls based on SBR (Styrene Butadiene Rubber).

Tab. 11

MIXING PROCEDURE AND TIME (SBR)

TIME (MINUTE)	
0	Synthetic Rubber (SBR #1502) + Master Batch A + High-Styrene (Duranit #15S) + Coumaron + Peptizing (Renacit #7)
5	White Carbon + Zinc Oxide + Stearic Acid
7	White Carbon + Triethanolamine
9	White Carbon + Master Batch B + Vulcanization Accelerator (DOTG)
14	Sulfur
17	Kneaded enough
19	Refining and Mixing
21	Making rubber sheets and cuting them off from the Mixing Roll
23	End

It takes about thirty (30) minutes for one cycle.

Tab. 12

COMPOSITION BASED ON SYNTHETIC RUBBER (NBR)

	Quantity Kgs / Batch
Synthetic Rubber (NBR)	10.600
Master Batch A	12.060
Master Batch B	0.160
Zinc Oxide	2.600
Stearic Acid	0.200
White Carbon	11.800
Hi-Styrene (Duranit #15S)	2.400
Triethanolamine	0.100
Peptizing Agent (Renacit #7)	0.100
Coumaron	1.000
Vulcanization Accelerator (DOTG)	0.140
Sulfur	1.200
White Pigment (TiO_2)	2.000
Antioxidant (Sandanto #2246)	0.200
Antioxidant (Antage SP)	0.200
Plasticizere (DOP)	1.000
Total	45.760

This is the typical composition for rubber rolls based on NBR (Acrylonitrile Butadiene Rubber).

Tab. 13

MIXING PROCEDURE AND TIME (NBR)

TIME (MINUTE)	
0	Synthetic Rubber (NBR) + Master Batch A + High-Styrene (Duranit #15S) + Coumaron + Peptizing (Renacit #7)
5	White Carbon + Zinc Oxide + Stearic Acid + White Pigment (TiO_2)
7	White Carbon + Triethanolamine + Antioxidant (SP) + Antioxidant (#2246) + Platicizere (DOP)
9	White Carbon + Master Batch B + Vulcanization Accelerator (DOTG)
14	Sulfur
17	Kneaded enough
19	Refining and Mixing
21	Making rubber sheets
23	and cuting them off from the Mixing Roll End

It takes about thirty (30) minutes for one cycle.

Tab. 14 THE SUMMARY OF TEST RESULT

		S B R	N B R
Total of Input Paddy	Tons	121.050	70.500
Total of Rubber wear	Kgs	7.700	3.300
Average Durability	Tons/one Kg Rubber	15.721	21.364
Average Rubber Weight	Kgs/one pair	15.200	15.880
Average Durability	Tons/one pair	239.000	339.300
Milling Efficiency	%	85.0	86.3
Hardness (JIS-A)	°	91 ~ 94	92 ~ 94

Tab. 15 THE PHYSICAL PROPERTIES

		S B R	N B R
Tensile Strength	Kg/cm^2	145	179
Tensile stress at 100% Elongation	Kg/cm^2	——	——
Elongation	%	220	110
Hardness (JIS-A)	°	95	94
Abrasion Resistance	cc/1000 rev.	0.5059	0.3090
Specific Gravity	g/cm^3	1.3053	1.3793

Remarks ; Vulcanizing for 180 minutes at 153℃

TEST FOR DURABILITY OF RUBBER ROLLS

FINAL REPORT

SYNTHETIC RUBBER (SBR) TYPE

Pair No. (Hardness)	A: Starting Weight (Kg)	B: Finishing Weight (Kg)	C: A−B (Kg)	D: Total Input Paddy (Kg)	E: D/C
1 (94°)	21.600	19.300	2.300		
2 (91°)	22.100	19.900	2.200		
3 (94°)	17.800	16.200	1.600		
4 (91°)	19.200	17.600	1.600		
		Total	7.700	121,050	15,721

Average 15.721 tons/one kg rubber

DATA FORM OF TEST

FOR DURABILITY OF RUBBER ROLLS

PAIR NO. SBR 1, 2, 3, 4

DATA		MILLING TIME			MOISTURE OF PADDY (%)	KIND OF PADDY	QUANTITY (kg)		EFFICIENCY OF MILLING (%)
DATE	HUSKER	START	FINISH	HOURS			INPUT PADDY	OUTPUT RICE	
22 Mar	No. 1	8:50	10:08	1.30	13	MOC TUYEN IR-203			
	No. 2	8:50	9:50	1.00					
	No. 1	10:30	14.45	4.25					
	No. 2	10:30	14:45	4.25					
			Total	10.80			26,550	19,500	73.45
23 Mar	No. 1	7:55	11:55	4.00					
	No. 2	7:55	15:10	7.25					
	No. 1	12:10	15:15	3.08					
			Total	14.33			34,200	27,200	79.53

DATA FORM OF TEST
FOR DURABILITY OF RUBBER ROLLS

PAIR NO. SBR 1, 2, 3, 4

DATA		MILLING TIME			MOISTURE OF PADDY (%)	KIND OF PADDY	QUANTITY (kg)		EFFICIENCY OF MILLING (%)
DATE	HUSKER	START	FINISH	HOURS			INPUT PADDY	OUTPUT RICE	
24 Mar	No. 1	7:30	7:50	0.33	13	MOC TUYEN IR-203			
	No. 2	7:30	7:50	0.33					
	No. 1	8:10	11.45	3.58					
	No. 2	8:10	11:45	3.58					
	No. 1	12:00	14:00	2.00					
	No. 2	12:00	14:00	2.00					
			Total	11.82			29,850	22,400	75.04
25 Mar	No. 1	7:20	14:10	6.83					
	No. 2	7:20	14:10	6.83					
			Total	13.66			30,450	23,000	75.53
		Grand Total		50.61			121,050	92,100	Average 76.08

TEST FOR DURABILITY OF RUBBER ROLLS

FINAL REPORT

SYNTHETIC RUBBER (NBR) TYPE

Pair No. (Hardness)	A: Starting Weight (Kg)	B: Finishing Weight (Kg)	C: A−B (Kg)	D: Total Input Paddy (Kg)	E: D/C
1 (94°)	18.500	17.900	0.600		
5 (93°)	20.300	19.300	1.000		
3 (93°)	21.300	20.400	0.900		
4 (92°)	19.800	19.000	0.800		
		Total	3.300	70,500	21,364

Average 21.364 tons/one kg rubber

DATA FORM OF TEST
FOR DURABILITY OF RUBBER ROLLS

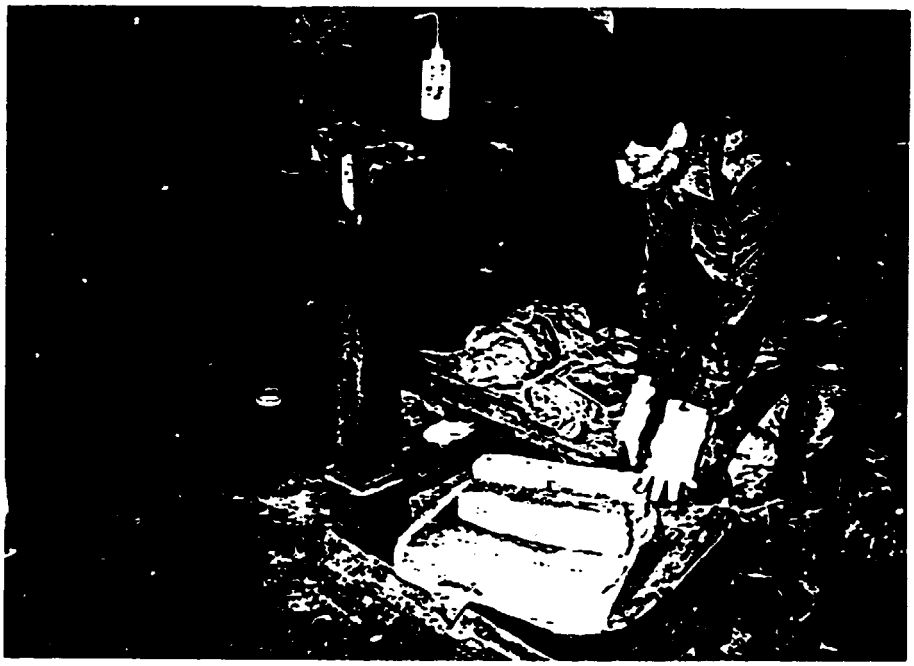
PAIR NO. NBR 1, 3, 4, 5

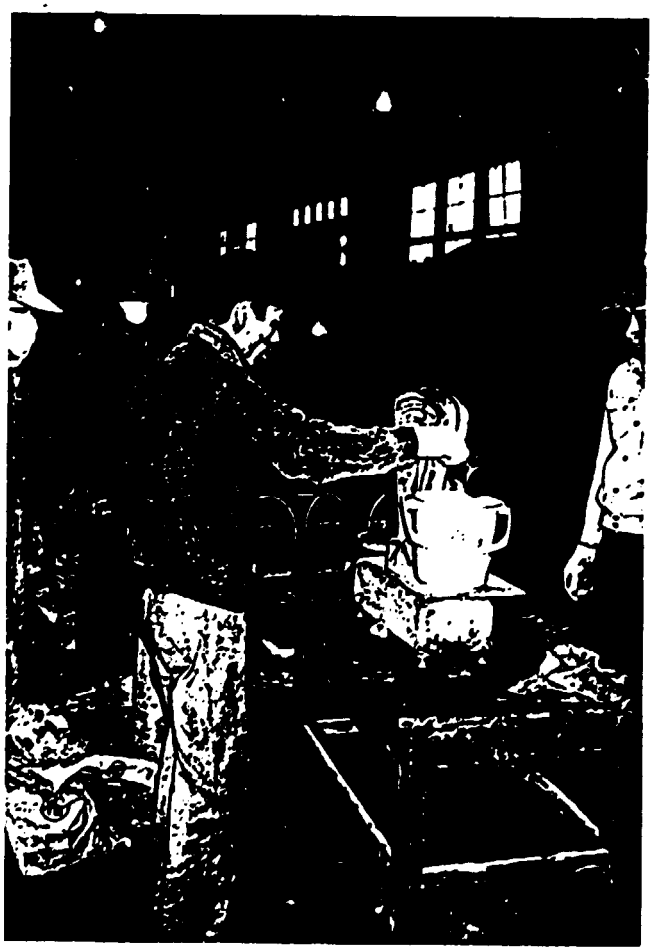
DATA		MILLING TIME			MOISTURE OF PADDY (%)	KIND OF PADDY	QUANTITY (kg)		EFFICIENCY OF MILLING (%)
DATE	HUSKER	START	FINISH	HOURS			INPUT PADDY	OUTPUT RICE	
27 Mar	No. 1	8:30	12:30	4.00	13	MOC TUYEN IR-203			
	No. 2	8:30	12:30	4.00					
	No. 1	12:50	14:30	1.67					
	No. 2	12:50	14:35	1.75					
			Total	11.42			28,500	21,700	76.14
28 Mar	No. 1	7:20	14:15	6.92					
	No. 2	7:20	14:15	6.92					
			Total	13.84			42,000	30,900	73.57
		Grand Total		26.26			70,500	52,600	Average 74.61

Production Process of the Rubber Roll

Weighing Process

weigh the rubber and chemicals





Production Process of the Rubber Roll

Mixing Process

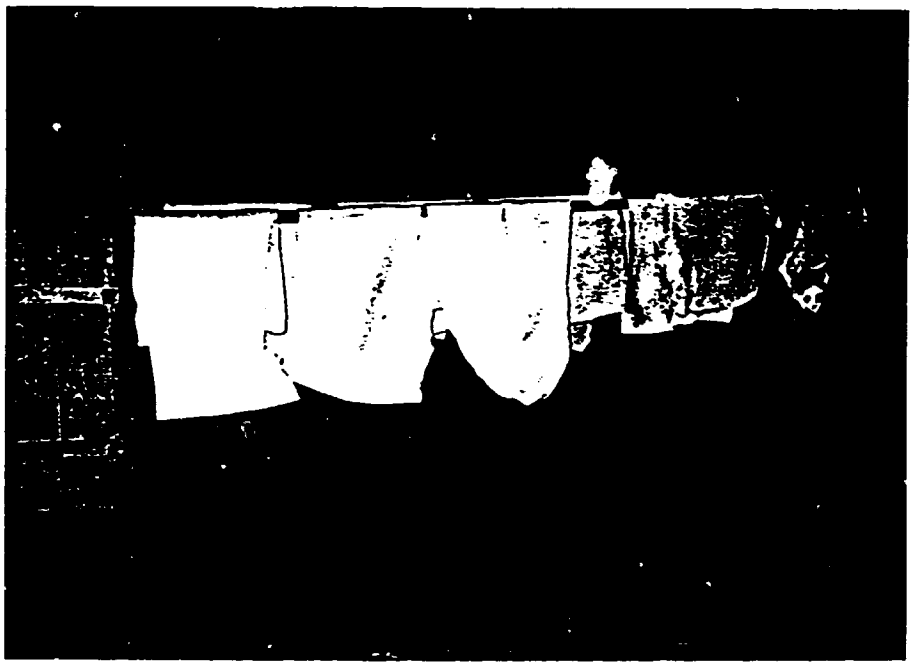
mix the rubber and chemicals on MIXING ROLL

cut off the mixed rubber from MIXING ROLL

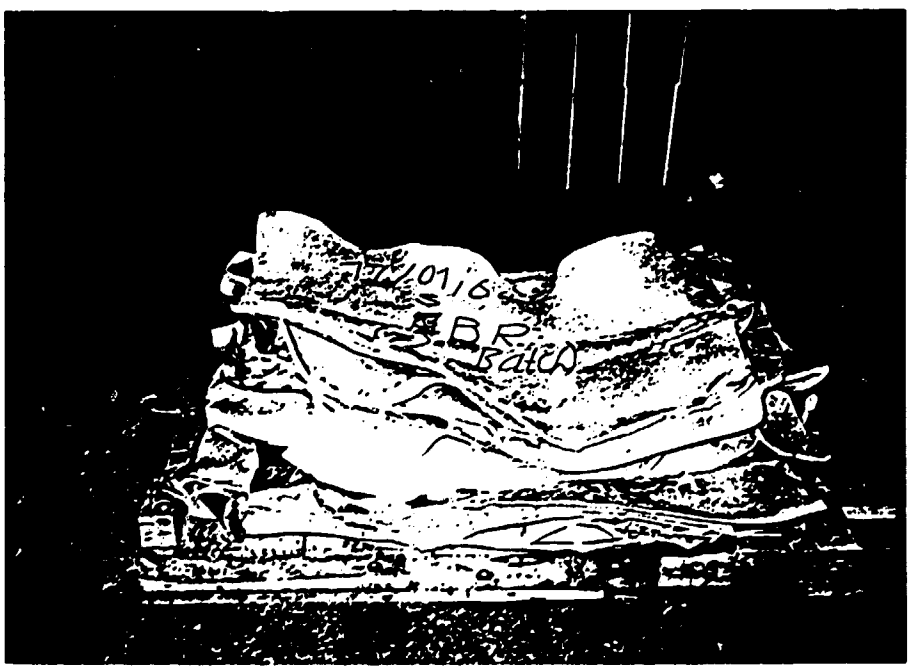
Production Process of the Rubber Roll

Mixing Process

cool the mixed rubber



age the the mixed rubber



Production Process of the Rubber Roll

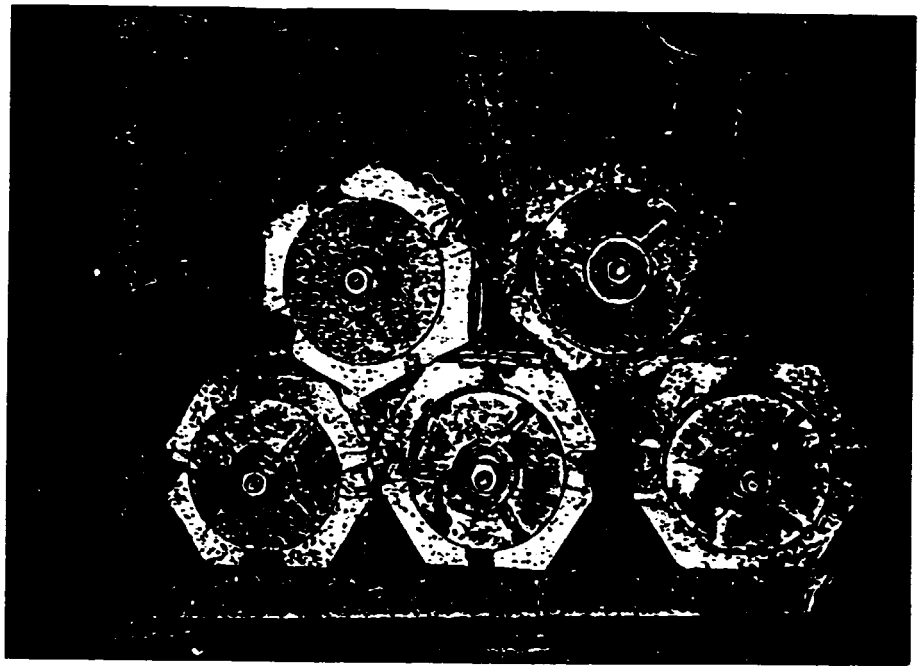
Winding Process

heat the mixed rubber

wind up the rubber sheets
by using NEW WINDING MACHINE

Production Process of the Rubber Roll

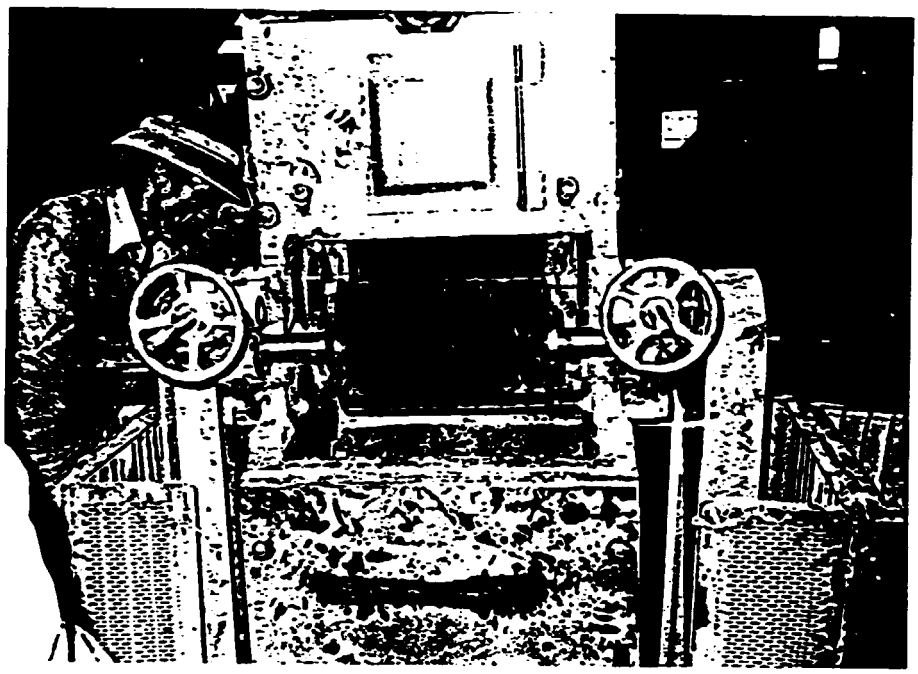
Vulcanizing Process



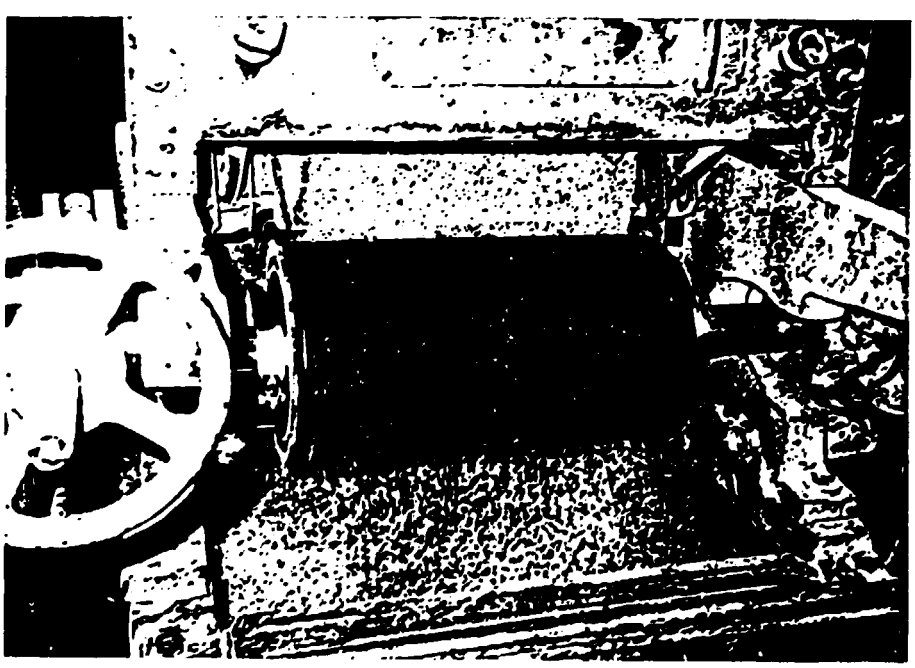
Finishing Process

The Paddy Husking Machine

in Yen My Rice Mill for 14-inch rubber roll



in operation



3-5. Establishment of the Procedures for rubber specimen testing

3-5-1. Procedure for Tensile Test

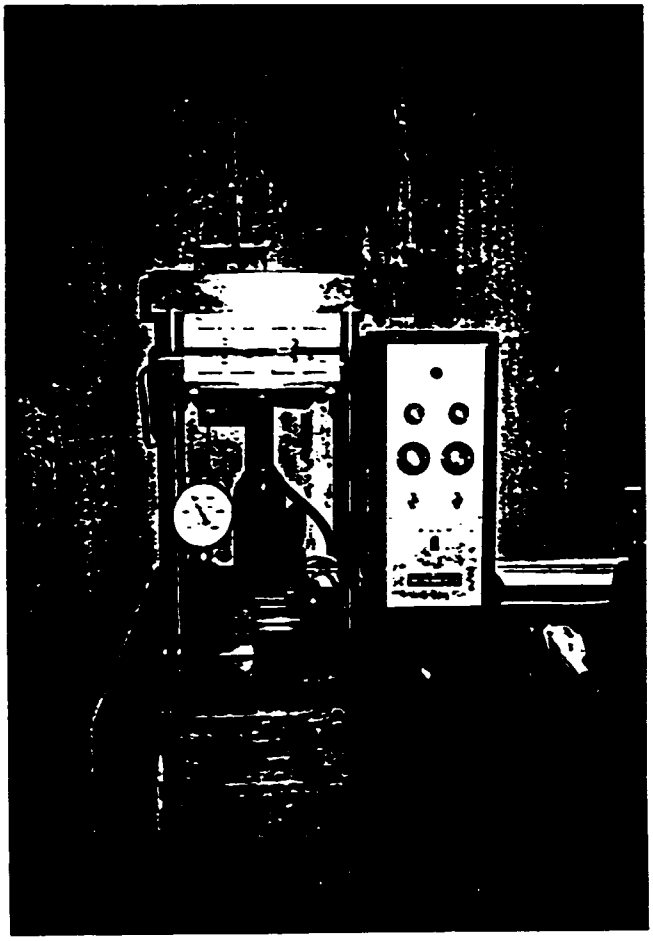
We have repeatedly guided and trained the factory staff on the Procedure for Tensile Test according to JIS (Japan Industries Standard) by by using an existing testing machine which was made in Japan.
We have also repeatedly guided and trained them on how to get the testing data and how to express the test result.

3-5-2. Procedure for Abrasion Test

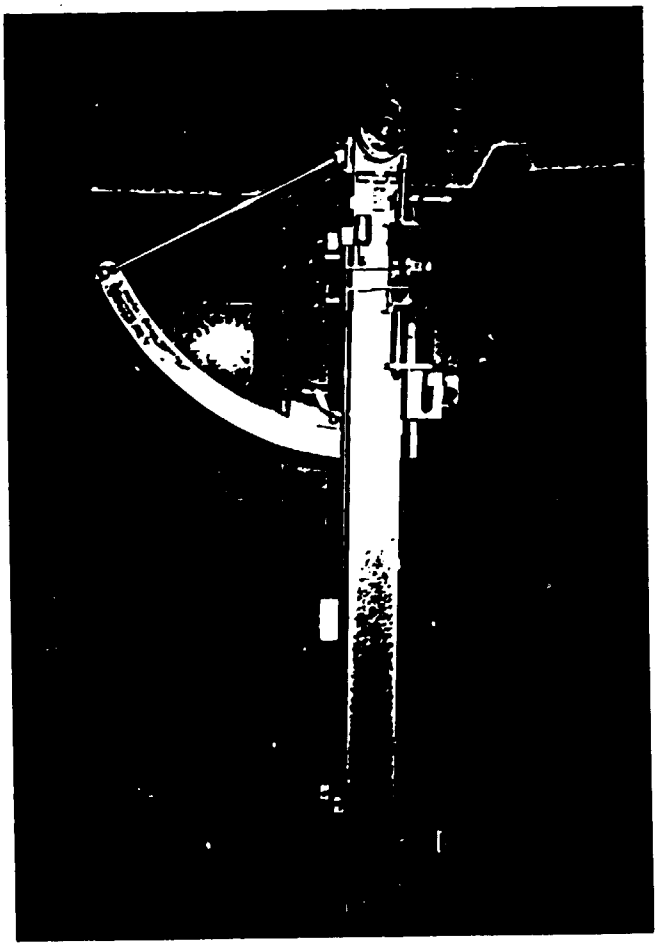
We have repeatedly guided and trained them on the Procedure for Abrasion Test according to the operating instructions by using an existing testing machine which was made in England, and and on how to calculate the abrasion loss of rubber by using an existing chemical balancer which was made in China. And we have also repeatedly guided them on how to express the test result.

The existing Testing Machine

Vulcanizing Press
with electric heater
made in Japan

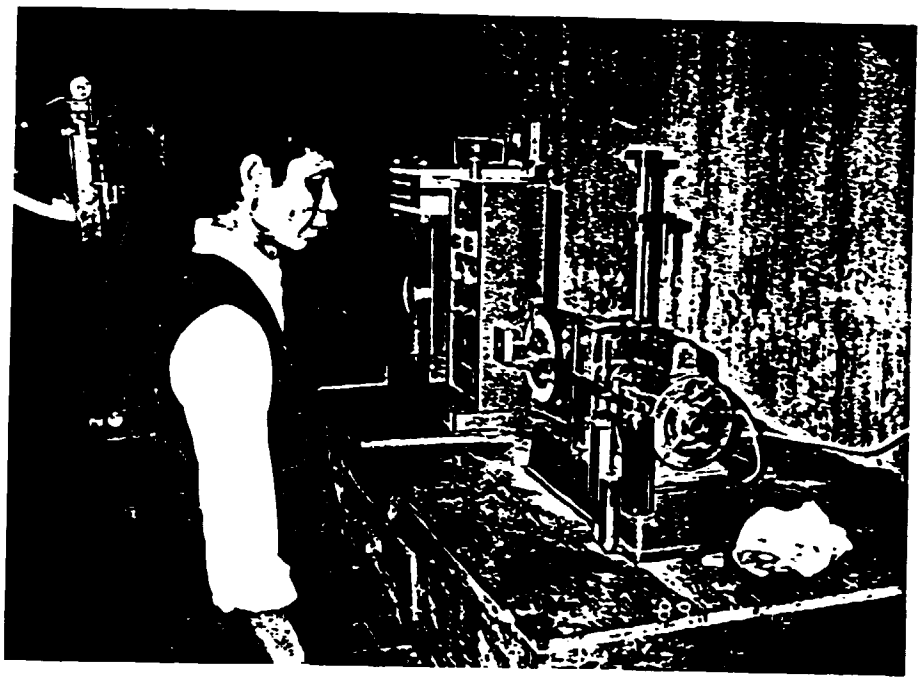


Tesile Tester
made in Japan



The existing Testing Machine

Abrasion Tester made in England



Chemical Balancer
made in China

3-6. Testing of the newly developed rubber rolls

The main purpose of this test is to test the endurance of drums on the newly developed rubber rolls which we proposed.

3-6-1. Type of newly developed rubber rolls

We proposed two (2) types and herein named as Type A and Type B. They are as follows.

Type A : drum reinforced with canvas
Type B : drum made from a perforated steel plate

3-6-2. Establishment of the Production Process

We explained the Procedures to the factory staff. The Procedures are shown on pages 45 to 48. And we guided and trained them according to the Procedures during trial manufacture.

3-6-3. Trial Manufacture

We manufactured some newly developed rubber rolls for trial. However, it was impossible to achieve the planned production number for trial because the metal molds for vulcanizing were broken by unexpected expansion force of rubber.

3-6-4. Test at Rice Mill (Lien Bat Rice Mill)

We carried out the test on one pair of Type B rubber rolls for about three (3) days. However, the drum seemed to be broken when the rubber wear was about 2/3 of one (1) rubber roll, judging from the factoy staff's report. So, we gave up the test on Type A, because the Type A drum is weaker than Type B.

MANUFACTURING PROCEDURES OF RUBBER ROLL MADE FROM DRUM REINFORCED WITH CANVAS

1. Procedure of the Rubber Paste Production

1-1. Composition of the Rubber Paste

The Composition is shown in Tab. 16 on page 47.

1-2. Mix the rubber sheet.

1-3. Cut the rubber sheet.

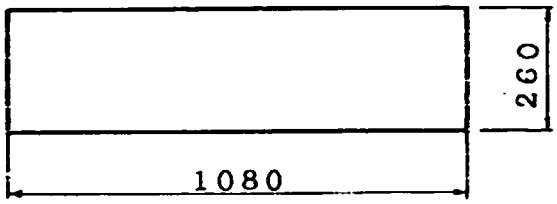
1-4. Solve the rubber sheet with solvet in the agitater

2. Procedure for spreading

2-1. Canvas
Type of Canvas : Canvas No. 6
Quality of the material : Cotton
Size : 36 inches × 50 mm

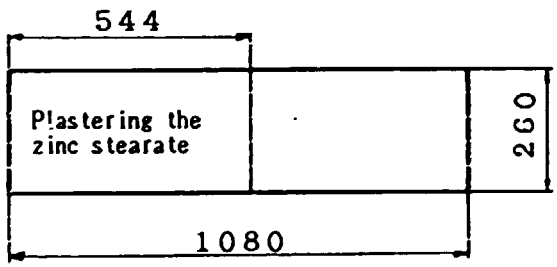
2-2. Spread rubber paste on the both faces of canvas with the spreader.

2-3. Cut the spread canvas to the size as follows.
Width 260mm × Length 1080 mm



2-4. Again paint rubber paste on the both faces of canvas by brush, and then dry.

2-5. Plaster the zinc stearate on the designated fron of the canvas, as follows.



2-6. Roll up the canvas sheet twice on the jig and fill in two (2) ditches with rubber. The size of rubber is as follows.
Width : 18 mm, Length : 260 mm, Thickness : 12 mm

2-7. Take out the canvas drum from jig for formation

3. Procedure for winding the rubber sheet onto the canvas drum

Set the formed canvas drum in the core for vulcanizing and wind the rubber sheets by using the winding machne.

4. Procedure for assembling metal mold for vulcanizing

4-1. Spread mold release to the metal mold for vulcanizing.

4-2. Set the outside mold on the lower mold and insert the winded product into the outside mold.

4-3. Set the upper mold on the outside mold.

4-4. Fix the bolt and set the mold in the jig for pressing.

4-5. Press the product with the hydraulic cylinder and fasten the bolt.

4-6. Lift the hydraulic cylinder and take out the mold from the jig for pressing.

4-7. Transfer the product on the cart for vulcanizing.

5. Procedure of vulcanization

Vulcanize rubber rolls for 90 minutes at 5 Kg/cm^2 (157 ℃) of steam pressure. But time and pressure is decided at locale.

6. Procedure for disassembling the metal mold after vulcanization

6-1. Transfer the vulcanized product out of the cart.

6-2. Loosen the bolt. If it will not loosen, press the product with the hydraulic press and loosen it.

6-3. Take the upper and lower mold off the outside mold with a plastic hammer, etc.

6-4. Set the outside mold in the jig and push the core out of the product with the hydraulic cylinder.

6-5. Change the jig to take the product out of the outside mold, and push the product out with the hydraulic cylinder.

6-6. Spread the mold release on the vulcanization metal mold.

Tab. 16

COMPOSITION

OF

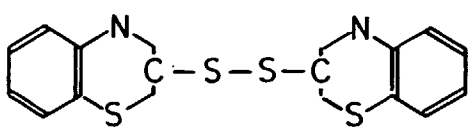
RUBBER PASTE

Natural Rubber (RSS #3)	100
Sulfur	3
Zinc Oxide	8
Stearic Acid	1
Vulcanization Accelerator (DM)	0.7
Pine Tar	3
Takifier (Resin)	1
Calcium Carbonate	40
Total	156.7

Description

1. Natural Rubber (RSS#3)
   Ribbed Smoked Sheet

2. Vulcanization Accelerator
   Dibenzothiazyldisulfide

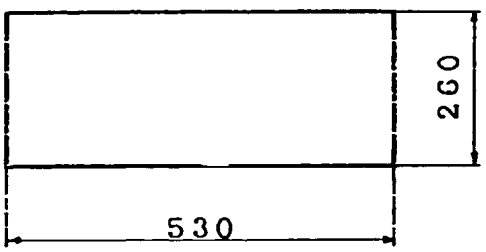


3. Pine Tar (Vegetable Oil Softener)
   Physical Properties is as follows.
   Melting Point : 70 ~ 80 ℃
   Specific Gravity : 1.045 ~ 1.086 g/cm³

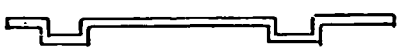
4. Takifier (Resin)
   Physical Properties is as follows.
   Specific Gravity : 0.900 ~ 0.930 g/cm³

PROCEDURES OF MANUFACTURING DRUM MADE FROM PERFORATED STEEL PLATE

1. Size of steel plate
   Thickness : 1.2 mm



2. Perforate and groove the steel plate.
   (Refer to the drawing)



3. Form into a cylinder and weld.

4. Forming the roll

4-1. Put the two separated molds (cores) in a welded steel plate roll.

4-2. Put the taper shaft into the core and hammer the shaft to the designated line.

4-3. Drive the grooving mold into the ditch with a hammer.

4-4. Beat the circumference of the steel plate roll with a two (2) pound hammer.

4-5. Drive the taper shaft again into the core to the maximum depth.

4-6. Beat the circumference of the steel plate roll again with a one (1) pound hammer.

4-7. Take out the taper shaft from the core and pull out the core from the formed steel plate roll.

Manufacturing the drum
of
the newly developed rubber roll

The drum is reinforced with canvas

Manufacturing the drum of the newly developed rubber roll

The drum is made from perforated steel plate

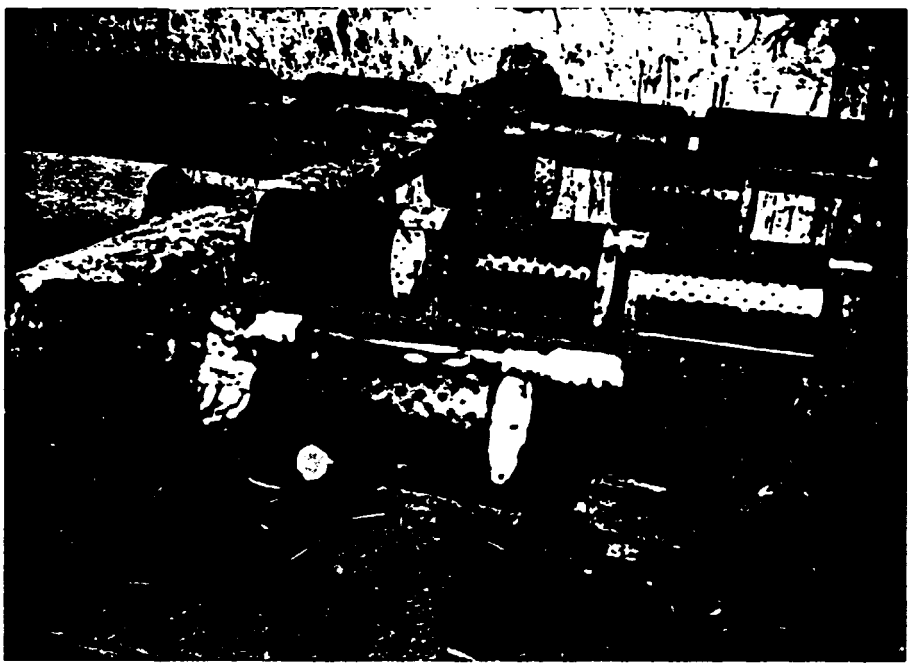
Drive the grooving mold

Beat the circumference

Manufacturing the drum
of
the newly developed rubber roll

The drum is made from perforated steel plate

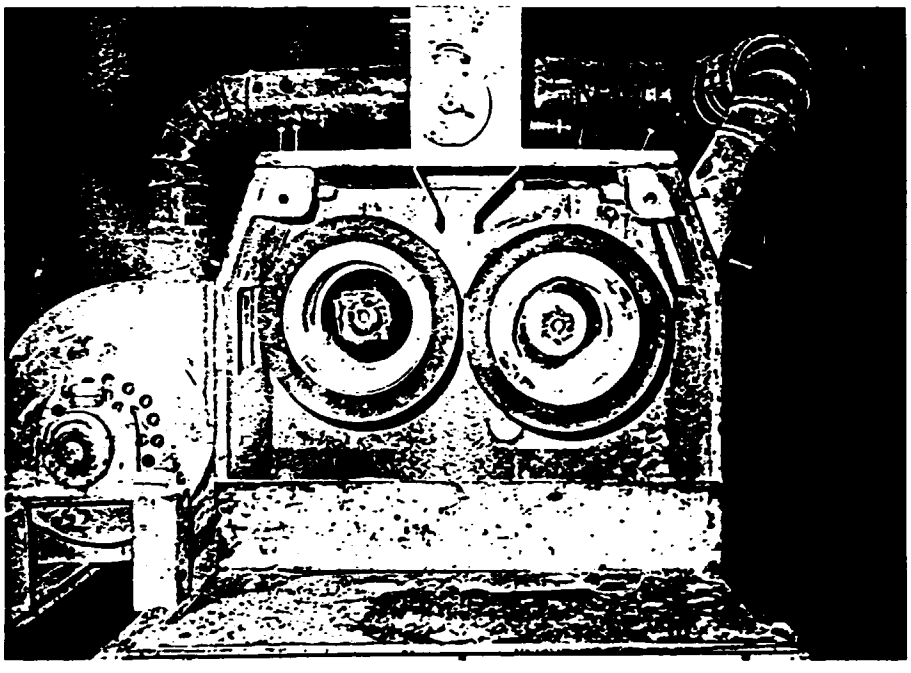
Plaster the drum with Chemlok
(a trade name of an adhesive)



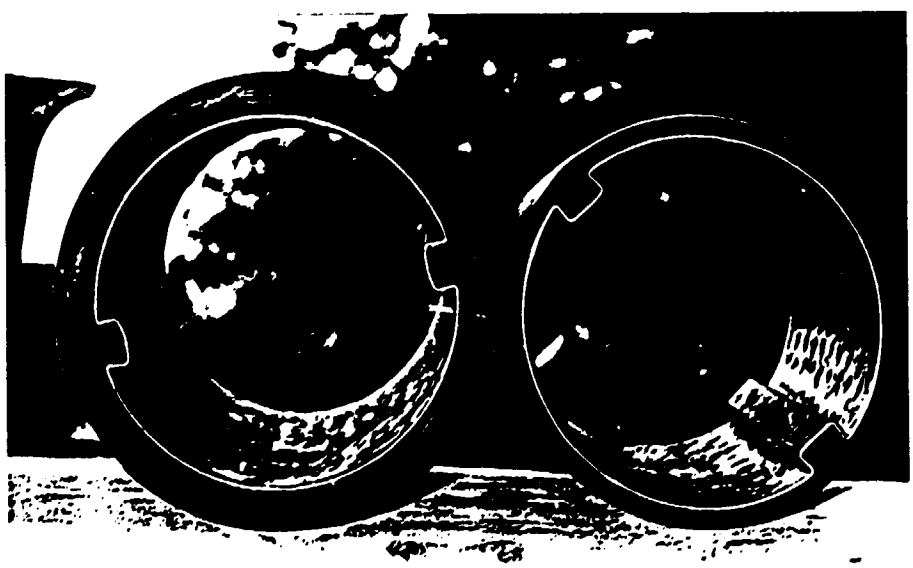
The Paddy Husking Machine

in Lien Bat Rice Mill

Fix the rubber rolls



The rubber roll condition after test



4. Conclusions

4-1. On Rubber Roll Quality

4-1-1. On adhesion between rubber and cast iron drum :

The surface treatment of the drum got better by using the Shot Blasting Machine. However, owing to firm adhesion, it is necessary to improve the composition of the existing ebonite bonding agents or to introduce other adhesives, for example Chemlok (a trade name).

4-1-2. On Quality Control :

Laying mixed rubber sheet and rolling rubber rolls on the floor are undesirable in the view of quality control. So we recommended that pallets be made and mixed rubber sheets and rubber rolls are put on them. The factory staff should be educated on quality control.

4-1-3. On Physical Properties :

We brought each specimen of mixed rubber tested at the rice mill back to Japan and carried out a test on them. However, as to the abrasion test, we used a different tester. There is the Williams type at Yen My Rice Mill but the Akron type at our factory. The comparison table of the physical properties is shown in Tab. 17 on page 55.

4-2. On Manufacturing Equipment

4-2-1. On 26-inch Mixing Roll :

4-2-1-1. In continuous mixing, the temperature of rolls increased more than expected. This high temperature is a cause of scorching. In this case, rolls should be cooled by water. However the existing pipe is too short and does not cool the rolls sufficiently. So, it is necessary to replace the existing pipe with a bigger one.

4-2-1-2. At the beginning of the operation, the rolls should be warmed, and the steam pipe should be added to the machine to save labor.

4-2-1-3. To improve the working environment, a duct and dust collector should be installed with the machine.

4-2-1-4. In the future, we think that the power of the motor for this machine will need to be increased for the mixing process based on improved composition or Synthetic Rubber.

4-2-2. On 14-inch Mixing Roll :

4-2-2-1. At the beginning of making the thin rubber sheets, the rolls should be warmed up. So we recommend that the steam piping be attached to this machine to save labor.

4-2-2-2. In order to obtain the required thickness of the rubber sheets, the surface of the roll should be kept in good condition and the stock guidance for the rubber should be improved in that geometry.

4-2-3. On the lighting in the factory :

In the manufacture of rubber products, the working conditions may be very dangerous and careful attention should be taken in operating and working. So, we recommend that the lighting in the ractory should be well-maintained for safety and efficiency in operating and working.

4-2-4. On the layout of Equipment :

In view of the production process, the existing layout of equipment is illogical. So, it will be necessary to review the layout in order to save labor.

Tab. 17 THE COMPARISON TABLE OF PHYSICAL PROPERTIES

Physical Properties		N R		S B R		N B R	
		MIZUCHI	YEN MY	MIZUCHI	YEN MY	MIZUCHI	YEN MY
Tensile Strength	Kg/cm²	182	128	159	145	234	179
Elongation	%	120	90	210	220	140	110
Hardness (JIS-A)	°	93	93	96	95	96	94
Abrasion Resistance	cc/1000 rev.	0.0421	0.4223	0.0614	0.5059	0.0167	0.3090
Specific Gravity	g/cm³	1.3036	1.2720	1.3037	1.3053	1.3873	1.3793

Remarks :

(1) Abrasion Tester Akron type at MIZUUCHI
Williams type at YEN MY RICE MILL

(2) NR means mixed rubber based on finally improved composition.

THE MINUTE

ON APPRAISAL OF FULFILMENT

CONTRACT 88/12 BETWEEN MIZUUCHI RUBBER CO. LTD JAPAN

AND UNIDO PROJECT VIE/82/004.

The meeting commenced on 9.30AM April 12th,1989 at Yen My Rice Mill (the place to be carried out this contract)

Participants :

+ UNDP/UNIDO .
  1. Mr. Jean Marc Bonnamy - Deputy representative of UNDP in Hanoi.
  2. Mr. Adermaln - Assistance to UNDP Program.
  3. Mr. Pham Duc Thang - Assistance to UNDP Program.
+ Mizuuchi Rubber Co.
  1. Mr. Shunji Kirino-Leader of Reseach and Development Dept.
  2. Mr. Schuichi Okuyama - Assistance .
+ Members of Project.
  1. Mr. Nguyen Dinh Thu - Chief Projector
  2. Mrs. Pham Thi Phuoc Hao - Deputy chief Projector.
  3. Mr. Do Dac Phuc - Director of Yen My Rice Mill.
+ Nissho Iwai Representation .
  1. Mr. M. Kosuda - GM Representation in Viet Nam.

  There were more participants in the meeting who were members of the Project and Group for investigating rubber roller.

After having the report on the process and activities of contract as well as result of trial test , all participants came to an agreement as follows:

1/ Equipments :

Machinery were completely assembled and getting good result on trial test , spare parts were fully enclosed asper contract.

2/ Production of Synthetic and Natural rubber :

+ Synthetic rubber : Produced out 2 kinds of SBR and NBR by using chemicals which was given by Mizuuchi people .
+ Natural rubber : Produced out Natural rubber roller with pig-iron core size 14 inches on the basic of available chemicals at Yen My Rice Mill .

3/ Trial test of Rubber roller :

+ SBR reached 239 MT/pair at Yen My Rice Mill .
+ NBR reached 339 MT/ pair at Yen My Rice Mill.
+ Natural Rubber based on instruction composition of Japanese expert , it reached 167 MT/pair at Yen My Rice Mill .

+ Size 220 X 261 (iron sheet core) reached 94 MT/pair at Lien Bat Rice Mill .

Because of machinery situation and kind of paddy , the new roller with iron sheet core , while on operation , the core was damaged .

4/ Training :

While assembling machinery , runing trial test , producing synthetic and natural rubber ,experts have fully guided to workers how to operate machinery , how to apply composition of rubber production .

All parties came to an agreement that all activities were carried out exactly the same with content stipulated in the contract and it can meet Vietnam present demand which is hightening quality of roller for food production .

Natural rubber which serves processing of food.

Made at Yen My on April 12th,1989 , in English , in 8 examplaries, 2 for each party.

UNDP. Representation.

Project Representation.

Mizuuchi Representation.

Yen My Rice Mill Representation.