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Rubber Position in the Free World during 1951

Contribution of
Chemicals Branch of
Materials Division of
Office of Research and Reports

1 February 1953

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RUBBER POSITION IN THE FREE WORLD DURING 1951

I. Introduction

A study of the rubber position in the Free World during 1951 indicates that the Free World controls the major proportion of all capabilities for rubbers production and for the fabrication of rubber goods in the world.

Of the world production of natural rubber in 1951, the Free World contributed practically all of the 1,380,000 tons of natural rubber produced.* Over 80% of the synthetic and 94% of the reclaimed rubbers produced by the World in 1951 were the output of the Free World. The production of rubber of all types, including natural, synthetic, and reclaimed, in the Free World area during 1951 is estimated at around 3,275,800 long tons. This production is made up of the following types:

Natural rubber	1,880,454	long tons
Synthetic "	908,377	" "
Reclaimed "	486,969	" "
Total	3,275,800	long tons

Rubber consumption in 1951 shows a similar high percentage by the countries of the Free World. The entire world consumed around 1,500,000 long tons of natural rubber in 1951, compared with 1,705,000 tons in 1950. Of this 1951 natural rubber consumption of 1,500,000 tons, the countries of the Free World consumed an estimated 1,328,000 tons, or 88% of the world total. The Free World consumed around 78.4% of the estimated world consumption of synthetic rubber and about 87% of the reclaimed rubber.

This preponderance of rubber consumed by the Free World is further illustrated by the total world production of tires during 1951. While the Free World produced an estimated 142,670,300 tires, the Soviet Bloc production is estimated to be less than 15,000,000 tires in 1951.**

The areas of the Free World have been divided into the major geographical sections in order to show more clearly the strategic importance of certain blocs of countries in the over-all position of the rubber capabilities of the Free World. The relative importance of rubber in these various areas of the Free World is shown by the following recapitulation of production and consumption of all types of rubber during 1951:

* See CIA ORR 24-52 Draft, October 1952, Rubber Position of the Soviet Bloc. The Soviet Bloc produced in 1951 an estimated 2,600 tons of natural rubber from latex-bearing plants such as kok-saghyz.

** Preliminary estimate.

Total Rubbers of all Types (long tons)

Area	Domestic Production*	Consumption
North America	1,278,535 a/	1,659,895
South America	35,080 b/	66,342
Far East and South Pacific	1,802,579 b/	166,280
Europe and UK	87,750 a/	702,127
Africa	72,000 c/	31,228
Total	3,275,800	2,625,872

* Domestic production of rubbers includes for each area only the types produced in countries of each area. For instance, in the North America area, only synthetic and reclaimed rubbers are given and in Africa only natural rubber is shown as domestic production.

a. Synthetic and reclaimed rubber.
b. Natural and reclaimed rubber.
c. Natural rubber.

From this consumption of rubber, the following motor vehicle tires were produced by the countries of the Free World area during 1951:

	Total Tires Produced (in numbers)
North America	97,980,829
South America	3,065,112
Far East and South Pacific	5,274,363
Europe and UK	34,552,195
Africa	1,470,000
Total	142,342,499

By the end of 1951, stocks of rubbers for all countries in the Free World area reportedly totalled over 750,000 tons. Of this total, available statistics by country accounted for 663,000 tons, made up as follows:

	Stocks of Rubber** (long tons)
North America**	263,340
South America	17,529
Far East and South Pacific	251,231
Europe and UK**	129,341
Africa	1,800
Total	663,241

** These stocks are working inventories of rubbers left over at the end of the year in the hands of rubber manufacturers, and do not include strategic Government military stockpiles of rubber.

Again, the North American area has the largest percentage of rubber stocks in the Free World Area, as well as production, consumption and production of motor tires. The area of Far East and South Pacific comes second in percentage of rubber stocks since this includes the major producing area of natural rubber in the world.

II. Free World Rubber Production during 1951

The production of rubber of all types, including natural, synthetic, and reclaimed, in the Free World area during 1951 is estimated at around 3,275,000 long tons. This production was made up by the following types:

Natural rubber	1,880,454	long tons
Synthetic "	908,377	" "
Reclaimed "	486,969	" "
Total	3,275,000	" "

Of the Free World production of natural rubber, estimated at 1,880,500 during 1951, 94.5% came from regions of the Far East and South Pacific. Malaya accounted for 32% of this production, Indonesia 42%, and both supplied nearly 75% of the entire world production of natural rubber.

The United States was the major producer of both synthetic and reclaimed rubber, supplying 93% and 75% respectively of the Free World production. The United Kingdom and Germany were next in reclaimed rubber production, supplying 7% and 5%. Canada was the only other major producer of synthetic rubber, with 6% of the Free World total during 1951.

The total output of all types of rubbers by the Free World during 1951 is shown below by the major geographical areas:

Table 1.

FREE WORLD OUTPUT OF RUBBER BY TYPES DURING 1951
(in thousand long tons)

Area	Natural	Synthetic	Reclaimed*	Total
North America	0	907.5	371.0	1,278.5
South America	30.0	0	5.1	35.1
Far East and South Pacific	1,778.5	0	24.0	1,802.5
Europe and UK	0	.9	86.8	87.7
Africa	72.0	0	N.A.	72.0
Total	1,880.5	908.4	486.9	3,275.8

* Production of reclaimed rubber depends on demand and is produced as needed rather than on a steady production schedule.

Table 2 shows production of rubbers by type for each of the countries of the appropriate geographical area.

A table of individual synthetic and reclaimed rubber plants, giving location and quantity of production for each plant by country, is shown in Appendix A. On plants where no specific information is available explanatory notes are included in the tables.

A. North America

The United States and Canada are the only producers of synthetic rubber in North America, and, except for small production in West Germany, the only commercial producers of synthetic rubber in the Free World area.

The synthetic rubber plants in the United States are widely scattered, as are also the facilities for reclaiming rubber. Only one company produces synthetic rubber in Canada.

The production of reclaimed rubber during 1951 in the U. S. attained a position of greater importance than ever, chiefly because of decreased use of natural rubber brought about by strenuous efforts to build up the natural rubber stockpile. Production of reclaimed rubber depends on demand and is produced as needed rather than on a steady production schedule. Thus, production of reclaimed rubber can and does vary widely from year to year and month to month.

Most major tire producing plants generally have facilities for reclaiming rubber, so that this important raw material would be relatively invulnerable to destruction in time of war as would be also the tire fabricating facilities. While a large percentage of reclaimed rubber is produced in Akron, Ohio, and vicinity, another large portion is produced in East St. Louis, Illinois, by the Midwest Reclaiming Co. The U. S. Rubber Company also has a large reclaiming plant at Naugatuck, Conn.

The U. S. produced 75.7% of Free World reclaimed rubber in 1951, out of a total North America contribution of 76.9%.

B. South America

South America is a small producer of natural rubber, most of which comes from Brazil. However, Brazil uses most of its own rubber and in postwar years has been importing some.

No synthetic rubber is produced. Recent interest by Brazil in the establishment of a synthetic rubber industy has not yet been successful.

Only small production of reclaimed rubber has been produced by countries of South America, amounting to less than 1% of the Free World total reclaimed rubber production in 1951.

C. Far East and South Pacific

The Far East produced 94% of the Free World output of natural rubber in 1951, of which Indonesia and Malaya were the major contributors with 42% and 32% respectively of total world supply.

No synthetic rubber is produced in this area, and only 4.2% of the total Free World production of reclaimed rubber in 1951 came from this area. Japan was the major contributor of Far East production of reclaimed rubber, producing an estimated 11,982 tons of the total 23,988 tons produced by these countries.

D. Europe including UK

No natural rubber is produced by European countries, and the production of synthetic rubber was barely started in 1951. West Germany was the only producer of synthetic rubber, producing less than 1,000 tons in 1951. However, production is expected to increase rapidly in future years with as much as 25,000 tons productive capacity expected by mid-1954.

Europe is second in production of reclaimed rubber. Information on such facilities in countries of Europe is incomplete. However, of the Free World total this area contributed 36,821 tons or 17.8%, of which UK, Germany, and Spain were the major producers.

E. Africa

The countries of Africa produced an estimated 72,000 tons of natural rubber in 1951, representing only 4% of the Free World total production of natural rubber.

No synthetic rubber is produced.

Information is not available on the production of reclaimed rubber, but it is considered negligible. South Africa reportedly has capacities for the output of 2,500 tons per year, but no data are available as to actual output.

TABLE 2. - PRODUCTION OF NATURAL, SYNTHETIC, AND RECLAIMED RUBBER IN THE FREE WORLD AREA DURING 1951[a/]

(In long tons)

Country	Natural	% Of Total	Synthetic	% Of Total	Reclaimed	% Of Total	Total	% O Tot
NORTH AMERICA	0	0	907,448	99.9	371,087	76.9	1,278,535	3
Canada	None		62,293		5,077		67,370	
Cuba	None		0		77[b/]		77	
Mexico	N.A.		0		N.A.[b/]		N.A.	
United States	None		845,155		365,933		1,211,285	
SOUTH AMERICA	30,000[a/]	2	0	0	5,073.2		35,080	
Argentina	-		-[d/]		1,000[b/]		1,000	
Bolivia	1,800		None		None		1,800	
Brasil	20,777		-[d/]		862		21,639	
Chile	0		None		2.5		2.5	
Colombia	400		None		N.A.		400	
Costa Rica	125		None		6.7		131.7	
Ecuador	363		None		None		363	
Guatemala	165		None		20		185	
Nicaragua	170		None		None		170	
Panama	64		None		None		64	
Peru	1,968		None		18		1,986	
Uruguay	None		None		164[b/]		164	
Venezuela	None		None		N.A.		N.A.	
FAR EAST and SOUTH PACIFIC	1,778,454	96.	0	0	23,988	1.2	1,802,579	5
Australia	-		-		8,606		8,606	
British Borneo	21,500		-		-		21,500	
Burma	14,000		-		-		14,000	
Ceylon	105,000		-		None		105,000	
India	17,148		-[d/]		2,200[b/]		19,348	
Indochina	52,136		None		-		52,136	
Indonesia*	805,159		None		-		805,159	
Japan	None		None		11,982[b/]		11,982	
Malaya	605,343		None		N.A.		605,343	
Oceania	2,709		None		None		2,709	
Other Asia	2,600		None		None		2,600	
Sarawak	42,359		None		None		42,359	
Thailand	110,500		-		None		110,500	
New Zealand	None		-		1,200		1,200	
EUROPE including ENGLAND	0	0	929	.1	86,821	17.8	87,750	
Austria	None		None		1,956		1,956	
Belgium	None		None		2,500		2,500	
Denmark	None		None		300		300	
Finland	None		None		331.5		331.5	
France	None		-[d/]		N.A.[b/]		N.A.	
Germany, West	None		929		27,355**		28,284	
Greece	None		None		N.A.		N.A.	
Israel	None		None		N.A.		N.A.	
Italy	None		-[d/]		2,500		2,500	
Netherlands	None		None		1,600[b/]		1,600	
Norway	None		None		500		500	
Pakistan	None		None		100		100	
Portugal	None		None		300		300	

* Includes Java, Sumatra, Borneo, and East Indonesia.

** 33948 including ground scrap.

TABLE 2. (Cont'd)

Country	Natural	% Of Total	Synthetic	% Of Total	Reclaimed	% Of Total	Total	% Of Total
Spain	None		None d/		10,000		10,000	
Sweden	None				2,500		2,500	
Switzerland	None		None		150		150	
United Kingdom	None		None		36,729		36,729	
Yugoslavia	None		None		N.A.		N.A.	
AFRICA	72,000	4	0	0	N.A.	0	72,000	2
Algeria	-		None		-		-	
Belgian Congo	12,000		None		-		12,000	
Egypt	-		None		-		-	
French Africa and Other	4,000		None		-		4,000	
Liberia	34,000		None		-		34,000	
Nigeria	22,000		None		-		22,000	
South Africa	-		-		N.A. b/			
GRAND TOTAL	1,880,454 e/		908,377 e/		486,402 e/		3,275,810	

a. The following countries of the Free World have not been included in the tables, because they contribute so little to rubber fabrication in the Free World.

North America	South America	Far East and South Pacific	Europe and UK	Africa
	Dominican Rep.	Formosa	Afghanistan	Ethiopa
	El Salvador	Philippines	Iran	Morocco
	Haiti		Iraq	Nepal
	Honduras		Lebanon	
	Paraguay		Syria	
	Puerto Rico		Turkey	

b. Rubber Statistical Bulletin, June 1952, gives the following capacities for reclaiming rubber estimated as of 1952:

1. Argentina	7,500
2. Cuba	400
3. France	30,000
4. India	4,000
5. Japan	23,000
6. Mexico	1,000
7. Netherlands	1,000
8. South Africa	2,200
9. Uruguay	500

c. Round figures of around 30,000 as estimated for area are used, since detailed country statistics are not available.

d. Experimental facilities for synthetic rubber or planned production of synthetic rubber.

e. Estimates made by Rubber Statistical Bulletin, June 1952, show production as 1,880,000 tons natural, 908,377 tons synthetic, and 433,702 tons reclaimed rubber. Reclaimed rubber total of RSB, however, includes only five major producers of the Free World.

III. Free World Trade in Rubbers during 1951

Most of natural rubber imports by rubber consumers of the world originates in Southeast Asia and South Pacific.

The total exports and imports, as derived from country statistics available, are summed up in Tables 3 and 4. It should be noted that these figures are not complete, and such detailed statistics cannot be derived for some countries.

TABLE 3

FREE WORLD IMPORTS OF RUBBER, 1951
(in long tons)

Area	Natural	Synthetic	Reclaimed	Total
North America	796,005	12,145	13,318	821,468
South America	37,625	226	2,565	40,416
Far East and South Pacific	679,450	654	1,626	681,730
Europe and UK	786,187	28,895	3,660	818,742
Africa	27,786	144	1,594	29,524
Total	2,327,053	42,064	22,763	2,391,880

Figures on exports also include re-exports. Net exports of natural rubber in 1951, as estimated by Rubber Statistical Bulletin, June 1952, totalled 1,827,500 tons. No such statistics are available for synthetic and reclaimed rubber.

TABLE 4

FREE WORLD EXPORTS OF RUBBER, 1951
(in long tons)

Area	Natural	Synthetic	Reclaimed	Total
North America	4,431	8,522	14,744	27,697
South America	2,291	N.A.	N.A.	2,291
Far East and South Pacific	2,303,007	N.A.	N.A.	2,303,007
Europe and UK	109,941	141	12,539	122,621
Africa	69,283	N.A.	1	69,284
Total	2,488,953	8,663	27,284	2,524,900

Detailed statistics are not sufficient to obtain net import and export figures. Statistics given, therefore, in most cases represent gross export and import figures. More detailed tables of this trade in rubber by country and area for 1951 are included in Appendix B, with notes and sources of information shown in the Bibliography attached as Appendix D to this report.

IV. Free World Consumption of Rubbers during 1951

A. Consumption of Rubber by Types

Consumption of natural rubber fell slightly from the 1950 high of 1,705,000 tons to around 1,500,000 for the entire world. The countries of the Free World area consumed an estimated 1,328,000 tons of natural rubber during 1951, 38.5% of which was consumed by the United States. The United Kingdom, France, and Germany were other major consumers, with 17.6%, 8.8% and 6.2% of the Free World consumption of natural rubber.

The United States and Canada consumed the major portion of the Free World synthetic rubber, and the United States, United Kingdom, West Germany, and Canada in that order were the important users of reclaimed rubber.

The consumption of rubber in the Free World during 1951, consisted of the following quantities by type:

Natural	1,323,298	long tons
Synthetic	813,390	" "
Reclaimed	454,184	" "
Total	2,625,872	" "

This total consumption of rubber by countries of the Free World is shown below by the major geographical sections:

TABLE 4

FREE WORLD CONSUMPTION OF RUBBERS BY TYPES DURING 1951
(in thousand long tons)

Area	Natural	Synthetic	Reclaimed	Total
North America	511.7	785.5	362.7	1,659.9
South America	60.0	1.2	5.1	66.3
Far East and South Pacific	141.8	.5	24.0	166.3
Europe and UK	584.8	26.0	91.3	702.1
Africa	30.0	.1	1.1	31.2
Total	1,328.3	813.3	484.2	2,625.8

Rubber consumption of each of the major countries by geographical area is given in Table 7. Countries having undeveloped rubber industries or insignificant contribution to rubber industry have not been included in many cases, and footnotes to appropriate tables indicate justification for such omissions.

The types of rubber used in each individual country vary according to availability, types of goods produced, extent of technology and various other factors. By geographical area, the percentage by types of rubber used is shown below:

TABLE 6

PERCENTAGE OF TYPES OF RUBBER USED

	% of Total by Area		
	Natural	Synthetic	Reclaimed
North America	30.9	47.3	21.8
South America	90.5	1.8	7.7
Far East and South Pacific	85.2	.4	14.4
Europe and UK	83.3	3.7	13.0
Africa	96.1	.4	3.5
Total	50.5	31.1	18.4

1. North America

Decreased use of natural rubber by the United States, as shown in Table 7 was due largely to attempts to build up a natural stockpile. At the same time great strides were made to rehabilitate synthetic rubber plants, which, aided by technical advances resulted in a considerable increase of synthetic rubber production and use in the U. S.

Reclaimed rubber also, during 1951, became of greater importance to the industry of the United States than ever. The tonnage used in the United States totalled 346,000 tons, and equaled approximately 29% of the total of both natural and synthetic rubber used during the year.

2. Other Areas

No drastic change was seen in the use patterns of types of rubbers in other areas.

Breakdown of types of rubbers used by countries for each of the geographical areas is shown in Table 7.

TABLE 7. - CONSUMPTION OF NATURAL, SYNTHETIC AND RECLAIMED RUBBER BY COUNTRIES OF THE FREE WORLD DURING 1951[a/]
(in long tons)

COUNTRY	NATURAL	SYNTHETIC	RECLAIM	TOTAL
NORTH AMERICA				
Canada	44,376	26,433	15,823	86,632
Cuba	1,917	61	248	2,226
Mexico	11,400	111	493	12,004
United States	454,015	758,897	346,121	1,559,033
Total	511,708	785,502	362,685	1,659,895
SOUTH AMERICA				
Argentina	20,000	39	1,483	21,522
Bolivia	50	0	6	56
Brazil	26,227	1,001	3,000	30,228
Chile	2,000	12	35	2,047
Colombia	4,700	16	129	4,845
Costa Rica	125	0	7	132
Guatemala	75	-	20	95
Nicaragua	10	-	-	10
Peru	2,577	3	27	2,607
Uruguay	2,232	120	114	2,466
Venezuela	2,000	4	330	2,334
Total	59,996	1,195	5,151	66,342
FAR EAST and SOUTH PACIFIC				
Australia	35,883	149	8,265	44,297
Burma	560	-	-	560
Ceylon	218	0	0	218
Indochina	1,000	N.A.	N.A.	1,000
India	22,427	4	1,500	23,931
Indonesia	7,299	0	0	7,299
Japan	59,400	382	12,678	72,460
Malaya	5,134	0	0	5,134
New Zealand	7,000	15	1,500	8,515
Philippines	1,153	None	22	1,175
Thailand	1,000	0	0	1,000
Formosa	691	-	-	691
Total	141,765	550	23,965	166,280

COUNTRY	NATURAL	SYNTHETIC	RECLAIMED	TOTAL
EUROPE including ENGLAND				
Austria	7,816	1,002	1,944	10,762
Belg.-Luxembourg b/	18,460	2,000	1,700	22,160
Denmark	6,000	150	580	6,730
Finland	4,939	10	224	5,173
France	117,123	9,070	10,000	136,193
Germany, West	83,088	4,425	27,501 c/	115,014
Greece	680	9	127	816
Italy	46,000 d/	4,000	2,500 d/	52,500
Lebanon-Syria	300 d/	None		300
Netherlands	14,143	362	1,600	16,105
Norway	5,040	210	500	5,750
Pakistan	1,200	7	1,000	2,207
Portugal	2,736	20	300	3,056
Spain	7,319	0	10,000	17,319
Sweden	19,000	580	2,028	21,608
Switzerland	7,741	301	300	8,342
Turkey	3,000	0	0	3,000
United Kingdom	234,234	3,867	30,991	269,092
Yugoslavia	6,000	-	N.A.	6,000
Total	584,819	26,013	91,295	702,127
AFRICA				
Algeria	600	-	-	600
Egypt	400	-	13	413
French W. Africa	160	-	-	160
French Morocco	350	30	75	455
South Africa	28,500	100	1,000	29,600
Total	30,010	130	1,088	31,228
GRAND TOTAL	1,328,298 d/	813,390 d/	484,184 d/	2,625,872 d/

a. The following countries are not included because of negligible importance and/or lack of sufficient information:

North America	South America	Far East and South Pacific	Europe and UK	Africa
	Domican Rep.		Afghanistan	Belgian Congo
	Ecuador		Iran	Liberia
	El Salvador		Iraq	Nigeria
	Haiti		Israel	
	Honduras			
	Panama			
	Paraguay			
	Puerto Rico			

b. Figures of rubber consumption for Belgium and Luxembourg have been combined here. Luxembourg's share would total approximately as follows: natural, 1,855 tons; synthetic, 15 tons; reclaimed rubber, 120 tons; total of all types consumed 1,990 tons.

c. Including scrap or ground rubber.

d. Consumption estimates for all types of rubber as given by the Rubber Statistical Bulletin, Vol. 6, No. 9, June 1952, p. 12, Table 5; p. 24, Table 16; and p. 32, Table 25 are as follows:

Natural	1,900,000
Synthetic	815,000
Reclaimed	421,000
Total	2,736,000

B. Consumption of Rubber for Transportation Goods

1. Tire Production

The production of tires is an important indication of the extent of development of a country's rubber industry. In the countries in which tire production is significant, the consumption of rubber for the manufacture of transportation goods represents a substantial percentage of the total rubber consumption.

Table 9 gives a breakdown by country and geographical area of the tires produced in countries of the Free World during 1951. The total tire production by geographical section is given in Table 8.

TABLE 8

FREE WORLD TIRE PRODUCTION DURING 1951
(in thousands of tires)

	Tires produced	% of Free World Production
North America	97,980.8	68.7
South America	3,065.1	2.1
Far East and South Pacific	5,274.4	3.7
Europe and UK	34,552.2	24.2
Africa	1,470.0	1.3
Total	142,342.5	100.0

It will be noted in Table 9 that of 32 countries of the Free World shown, only nine countries of the total number produce 1% or more of the Free World total tires. These nine countries produce approximately 92.6% of the Free World tires and of these North America produces 68.7%.

Appendix C gives a breakdown of individual rubber fabrication plants, including tire plants, by location, country, and geographical area. This list gives production of tires by plants where known and indicates the types of other rubber goods produced. This list, it must be understood, is not complete, but is believed to represent major plants contributing to the fabrication of rubber goods in countries of the Free World.

a. North America

In the U.S.A., where 64.6% of the tires of the Free World are made, the center of control of the industry is Akron, Ohio, where four of the large companies have their main offices in addition to the plants and offices of several small members of the industry. Census for 1947 shows

that for the tire and tube industry, 41% of the workers, 36% of value added by manufacture, and 31% of the value of materials, etc., used was in Ohio.

There is one type of tire that is built almost entirely in Akron, which is known as "off-the-road" type and includes the large earth-mover sizes and other special purpose tires. Needless to say, manufacture of this type and size tire requires very heavy and expensive equipment which precludes much duplication in branch plants. As a result, a large portion of the approximately 20% of tires still made in Akron is made up (in tonnage) by these special purpose tires.

However, it was found that, due to decentralization of the industry which has been gradually taking place since 1936, only about 20% of the tires made in the U.S.A. are now produced in Akron. The U. S. Rubber Co. is the only large rubber company that is not located in Akron. Their main tire plant is in Detroit, Michigan, with their mechanical rubber plant at Passaic, N. J.

One item necessary to tire manufacture and one which is seldom given much thought is the inside of a tire valve. There are two made in the U.S.A., Shrader and Dill. This is the only item which is a part of the tire and tube assembly that can be classed as vulnerable to air attack during a war. All valve insides for autos, trucks, tractors, trailers and bicycles are exactly the same design and size throughout the world. It is the practice of these two valve manufacturers to maintain about a four months supply in advance.

U. S. production of tires of all types (excluding bicycle) totalled approximately 92 million during 1951, compared to some 97.8 million in 1950. The tire production facilities of this continent would be capable, in a period of balanced production of all types of motor vehicle tires, of supplying most of the needs of the Free World except the United Kingdom and France. If other Free World supplies of rubber materials were cut off, but their facilities for tire production were not impaired, they would be much more likely to call upon the U. S. for new rubber materials than for finished rubber manufactures. If their factories were unable to operate, however, and they were to request finished tires, it is probable that the pattern of essential requirements would vary widely from the normal peacetime pattern, and that

North American production facilities would not suffice to supply the altered types of tires then in demand, except after expansion of facilities for desired types. Nevertheless, in tires and in similar degree in other rubber products, the main point of strength in the Free World is the North American continent, just as in the case of rubber materials (assuming no enemy bombing or sabotage of synthetic rubber plants and rubber warehouses).

b. Other Areas

Production of tires in all other geographical areas of the Free World (exclusive of North America) produce a little less than one-half of the quantity of tires produced in North America. (See Table 9.) However, tire production continues to increase in many European countries, and requirements for larger quantities of rubber can be expected.

PRODUCTION OF MOTOR VEHICLE TIRES

TABLE 9. - IN COUNTRIES OF THE FREE WORLD DURING 1951 a/

COUNTRY		TIRES (in number)	% OF FREE WORLD
NORTH AMERICA			
Canada		5,000,000	3.5
Cuba		110,213	.1
Mexico		700,000	.5
United States		92,170,616	64.6
	Total	97,980,829	68.7
SOUTH AMERICA			
Argentina		940,000	.66
Brazil		1,500,000	1.05
Chile		130,000	.09
Colombia		173,000	.12
Peru		108,000	.07
Uruguay		87,939	.07
Venezuela		126,173	.08
	Total	3,065,112	2.1
FAR EAST and SOUTH PACIFIC			
Australia		2,300,000	1.6
India		892,000	.6
Indonesia		232,363	.16
Japan		1,350,000	.95
New Zealand		500,000	.35
	Total	5,274,363	3.7
EUROPE including ENGLAND			
Austria		400,600	.3
Belg.-Luxembourg		825,000	.6
Finland		99,809	.06
France		9,092,000	6.3
Germany, West		5,346,100	3.8
Ireland		245,000	.17
Italy		2,640,000	1.7
Netherlands		455,000	.3
Norway		81,000	.05
Portugal		180,000	.15
Spain		360,000	.3
Sweden		1,150,000	.9
Switzerland		550,000	.4
United Kingdom		13,002,686	9.1
Yugoslavia		124,000	.08
	Total	34,552,195	24.2
AFRICA			
South Africa		1,470,000	1.3
	Total	1,470,000	1.3
	GRAND TOTAL	142,342,499	100.0%

a. See Appendix D for sources of information.

2. Types of Rubber used for Transportation Goods

The types of rubber used in transportation goods varies, of course, according to development of industry, types and varieties of tires and other goods. It is interesting to note the percentage of types of rubber used for transportation goods in a few of the major countries of North America and Europe. The following table gives this breakdown:

TABLE 10

PERCENTAGE OF TYPES OF RUBBER USED FOR TRANSPORTATION GOODS[a/]

	Natural	Synthetic
UK	99.9	.1
Canada	66.7	32.3
France[b/]	95.3	4.7
U.S.	38.0	62.0

a. No information is available on the breakdown of reclaimed rubber used for transportation purposes. These percentages are calculated on basis of information from RSB, Vol. 6, No. 9, June 1942 pp. 33, 34, Tables 27 (a) (b) (c) and (d).
b. These percentages are calculated on basis of 1950.

Technical knowledge and advances in the manufacture and use of synthetic rubber in North America during the past ten years is nearly unbelievable. Cold rubber and oil-extended synthetic rubber are outstanding recent contributions to improved quality, saving of styrene and butadiene, and increased production. In the United States during 1945, natural rubber accounted for only 11% of the new rubber used in civilian transportation goods and less than 10% in civilian non-transportation goods. Many good passenger car tires were manufactured with a content of synthetic rubber as high as 97%. While products made during the war would not meet today's standard of quality, industry technicians now estimate that in a similar emergency 16% natural rubber for civilian transportation and 12% for non-transportation goods would be fully adequate, the remainder consisting of synthetic rubbers. The production capacity of synthetic rubber in the United States and Canada has grown from around 12,000 tons in 1941 to over 1.1 million tons annually by the end of 1951.

3. Percentage of Rubber Consumed in the Manufacture of Transportation Goods

Because of the wide diversity of consumption patterns for transportation goods, resulting mainly from the degree of motorized transport in a country, no breakdown has been attempted by country to show consumption of rubber by types of

goods produced. However, an overall estimate for each of the major geographical areas has been attempted and shows the following ratios of total rubber consumed for transportation uses.

TABLE 11

PERCENTAGE OF TOTAL RUBBER CONSUMPTION FOR TRANSPORTATION USES

	% Of Total Rubber by Area
North America	66
South America	58
Far East and South Pacific	40
Europe and UK	64
Africa	81
Free World Total	63.7

See Table 13 for more detailed breakdown.

C. Consumption of Rubber for Non-Transportation Goods

No attempt has been made to break down the consumption of rubber for various types of goods or for a breakdown between transportation and non-transportation goods for each individual country. However, a breakdown showing rough estimates for consumption of rubber for transportation and non-transportation uses by each of the geographical areas has been made and is shown in Table 13. The following table (Table 12) sums up this pattern:

TABLE 12

CONSUMPTION OF RUBBER IN FREE WORLD DURING 1951
(in thousand tons)

	Transportation	Non-Transportation	Total
North America	1,095.6	564.3	1,659.9
South America	38.5	27.8	66.3
Far East and South Pacific	66.5	99.8	166.3
Europe and UK	449.3	252.8	702.1
Africa	25.2	6.0	31.2
Total	1,675.1	950.7	2,625.8

Data in Appendices A and C gives names and location in countries of the Free World of the major rubber plants, both synthetic producing and fabrication. Not all known plants are shown because there are so many of them, and the ones that are given probably produce 95% of total toannage which is sufficient to give an accurate picture of the world industry as a whole.

1. Production of Non-Transportation Goods

a. North America

Mechanical rubber goods, which is a very important division of the industry is quite well decentralized.

While Goodrich and Goodyear are both in Akron and are very large producers of large belts (conveyor and transmission), there are other producers of large belts in widely separated cities, such as: U. S. Rubber Co. and Manhattan Rubber Co. in Passaic, N. J., Boston Woven Hose in Boston, Mass., Hewitt Rubber Co. in Buffale, N. Y., and Republic of Youngstown, Ohio. Smaller items in mechanical goods are even more widely separated throughout many branch plants of the large companies, and also many small independent companies located in nearly every state of the union. The fact remains, however, that the production of a very large percentage of large tonnage items, such as "off-the-road" tires, conveyor belts, and large rubber rollers, is still concentrated in Akron and these items are vital to the heavy industry of this country.

The manufacture of rubber composition soles, heels and footwear is very widely decentralized from coast to coast as is also rubber drug sundries.

General Tire, Goodyear, Goodrich and Firestone have plants from coast to coast, some of which produce tire cord and others that fabricate rubber end items.

With the rubber fabricating industry decentralized throughout the U.S.A., as it is in all its divisions, including chemicals, carbon black, rayon, nylon and cotton cord and fabrics, and steel bead wire, it becomes quite invulnerable to bombing attacks.

b. Other Areas

Most fabricating plants are fairly widely dispersed, except in countries where only one or two tire plants are present. However, in such countries the tire production is usually not substantial enough to warrant serious risk of bombing.

Perhaps the greatest vulnerability in most of these areas is the raw material supply. Western Europe, for example, must depend on the Far East for rubber supplies. On the other hand, Far East and South Pacific have little fabricating capacity for the manufacture of rubber products

and is even more dependent on other areas for rubber chemicals and carbon black.

The major production in these less developed rubber industries of the Free World area is the production of footwear and basic mechanical rubber goods, with only minimum requirements for tires being met.

TABLE 13

ALLOCATION OF RUBBER BY MAJOR TYPES OF RUBBER GOODS PRODUCED IN COUNTRIES OF FREE WORLD DURING 1951[a/]

(in thousand long tons)

FREE WORLD AREA	% RUBBER CONSUMED	RUBBER CONSUMED	% TIRES PRODUCED	RUBBER CONSUMED FOR TRANSPORTATION GOODS	% OF RUBBER FOR TRANSPORTATION GOODS	RUBBER CONSUMED FOR NON-TRANS. GOODS
North America	63.3	1,659.6	68.7	1,093.6	66	564.3
South America	2.5	66.3	2.1	38.5	58	27.8
Far East and South Pacific	6.3	166.3	4.	66.5	40	99.8
Europe including England	26.7	702.1	24.2	449.3	64	252.8
Africa	1.2	31.2	1.0	25.2	81	6.0
TOTAL	100%	2,625.8	100%	1,675	63.7%	950.7

a. Figures giving tonnage include all natural, synthetic and reclaimed rubber used by all countries of the Free World.

D. Raw Material Supplies

A variety of products are necessary for the production of rubber goods. Rubber (natural, synthetic, reclaimed) is, of course, the major and basic raw material, but a quantity of various chemicals is also required. These include carbon black, sulfur, zinc oxide, accelerators (such as mercaptobenzthiazole, dibenzthiazyl disulphide, hexamethylenetetramine), anti-oxidants (phenylbeta-naphthylamine, phenylthiourea), plasticizers (thiodiglycollic acid dibutyl ester) softeners, pigments, fillers, and a variety of other chemicals used in small quantities by rubber industries for the fabrication of the various rubber end-products.

A rough estimate of the quantities of major necessary chemicals, textiles and other raw materials necessary for the fabrication of rubber goods is shown in Table 14.

1. North America

A study of production figures in Table 2 indicates that the North American continent is in a very strategic position insofar as the rubber industry is concerned. Every material needed by the synthetic rubber industry is conveniently available in North America, and the capacity for production of synthetics, together with the Government's strategic stockpile of natural rubber, is designed to supply all the supplies needed by this area during a long war, making this continent the strong point of the Free World. Since this will be as apparent to any enemy nation as it is to us, every effort should be made to safeguard the facilities for producing synthetic rubber feedstocks and copolymers and the natural rubber stockpile against enemy attack or sabotage.

2. Other Areas

Many countries of the Free World, particularly those in South America, the Far East and South Pacific, and Africa, depend to a large degree on the United States and/or such chemically advanced countries of Europe as Germany and the United Kingdom to supply a great many of the rubber chemicals necessary for the manufacture of rubber goods.

Europe, including the UK, comes second to North America as a supplier of most of these basic chemicals.

TABLE 14

MATERIALS NECESSARY FOR RUBBER FABRICATION
(in long tons)

MATERIALS	NORTH AMERICA	SOUTH AMERICA	FAR EAST and SOUTH PACIFIC	EUROPE and ENGLAND	AFRICA	TOTALS	METHOD OF ESTIMATION
COTTON TIRE CORD	534,514	20,206	33,592	218,099	8,547	814,960	13.15 lbs. Tire cord per average tire.
COTTON FABRICS FOR BELT HOSE and FOOTWEAR	No figures available that are sufficiently accurate.						
STEEL WIRE FOR STEEL BEADS	58,130	2,133	3,653	23,717	930	88,563	1.43 lbs Steel wire per average tire.
POL CARBON BLACK	524,891	21,339	52,853	212,375	6,647	818,105	700 lbs. Carbon black per long ton of rubber.
LIGHT OILS-PLASTICIZERS	No figures available that are sufficiently accurate.						
COKE CHEMICALS -- ACCELERATORS	16,496	670	1,661	6,674	208	25,709	1% on total rubber.
COKE CHEMICALS -- ANTIOXIDANTS	16,496	670	1,661	6,674	208	25,709	1% on total rubber.
ZINC FOR ACCELERATOR ACTIVATOR and REINFORCER	49,490	2,012	4,983	20,024	627	77,136	3% on total rubber.
SULFUR CURING AGENT	37,942	1,542	3,820	15,351	480	59,135	2-3/10% on total rubber.
TIRE VALVE ASSEMBLIES WGT. OF METAL	6,999	219	377	2,468	105	10,168	.16 lbs Wgt. per tire valve assembly.

V. Stocks of Rubber in Free World Area during 1951

Stocks of all types of rubber in countries of the Free World are presented, where available, in Table 16. These figures cannot be considered complete nor for the major countries (such as U. S., UK, France, Germany, and Canada) do they include strategic Government stockpiles of rubber.

Table 15 below shows total stocks, by area for each of the types of rubbers, as derived from individual country statistics shown in Table 16. These stocks, as reported, represent working inventories of rubbers left over at the end of 1951 in the hands of rubber manufacturers.

TABLE 15

REPORTED STOCKS BY TYPES OF RUBBER IN THE FREE WORLD AT THE END OF 1951

(in long tons)

Area	Natural	Synthetic	Reclaimed	Total
North America	81,399	134,525	47,416	263,340
South America	16,640	35	874	17,529
Far East and South Pacific	242,986	487	7,758	251,231
Europe and UK	110,735	9,013	9,593	129,341
Africa	1,800	N.A.	N.A.	1,800
Total	453,560	144,040	65,641	663,241

As shown in Tables 16 and 17, the U. S. holds the major portion of synthetic and reclaimed rubber stocks, while natural rubber stocks held in the producing areas of the Far East and South Pacific are highest, with Europe and North America next in line.

TABLE 16. - STOCKS OF NATURAL, SYNTHETIC, AND RECLAIMED RUBBER IN THE FREE WORLD AREA DURING 1951[a/]
(in long tons)

COUNTRY	NATURAL	SYNTHETIC	RECLAIMED	TOTAL
NORTH AMERICA	81,399	134,525	47,416	263,340
Canada	4,421	5,085	2,304	11,810
Cuba	409	20	30	459
United States	76,569	129,420	45,082	251,071
SOUTH AMERICA	16,640	15	574	17,529
Argentina	6,250	Nog.	700	6,950
Brazil	9,086	10	167	9,263
Chile	570	5	7	582
Costa Rica	9	-	-	9
Guatemala	25	-	-	25
Peru	200	-	-	200
Venezuela	500	-	-	500
FAR EAST and SOUTH PACIFIC	242,286	482	7,758	251,330
Australia	7,814	155	1,259	9,228
Ceylon	15,306	-	-	15,306
Formosa	1,000	0	N.A.	1,000
India	7,779	-	500	8,279
Indochina	7,672	None	None	7,672
Indonesia	70,000	-	-	70,000
Japan	9,450	332	5,999	15,781
Malaya	123,738	-	-	123,738
Philippines	227	-	-	227
EUROPE including ENGLAND	110,235	2,013	9,593	129,341
Austria	2,100	100	400	2,600
Belgium-Luxembourg[b/]	2,500	200	500	3,200
Denmark	1,000	150	30	1,180
Finland	2,466	N.A.	N.A.	2,466
France	16,374	3,395	N.A.	19,769
Germany, West	10,277	1,726	3,729	15,732
Italy	6,000	1,500	N.A.	7,500
Netherlands	1,920	114	160	2,194
Norway	1,200	N.A.	N.A.	1,200
Pakistan	100	None	None	100
Switzerland	1,500	N.A.	N.A.	1,500
Turkey	1,500	N.A.	N.A.	1,500
United Kingdom	63,298	1,828	4,774	69,900
Yugoslavia	500	N.A.	N.A.	500

COUNTRY	NATURAL	SYNTHETIC	RECLAIMED	TOTAL
AFRICA	1,800	N.A.	N.A.	1,800
Liberia	1,800	-	-	1,800
GRAND TOTAL	453,560a/	144,040a/	65,641a/	663,241a/

a. The following countries of the Free World have not been included in this table because such information is not available.

North America	South America	Far East and South Pacific	Europe and UK	Africa
Mexico	Bolivia	British Borneo	Greece	Algeria
	Colombia	Burma	Iran	Belgian Congo
	Dominican Rep.	New Zealand	Iraq	Egypt
	Ecuador	Oceania	Israel	French Africa
	El Salvador	Other Asia	Lebanon-Syria	Nigeria
	Haiti	Sarawak	Portugal	South Africa
	Honduras	Thailand	Spain	
	Nicaragua		Sweden	
	Panama			
	Uruguay			

b. Stocks for Belgium and Luxembourg are combined here. Luxembourg holds the following quantities of the types of rubber: natural 300, synthetic 23, reclaimed 30, total-353 tons.

c. Figures for rubber stocks as shown are not complete for all countries. Rubber Statistical Bulletin, June 1952, gives the following as totals of all types of rubber stocks: (These figures of stock do not include military stockpiles)

Natural	567,300 tons
Synthetic	142,500 "
Reclaimed	57,148 "
Total	767,148 "

These figures of stocks do not include military stockpiles of major powers.

VI. Manpower used in Rubber Fabricating Industries for the Free World Area during 1951

Statistics on manpower required by rubber industries of countries in the Free World are incomplete, but it was felt that such information might aid in obtaining the proper perspective of this important industry in relation to other industries.

For comparative purposes, a brief study of Soviet Bloc* rubber industries showed a total manpower requirement of 258,881 laborers, of which the USSR share was around 145,000.** Using a logical assumption that workers and machinery are less efficient in the Orbit countries than in Western Europe, a tonnage figure of 1.85 tons per man-year of labor was selected and applied to the tonnage of rubber fabricated in Soviet Bloc countries except in cases where actual labor figures could be determined for available data. In contrast to this low figure, it was noted that in the U. S., 5.3 tons of rubber are fabricated per man-year of labor, while in Western Europe the tonnage per man ranged from 1.8 to 3 tons. One exception to this tonnage range in Western Europe was noted in a Luxembourg tire plant which manufactures tires only. This new plant with new and efficient machinery, during the first half of 1951, averaged 7.7 tons per man-year. The fact that nothing but tires were made probably raised this ratio in comparison to other countries which include in their manufacture many small items such as shoe soles molded or lathe cut items and such small tricky products.

The total, but incomplete figures of labor required by areas of the Free World, is shown in Table 17. Sources for these figures are shown in the Annex to this study, as well as notes as to effective date of this information where years other than 1951 are given.

* Excluding Albania, Bulgaria, Czechoslovakia, Hungary, East Germany, Poland, Rumania, USSR and China.
** Report 110 - Rubber and Rubber Fabrication in the Orbit - S, 1 March 1952.

TABLE 17

MANPOWER IN RUBBER FABRICATING INDUSTRIES

OF THE FREE WORLD AREA DURING 1951

Location	Number of Firms	Number of Employees
North America		
Canada	55	20,000
Cuba	N.A.	336
Mexico	N.A.	N.A.
United States	500	236,000
South America		
Argentina	117	10,535
Bolivia	N.A.	N.A.
Brazil	100	18,500
Chile	105	1,330
Colombia	N.A.	1,800
Guatemala	N.A.	156
Peru	N.A.	N.A.
Uruguay	18	1,565
Venezuela	11	450
Far East and South Pacific		
Australia	77	11,556
Formosa	60	N.A.
India	100	67,000
Indonesia	72	N.A.
Japan	668	73,300
Malaya	33	N.A.
New Zealand	81	1,777
Thailand	17	N.A.
Europe including UK		
Austria	N.A.	5,985
Belgium	100	7,000
Denmark	26	3,585
Finland	N.A.	3,268
France	350	53,000
* Germany, West	N.A.	59,223
Greece	N.A.	3,500
Italy	100	30,000
Israel	20	N.A.
Luxembourg	N.A.	N.A.
Netherlands	25	5,967
Norway	N.A.	3,350
Pakistan	N.A.	2,000
Portugal	37	2,392
Spain	N.A.	N.A.
Sweden	N.A.	6,046
Switzerland	N.A.	4,530
Turkey	N.A.	2,500 - 3,500
United Kingdom	317	107,400
Yugoslavia	N.A.	N.A.
Africa		
Algeria	N.A.	400
Egypt	N.A.	N.A.
South Africa	N.A.	N.A.