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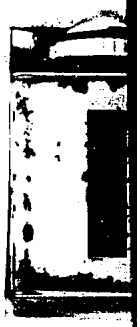

USSR BECOMES WORLD'S SECOND LARGEST CHEMICAL PRODUCER

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In 1913, with a production valued at 70 million US dollars, Russia produced less than 3 percent of the world's chemicals. In 1927, however, its share amounted to 3.6 percent (190 million dollars and in 1938 to 8.4 percent (900 million). By 1952, this figure had risen to approximately 5 billion dollars, or 11 percent, and in 1953, to 6.2 billion, or 12.5 percent of world production. In the field of chemistry the Soviet Union has overtaken the Western European countries and in world production is second only to the US.

The attempt to analyze the chemical industry of the USSR is greatly impeded by a lack of authentic information. In recent times, insofar as official data are concerned, practically all that is available are the very summarily kept publications about the Five-Year Plans, an occasional statement about the percentage of increase in production, and information of a like nature concerning the putting into operation of apparatus in one or another chemical plant. Occasionally particulars of the Soviet economy may be obtained through the reports of those returning from the USSR or from foreign specialists who were active there. All of this information leaves considerable gaps. It only begins to make sense when it is projected onto information of an earlier period.

Until the 1930s, the journalistic enthusiasm of the Soviets was great. Russian technical journals reported in detail on the forward strides in scientific exploration, on production, on new plants, etc. Production and export statistics were available to a considerable degree. From these reports, it is possible to draw conclusions concerning the present level of production. It is, however, impossible to follow this development exactly. Insofar as such details are presented in the following report, they represent indirect deductions and are set forth with reservations.

In 1953, the Soviet Union produced approximately 6.2 billion US dollars' worth of chemical production, more than twice as much as the German Federal Republic and nearly one third the production of the US. These relationships in the coming years will presumably shift even more in favor of the USSR, whose production -- to judge by its plans -- may reach a value of 7.5 billion dollars in 1955.

In comparing the structure of the Soviet chemical industry with that of Western European countries, one finds considerable differences. The accent is on fertilizers, inorganic heavy chemicals, ferroalloys, synthetic rubber, rubber goods, fuels, and other producer goods. In these fields the Russians have far surpassed the other industrialized countries, with the exception of the US. The same may soon apply to petrochemistry. But synthetic materials, chemical fibers, dyestuffs, mineral dyes, lacquers, pest-control products, perfumes, cosmetics, photographic products, and to a certain degree even medicines, have failed to keep pace with foreign countries. It is the goal of Soviet industrial planning to forge ahead in these special branches and to fill in the existing gaps as soon as possible. Increased demands for chemical consumer goods will continue to be subordinated to general industrial development, as in the past.

Sulfuric Acid and Sulfur

The production of sulfuric acid in the US is four times that of the USSR, but already in 1952, the Soviet Union supplied as much as Great Britain and France combined, and far more than Germany as a whole. Its production increased

from 1.5 million metric tons per year before the onset of the war to over 3 million tons in 1951, and today may be in the neighborhood of 3.5 million tons. The acid is produced in superphosphate plants and in chemical and chemical-metallurgical combines which are distributed throughout the country, particularly in the central European USSR, the Northwest, the Ukraine, the Urals, and in West Siberia.

Earlier, the principle raw material was pyrite from the Urals. This supply, however, is on the decline. For this reason there is an increase in the use of gas from roasting ovens of nonferrous metallurgical plants which have been combined with sulfuric acid plants. Other possible raw materials, such as carbon pyrites, pyrrhotite, and gypsum may also eventually attain a special significance. A dismantled gypsum-sulfuric acid plant of the I. G. in Wolfen (East Germany), the capacity of which was about 150,000 metric tons per year, has already been operating for several years in the USSR.

Elemental sulfur is obtained from 15 mines. The most important deposit is in the Karakum Desert, some 400 kilometers east of the Caspian Sea. In several copper plants, principally in Mednogorsk (Blyava, in the sourthern Urals), sulfur is produced with copper by the Norwegian Orkla method. Further sources of sulfur are coke- and roasting-oven gas, the products of subterranean gasification of coal, and finally the mirabilite obtained in the recently opened Kara-Bogas Combine (Caspian Sea). The production of elemental sulfur amounted to 80,000 tons in 1937 and 1944 and could not have increased to much more than 100,000 tons since then. The entire consumption of sulfur (in all forms) is at present in the neighborhood of 1.5 million metric tons per year.

Sodium Carbonate, Sodium Hydroxide, and Chlorine

The US at present still produces about four times as much sodium carbonate and five times as much sodium hydroxide as the Soviet Union. British production of sodium carbonate nearly equals that of the USSR, but her production of sodium hydroxide exceeds that of the latter by perhaps 150,000 metric tons per year. The USSR has already overtaken all other sodium alkali-producing countries. The USSR produced 532,000 tons of sodium chloride in 1938, approximately 800,000 tons in 1950, 870,000 tons in 1951, about one million tons in 1952, and 1 1/4 million tons in 1953. According to the data available so far, the 1954 production is 1.4 million tons, and a production of 1.5 million tons is to be expected for 1955.

About 130,000 tons of sodium hydroxide were obtained in 1938. The estimates for the years 1950 through 1955 are: 390,000, 420,000, 465,000, 535,000, 590,000, and 700,000 tons, respectively. The principle areas for production of soda are Berezniki in the Urals, Slavyansk and Lisichansk in the Donets Basin, Baku, and Sterlitamak in Bashkir. Besides these, there are several other Solvay process plants and natural soda plants. Sodium hydroxide is extracted at the above-mentioned sodium plants both by causticizing as well as by electrolysis. In addition, there is still another series of chlorine-alkali electrolysis installations. Moreover, various larger electrolyzers have recently been erected in a new chemical center in the Volga area.

Only foreign estimates are available on chlorine production. These indicate a production of about 75,000 tons for 1950. It is asserted that part of the chlorine gas produced may have been blown off and wasted. Nevertheless, this estimate seems a bit conservative, and the true production may currently be even greater.

Bromine and Iodine, Fluorine Compounds

Raw material sources of bromine are various seas and ponds, diluted soluble oils (petroleum bohrwasser), the discarded solution from the processing of carnallite at the potassium plants in the Urals and Galicia, and finally, the brine of the Kara-Bogas Bay on the Caspian Sea, where a huge combine for the

production of sodium sulfate and other inorganic substances has been operating for some time. The production of elemental bromine rose from 200 tons in 1932 to 750 tons in 1936. In 1937, the production of 1,450 tons of technical bromine and 255 tons of bromine preparations was planned. With the development of transportation facilities the demand for ethyl bromide, and, consequently, the production of bromine, may have increased.

Iodine is produced primarily from diluted soluble oils in the Caucasus. The production rose from 13 tons in 1930 to 90 tons in 1934 and 163 tons in 1936, and at present is in the neighborhood of 250 tons per year.

Fluorine compounds are produced principally in the Urals. A plant in Polevskoy produces cryolite, sodium fluoride, aluminum fluoride, and sodium silicon fluoride. The latter is also produced as a by-product in several superphosphate plants. In the meantime, a second cryolite plant has been built in the Urals, and probably also one in Central Asia. There was also one planned for the Donets Basin. The chemistry of inorganic fluorides is presumed to be not yet greatly developed.

Calcium Carbide

The production of carbide is about five times the 1938 production and now is in the neighborhood of 475,000-500,000 tons. Compared with the US (640,000 tons in 1952), this is a relatively high volume of production. But the West German Republic (740,000 tons), the GDR (650,000 tons), and Japan (620,000 tons) produce considerably more than the USSR. The Soviet Union produces very little calcium cyanimide, and for that reason currently needs large quantities of carbide for the snythetic rubber industry and for autogenous metalworking. There is, therefore, not much carbide available for other chemical purposes. The yield of acetylene by other methods is supposedly not great. It might be deduced from this that acetylene chemistry is only slightly developed.

Phosphorus

It is roughly estimated that the Soviet Union has the capacity to produce about 45,000 tons of elemental phosphorus. The production may have more than doubled from 15,000 tons before the war to perhaps 35,000 tons today. Among the world producers of phosphorus, the USSR holds second place behind the US, with about 12 percent of the total production. The greater part is used in the production of concentrated phosphorus fertilizers, such as double- and triple-strength superphosphates, as well as highly concentrated mixed fertilizers.

The following locations of plants for the production of elemental phosphorus and derivatives are known (those plants operating under the damp-treatment process are not considered here): Aktyubinsk, Kazakhstan; Berezniki, Molotovskaya Oblast; Dzerzhinsk, near Gorkiy; Kandalaksha, Murmanskaya Oblast, Kineshma, Ivanovskaya Oblast; Kirovsk, Murmanskaya Oblast; Pervouralsk, Sverdlovskaya Oblast; Ugol'ny, North Urals; and Voskresensk, Moskovskaya Oblast.

Chemical Fertilizers

The consumption of snythetic fertilizers has approximately doubled since prewar times. By Western European standards, however, on a per-capita basis this is still small. From the occasionally reported wholesale figures for production of fertilizers, the increases in production are shown in the following table (in 1,000 tons):

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	Production 1940	Plan 1950	Production 1950	Plan 1955
Phosphate fertilizers (P_2O_5 content)	1,500 (300)	3,000 (600)	2,700 (540)	5,000 (1,000)
Potash fertilizers, concentrate (K_2O content)	850 (425)	1,100 (550)	1,100 (550)	2,000 (1,000)
Nitrogen fertilizers (N content)	520 (170)	1,000 (330)	1,150 (380)	2,300 (760)
Total fertilizers	2,870	5,100	4,950	9,300

The total production for 1953 is estimated at 5.5 million tons. Of this, 1.7 million tons is nitrogen, 1.2 million tons potash, 2.6 million tons phosphorus. According to official information, it is planned by 1959 to bring production up to 16.5-17.5 million tons, and by the end of 1964 up to 28-30 million tons. The USSR would thus become the second largest fertilizer producer of the world. This plan can only be fulfilled if new capacity is created every 2 years which would equal in size all the synthetic fertilizer plants built from 1927 to the beginning of the war. The new plants are to be distributed over all the agricultural regions of the country.

Priority will be given more than before to highly concentrated preparations in order to spare costs of transportation. One of the newest products, it was recently announced, is ammoniated potassium phosphate ($m\ KH_2PO_4 \cdot n\ NH_4H_2PO_4$), which was developed since 1937 by the Institute of General and Inorganic Chemistry of the Academy of Sciences. It is produced by crystallization and contains 50-52 percent P_2O_5, 16.5-20 percent K_2O, 5-6.5 percent N, and not more than 2-3 percent Cl -- ion. Raw materials employed are phosphoric acid, ammonium hydroxide, and potassium chloride. Aphthitalite and ammonium phosphate may also be obtained from the mother lye (mutterlauge) by the addition of sodium sulphate.

Mixed fertilizers will be produced in the large nitrogen combines, the superphosphate plants, and other fertilizer enterprises. In various institutes, including the All-Union Institute of Agricultural Microbiology in Moscow, bacterial preparations with strong fertilizing effects have been developed.

Nitrogen Compounds

According to the latest estimates, which are derived from previous calculations, the present production of nitrogen compounds amounts to 500,000-540,000 tons per year, or 7-8 percent of world production. By 1955, an increase of about 910,000 tons output is to be expected (760,000 tons of nitrogen fertilizers and 150,000 tons of industrial nitrogen; 790,000 tons will be synthetic and 120,000 tons will be from coking plants). In the course of the next 10 years, that is by 1964, a five-fold increase is planned. If this intention is realized, the USSR may closely rival the US in nitrogen production, leaving all other producers far behind.

In 1940, approximately 250,000 tons of nitrogen compounds were produced, 190,000 tons synthetically and 60,000 tons in coking plants. Of this, about 170,000 tons were fertilizer and 80,000 tons were industrial products. By 1950, the production of nitrogen fertilizer increased by 2.2 times, or to 380,000 tons, and that of industrial nitrogen to an estimated 100,000 tons. Of the total 480,000 tons, 410,000 tons may have been synthetic and 70,000 tons from coking plants.

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The Soviet nitrogen industry has been set up in such a manner that about half of the ammonia production can be used to produce nitric acid, and the greater part of this in turn can be converted to Hoko-acid (concentrated nitric acid). Among the products produced from ammonia, ammonium nitrate occupies a conspicuous place as a ballast-free nitrate fertilizer. In addition, ammonium nitrate can be used in the production of explosives. Nearly all the large combines are so laid out that a conversion of ammonium nitrate to Hoko-acid is possible. Calcium cyanimide is produced only in small quantity because of the lack of CaC_2.

Despite a shift of the nitrogen industry toward the East, a considerable part of the production capacity has remained in European USSR. The principal part of the production of synthetic ammonia and derivatives is produced, as before, by the great combines in Central USSR, the Ukraine, the Urals, Siberia, and Central Asia.

	Capacity (metric tons per year)
Berezniki Chemical Combine "Voroshilov," Urals	129,000
Chirchik Electrochemical Combine "Stalin," Tashkentskaya Oblast, Central Asia	123,000
Magnitogorsk Chemical Combine "Stalin," Urals	120,000
Lisichansk Nitrogen Combine, Ukraine	100,000
Kemerovo Nitrogenous Fertilizer Plant, West Siberia	75,000
Stalinogorsk Chemical Combine "Stalin," Tula Province	66,000
Dneprodzerzhinsk Nitrogen Combine, Ukraine	55,000
Dzerzhinsk Chemical Plant "Kalinin," Gorkovskaya Oblast	48,000
Gorlovka Nitrogen Combine, Stalinskaya Oblast, Ukraine	45,000
Derbent Chemical Combine, Dagestan, Caucasus	38,000
Khalilovo Nitrogen Plant, Urals	30,000
Grozny Nitrogen Plant, Caucasus	25,000
Baku Nitrogen and Soda Plant, Caucasus	25,000
Gubakha Nitrogen Combine, Molotovskaya Oblast, Urals	25,000
Brozeuli Nitrate Fertilizer Combine, Georgia	22,000
Kamensk-Shakhtinskiy Chemical Combine, Rostovskaya Oblast	20,000
Shchelkovo Chemical Plant, Moskovskaya Oblast	7,500

Until the end of 1944, the figures cited above for the individual atmospheric-nitrogen hydration plants were known. The totals are probably not complete. Furthermore, they include partly capacities available at the time and partly planned capacities.

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There are many plants in the Soviet Union producing nitric acid. Most of these possess equipment for the production of Hoko-acid. Some of these plants are located near atmospheric nitrogen or coke-chemical plants, and other plants operate without their own ammonia extractors.

Phosphate Fertilizers

As phosphate raw materials, the USSR possesses apatite on the Kola Peninsula and phosphorite on the upper Kama, in the oblasts of Moscow, Aktyubinsk, in Podolsk, the Ukraine, the Urals, the Volga region, Belorussia, Estonia, Georgia, etc., but above all in Central Asia in the Kara-Tau Mountains. In the latter is allegedly located the largest deposit of phosphorus in the world.

The most important phosphate fertilizer is superphosphate. It was formerly produced in eight plants: in Leningrad, Voskresensk, Molotov, Konstantinovka, Dzerzhinsk, Vinnitsa, Odessa, and Aktyubinsk. To these were added in 1939 the superphosphate plants at Riga, Kovno, Memel, and Lemberg. Besides these, there are superphosphate plants in Berezniki as well as in other chemical combines. During the war, four superphosphate plants were constructed in Central Asia for the processing of the Kara-Tau phosphate ores, and after the war three new plants were built, in the Ukraine, in Kirovakan, Armenia, and in Estonia. The last is being greatly expanded.

In addition to superphosphate, phosphorite meal, ground basic slag, phosphate precipitate, double and triple superphosphate (based on thermal phosphoric acid), and concentrated phosphate fertilizers from thermal phosphoric acid are produced in such places as Kandalaksha and Kirovsk.

As a producer of phosphate fertilizers, the Soviet Union stands about equal to France, the greatest of the Western European producers.

Petrochemistry

It is maintained in the foreign press that one of the greatest bottlenecks of the Soviet economy is petroleum, that its production, in comparison with a world cross-section, has been exceptionally slow in developing, and that consumption is significantly lower than in western countries. The reserves [it is claimed] are visibly decreasing, and the lack of oil can restrict the further development of industry and seriously hinder the war efforts of the Soviet Union. Such arguments are not only false but dangerous. Even as it was difficult a few years ago to believe in the possibility of Soviet atomic weapons, in similar fashion we quite falsely estimate the Soviet potential in the petroleum field.

The petroleum production of the USSR amounted to some 31 million tons in 1940. Because of the effects of war and the exhaustion of the upper stratum at Baku, only 21 million tons were produced in 1945. But it was already possible in 1950 to exceed the production plan (for 35.4 million tons) with a production of 37.6 million tons. In 1951, 42.3 million tons were produced, the following year 47.4 million tons, and in 1953, 52.3 million tons (8 percent of world production). In 1954, it will probably be 57 million tons. The so-called Stalin Plan anticipated an output of about 60 million tons for 1960. But advances in the field of petroleum made it possible to require the production of 69.9 million tons in the Five-Year Plan later drawn up. The best evidence against an alleged petroleum shortage in the Soviet Union are her exports of petroleum during the past 3 years. They amounted to about one million tons in 1952 and 2 million tons in 1953, and will probably reach 4 million tons in 1954 (including shipments from Rumania). Primarily, diesel, gas, and heating oils are exported. The high point to date of petroleum exports was attained in 1932 with shipments totaling 6 million tons.

Of the approximately 70 petroleum refineries, some 15 each are located in the Caucasus and in the Volga-Ural region, and 10 each in East Galacia and in the Asiatic regions of the country. The rest are distributed among the other industrial regions. The operating capacity of the refineries increased from 33 million tons in 1950 to about 47 million tons in 1953 and may reach an output of 65 million metric tons a year in 1955. The operational capacity of the cracking plants was even more developed: from 12 million tons capacity in 1950 to over 15 million tons in 1951, and -- conceivably -- about 32 million tons in 1955.

Before the war about one third of the crude oil put into refineries went through the cracking process later; this proportion has now increased to about half. Of the 1940 production of gasoline derived from crude oil, amounting to a scant 4.9 million tons, two thirds was produced by the cracking plants. Today it may be four fifths. At present, an estimated 12-13 million tons of gasoline derived from crude oil is being produced.

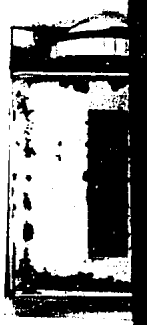
The yield of ligroine may have increased in a similar manner, from one million to 2.5 or 3 million tons, and the output of diesel oil to an even greater extent, from about 980,000 to 5 million tons, probably even more. The enlargement of capacities has been accompanied by an improvement of production methods and a modernization of the refineries, which were probably old and deteriorated.

Synthetic fuels cannot be overlooked in any evaluation of the petroleum situation of the Soviet Union. Even before the outbreak of war, experimental plants were working in this field. In the meantime, parts of the Leuna Plant have been erected near the mouth of the Dniestr, between Tiraspol' and Nikolayev, with the help of German specialists, as have other dismantled German plants in the chemical combines of Dzerzhinsk (Gorkovskaya Oblast) and Cheremkhovo (Irkutskaya Oblast). Carbohydration plants are located in Kemerovo (West Siberia) and in Chirchik (Uzbekistan).

According to the latest five-year plan, synthetic gasoline and carbohydration are expected to be significantly developed. There are reports that 41 synthetic gasoline plants are already in operation, and 11 more should be by the end of 1954. The present production of synthetic fuels could probably satisfy the needs of two fully equipped air fleets.

It is impossible to investigate the validity of these reports. It is possible that they pertain only to plans. Yet, there is no reason to believe that the Soviet regime will not carry out such plans. German methods for the synthetization of gasoline were supposedly turned over to the Russians shortly after the Treaty of 1939 was made. But even were this not the case, there would still no longer be technological secrets today, for German technicians are available in great numbers.

Oil shale is a further source of fuel. The most important deposits are located in Estonia near Kokhtla-Yarve, in Leningradskaya Oblast, and near Gdov in the Volga region. In the principal Estonian production areas some 8 million tons of shale were obtained in 1950. They should reach about 18 million tons by 1955. Leningradskaya Oblast supplied probably 3 million tons and Gdov relatively lesser amounts. The total production of shale oil should, according to plan, be increased from the 1950 production of 450,000 tons to 810,000 tons in 1955. The Estonian shale serves as a basis for a developing shale-chemical industry. Among other things, synthetic gasoline is being produced. According to plan, the production should increase by 80 percent from 1950 to 1955. The gas obtained by shale distillation is piped into Leningrad and already serves a large part of the domestic needs; production has increased by 2.2 times.



Natural gas is of increasing significance. However, the production for 1950 seems to have amounted to only about 3.5 billion cubic meters, as compared with the plan requirement of 8.4 billion cubic meters. A yield of 6.3 billion cubic meters is expected for 1955. The most important field is located northeast of Saratov. An 845-kilometer-long pipeline carries the gas to Moscow. This makes possible a saving of probably 8.5 million tons of coal per year. A very productive source of natural gas near Dashava in the eastern Carpathians serves the cities of Lemberg and Kiev.

Finally, the cities of Kuybyshev and Ufa receive long-distance gas from the area between the Volga and the Urals, and a natural gas pipeline is being built from the source near Ukhta to the city of Molotov.

Natural gas is also used to a certain extent as motor fuel. Furthermore, like crude oil, it serves as a basis for a developing petrochemical industry. Plants for the extraction of organic chemicals are located near the crude oil refineries of the Caucasus. Others are being built in the new chemical center on the Volga. Acetylene, ethylene, naphthalene acids, benzol, toluol, and other aromatics were extracted by Soviet methods before 1941.

During the war, the Americans made available their methods in the field of petrochemistry and were active in erecting plants and operating them. A plant for the production of benzol from ethane and propane was erected in Ishimbay at that time with help from the US.

In addition to the aforementioned products, such things as ethanol and other alcohols, organic acids, solvents, medicines, dyes, synthetic rubber, fuels, and numerous other products were produced from crude oil as well as from natural gas. At present, the Americans are far superior to the Russians in the field of petrochemistry. There is little doubt, however, that this branch of production will soon be a very important factor in Soviet chemistry.

Products of Tar Distillation

Today, plants for the distillation of tar are located near all the larger coking plants. They are primarily in the Ukraine, in the Urals, and in West Siberia. Furthermore, tar is being supplied for distillation to various chemical plants which are engaged in the production of dyestuffs, intermediate products, and other organic chemicals.

Official figures have not been made available for a long time. Production in 1955 is expected to be as follows (in 1,000 tons):

Tar	1,550
Benzol	365
Toluol	69
Solvent naphtha	14
Other light oils	15
Ammonium sulfate	540
Coke-oven gas (in billions of cubic meters)	390

These production figures are about one third those of the US for 1951.

The technique of distillation has recently been improved. The output can thereby be increased. This applies, among other things, to naphthalene, which seems to have created considerable interest as a raw material for organic chemical synthetics. Until now, the operational efficiency of the organic-synthetic industry generally has been less developed than in other industrial countries. This may be concluded from the proportionately small chloride and carbide production.

Synthetically-produced products, i.e., benzol, toluol, phenol, and others, are not included in this statement. Synthetics plants for carbonaceous materials (Kohlenwertstoffe) operate in connection with various explosives plants, crude oil refineries, and several chemical combines, for example: Rubezhnoye Chemical Combine, Ukraine; Leningrad-Okhta Chemical Combine; Kineshma Chemical Plant "Tovarishch Frunze," Ivanovskaya Oblast; Chemical Plant Bondyuzhskiy Zavod, Tatar ASSR; Berezniki Chemical Combine "Voroshilov," Urals; Polevskoy Chemical Plant, Sverdlovskaya Oblast, Urals; and Ufa Chemical Combine, Bashkir ASSR.

Tar Dyestuffs

Production is concentrated extensively in and around Moscow and consists mostly of former German private enterprise facilities. Other plants are in the Ukraine, along the Volga, in Leningrad, and in other cities. The main producers are: Moscow Derbenevskiy Plant (formerly Farbwerke Hoechst); Moscow Dorogomilovskiy Plant (formerly Richard Meyer AG, Berlin); Butyrki Plant in Moscow (formerly Badische Anilin- und Soda-Fabrik); Kineshma Chemical Plant "Tovarishch Frunze" on the Volga in the Ivanovskiy Okrug (formerly "Benzolom"); Rubezhnoye Chemical Combine near Lisichansk in the Donets Basin; and Stalinogorsk Chemical Combine "Stalin."

After the war, two new plants were put into operation in eastern USSR. Production has increased as follows (in 1,000 tons):

1913	--	4	1940	--	40
1929	--	13	1950	--	43
1933	--	16	1951	--	60
1938	--	35	1952	--	64

At present, some 70,000 metric tons a year are produced. The assortment is not yet large. Principally commercial sulfuric and azo-dyestuffs are being produced. The demand for these varieties appears to be readily met, for large quantities are being sold abroad to such countries as Iran, India, Argentina, Japan, and others. The output of indanthrene and other dyestuffs of high quality is relatively small.

Industrial plans call for an increased operating capacity and an improvement over the previous poor quality of dyestuffs, and a considerable increase in the variety of dyestuffs. This will result in emphasis being placed upon the manufacture of high-quality products, such as photographic dyes.

Synthetic Rubber

The Soviet Union was the first country to undertake the large-scale production of synthetic rubber (1932). There were four plants in 1939 which utilized ethyl alcohol as a raw material. A fifth plant used calcium carbide as a base. During the war, a large portion of the production dropped off. With the help of specialists from the US and -- after 1945 -- from Germany, new plants were built. At present, there are already about 20 synthetic plants, and their number continues to increase.

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The following plant locations are known: Moscow, Leningrad, Yaroslavl', Voronezh, Yefremov (Tulskaya Oblast), Baku, Yerevan (Armenia), Aktyubinsk (Kazakhstan), Magnitogorsk, Kazan, Novo-Tagil (Urals), Kemerovo (West Siberia), Riga, Michurinsk, Medvezhinsk, Rizhskiy near Kursk, and Temir-Tau (Karaganda).

Production in 1,000 Tons (partially estimated)

1933	--	2	1950	--	225
1935	--	26	1951	--	270
1938	--	85	1952	--	290
1940	--	125	1953	--	330
1949	--	200			

Of the 1950 production (250,000 tons planned), probably some 155,000 tons were extracted from an alcohol base and 95,000 tons on a carbide (or possibly some on a petroleum) base. An 82-percent increase in production, to about 400,000 tons, is anticipated for 1955, as compared with 1950. Production will be extensively based upon natural gas. At present, the US produces about three times as much synthetic rubber as Russia. The USSR is the second largest producer in the world.

The attempts to raise plants from which synthetic rubber can be obtained -- especially Kok-Saghyz -- on a broad basis have not met with the desired success. At present, on a relatively large acreage of these plants, some 15,000 tons a year of natural rubber are produced. However, the rubber needs of the Soviet Union amount to approximately 400,000 tons, of which about half goes into the production of tires.

Importation of natural rubber amounted to 27,000 tons in 1938. One hundred thousand tons each year were imported in 1948 and 1949, and in the following 3 years, some 80,000 tons each. In 1953, according to the latest available information, significantly less was brought in. Moreover, the German Democratic Republic has for several years delivered some 35,000 tons of synthetic rubber a year to the Soviet Union.

Plastics

The consumption of plastic substances probably amounts to 650,000 metric tons per year. It thus amounts to somewhat over 3 kilograms per capita of the population and is only half that of the US. This seems to include chemical fibers, synthetic rubber, photographic film, and the like in the USSR. Production is, however, expanding.

Three new plants have been put into operation since the war and still others are planned or under construction. An experimental institute, founded several years ago in Leningrad, is occupied with the technology of new types of plastics, especially polyvinyl resins. Vinyl resin, in the form of pipes, welding rods, and sheets, is being produced in several plants. Polyacryl resins are also produced.

Before the war, primarily phenolformaldehyde resins were produced, along with casein resin, celluloid, and other cellulose substances. But because of raw material shortages, the production was small: only 14,000 tons in 1938, as compared with 10,500 tons in 1936 (2/3 phenoplast and 1/3 celluloid). Plant locations are as follows:

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Casein-resin -- Mnevniki near Moscow; Kalinin (formerly Tver); Dnepropetrovsk, Ukraine; Reval, Estonia (two plants); Dorpat (Estonia); Riga (Latvia); and Shaulyai (Lithuania).

Celluloid -- Okhta Chemical Combine near Leningrad; and Rubber Plant "Estico," Dorpat (small plant).

Cellulose acetate -- Produced in Okhta primarily for safety-film; cellophane (Zellglas) in the Mytishchiy Plant near Moscow, in Klin, Moskovskaya Oblast, and in the rayon plant of the former Kuito O. Y. near Enzo (former Finnish area). Cellulose esters and ethers, for example, benzylcellulose, are being produced in the Okhta Chemical Combine.

Safetyglass -- Produced in a series of plants in Konstantinovka, Ukraine ("Avtosteklo" Plant), Gorkiy (Glass Plant), Dzerzhinsk, and Moscow ("Avtosteklo" Plant). These plants produce three-ply glass, the center layer of which consists of celluloid or acrytalen. Types in which the celluloid center layer is replaced by vinyl resin or cellulose acetate are supposedly being produced in Mytishchiy near Moscow.

Phenoplast -- Orekhovo Zuyevo "Karbolit" Plant, which also produces acrylate; chemical plant in Kuskovo near Moscow; experimental plant of the "Soyuzkhimplastmass" Trust in Lyubuchany; Dzerzhinsk Chemical Plant; and Okhta Chemical Combine.

Aminoplast -- Odessa "Bol'shevik" Plant; also in Karachar and Kuskovo near Moscow.

Synthetic copalite (Kunstkopale) -- Okhta Chemical Combine.

Imitation leather materials (especially for shoe soles, primarily of a rubber base but also of synthetic materials (for example, nitrocellulose) -- "Proletarskiy Trud" in Leningrad; Leningrad Synthetic Leather Plant No 1 in Shchelkovo, near Moscow; and Plant "Nogin" in Kuntsevo, near Moscow.

Vulcanized fiber -- Kineshma Paper Plant; and Volodarskiy Paper Plant.

Linoleum -- Odessa Cord and Linoleum Plant "Bol'shevik."

Chemical Fibers

Soviet production of chemical fibers from cellulose, according to a 1951-1952 American report, is probably about one fifth that of the US, or about 120,000 tons (total German production, approximately 255,000 tons). In 1950, it was said to have amounted to 75,000 tons, half of which was composed of rayon and cellulose wool. By 1955, the capacity should have increased by 4.7 times as compared with 1950, or probably to 350,000 metric tons a year. Primarily viscose fibers are manufactured. Acetate fibers, because of a lack of acetate, are being produced only in small quantity. Nearly all the factories were destroyed during the war, but have been restored since. These are: "Viskosa" in Mytishchiy near Moscow; "Pyatiletka" in Leningrad; "Kuybyshev" in Mogilev, Belorussia; "Klinvolokno" in Klin, Moskovskaya Oblast; "Kievvolokno" in Kiev-Darnitsa; and "Kuito" in Enso (formerly Finland).

The majority of these produced rayon and a few also cellulose wool.

So far, at least three plants for rayon and four for cellulose wool have been erected, probably in Stalingrad, Kamensk on the Kama, and Kalinin, among other places. Ugrezhskoye near Moscow, Gorkiy, Tambov, Molotov (Perm), Krasnodar, Cherkassk, Sinarskaya (Sverdlovskaya Oblast), and Kolomna near Moscow have been suggested as possible locations in an earlier report.

Recently, completely synthetic fibers have been produced. The "most modern nylon fiber plant in the world" is supposed to have been built in Klin and is said to have produced 4 tons a day in 1950. Stockings made of this material are said to be first-class. In 1952, the production of stockings from synthetic fibers is supposed to have amounted to 55 million pairs, 35 percent more than in 1951. A new chemical fiber, "Nitrilon," evidently a polyacrylnitril fiber, was developed in a textile combine in Leningrad. It is supposed to be manufactured soon in quantity.

Medicines

By and large, Russia supplies her own pharmaceutical products. Her imports consist only of special preparations. Conversely, a series of goods are exported, for example, antibiotics have for several years been exported to the People's Democracies. The consumer pattern is different from that of Western European countries. For example, finished medicines are used in significantly smaller quantity, and the absolute consumption is smaller. Now and again complaints arise over the quality of the medicines. For the most part, however, they seem to be satisfactory. These things have been observed not only during the war, but also recently by western foreigners who have traveled in the USSR.

The production program embraces practically the whole scale of universally used medicines, including sulfanilimide, antibiotics, etc. They are producing among other things, penicillin (in Kiev, Riga, and at least four other factories), streptomycin, albumycin -- for use against dysentery, spotted fever, typhus, etc., and synthomycin -- against dysentery, typhus, pneumonia, and trachoma. Synthetic hormones, such as testosterone and methyltestosterone, as well as preparations like "PASK" (p-Aminosalicyl-acid) and "Tibon" are also produced.

According to the current economic plan, the total production of medicines is expected to increase by 2 1/2 times during the period 1950-1955. Special attention is expected to be devoted to the further production of "the latest medicines and other preventive and curative means." A series of scientific institutes, such as the Chemical Pharmaceutical Institute "Sergo Ordzhinikidze" (NIKhFI) in Moscow, the Ukrainian State Institute for Experimental Pharmacy in Kharkov, the Scientific Pharmaceutical Research Institute in Leningrad, the Central Scientific Pharmaceutical Research Station (TsANIS) in Moscow, the Union Institute for Medicinal Herbs (VILAR), and various others, including a series of laboratories near the larger enterprises, are occupied with research in the field of medicine. The medicines produced by these enterprises have proven to be, in part, improvements on foreign products. But there have also been numerous valuable preparations discovered independently.

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