EXTRA

PROVISIONAL INTELLIGENCE REPORT 110

THE SULFURIC ACID INDUSTRY IN POLAND

CIA/RR PR-96
21 January 1955

CENTRAL INTELLIGENCE AGENCY

OFFICE OF RESEARCH AND REPORTS

WARNING

This material contains information affecting the National Defense of the United States within the meaning of the espionage laws Title 18, USC, Secs. 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law

Approved For Release 1999/09/02 : CIA-RDP79-01093A000800030001-7

CONFIDENTIAL

~~SECRET~~

US OFFICIALS ONLY

PROVISIONAL INTELLIGENCE REPORT

THE SULFURIC ACID INDUSTRY IN POLAND

CIA/RR PR-96

(ORR Project 22.573)

NOTICE

The data and conclusions contained in this report do not necessarily represent the final position of ORR and should be regarded as provisional only and subject to revision. Comments and data which may be available to the user are solicited.

CENTRAL INTELLIGENCE AGENCY

Office of Research and Reports

US OFFICIALS ONLY

~~SECRET~~

CONFIDENTIAL

CONTENTS

CONFIDENTIAL

CIA/RR PR-96
(ORR Project 22.573)

SECRET

THE SULFURIC ACID INDUSTRY IN POLAND*

Summary

Sulfuric acid is an essential component in the industrial development of any nation. It is vital to the production of fertilizers, steel products, petroleum products, explosives, chemicals, synthetic fibers, plastics, dyes, and nonferrous metals.

The sulfuric acid industry in Poland was practically wiped out during World War II, but it has grown rapidly since 1945. The 1955 estimated total production of 525,000 metric tons** will make Poland the second largest producer of sulfuric acid among the Satellites. This production will be equivalent to about 16 percent of the estimated 1955 USSR production, about 32 percent of the total Satellite production (including Communist China), and about 10.6 percent of the total production of the Soviet Bloc. In 1953 the production of sulfuric acid in Poland was equal to about 3.3 percent of the 1953 US production.

It is expected that approximately 75 percent of the 1955 estimated production of sulfuric acid in Poland will be produced by the chemical industry and that the remainder will be produced as a byproduct of metallurgical plants.

In the production of sulfuric acid, Poland is adopting Soviet technology, which differs only slightly from US technology. This difference is primarily the result of the different raw materials used. Whereas elemental sulfur is used widely in the US, Poland relies primarily on pyrites and gypsum. Of the 525,000 tons of sulfuric acid to be produced in 1955, Poland will derive about 189,000 tons from pyrites (half of which is to be imported), 105,000 tons from compounds of sulfur and nonferrous metals, 152,250 tons from gypsum and anhydrite, 68,250 from marcasite,*** and nearly

* The estimates and conclusions contained in this report represent the best judgment of the responsible analyst as of 2 November 1954.

** Unless otherwise stated the basis of all figures in this report will be 100-percent acid. Tonnages are given in metric tons.

*** Marcasite is a white iron pyrite (FeS_2) -- 46.6 percent iron and 53.4 percent sulfur.

10,500 tons from waste gas.*

Sulfuric acid is utilized by various iudustries in the manufacture of a wide variety of products. Although the demand for sulfuric acid for the manufacture of these products is increasing, Poland is depending on its domestic production. There is no record of substantial imports since 1951.

The sulfuric acid industry in Poland is not currently able to satisfy domestic requirements. This inadequacy has necessitated a reorientation of the phosphate fertilizer program away from superphosphate to other phosphate fertilizers which do not require sulfuric acid.

The estimated pattern for the utilization of sulfuric acid by industries in Poland in 1955 is as follows: superphosphate, 252,000 tons; ammonium sulfate, 68,250 tons; hydrochloric acid, 15,750 tons; aluminum sulfate, 10,500 tons; synthesis of organic compounds, 57,750 tons; synthetic fibers, 73,500 tons; processing various metals, 36,750 tons; other utilization, 10,500 tons.

The stockpiling of sulfuric acid is not feasible from the point of view of either safety of economy. The utilization of sulfuric acid in the fertilizer industry provides a quasi-reserve which, in case of emergency, may be reallocated to more essential industries on a limited scale.

Continued failure to accomplish the yearly sulfuric acid plan indicates that the chemical industry in Poland is falling below production goals.

Poland imports about half of the pyrites used by the sulfuric acid industry. Although this import requirement constitutes a current vulnerability to economic warfare, the development of the gypsum process and the new pyrites deposits allegedly discovered in Poland may eliminate the need for imports.

A marked increase in production, coupled with a decrease in the allocation of sulfuric acid for nonstrategic industries (such as the fertilizer industry), could indicate larger quantities being used in the manufacture of the explosives, steel, and gasoline required for military action.

* Waste gas is removed in the purification of water gas, refinery gas, natural gas, and other fuel gases.

I. Introduction.

A. General.

All industrialized nations require large quantities of sulfuric acid. This commodity, not in itself an end product, is a necessary input item in operations such as the pickling of steel; the refining of petroleum; and the manufacture of explosives, paints, dyes, rayon, and fertilizers -- ammonium sulfate and superphosphate. In wartime sulfuric acid is essential in the production of high explosives and propellants. Because of its diversified use and rapid response to changes in production and consumption of end items, sulfuric acid serves as a business indicator. 1/*

The stockpiling of sulfuric acid is not feasible from the viewpoint of either safety or economy. The utilization of sulfuric acid in the fertilizer industry, however, provides a quasi-reserve which can be reallocated to more essential industries in case of emergency. 2/

B. Organization of the Polish Chemical Industry.

The basic trend in the postwar organization of Poland's chemical industry has been toward greater functional and geographic integration, aiming at simplification of the chain of supervisory responsibility and reduction of the number of organizational echelons. At first, there were six echelons in the organization of a given industry: the ministry, the central administration, a board of directors for each particular branch of the industry, an association with horizontal jurisdiction over a specific commodity or groups of commodities, a combine consisting of several plants, and the individual factory. In the subsequent integration, the board of directors for a particular branch of industry and the combine were gradually eliminated. The most recent tendency is to do away with the horizontal type of association and to institute a three-echelon system: the ministry, the central administration, and the producing plant.

The division of administrative functions in the three-echelon system is as follows:

1. Ministry: general supervisory functions; the regulation and organization of industry.

* Footnote references in arabic numerals are to sources listed in Appendix E.

2. Central Administration: general management; the coordination and control of branches of industry.

3. Producing Plant: production and management of physical and financial resources.

The law of 12 May 1950 on the reorganization of industry established the principle that in key industries the single plant is the basic organizational unit responsible for independent financial accounting, planned agreements on output, and direct contact with sources of supply. This law also established an Economic Committee of the Council of Ministers responsible for the coordination of actual industrial output with the national economic plan.

Under a resolution of 30 December 1950, industry is broken down into the following Ministries: Heavy Industry, Light Industry, Agriculture and Foodstuffs Industry, Chemical Industry, Industrial Building Industry, Urban Building Industry, and Metallurgical Industry. 3/

The Ministry of the Chemical Industry is broken down into the following Central Administrations:

Inorganic
Sulfuric Acid and Phosphorous Fertilizers
Synthetic Chemistry
Dyes and Semiproducts
Explosives
Paints and Lacquers
Technical Gases
Chemical Plant Construction
Rubber
Artificial Fibers
Pharmaceuticals
Paper
Sales

The sulfuric acid produced by the chemical industry is under the jurisdiction of the Central Administration of Sulfuric Acid and Phosphorous Fertilizers. 4/

The sulfuric acid produced by the metallurgical industry is a byproduct from the lead and zinc smelters, which are under the jurisdiction of the Ministry of the Mining Industry.

II. Production.

A. General.

The prewar sulfuric acid industry in Poland was relatively small and was equal to only a small percentage of US or USSR production.

Following World War II a majority of the sulfuric acid plants were in ruins. There was, moreover, a shortage of industrial equipment, raw materials, and acid production specialists. The period of the Three Year Plan (1947-49) was spent rebuilding the industry. 5/

In the second half of 1950, Soviet experts came to Poland and attempted to bolster the lagging industry. Soviet technology was adopted, and plans were drawn for the abandonment of the obsolescent chamber process in favor of the tower and contact processes. (See Appendix B, technology, for an explanation of these processes and the chart* for the tower process.) The two latter processes are more efficient than the former, and lead — a commodity which is scarce in Poland — is not required in their construction.

Sulfuric acid in Poland is produced by plants under the Chemical Ministry and as a byproduct of lead, zinc, and copper smelters 6/ (see Appendix A, plant study).

B. Chemical Industry.

Prior to World War II the chemical industry accounted for approximately 40 percent of the total domestic production of sulfuric acid in Poland. In 1945 the chemical industry's production of sulfuric acid was zero. 7/ Beginning in 1946, however, when the chemical industry produced approximately 25 percent of the total domestic output, production increased steadily, and by 1949 the chemical industry included 10 plants producing 146,000 tons of sulfuric acid which, together with 132,000 tons produced by the nonferrous metal plants, brought total production up to 278,000 tons. 8/

During the current Six Year Plan (1950-55), although the industry has been expanded, it has not been able consistently to

* Following p. 32.

fulfill yearly plans. By 1955, it is estimated that the chemical industry, as such, will produce 396,000 tons, approximately 75 percent of the total domestic output of 525,000 tons. 9/ This increase will result from the building of new plants, especially the plants at Wizow and Busko, which use domestic gypsum as a raw material, and from the reconditioning of existing plants. 10/

Estimated production of sulfuric acid by the chemical industry in Poland, for selected years 1937-55, is shown in Table 1.

Table 1

Estimated Production of Sulfuric Acid
by the Chemical Industry in Poland
Selected Years, 1937-55

Year	Production (Metric Tons)
1937	74,000 11/
1938	57,424 12/
1945	0 13/
1946	31,000 14/
1947	47,600 15/
1948	104,000 16/
1949	146,000 17/
1950	176,000 18/
1951	168,000 19/
1952	243,000 20/
1953	294,000 21/
1954	345,000 a/
1955	396,000 a/

a. Estimates.

The effect of remodeling the sulfuric acid industry in Poland -- that is, conversion to contact and tower processes -- is shown in Table 2.* This table shows the amount of acid produced by the chemical industry by process for the years 1949-55.

* Table 2 follows on p. 7.

Table 2

Production of Sulfuric Acid by Process
by the Chemical Industry in Poland
1949-55 22/

Metric Tons

	Process					
Year	Chamber	Percent of Total	Tower	Percent of Total	Contact	Percent of Total
1949	49,640 a/	34	64,240	44	32,120	22
1950	52,800	30	80,960	46	42,240	24
1951	43,680	26	67,200	40	57,120	34
1952	51,030	21	104,490	43	87,480	36
1953	29,400	10	147,000	50	117,600	40
1954	13,800	4	182,850	53	148,350	43
1955	11,880	3	190,080	48	194,040	49

a. Indicates production as metric tons of 100 percent acid.

In 1949 there were 10 sulfuric acid plants belonging to the chemical industry in operation. Five of these plants used the chamber process, 3 the tower process, and 2 the contact process. In 1954, only one chemical plant will produce sulfuric acid by the chamber process. In 1960 it is planned to produce 40 percent of the acid by tower and 60 percent by contact process. 23/

C. Metallurgical Industry.

Before World War II the metallurgical industry produced approximately 60 percent of Poland's sulfuric acid. This condition was largely the result of a government decree in Upper Silesia which forbade the discarding of fumes from zinc and lead smelters because they destroyed nearby crops. 24/

In 1945 the metallurgical industry produced 36,000 tons of sulfuric acid; this constituted Poland's entire domestic production

of sulfuric acid for the year. 25/ From 1946 to 1948 the metallurgical industry continued to produce more than did the chemical industry. Since 1948, however, the metallurgical industry has been hampered by a dwindling supply of lead and zinc blends, and production has been irregular and unreliable. 26/

Production of sulfuric acid by the metallurgical industry in Poland, for selected years, 1937-55, is shown in Table 3. It is not known what process or processes are utilized by the metallurgical industry, but it is believed that the plants have been, or are being, converted to the tower or contact process.

Table 3

Production of Sulfuric Acid
by the Metallurgical Industry in Poland
Selected Years, 1937-55

Metric Tons

Year	Production
1937	114,000 27/
1938	138,576 28/
1945	36,000 29/
1946	92,500 30/
1947	107,800 31/
1948	117,000 32/
1949	132,000 33/
1950	111,000 34/
1951	124,000 35/
1952	131,000 36/
1953	106,000 a/ 37/
1954	108,000 a/ b/
1955	129,000 b/

a. Production in these years is lower because of an inadequate supply of pyrites.
b. Estimated. (For methodology, see Appendix C.)

D. Total Production.

Postwar production of sulfuric acid in Poland has lagged behind the requirements of the country. 38/ The Plan has been met only twice, in 1948 and 1949, and the scarcity is reflected in the rest of the economy. 39/ Plans are now under way to conserve sulfuric acid by producing phosphate fertilizers other than superphosphate. 40/ It requires 1 ton of 100 percent sulfuric acid to produce 3 tons of superphosphate fertilizer. 41/

The growth of the sulfuric acid industry of Poland is dependent largely upon the ability to utilize the domestic gypsum and anhydrite deposits as raw material. 42/

Production of sulfuric acid in Poland for selected years, 1937-55, is shown in Table 4.*

E. Polish Production of Sulfuric Acid Compared with That of the US and the Soviet Bloc.

Production of sulfuric acid in Poland, the USSR, and the US, 1946-55, is shown in Table 5.* In 1953, Poland's production was equal to approximately 14.5 percent of USSR production and 3.3 percent of US production.

By 1955, Poland will be the second largest producer of sulfuric acid in the Satellites and will produce approximately 32 percent of the total production of the Satellites (including Communist China) and approximately 10.5 percent of the total Soviet Bloc production.

* Tables 4 and 5 follow on p. 10.

Table 4

Production of Sulfuric Acid in Poland
Selected Years, 1937-55

Metric Tons

Year	Chemical Industry	Metallurgical Industry	Total
1937	74,000 43/	114,600 44/	188,600 45/
1938	57,424 46/	138,576 47/	196,000 48/
1945	0 49/	36,000 50/	36,000 51/
1946	31,000 52/	92,500 53/	123,500 54/
1947	47,600 55/	107,800 56/	155,400 57/
			(176,000) a/ 58/
1948	104,000 59/	117,000 60/	221,000 61/
			(211,000) 62/
1949	146,000 63/	132,000 64/	278,000 65/
			(276,000) 66/
1950	176,000 67/	111,000 68/	287,000 69/
			(337,000) 70/
1951	168,000 71/	124,000 72/	292,000 73/
			(N.A.)
1952	243,000 74/	131,000 75/	374,000 76/
			(385,000) 77/
1953	294,000	106,000 b/	400,000
			(406,000)
1954 78/	345,000 b/	108,000	453,000 b/
			(460,000)
1955	396,000 b/	129,000	525,000 b/
			(540,000)

a. Figures shown in parentheses are plan figures.
b. Estimated.

Table 5

Production of Sulfuric Acid in Poland,
the USSR, and the US
1946-55

Thousand Metric Tons

Year	Poland	USSR 81/	US 82/
1946	123.5	1,520	7,860
1947	155.4	1,370	9,050
1948	221.0	1,590	9,300
1949	278.0	1,810	9,850
1950	287.0	2,040	11,000
1951	292.0	2,280	11,250
1952	374.0	2,500	11,800
1953	400.0	2,750	12,000
1954	453.0	3,030	N.A.
1955	525.0	3,330	N.A.

III. Stockpiling.

There is no stockpiling of sulfuric acid in Poland. This statement is based on two facts:

1. The stockpiling of sulfuric acid is not feasible from the viewpoint of either safety or economy.

2. Production has continually fallen below plan, and is not able to satisfy current consumption requirements. 84/

The requirements of the fertilizer industry for sulfuric acid, approximately 320,250 metric tons of 100 percent acid in 1955, constitutes a quasi-reserve, which could be allocated to a more strategic industry in the advent of war. It is obvious, however, that even in wartime, fertilizer production cannot be cut drastically.

IV. Trade.

Polish trade in sulfuric acid has been practically nonexistent since 1950. Production of sulfuric acid is small in most of the Satellites, and it is usually all consumed by the producing country. There is no evidence of Polish-Western trade in sulfuric acid since 1950.

Except in 1951, there were no imports of sulfuric acid into Poland from 1950 to 1953. In 1951, 1,150 tons were imported from East Germany, and there was a shipment of 2 tons from Antwerp to Gdynia which was probably a transshipment; being such a small quantity, it was probably laboratory-grade acid. 85/ An undated CIECH (Central Import-Export Agency for Chemicals and Chemical Laboratory Equipment) catalogue lists sulfuric acid as a Polish export. Frequent statements that domestic production is not sufficient to satisfy home requirements refute this claim, and no evidence of any exports can be found.

V. Consumption.

Sulfuric acid is utilized in the production of a wide variety of products. Planned consumption of sulfuric acid in Poland, 1955, is shown in Table 6.*

* Table 6 follows on p. 12.

Table 6

Planned Consumption of Sulfuric Acid in Poland 86/
1955

Consumer	Amount (Metric Tons)	Percent of Total Production
Superphosphate	252,000	48
Ammonium Sulfate	68,250	13
Hydrochloric Acid	15,750	3
Aluminum Sulfate	10,500	2
Organic Synthesis	57,750	11
Synthetic Fibers	73,500	14
Metals	36,750	7
Others	10,500	2
Total	525,000	100

Table 7* shows a comparison of the 1955 Polish planned consumption with an average US and USSR consumption pattern. It has been necessary to exercise a certain degree of license in arranging the US and Soviet categories to adjust to the Polish breakdown.

VI. Inputs into Industry.

A. Sulfur-Bearing Materials.

1. General.

In the US, elemental sulfur is the principal raw material for the manufacture of sulfuric acid. 87/ Most other countries, including Poland and the USSR, are forced to rely on pyrites (in one form or another) because of the lack of adequate supplies of elemental sulfur. 88/ Other raw materials commonly used are waste smelter gases containing sulfur dioxide from nonferrous metal operations; "spent oxide," a mixture of ferric oxide, ferrous sulfide, and sulfur resulting from the use of ferric oxide to absorb hydrogen sulfide

* Table 7 follows on p. 13.

Table 7

Consumption of Sulfuric Acid in Poland, the USSR, and the US a/

	Percent of Total Production		
Consumer	Poland	USSR 89/	US 90/
Superphosphate	48.0	30.0	35.0
Ammonium Sulfate	13.0	10.3 b/	6.0
Hydrochloric Acid)	3.0		
Ammonium Sulfate)	2.0		20.0
Organic Synthesis)	11.0		
Synthetic Fibers	14.0	2.0 c/	6.0
Metals	7.0	3.5 d/	9.0
Others	2.0	36.0 e/	4.0
Total	100.0	81.8 f/	80 g/

a. Figures for Poland are those of the 1955 estimate; Figures for the US and the USSR represent average consumption patterns.
b. Includes only ammonium sulfate recovered from coke chemicals.
c. Includes only viscose rayon.
d. Includes only steel.
e. Includes consumption for dyes and intermediates, synthetic ammonium sulfate, hydrochloric acid, paints and pigments, explosives, nonferrous metallurgy, and miscellaneous chemical and industrial uses.
f. The remaining, approximately 18 percent, is consumed in petroleum refining.
g. The remaining 20 percent is accounted for as follows: petroleum refining, 11 percent; paints and pigments, 7 percent; industrial explosives, 1 percent; and textile, 1 percent.

out of illuminating gas; and various waste liquors or sludges occurring from the use of sulfuric acid in such processes as the refining of petroleum and the pickling of steel. 91/

2. Polish Raw Materials.

In prewar Poland (1930-38) approximately 36 percent of sulfuric acid production was derived from pyrites and 64 percent from zinc and lead blend. 92/ Following the war (1946-48) a majority of production was still derived from zinc and lead blends. These blends, however, are now partially exhausted and cannot be considered as a permanent basic raw material. 93/ This deficit is being compensated for in part by the utilization of gypsum and anhydrite as raw materials. 94/

a. Pyrites.

The domestic production of pyrites is able to supply approximately half of the sulfuric acid requirements for pyrites. The remainder must be obtained by import. 95/

b. Gypsum and Anhydrite.

Gypsum and anhydrite are both calcium sulfate ($CaSO_4$). In addition the gypsum molecule has two waters of hydration ($CaSO_4.2H_2O$). Little is known about the magnitude of production, but all gypsum and anhydrite exports were stopped in 1950, and it is believed that acid requirements could be satisfied without much difficulty. 96/

c. Zinc and Lead Blends.

Zinc and lead blends, the nomenclature assigned to the respective sulfides to distinguish them from the oxides, were responsible for a large share of prewar acid production in Poland. In 1945 the only acid produced was derived from this raw material. The deposits are now partially exhausted, however, and can no longer be considered as a permanent basic raw material for sulfuric acid. 97/

d. Waste Gases.

Waste gases are removed in the purification of water gas, refinery gas, natural gas, and other fuel gases in the form of hydrogen sulfide. There is no mention of the utilization of this

source in early reports, and its planned utilization in 1955 is some indication of the Polish need to utilize all possible sources of sulfur.

The requirements for sulfur-bearing raw materials in the sulfuric acid industry in Poland, 1955 Plan, are shown in Table 8.

Table 8

Requirements for Sulfur-Bearing Raw Materials
in the Sulfuric Acid Industry in Poland
1955 Plan

Raw Material	Sulfur Required (Metric Tons) a/	Acid Production a/ (Metric Tons)	Percent of Total Acid Production a/ 98/
Pyrites b/	67,775	189,000	36
Marcasite and Pyrites from Concentrated Zinc Ore c/	24,475	68,250	13
Compounds of Sulfur with Nonferrous Metals (Zinc, Lead, Copper) d/	37,653	105,000	20
Waste Gases	3,765	10,500	2
Gypsum and Anhydrite	54,596	152,250	29
Total	188,264	525,000	100

a. Estimated. For methodology, see Appendix C.
b. Raw materials for the chemical industry.
c. Raw materials utilized by both the chemical and metallurgical industries.
d. Raw materials for the metallurgical industry.

B. Nitrogen.

Oxides of nitrogen are consumed in both the tower and chamber process. Polish technology provides that the oxides are introduced in the form of nitric acid. The input requirement is 10 kilograms of

nitric acid per ton of 100 percent sulfuric acid. 99/

Inputs of nitric acid for the sulfuric acid industry in Poland, 1955, are shown in Table 9.

Table 9

Estimated Inputs of Nitric Acid for the Sulfuric Acid Industry in Poland
1955

Process	Sulfuric Acid Production (Metric Tons)	Kilograms of Nitric Acid per Metric Ton of Sulfuric Acid	Nitric Acid Inputs (Metric Tons)
Chamber	11,900	10	119
Tower	254,500	10	2,545
Total	266,400		2,664

This nitric acid requirement constitutes approximately 1.68 percent of the estimated 1955 production of nitric acid in Poland.

C. Electricity.

No information is available concerning consumption of electric power for production of sulfuric acid in Poland. US practice requires about 15 kilowatt-hours per ton of acid for either the tower process or the chamber process and 5 kilowatt-hours per ton of acid for the contact process. 100/ On the basis of US analogy, an estimate of electric power requirements can be made. Estimated electric power inputs for the sulfuric acid industry in Poland, 1955, are shown in Table 10.*

The 5,291,500 kilowatt-hours represent only a small percentage of the planned 1955 output of 19.3 billion kilowatt-hours in Poland. 101/

* Table 10 follows on p. 17.

Table 10

Estimated Inputs of Electric Power
for the Sulfuric Acid Industry in Poland
1955

Process	Sulfuric Acid Production (Metric Tons)	Kilowatt-Hours of Electric Power per Metric Ton of Acid	Electric Power Inputs (Kilowatt-Hours)
Chamber	11,900	15	178,500
Tower	254,500	15	3,820,000
Contact	258,600	5	1,293,000
Total	525,000		5,291,500

VII. Capabilities, Vulnerabilities, and Intentions.

A. Capabilities.

The Polish sulfuric acid industry currently is not able to satisfy domestic requirements. 102/ This is illustrated by the reorientation of the phosphate fertilizers industry away from superphosphate to other phosphate fertilizers which do not require sulfuric acid. 103/ Continued failure to accomplish the sulfuric acid yearly plan goal would indicate that the chemical industry is in general falling below the established production goals.

B. Vulnerabilities.

Poland imports approximately half of the pyrites used by the sulfuric acid industry. Although this dependence on imports constitutes a current vulnerability, the situation may be relieved by development of the gypsum process and by the newly discovered sulfur or pyrites deposit allegedly discovered in Poland. 104/

C. Intentions.

A marked increase in production coupled with a decrease in the allocation of sulfuric acid for fertilizer might indicate that large quantities were being consumed in the manufacture of the explosives, steel, and gasoline necessary for military action. There is no evidence, however, that such a plan is currently being followed. Continued failure to accomplish the sulfuric acid yearly plan goal would indicate that the chemical industry is in general falling below the established production goals.

APPENDIX A

SULFURIC ACID PLANTS IN POLAND IN 1954*

1. Location: Busko. 106/

   Coordinates: 50°28' N - 20°43' E.

   Plant Name: N.A.

   Industry: Chemical. 107/

   Raw Material: Gypsum and anhydrite. 108/

   Process: Contact.**

   Products: Sulfuric acid, cement.*** 109/

   Capacity: 98,000 tons sulfuric acid per year (estimated ultimate maximum). This plant expected to be the same size as Wizow.

2. Location: Gdansk (Danzig). 110/

   Coordinates: 54°40' N - 19°15' E.

   Plant Name: Sulfuric Acid and Superphosphate Factory. 111/

   Industry: Chemical. 112/

   Raw Material: Pyrites. 113/

   Process: Tower. 114/

   Products: Sulfuric acid, superphosphate, 115/ HCl. 116/.

* In 1954, all but one Polish sulfuric acid plant belonging to the chemical industry will use either the tower or contact process. 105/
** It is assumed that the plant is based on Wizow design.
*** Cement is a byproduct of the gypsum process.

Capacity: N.A.

3. Location: Gleiwitz. 117/

Coordinates: 50°17' N - 18°40' E.

Plant Name: Gliwicka Fabryka Kwasu Siarkowego (Gleiwitz Sulfuric Acid Plant). 118/

Industry: Chemical. 119/

Raw Material: Pyrites. 120/

Process: Tower. 121/

Products: Sulfuric acid. 122/

Capacity: N.A.

4. Location: Gorlice.

Coordinates: 54°05' N - 21°29' E.

Plant Name: Schuchardt Chemical Plant. 123/

Industry: Chemical.

Raw Material: Pyrites.

Process: N.A.

Products: Sulfuric acid.

Capacity: N.A.

5. Location: Katowice.

Coordinates: 50°16' N - 19°01' E.

Plant Name: Hohenlohehuette O.S. 124/

Industry: Metallurgical. 125/

Raw Material: Zinc blend.

Process: N.A.

Products: Calcined blends, sulfuric acid, nitric acid, crude zinc, zinc dust, zinc alloy. 126/

Capacity: 9,000 tons sulfuric acid per year. 127/

6. Location: Kielce. 128/

Coordinates: 50°53' N - 20°38' E.

Plant Name: National Chemical Establishment "Fosf." 129/

Industry: Chemical.

Raw Material: Pyrites.

Process: N.A.

Products: Sulfuric acid, superphosphate. 130/

Capacity: 10,800 tons sulfuric acid per year. 131/

7. Location: Lipiny. 132/

Coordinates; 50°19' N - 18°55' E.

Plant Name: Silesia Metallurgical Plant. 133/

Industry: Metallurgical. 134/

Raw Material: Zinc blend.

Process: N.A.

Products: Calcined blends, sulfuric acid, nitric acid, bisulfite, sodium sulfite, liquid sulfur dioxide, crude zinc, refined zinc. 135/

Capacity: 18,000 tons sulfuric acid per year. 136/

8. Location: Mikolow.

Coordinates: 50°10' N - 18°54' E.

Plant Name: Mikolow Chemical Factory. 137/

Industry: Chemical. 138/

Raw Material: Pyrites (estimated).

Process: N.A.

Products: Sulfuric acid. 139/

Capacity: N.A.

9. Location: Poznan. 140/

Coordinates: 52°25' N - 16°58' E.

Plant Name: State Sulfuric Acid Plant, "Poznan."

Industry: Chemical. 141/

Raw Material: Pyrites. 142/

Process: Tower. 143/

Products: Sulfuric acid, hydrochloric acid, reagent-grade nitric acid. 144/

Capacity: N.A.

10. Location: Radzionkow.

Coordinates: 50°25' N - 18°55' E.

Plant Name: Lararz Metallurgical Plant. 145/

Industry: Metallurgical. 146/

Raw Material: Zinc.

Process: N.A.

Products: Calcined blends, sulfuric acid. 147/

Capacity: N.A.

11. Location: Raciborz.

Coordinates: 50°05' N - 18°12' E.

Plant Name: N.A.

Industry: Chemical. 148/

Raw Material: Pyrites (estimated).

Process: N.A.

Products: Sulfuric acid. 149/

Capacity: N.A.

12. Location: Redziny.

Coordinates: 50°52' N - 19°13' E.

Plant Name: Redziny Chemical Factory. 150/

Industry: Chemical. 151/

Raw Material: Pyrites (estimated).

Process: N.A.

Products: Sulfuric acid, hydrochloric acid, superphosphate, calcined glauber salt. 152/

Capacity: N.A.

13. Location: Saarau.

Coordinates: 51°15' N - 20°11' E.

Plant Name: Silesia United Chemical Plant. 153/

Industry: Chemical.

Raw Material: Pyrites (estimated).

Process: N.A.

Products: Sulfuric acid. 154/

Capacity: N.A.

14. Location: Siemianowice.

Coordinates: 50°18' N - 19°02' E.

Plant Name: Siemianowice Metallurgical Plant. 155/

Industry: Metallurgical. 156/

Raw Material: Zinc.

Process: N.A.

Products: Calcined blends, sulfuric acid. 157/

Capacity: N.A.

15. Location: Szczecin (Stettin). 158/

Coordinates: 53°25' N - 14°36' E.

Plant Name: State Superphosphate Factory "Union." 159/

Industry: Chemical. 160/

Raw Material: Pyrites. 161/

Process: Tower. 162/

Products: Sulfuric acid, superphosphate. 163/

Capacity: N.A.

16. Location: Szopienice.

Coordinates: 50°16' N - 19°07' E.

Plant Name: Szopienice Metallurgical Plant. 164/

Industry: Metallurgical. 165/

Raw Material: Zinc blend.

Process: N.A.

Products: Calcined blends, sulfuric acid, elemental sulfur, crude zinc, refined zinc. 166/

Capacity: 30,000 tons sulfuric acid per year. 167/

17. Location: Torun. 168/

Coordinates: 53°02' N - 18°36' E.

Plant Name: Polkhem. 169/

Industry: Chemical. 170/

Raw Materials: Pyrites. 171/

Process: Contact. 172/

Products: Sulfuric acid, superphosphate. 173/

Capacity: 20,000 tons sulfuric acid per year. 174/

18. Location: Trzebinia.

Coordinates: 50°10' N - 19°29' E.

Plant Name: Trzebinia Metallurgical Plant. 175/

Industry: Metallurgical. 176/

Raw Material: Zinc and lead blends.

Process: N.A.

Products: Calcined pyrites, sulfuric acid. 177/

Capacity: N.A.

19. Location: Ubocz (Gruffenberg). 178/

Coordinates: 53°54' N - 15°12' E.

Plant Name: State Superphosphate Factory Ubocz. 179/

Industry: Chemical. 180/

Raw Material: Pyrites (estimated).

Process: N.A.

Products: Sulfuric acid, superphosphate, 181/ fluosilicate. 182/

Capacity: N.A.

20. Location: Walbrzych. 183/

Coordinates: 50°46' N - 16°17' E.

Plant Name: Sulfuric Acid Plant, Walbrzych. 184/

Industry: Chemical. 185/

Raw Material: Pyrites. 186/

Process: Tower. 187/

Products: Sulfuric acid. 188/

Capacity: N.A.

21. Location: Wizow. 189/

Coordinates: 50°55' N - 16°06' E. 190/

Plant Name: N.A.

Industry: Chemical. 191/

Raw Material: Gypsum and anhydrite. 192/

Process: Contact. 193/

Products: Sulfuric acid, cement.*

Capacity: 98,000 tons sulfuric acid per year (ultimate). 194/

Production (Sulfuric Acid):

1951	15,200 tons	195/
1952	34,000 tons	196/
1953	58,000 tons	197/

22. Location: Zgierz.

Coordinates: 51°51' N - 19°25' E.

Plant Name: Boruta Sulfuric Acid Plant.

Industry: Chemical.

Raw Material: Pyrites (estimated).

Process: N.A.

Products: Sulfuric acid.

Capacity: N.A.

* Cement is a byproduct of the gypsum process.

APPENDIX B

TECHNOLOGY OF THE SULFURIC ACID INDUSTRY

1. General.

The prewar sulfuric acid industry in Poland was technologically backward. The 3-year period, 1947-49, was spent rebuilding existing plants. In the second half of 1950, Soviet technology was adopted by the industry. 198/

2. Chamber and Tower Processes.

The chamber and tower processes for producing sulfuric acid are employed extensively where dilute, impure acid will suffice.

In the chamber process, sulfur dioxide gas is introduced into large lead-lined chambers where, in combination with oxides of nitrogen* and water, it is converted to sulfuric acid. The oxides of nitrogen are subsequently recovered in Gay Lussac and Glover towers and are reused. The sulfuric acid from a chamber plant is of 62 to 65 percent concentration. 200/

A number of modifications to the chamber process have been designed and operated. The Peterson system, one of these modifications, is widely used in the USSR, and it is assumed that this is the process introduced into Poland by the Soviet advisors. 201/ In this system the lead-lined chambers are replaced by towers packed with ceramic rings and lined with acid-resistant bricks. The tower process produces 75 to 78 percent sulfuric acid.** 202/

3. Contact Process.

In contrast to the requirements of the chamber and tower processes the sulfur dioxide for a contact plant must be carefully purified to

---

* In Poland and the USSR the nitrogen is introduced into the system in the form of nitric acid. 199/

** The chamber process is well known is this country, but a flow sheet of the tower process as used in the USSR is provided in this report -- following p. 32, below.

prevent "killing or clogging" of the catalyst mass. The purified gas is passed over a platinum or vanadium catalyst where oxidation to sulfur trioxide takes place. The resulting gas is then passed countercurrent to a stream of concentrated sulfuric acid (about 98 percent acid) in which it is absorbed. The end product is a 99 to 100 percent sulfuric acid. A portion of the acid is diluted to 98 percent and is recycled to the absorbers. 203/

4. Sources of Sulfur Dioxide.

Pyrites and gypsum are the principal materials used in Poland as sources of sulfur dioxide. 204/

5. The Gypsum Process.

The obtaining of sulfur dioxide from gypsum, although common to Europe, is not widely known in the US. The following information is based on Soviet technology:

> The gypsum or anhydrite is reduced by coal at a temperature of 1400°C in the presence of silica and alumina. The reaction is as follows:
>
> $$CaSO_4 + 2C \longrightarrow CaS + 2CO_2$$
> $$3CaSO_4 + CaS \longrightarrow 4CaO + 4SO_2$$ 205/

Soviet inputs and yields for the gypsum process in a furnace 70 meters long and 2.8 meters in diameter are shown in Table 11.

Table 11

Mean Soviet Inputs and Yields for the Gypsum Process in a Furnace 70 m by 2.8 m

Metric Tons

Input		Yields	
Anhydrite	190	SO_2	80 (100 Percent Sulfuric Acid, 122.5)
Coke	20		
Coal	45		
		Cement	120

6. Grades of Acid.

The grades of sulfuric acid produced in Poland are not known. Soviet technology is being introduced, however, and it may be concluded that Soviet standards have been adopted. Grades and concentrations of sulfuric acid produced in the USSR are shown in Table 12.

Table 12

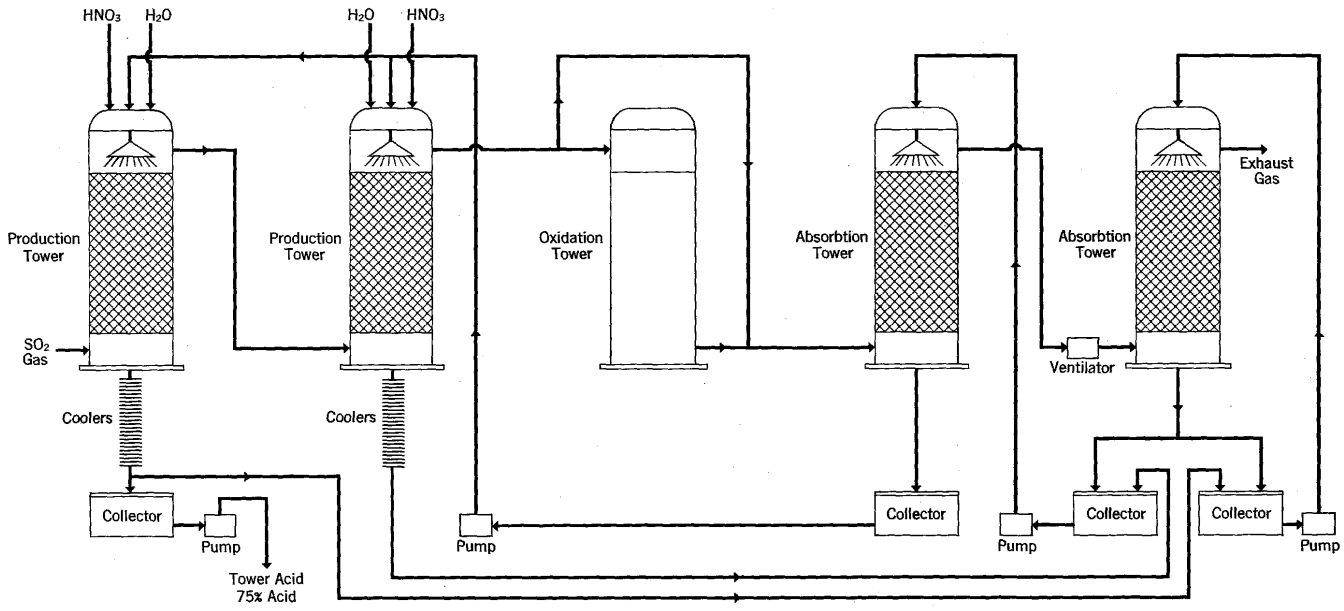
Grades and Concentrations of Sulfuric Acid Produced in the USSR

Grade a/	Percent of Concentration
Chamber Acid	65
Tower Acid	75
Regenerated Acid	75
Oil of Vitriol from Contact and Chamber Process	95.2
Oil of Vitriol from Tower Process	90.5
Oil of Vitriol from Regenerated Acid	91
Battery Acid, Grade A	94
Battery Acid, Grade B	92
Oleum, Nitration Grade	104.5
Oleum, High Percentage	113.5
Oleum, for Other Uses	103.9

a. The nomenclature follows the Soviet text.

Regenerated sulfuric acid is recovered from the pickling of steel and the manufacture of explosives. Battery acid is produced by the contact process and later is diluted for storage battery use. Grade A is of high purity, and commercial production has only recently begun in the USSR. 207/

Sulfuric Acid: Tower Process Flow Diagram



SOURCE: **Obshchaya Khimicheskaya Tekhnologiya** (General Chemical Technology) by S. I. Volfkovitch, A. P. Yegorov, and D. A. Epshtein, Vol. I; Goskhimizdat, 1953, P. 407.

13554 12-54

APPENDIX C

METHODOLOGY

General:

The type of information available has made it necessary to treat the subject of this report on an over-all industry basis rather than on an individual plant study basis.

Table 1.

Production of sulfuric acid by the chemical industry for 1954 and 1955 was obtained by extrapolation of a production curve for the years 1937, 1938, and 1945 to 1953 and by consideration of percentage of past plan fulfillment.

Table 2.

Tons of acid produced per process were obtained by multiplying reported production by reported percentage per process.

Table 3.

Production of sulfuric acid by the metallurgical industry was obtained as the difference between total production and production by the chemical industry.

Table 4.

Production of sulfuric acid by the chemical industry for 1954 and 1955 was obtained by extrapolation of a production curve for the years 1937, 1938, and 1945 to 1953 and by consideration of percentage of past plan fulfillment.

Production of sulfuric acid by the metallurgical industry was obtained as the difference between total production and production by the chemical industry.

Table 6.

Tons of acid utilized by consuming commodities were obtained by multiplying estimated 1955 production by the reported percentage per consuming commodity.

APPENDIX D

GAPS IN INTELLIGENCE

The principal gaps in the intelligence concerning the sulfuric acid industry in Poland are as follows:

1. Current (1954) individual plant capacity and production. In particular, information is needed concerning production by the plants of the metallurgical industry.

2. Information concerning contemplated expansion plans.

APPENDIX E

SOURCES AND EVALUATION OF SOURCES

1. Evaluation of Sources.

The following reports provided valuable, reliable, and comparatively detailed information concerning the sulfuric acid industry in Poland:

UNRRA, Survey of Poland, 1944. U. Eval. RR 2.
Chemik, Warsaw, Various Issues. U. Eval. RR 2.
The National Committee for a Free Europe, Poland's Chemical Industry, Dec 1953. U. Eval. RR 3.

2. Sources.

Evaluations, following the classification entry and designated "Eval.," have the following significance:

Source of Information	Information
Doc. - Documentary	1 - Confirmed by other sources
A - Completely reliable	2 - Probably true
B - Usually reliable	3 - Possibly true
C - Fairly reliable	4 - Doubtful
D - Not usually reliable	5 - Probably false
E - Not reliable	6 - Cannot be judged
F - Cannot be judged	

"Documentary" refers to original documents of foreign governments and organizations; copies or translations of such documents by a staff officer; or information extracted from such documents by a staff officer, all of which may carry the field evaluation "Documentary."

Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this report. No "RR" evaluation is given when the author agrees with the evaluation on the cited document.

1. T.C. Gregory, Uses and Applications of Chemicals and Related Materials, Reinhold Publishing Co., New York, 1939.
2. E.R. Reigel, Industrial Chemistry, Fifth Edition, Reinhold Publishing Co., New York, 1949.

25X1A2g 3. [redacted]

4. Ibid.
5. Chemik, Vol. 9, Sep 1953. U. Eval. RR 2.
6. Ibid.
7. Przemysl Chemiczny, Vol. 9, Nov 1953, p. 556. U. Eval. RR C-3.
8. Chemik, Vol. 6, 1953. U. Eval. RR C-3.

25X1A2g [redacted]

9. Przemysl Chemiczny, Vol. 9, Nov 1953. U. Eval. RR 3.

25X1A2g [redacted]

10. Economic Geography of Poland, Krakow-Warszawa, 1951, p. 153. Eval. RR 3.
Chemik, Vol. 9, Sep 1953. U. Eval. RR 2.

25X1A2g 11. [redacted]

12. UNRRA, Survey of Poland, 1944. U. Eval. RR 2.

25X1A2g [redacted]

13. Przemysl Chemiczny, Vol. 9, Nov 1953. U. Eval. RR 3.

25X1A2g 14. [redacted]

15. Ibid.
16. CIA FDD, Special Translation, No. 22, 17 Jun 1953. S, US OFFICIALS ONLY. Eval. Doc.
17. Chemik, Vol. 6, Sep 1953. U. Eval. RR 3.
18. Ibid.
19. Ibid.
20. Ibid.
21. Ibid.
22. Chemik, Vol. 9, Sep 1953. U. Eval. RR 2.
23. Ibid.
24. National Committee for a Free Europe, Poland's Chemical Industry, 28 Dec 1953. U. Eval. RR 3.
25. Prezemysl Chemiczny, Vol. 9, Nov 1953. U. Eval. RR 3.
Glos Szczecinski, Szczecin, 29 Dec 1953. U. Eval. RR 3.
26. National Committee for a Free Europe, Poland's Chemical Industry, 28 Dec 1953. U. Eval. RR 3.

27. UNRRA, op. cit.
25X1A2g [redacted]
28. Ibid.
UNRRA, op. cit.
29. Przemysl Chemiczny, Vol. 9, Nov .953. U. Eval. RR 3.
25X1A2g 30. [redacted]
Chemik, Vol. 9, Sep 1953. U. Eval. RR 2.
25X1A2g 31. [redacted]
32. CIA FDD, Special Translation No. 22, 17 Jun 1953. S, US OFFICIALS ONLY. Eval. Doc.
33. Ibid.
Chemik, Vol. 6, 1953. U. Eval. RR 3.
34. Ibid.
25X1A2g [redacted]
Eval. RR 3.
35. Chemik, Vol. 6, 1953. U. Eval. RR 3.
25X1A2g [redacted]
36. Chemik, Vol. 6, 1953. U. Eval. RR 3.
FOIAb3b1 [redacted]
37. Chemik, Vol. 6, 1953. U. Eval. RR 3.
FOIAb3b1 [redacted]
38. Chemik, Vol. 9, Sep 1953. U. Eval. RR 2.
25X1A2g 39. [redacted]
CIA FDD, Special Translation, No. 22, 17 Jun 1953. S, US OFFICIALS ONLY. Eval. Doc.
40. Zycie Gospodarcze, Vol. 8, No. 32, 13 Dec 1953, pp. 1267-1269. U. Eval. RR 3.
41. Reigel, op. cit.
42. National Committee for a Free Europe, Poland's Chemical Industry, 28 Dec 1953. U. Eval. RR 3.
43. UNRRA, op. cit.
44. Ibid.
25X1A2g [redacted]
45. UNRRA, op. cit.
46. Ibid.
47. Ibid.
48. Ibid.
49. Przemysl Chemiczny, Vol. 9, Nov 1953. U. Eval. RR 3.
50. Ibid.
Glos Szczecinski, Szczecin, 29 Dec 1953. U. Eval. RR 3.

51. Pyat'let Narodnoy Pol'shi (Five Years of People's Poland), Moscow, 1951. U. Eval. RR 3.

25X1A2g 52. [redacted]

53. Ibid.

Chemik, Vol. 6, 1953. U. Eval. RR 3.

25X1A2g 54. [redacted]

55. Ibid.

56. Ibid.

57. Ibid.

58. Ibid.

59. CIA FDD, Special Translation, No. 22, 17 Jun 1953. S, US OFFICIALS ONLY. Eval. Doc.

60. Ibid.

25X1A2g 61. [redacted]

62. CIA FDD, Special Translation, No. 22, 17 Jun 1953. S, US OFFICIALS ONLY. Eval. Doc.

63. Chemik, Vol. 6, 1953. U. Eval. RR 3.

64. CIA FDD, Special Translation, No. 22, 17 Jun 1953. S, US OFFICIALS ONLY. Eval. Doc.

65. Ibid.

66. Ibid.

67. Chemik, Vol 6, 1953. U. Eval. RR 3.

68. Ibid.

25X1A2g

69. [redacted]

70.

71. Chemik, Vol. 6, 1953. U. Eval. RR 3.

72. Ibid.

25X1A2g

73. [redacted]

FOIAb3b1 74. [redacted]

75. Chemik, Vol. 6, 1953. U. Eval. RR 3.

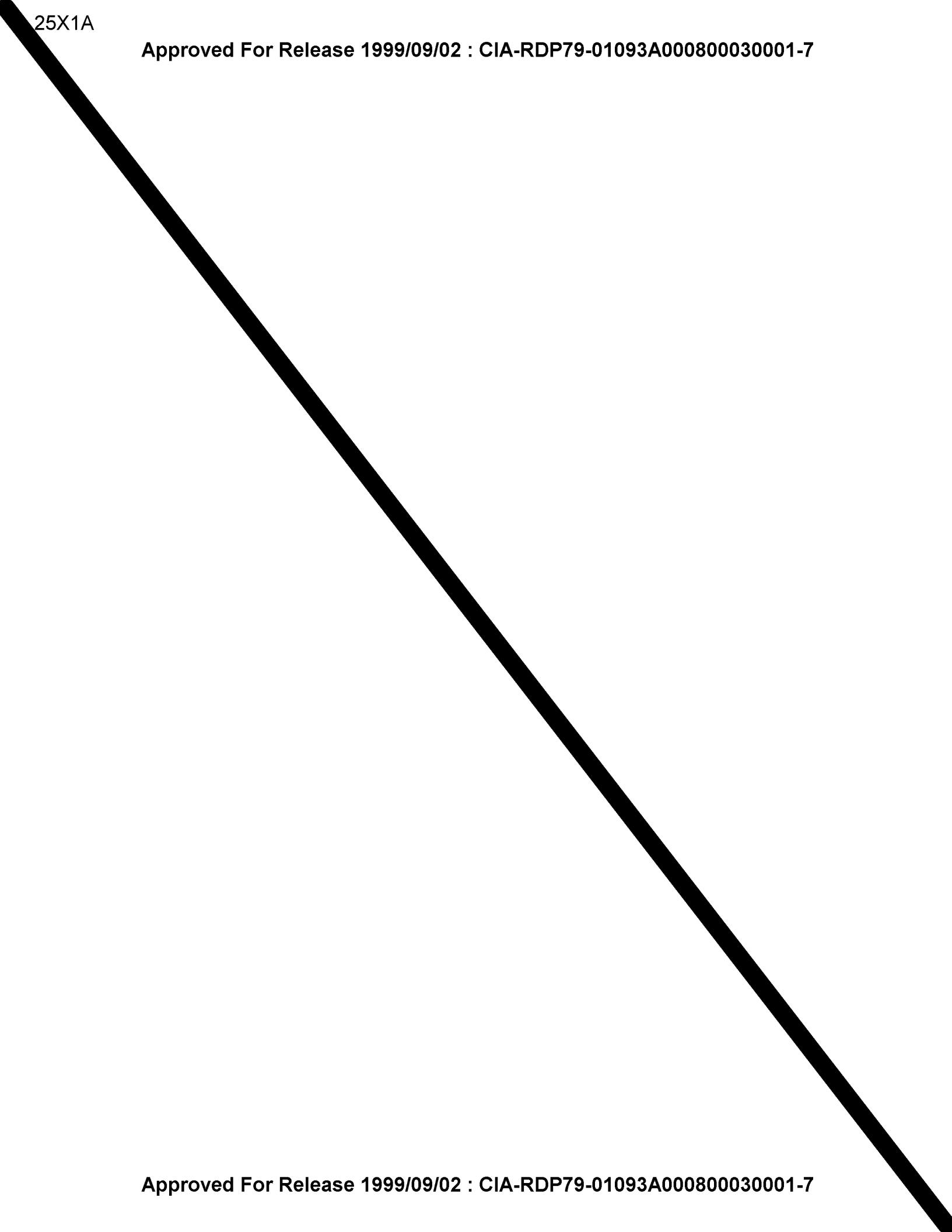
FOIAb3b1

FOIAb3b1 76. [redacted]

77. Zycie Gospodarcze, Vol. VIII, Warsaw, 1953. U. Eval. RR 3.

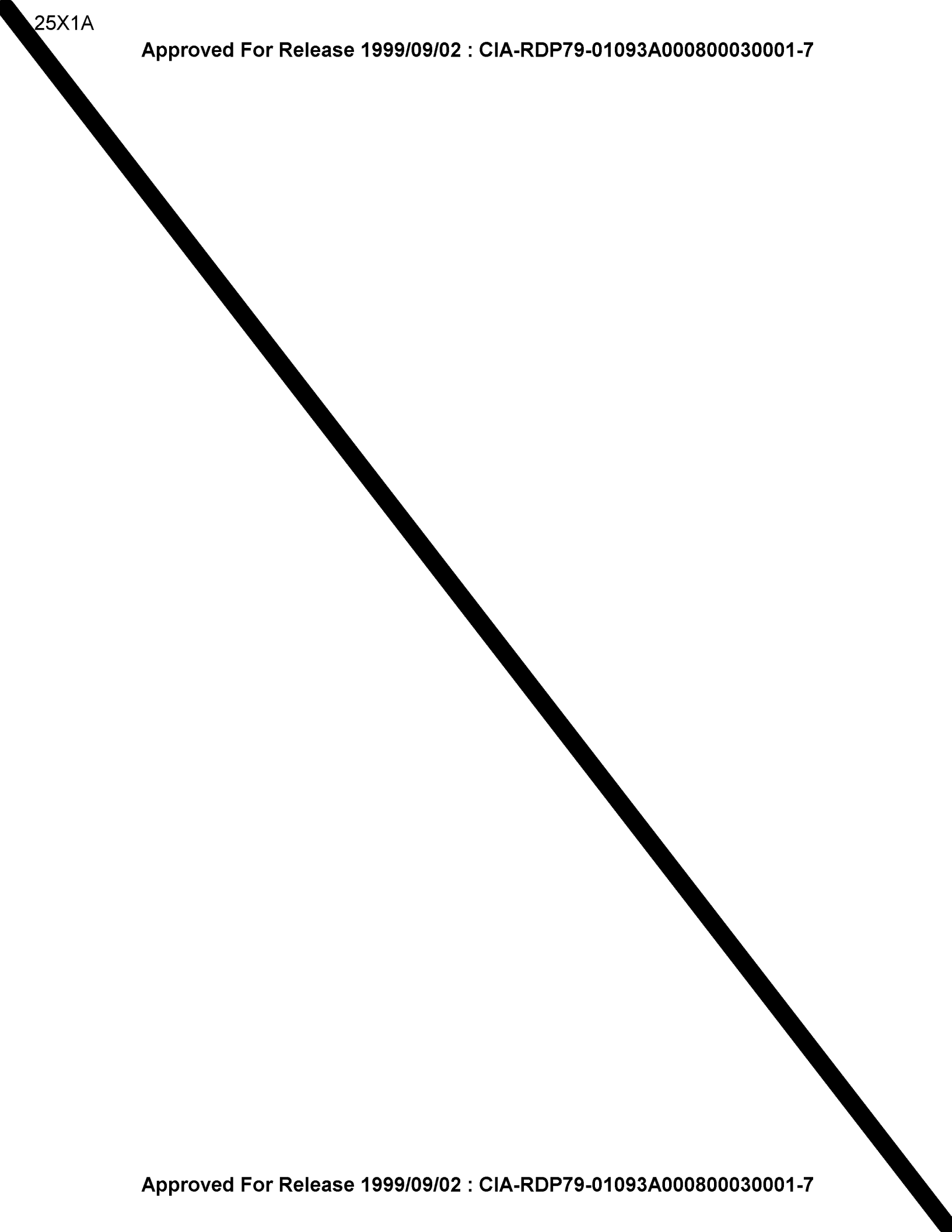
FOIAb3b1 78. [redacted]

79. [redacted]
80. Ibid.
81. CIA/RR 25, The Sulfuric Acid Industry in the USSR, 29 Oct 1953. S, US OFFICIALS ONLY.
82. Ibid.
83. Reigel, op. cit.
84. Chemik, Vol. 9, Sep 1953. U. Eval. RR 2.
85. [redacted]
86. Przemysl Chemiczny, Nos. 7-8, Jul-Aug 1952. U. Eval. RR 3.
87. Reigel, op. cit.
88. CIA/RR 25, op. cit.
National Committee for a Free Europe, Poland's Chemical Industry, 28 Dec 1953. U. Eval. RR 3.
89. CIA/RR 25, op. cit.
90. Reigel, op. cit.
91. Reigel, op. cit.
92. National Committee for a Free Europe, Poland's Chemical Industry, 28 Dec 1953. U. Eval. RR 3.
93. Ibid.
94. Chemik, Vol. 9, Sep 1953. U. Eval. RR 2.
95. Ibid.
National Committee for a Free Europe, Poland's Chemical Industry, 28 Dec 1953. U. Eval. RR 3.
96. Chemik, Vol. 9, Sep 1953. U. Eval. RR 2.
97. Przemysl Chemiczny, Vol. 9, Nov 1953. U. Eval. RR 3.
Chemik, Vol. 9, Sep 1953. U. Eval. RR 2.
98. Przemysl Chemiczny, Nos. 7-8, Jul-Aug 1952. U. Eval. RR 3.
99. Chemik, Vol. 9, Sep 1953. U. Eval. RR 2.
100. CIA/RR 25, op. cit.
101. Statute Concerning the Six-Year Plan for Economic Development and for Building the Foundation of Socialism for the Years 1950-1955, 21 Jul 1950. C. Eval. RR 2.
102. Chemik, Vol. 9, Sep 1953. U. Eval. RR 2.
103. Production of Chemicals for Agriculture, Vol. 8, 13 Dec 1953. U (for official use only). Eval. RR 3.
104. [redacted]
105. Chemik, Vol. 9, Sep 1953. U. Eval. RR 2.
106. Ibid.
107. Ibid.
108. Ibid.
109. Ibid.



Approved For Release 1999/09/02 : CIA-RDP79-01093A000800030001-7

138. Ibid.
139. Ibid.
140. Chemik, Vol. 9, Sep 1953. U. Eval. RR 2.
141. Ibid.
142. Ibid.
143. Ibid.
25X1A2g 144. [redacted]
145. Ibid.
146. Ibid.
147. Ibid.
148. Industrial Year Book of Poland, Chemical Industry Plants, Vol. II, 1948. U. Eval. RR 3.
149. Ibid.
25X1A2g 150. [redacted] 25X1A
151. Industrial Year Book of Poland, Chemical Industry Plants, Vol. II, 1948. U. Eval. RR 3.
25X1A2g 152. [redacted] 25X1A
153. Ibid.
154. Ibid.
155. Ibid.
156. Ibid.
157. Ibid.
158. [redacted] 25X1A
25X1A2g 159. [redacted]
160. Chemik, Vol. 9, Sep 1953. U. Eval. RR 2.
161. Ibid.
162. Ibid.
163. [redacted] 25X1A
25X1A2g 164. [redacted]
165. Ibid.
166. Ibid.
167. [redacted] 25X1A
25X1A2g 168. [redacted]
169. Ibid.
170. Chemik, Vol. 9, Sep 1953. U. Eval. RR 2.
171. Ibid.
172. Ibid.



Approved For Release 1999/09/02 : CIA-RDP79-01093A000800030001-7

204. Chemik, Vol. 9, Sep 1953. U. Eval. RR 2.
205. Volfkovich, Yegorov, and Epshtein, op. cit.
206. CIA/RR 25, op. cit.
207. Reigel, op. cit.

CONFIDENTIAL

SECRET

US OFFICIALS ONLY

US OFFICIALS ONLY

SECRET

CONFIDENTIAL

Approved For Release 1999/09/02 : CIA-RDP79-01093A000800030001-7