#10
17

CENTRAL INTELLIGENCE AGENCY

INFORMATION REPORT

SECRET/CONTROL--US OFFICIALS ONLY

25X1

COUNTRY USSR (Gorkiy Oblast)

REPORT [redacted]

SUBJECT Research Work at the OKA Chemical Plant in Dzerzhinsk

DATE DISTR. 25 February 1954

NO. OF PAGES 3

DATE OF INFO. [redacted]
PLACE ACQUIRED

REQUIREMENT NO. RD

REFERENCES 25X1

This is UNEVALUATED Information

THE SOURCE EVALUATIONS IN THIS REPORT ARE DEFINITIVE.
THE APPRAISAL OF CONTENT IS TENTATIVE.
(FOR KEY SEE REVERSE)

[redacted]

25X1

1. After their arrival at Dzerzhinsk (N 56-15, E 43-24) in July 1948, the six German specialists working at the Office for Special Technical Tasks of the OKA Chemical Plant at Dzerzhinsk were first engaged in completing the study on propane oxydation which had been worked on at the Karpov Institute in Moscow from November 1946 until June 1948 and which was almost complete. From the fall of 1948 until October 1950, mainly research work in the field of jet and rocket fuel followed, beginning with the preparatory synthesis of acetonin and studies on the possibilities of its application as rocket fuel; the production and testing of trithiaceton; the testing of mixtures of acetonin, sulphur, aniline, and cracking gasoline; and the determination of hypergolic qualities of organic sulphur combinations, i. e., their aptitude to self-inflammability with one oxygen carrier. The Office for Special Technical Tasks at the same time successfully produced triethylamine and other amines on the basis of halogencarbohydrates and was experimenting on the production of rocket fuel from alkali-naphthalene compounds and on the use of furfuryl alcohol as rocket fuel. Since 1949, some of the German specialists were engaged in research work on inhibitors, i. e., materials scheduled to prevent the corrosive effect of nitric acid on rocket motors. Since the fall of 1950, the acetonin synthesis was tested in a pressure device by the Technical Laboratory of the OKA Chemical Plant. These experiments were not yet completed in May 1951. Since October 1950, the German specialists of the Office for Special Technical Tasks, except one who was working in the field of rocket fuels, were engaged in other tasks including the working out of a procedure for the production of methacryl nitril by the Rulon Plant, which was near the OKA Plant, or temporarily assisting Soviet chemists of the plant in studies on desulphurating diphenyl thiourea.

25 YEAR RE-REVIEW

SECRET/CONTROL--US OFFICIALS ONLY

STATE	x	ARMY	X	NAVY	x	AIR	x	FBI		AEC		OSI Ev		
												[redacted]		

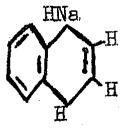
25X1

(Note: Washington Distribution Indicated By "X"; Field Distribution By "#".)

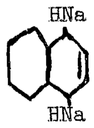
2. In connection with the research work on hypergolic rocket fuels, a number of organic sulphur compounds, in addition to the various amines, were examined on their ignition ability with nitric acid. This work included experiments with ethyl mercaptane and ethylene dimercaptane. Ethyl mercaptane was produced on a commercial scale at the Yava Plant, located east of the OKA Plant, and, according to Bobyshev (fnu), head of the Office for Special Technical Tasks of the OKA plant, was used as an odor additive to natural gas which was supplied from Saratov (N 50-34, E 46-02) to Moscow via Dzerzhinsk by pipe lines. Examination showed that ethyl mercaptane and ethylene dimercaptane, both alone and mixed with amino-gasoline, had no special ignition aptitude with nitric acid. The amino-gasoline mixtures used for this purpose contained approximately 40 per cent of acetonin, 10 per cent of mercaptane, and 50 per cent of cracking gasoline of boiling fractions between 50 and 200 degrees centigrade. The acetonin used was identified as 2.2.4.6.6. pentamethyl pyrimidine and 1.2.5.6. tetrahydropyrimidine with $C_9H_{18}N_2$ - 2 H_2O (sic). Trithio acetaldehyde, trithio acetone, and thialdine were the only ones of the various organic sulphur compounds and sulphuramine compounds found to have good properties as to ignition aptitude. For instance, a mixture of 40 per cent of thialdine and 60 per cent of cracking gasoline was a very suitable hypergolic mixture which, however, was given little attention by the Soviet specialists. The compounds produced of acetonin with carbon disulfide or elementary sulphur both alone and mixed with gasoline-aniline showed suitable ignition delays. They could, however, not be clearly identified as to their chemical properties up to May 1951.

3. Laboratory research work was carried out on sodium naphthalene compounds based on publications by international specialists on the addition of alkali metals to cyclic hydrocarbons. The reactions tested were especially successful in the presence of polyethers like methylal, trimethylene glycol, dimethylether, glycerol dimethylether, orthoformic acid, methyl or ethyl ether, various ethers of ethylen glycol, dioxane (trimethylene glycol methylene ether), and dimethylene pentaerythritol. Suitable diluents were alkyl sulfides that had no influence on the reaction. Hydrocarbons used included: diphenyl (phenylbenzene), dinaphthyl, phenantrene, acetnaphthene, anthracene, retene, and their alkyl derivates. It became evident that one mole of naphthalene added one as well as two gm-atoms of sodium. The formulas were:

1 gm-atom Na



or 2 gm-atoms Na



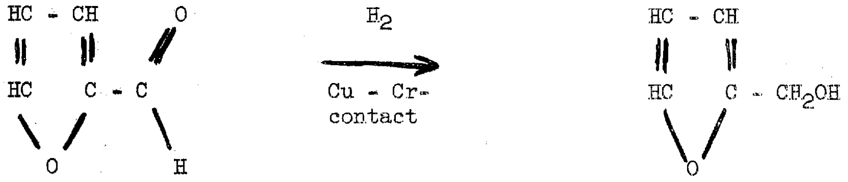
monosodium naphthalene

disodium naphthalene

Monosodium naphthalene was green in solution, was conductive, and was believed to exist as an atom group with free valences. Mixed with water or ethyl alcohol, it was decomposed to dihydronaphthalene, while it formed dihydronaphthalene dicarbonic acid with carbonic acid. Potassium and lithium reacted like sodium. No information was available as to whether the OKA Plant mainly used monosodium naphthalene or disodium naphthalene. The sodium compounds were dissolved in gasoline or, if necessary, were still more diluted. The sodium percentage in relation to the entire gasoline solution was not allowed to be less than one per cent, as otherwise the ignition aptitude of the solution decreased considerably. These solutions had the disadvantage that they could be preserved only for a few days because of the constant presence of traces of water. The ignition delay of a solution containing one per cent of sodium was good.

[redacted] 25X1

4. Large series of experiments on catalytic hydrogenization of furfural were conducted in an effort to obtain furfuryl alcohol, with furfural being hydrogenized in the gas phasis at normal atmospheric pressure with hydrogen by means of various catalysts. These catalysts were produced at the Office for Special Technical Tasks, and the experiments were finally executed with a copper chromium catalyst in a small technical installation erected for this purpose. Catalysts containing cobalt or copper-aluminum could also be used, with kiesel guhr serving as catalysts support. The process pursued for preliminary experiments involved a quantity of 100 liters of distilled furfural together with a catalyst of four kg containing 75 per cent of cobalt, and 1.5 of sodium carbonate. This was heated in a tubular reactor to between 80 and 100 degrees centigrade and was exposed to a pressure up to 50 atmospheres. Five to 30 cubic meters of hydrogen at 20 degrees centigrade and one atmosphere were added per hour. After cooling, and being filtered and distilled, the reaction mixture yielded approximately 90 per cent of furfuryl alcohol. The experiments made at the experimental plant were as follows:



This method required that only the aldehyde group be reduced and that the double bonds be preserved as far as possible. The theoretical values were approximately reached in the experiments. Furfuryl alcohol proved suitable as rocket fuel. Up to 30 per cent of furfuryl alcohol, for instance, was added to a mixture of acetonin, aniline, and xylidine, giving a product which was characterized by especially high stability as compared with many other mixtures tested as rocket fuels which dissociated or became useless in a short time.

5. As soon as they had reached a certain development stage, all materials developed in the Office for Special Technical Tasks with the assistance of German specialists, as well as the pertinent synthesis methods, were forwarded to Plant No. 94 in Moscow. There they were tested as to their technical properties. The German specialists, whose activity, even though they worked at the OKA Plant in Dzerzhinsk, was directed by Plant No. 94, never heard anything of the test results and of what became of their findings. [redacted] Dr. Fritz Andreas also was one of the German chemists who worked on sodium-naphthalene compounds at the OKA Plant. 25X1