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RESEARCH AND DEVELOPMENT OF THE OIL SHALE RESOURCES OF GERMANY, 1940 - 1945

Table of Contents

image 0001

HUB-FURNACE FOR OIL SHALE CARBONIZATION.

DESCRIPTION OF THE FURNACE AND THE PROCESS.

The following six frames are a part of Document B-1 and have been added to the reel as they were not available at the time of the original microfilming.

Image 0042

A SERIES OF GERMAN DOCUMENTS RELATING TO THE RESEARCH, DEVELOPMENT, AND OPERATIONS OF THE GERMAN OIL SHALE INDUSTRY, 1940 TO 1945

The following German Documents, together with their attached translations, abstracts or titles, represent a portion of a large series of reports and records which came into possession of the ALSOS MISSION, M.I.S. G-2, WAR DEPARTMENT, during the operation of one of its assigned tasks in Wurttemberg, Germany, April 1945. The documents have been reviewed and prepared in their present form by the Fuels and Lubricants Division, Office of The Quartermaster General. In preparing the translations, personnel from the United States Bureau of Mines have extended a timely and substantial assistance.

Image 0049

DOCUMENT A - 1

MAP SHOWING AREAS EXPLORED BY CORE DRILLING IN SEARCH OF THE RICHER BEDS OF OIL SHALE IN WURTTEMBERG, 1942

The Schomberg-Balingen-Hechingen area, shown on the map, has proved to be the richest portion of the well known oil shale deposits of Wurttemberg. The seven local areas shown to have been core tested have disclosed the presence of 200,000,000 tons of oil shale, of which the recoverable oil content is about 9,000,000 tons, equivalent to approximately 60,000,000 U. S. barrels. All of the shales in this area are surface exposed. The beds vary in thickness from seven to ten meters.

Image 0050

DOCUMENT A - 2

DISCUSSION CONCERNING OIL SHALE CARBONIZATION BETWEEN DR. ALTPETER, DR. SCHWEITZER AND DR. STANDENMEYER, JUNE 1942.

Image 0052

DOCUMENT A-3

A PRELIMINARY REPORT ON THE POTENTIAL SHALE OIL PRODUCTION OF THE EUROPEAN CONTINENT, EXCLUSIVE OF RUSSIA, JULY 1943.

Image 0060

DOCUMENT A-4

REPORT ON THE PRESENT TECHNICAL STATUS AND THE DEVELOPMENT OF METHODS FOR CARBONIZATION (RETORTING) OF OIL SHALES BASED UPON RECENT AND CURRENT PRACTICE (JULY 1943)

image 0072

DOCUMENT A-5

CRITICAL OBSERVATIONS IN REGARD TO TREATMENT OF OIL SHALES

Image 0103

DOCUMENT A-6

A DISCUSSION REGARDING THE LOCATIONS WHERE SOME PLANTS SHALL BE ERECTED. PROCEEDINGS OF A MEETING IN THE HOME OFFICE OF THE WURTTEMBERG GOVERNMENT AT STUTTGART, SEPTEMBER 1943.

Image 0137

DOCUMENT A-7

A PRELIMINARY SURVEY OF THE OIL SHALE RESERVES OF EUROPE TOGETHER WITH A BRIEF OF THE PROCESSES AVAILABLE FOR THE TREATMENT OF THE VARIOUS OIL SHALES, NOVEMBER 1943

image 0142

DOCUMENT A-8

UNDERGROUND CARBONIZATION

SCHNEIDER PROCESS

A description of the first experiments. The method employed is somewhat similar to the Swedish method. Heating up of the shale by employing electrically heated resistances is discussed. Borings are drilled in a direction slightly inclined from the horizontal. This is one of the earliest methods proposed to the Germans for the production of shale oil by means of distillation in place. The difficulties encountered were too great from an economic standpoint to continue these early efforts which are described in the report.

Image 0166

DOCUMENT B-1

A PROCESS AND DEVICE FOR CONTINUOUS FEED LOW TEMPERATURE CARBONIZATION AND GASIFICATION OF SOLID FUELS AND SHALES CONTAINING OIL, APRIL 1942

Image 0183

DOCUMENT B-2

A PROPOSAL FOR A 1,000-TON-DAILY-CAPACITY

CARBONIZATION PROJECT AT FROMMERN, WURTTEMBERG, MAY 1942

image 0197

DOCUMENT B-3

SCHWEITZER PROCESS FOR LOW TEMPERATURE CARBONIZATION OF ESTONIAN OIL SHALE

PROPOSALS MADE BY DR. SCHWEITZER, SEPTEMBER 1943

image 0209

DOCUMENT C-1

LOW TEMPERATURE CARBONIZATION OF OIL SHALE UTILIZING A TRENCH SYSTEM (PATENT APPLICATION)

image 0216

DOCUMENT C-2

PROCESS TO EXTRACT OIL FROM OIL SHALE BY DISTILLING THE OIL SHALE IN ITS STRATA (PATENT APPLICATION)

image 0232

DOCUMENT C-3

THE DR. OTTO AND COMPANY CARBONIZATION PLANT AT PORTLAND CEMENT WORKS, DOTTERNHAUSEN, WURTTEMBERG.

image 0242

DOCUMENT C-4

REMARKS CONCERNING A PATENT APPLICATION FOR CARBONIZATION UTILIZING A BATH OF MOLTEN METAL

image 0243

DOCUMENT C-4

REMARKS CONCERNING A PATENT APPLICATION FOR CARBONIZATION UTILIZING A BATH OF MOLTEN METAL

image 0247

DOCUMENT C-5

SOME REMARKS REFERRING TO THE PATENT APPLICATION FOR CARBONIZATION IN A BATH OF MOLTEN METAL.

image 0262

DOCUMENT C-6

REPORT OF A MEETING WITH AN EMPLOYEE OF THE SCHENK COMPANY AT MAULBRONN (DECEMBER IN 1944)

AN ARRANGEMENT TO DRAW OFF THE MOLTEN ALUMINUM FROM THE FURNACE

Beakers with walls only 4 mm. thick are too thin; beakers with a thickness of the walls of 20 - 25 mm. are better. The time for cooling the aluminum from 750 to 550° C. will be about 6 to 10 minutes. To draw off 11 cbm. of molten aluminum will require 5 to 6 hours. The beakers must be smeared with a mixture of clay and graphite. To cool the aluminum from 750 to 550° C. will require the transfer of 120 cal. per kg. of aluminum, or when cooling down 20 kg. of aluminum (contents of one beaker), 2,400 cal. must be transferred. By beating the beakers, the aluminum blocks will readily fall out. The mixture of clay and graphite must be applied in the powdered state.

image 0271

DOCUMENT C-7

A DISCUSSION OF SOME CARBONIZATION PROBLEMS PRESENT IN THE OPERATIONS OF A RETORT UTILIZING MOLTEN ALUMINUM, AUGUST 1944.

image 0273

DOCUMENT C-8

SOME PROBLEMS BEARING ON THE USE OF ALUMINUM IN OIL SHALE RETORTS

image 0284

DOCUMENT C-9

METHODS AND EQUIPMENT FOR ELECTRICAL CARBONIZATION OF OIL SHALES, NOVEMBER 1944.

image 0288

DOCUMENT C-10

A NEW PROCESS OF LOW TEMPERATURE CARBONIZATION OF OIL SHALE UTILIZING A BATH OF MOLTEN METAL (ALUMINUM - SILICON ALLOY, MELTING POINT 580°C)

image 0302

DOCUMENT D-1

A COMPARISON OF STEEL REQUIREMENTS FOR OIL SHALE CARBONIZATION OPERATIONS UTILIZING SURFACE RETORTS AND UNDERGROUND CHAMBERS IN PLACE

image 0330

DOCUMENT D-2

KOHLE-OIL-UNION, SCHÖRZINGEN

UNDERGROUND CARBONIZATION

Report of the first three tests made at Holzheim. These operations were preliminary to the more extensive development of the underground retorting as practiced at Schörzingen.

image 0334

DOCUMENT D-3

A BRIEF OF THE GERMAN NAVY'S INTEREST IN THE MATTER OF SHALE OIL PRODUCTION FROM THE UNDERGROUND OPERATIONS CONDUCTED BY THE KOHLE-OL-UNION NEAR SCHÖRZINGEN, WURTTEMBERG

image 0367

DOCUMENT D-4

UNDERGROUND CARBONIZATION OF OIL SHALE IN WURTTEMBERG

image 0372

DOCUMENT E-1

REPORT ON

THE DEVELOPMENT OF, AND THE PRESENT STATUS OF THE CONSTRUCTION PROJECT "W U S T E"

image 0391

R E P O R T

ON

THE DEVELOPMENT OF, AND THE PRESENT SITUATION OF THE CONSTRUCTION PROJECT "WUSTE"

C O N T E N T S

image 0392

B e r i c h t

über Entwicklung und derzeitigen Stand des Bauvorhabens W ü s t e .

Gliederung:

image 0429

DOCUMENT E-2

SOME OBSERVATIONS AND CONCLUSIONS REGARDING THE CARBONIZATION OF 678 TONS OF OIL SHALE IN A PILE 3.18 METER HIGH (MEILER METHOD)

image 0456

DOCUMENT E-3

RESULTS OF A SERIES OF 27 PILOT PLANT TESTS CONDUCTED AT THE SCHOMBERG MEILER METHOD PROVING GROUND

July 1944 to March 1945

The 27 pilot scale tests which are described in the attached documents (see note at foot of summary table) were carried on during the period July 1944 to March 1945 in order to observe the carbonization reactions prior to the beginning of the full scale Meiler-pile operations. A study of the operating characteristics of the 600 to 1700 ton piles disclosed the prevailing advantages and disadvantages of the Meiler method. A summary table showing the relative performance record of most of the tests is shown. It is of interest to note that the recoveries of oil (total liquid-hydrocarbons) obtained from some twenty tests varied from a low of 37.5% to a high of 73.0%, based on the Fischer test.

image 0494

DOCUMENT E - 4

A SUGGESTED NEW METHOD OF BUILDING AND DISPOSING OF MEILER PILES

The attached document, with accompanying sketches, constitutes a proposal for a new method of meiler-pile operations. The system provides for mechanical means of building and forming the meiler-piles and disposing of the residue following the carbonization of the shale.

The advantages of the proposed system are said to lie in the fact that the arrangement for building the pile permits the placing of the various sizes of the shale pieces in the best position in the pile to bring about a uniform progression of carbonization within the shale heap and thereby obtain maximum recoveries of oil

image 0611

DOCUMENT E - 5

AN ATTEMPT TO MAKE A ROUGH HEAT BALANCE SHEET FOR THE MEILER PILE METHOD OF CARBONIZATION

image 0625

DOCUMENT E - 6

REPORT FOR JANUARY 1945, DEUTSCHE OLSCHIEFER FORSCHUNGSGESELLSCHAFT

INCLUDING SOME DATA AND TABLES COVERING LABORATORY TESTS

image 0632

DOCUMENT E - 7

SOME THEORETICAL AND ANALYTICAL CONCLUSIONS DRAWN FROM THE JANUARY 1945 LABORATORY RESEARCH REPORT

image 0644

DOCUMENT E-8

A STUDY OF THE VARIOUS FORMS OF THE MEILER PILE AND ITS RELATION TO CONTROLLED CARBONIZATION OF THE SHALE

image 0652

DOCUMENT E-9

OIL SHALE CORROSION PROBLEMS

Corrosion is caused by elementary sulphur, H_2S and mercaptanes. The mercaptanes are the most corrosive acting agents in the shale oil present. Removal of the mercaptanes by sweetening is discussed.

image 0662

DOCUMENT E-10

SOME CORROSION PROBLEMS ENCOUNTERED IN THE PRODUCTION OF OIL SHALE

Results of a laboratory determination of the different sulphur compounds present in the shale oil. Only 15% of the total sulphur contents are causing corrosion. With reference to the corrosive acting sulphurs, 26% are in the form of H_2S, 51% elementary sulphur and 23% mercaptans. A method for removal of the sulphur compounds is suggested. Fractions boiling above 350° C were found to be very corrosive.

image 0669

DOCUMENT E-11

REPORT FROM PROFESSOR HEINZE
CONCERNING LOWERING OF THE POUR POINT
BY A SPECIAL AGENT PROVIDED OUT OF A GERMAN PETROLEUM OIL

image 0679

DOCUMENT E-12

RESULTS OF SOME LABORATORY TESTS CONDUCTED TO LOWER THE POUR POINT OF SHALE OIL BY ADMIXTURES OF OTHER OILS

image 0691

DOCUMENT E-13

RESEARCH LABORATORY REPORTS FOR THE MONTHS OF NOVEMBER AND DECEMBER 1944

image 0697

DOCUMENT E-14

LOWERING OF THE POUR POINT

Residues of the shale oils, heated up to 380° - 400°C, were admixed in small quantities to the shale oil. The pour point was lowered to -26°C. This method proved very good and does not require any agents from sources other than the shale oil itself.

image 0710

DOCUMENT E-15

LOWERING OF THE POUR POINT

Admixing a distillation residue of unknown origin, the pour point was lowered very effectively.

image 0713

DOCUMENT E-16

LOWERING OF THE POUR POINT BY HEATING UP THE OILS

a. Heating the oil up to 230°C fails to give results.

b. Distillation to 340°C, heating the residue above 340°C and afterwards mixing of the distillate and the residue lowers the pour point very effectively, but, at the same time, it increases the asphalt content and the viscosity of the oil.

image 0716

DOCUMENT E-17

LOWERING OF THE POUR POINT

The oil was mized with lignite gasoline, cooled and afterward filtered, admixing a certain amount of small balls of "Tonsil" to obtain a higher filteration speed and an absorption of the paraffine crystals by the "Tonsil". There was no advantage apparent as compared to other experiments which do not utilize "Tonsil".

image 0720

~~DOCUMENT E-18~~

LOWERING OF THE POUR POINT BY EXTRACTION OF THE PARAFFINES USING SOLVENTS

By extracting the paraffines, it is possible to lower the pour point without raising the asphalt content.

The following solvents were utilized?

a. Mixtures of ethyl-ether and alcohol.

b. Acetone (the most effective solvent).

c. Hexane (unfavorable because it dissolves paraffines).

d. Gasoline from lignite carbonization (not very effective).

The shale oil is mixed with the solvent, cooled down, the insoluble paraffines are filtered, and the solvents are then vaporized. To avoid the vaporization of the solvents, tests were made, admixing only small quantities of the lignite gasoline (about 20%). The mixture was cooled and the paraffines were filtered. Lowering of the pour point was possible, but the filteration was very difficult.

image 0724

DOCUMENT E-19

LOWERING OF THE POUR POINT BY ADMIXING SMALL QUANTITIES OF VARIOUS SOLVENTS.

image 0735

DOCUMENT E-20

LOWERING OF THE POUR POINT BY A SLIGHT CRACKING OF THE OILS

a. Cracking, by subjecting the oils to a temperature of 200°C for extended periods of time, brings no alteration.

b. Subjecting the oils to temperatures of 300°C and higher lowers the pour point.

image 0741

DOCUMENT E-21

LOWERING OF THE POUR POINT

The pour point was lowered by admixing a small amount of Paraflow. The results indicated a marked improvement in the pour point.

image 0743

DOCUMENT E-22

LOWERING OF THE POUR POINT

The paraffines were extracted by gradually freezing and filtering. This method was positive and effective.

image 0746

DOCUMENT E-23

LOWERING OF THE POUR POINT UTILIZING ADMIXTURES

1. Pitch-residues lower the pour point.
2. Solutions of rubber lower the pour point.

image 0752

DOCUMENT E-24

THE DETERMINATION OF SUITABLE METHODS OF CONCENTRATING THE KEROGEN CONTENT OF OIL SHALES TO FACILITATE ANALYTICAL STUDIES

image 0756

DOCUMENT E-25

LOWERING OF THE POUR POINT

The oils were heated up to more than 325°C. The pour point will be lowered, but the asphalt content will increase. It was possible to lower the pour point to -26°C.

image 0765

DOCUMENT F-1

SOME OBSERVATIONS AND TESTS BEARING ON THE FUSION OF SHALE FORMED DURING THE PROCESS OF CARBONIZATION, JUNE 1943

image 0772

DOCUMENT F-2

A STUDY OF THE INFLUENCE OF PARTICLE SIZE (MASSIVITY) ON THE PERIOD NECESSARY FOR COMPLETE CARBONIZATION OF OIL SHALE

image 0787

DOCUMENT F-3

EXAMINATION OF OIL SHALE WITH THE AID OF AN ELECTRON MICROSCOPE

image 0807

DOCUMENT F-4

A LABORATORY STUDY OF THE REACTIONS INVOLVED DURING THE DECOMPOSITION AND CARBONIZATION OF OIL SHALES FROM WURTTEMBERG, BULGARIA AND ESTONIA.

image 0819

DOCUMENT F-5

THE DETERMINATION OF THE PHENOLES PRESENT IN THE OIL SHALE

image 0827

DOCUMENT F-6

AN OIL SHALE RETORT WITH AN AUTOMATIC CONTINUOUS FEED AND DISCHARGE

image 0832

DOCUMENT F-7

DATA WITH REFERENCE TO THE TESTING AND OPERATION OF THE GRAF PILOT OIL SHALE PLANT AT SCHANDELAH, BRUNSWICK, GERMANY.

image 0838

DOCUMENT F-8

A NEW METHOD OF ASSAYING THE OIL AND GAS CONTENT OF BITUMINOUS SHALES

In 1943 Dr. R. Heinze developed an improved method of assaying oil shales, one in which the data presented herewith, indicates the process to be superior to the recognized standard Fischer test. Its leading features (1945) rest in its ability to complete the assay in one hour's time and to effect a recovery of approximately 103% of the Fischer test. Its operation and performance data are given in the attached German document.

image 0856