FILM STUDY GROUP

SUBJECT INDEX AND REPORT

T.O.M. REEL NO. 105

Prepared by

CALIFORNIA RESEARCH CORPORATION

CALIFORNIA RESEARCH CORPORATION

RICHMOND, CALIFORNIA

# INDEX OF TECHNICAL OIL MISSION MICROFILM

REEL NO. 105

(Prepared by California Research Corporation)

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CALIFORNIA RESEARCH CORPORATION

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# ABSTRACT OF TECHNICAL OIL MISSION

## MICROFILM

## REEL NO. 105

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REEL NO. 105

INSTRUCTION SHEET FOR THE OPERATION OF THE JENTSCH IGNITION POINT MEASURING INSTRUMENT FOR THE TEST OF ENGINE FUELS, HEATING AND LUBRICATING OILS AND SOLID FUELS F.10422-10451

This is an instruction sheet for the operation of the Jentsch instrument. It contains no illustration but describes the apparatus and method. It is based on a controlled oxygen stream flowing through a combustion chamber in which the material under investigation is tested. The temperature of spontaneous ignition, the ignition delay, the evaporation ratio, flash point, etc. are determined. By a special chart which is not added octane and cetane number and some more characteristics can be found from the measured data.

July 18, 1942 ON ENGINES AND FUELS F.10455-10474

This is a lecture briefly outlining the different operation of internal combustion engines of various types such as ordinary gasoline engines, Diesel engines, Otto cycle engines and Hesselmaum engines. The varied operation and purposes of these engines require different characteristics of fuels. These characteristics and their importance for the operation of these engine types are discussed and illustrated with some pictures and charts.

SERVICE INSTRUCTIONS ON MATTERS OF MILITARY SUPPLIES F.10475-10487

These concern merely personnel instructions for the handling of inspection and transportation of materials and other instructions of no scientific interest.

SPECIFICATIONS FOR ARMY SUPPLIES AND EQUIPMENT F.10488 10489

This is only a form sheet.

July 12, 1944 BUTADIENE OVENS AT HÜLS F.10490 10499

This is a report on Butadiene ovens at Hüls. Some defects and disadvantages are described. The paper is partly illegible. In some of the ovens construction details were changed and the result is discussed. The No. 10 oven is mentioned as being particularly good in regard to operation and output. Some pictures accompany the report which also contains a description of the process and operation.

THE PROCESS OF MANUFACTURING BUTADIENE FROM 1,3-BUTYLENE GLYCOL

Aug. 11, 1944 F.10495-10512

This is a rather thorough description of the whole manufacturing process, explaining the course of the reactions and the equipment in which they are carried out as well as the method of operation and the yield. It is an endothermic catalytic reaction and goes on in two main steps in two separate reactions in the oven at a rather narrow temperature range of 270-280°. Hydrogenation is carried out by means of a catalyst the composition and preparation of which is explained. The crude butanol obtained in addition to several by-products has to be purified by distillation. The distillation process and the method of utilizing the by-products are outlined. Some parts of the paper are illegible as well as most of the illustrating figures.

REEL NO. 105

(Date illegible) CONVERSION OF ACETALDEHYDE INTO ACETALDOL F.10513-10522

This process consists of two main steps, first of the conversion of acetaldehyde into crude acetaldol and of the aldol distillation. The first step is exothermic and proceeds in presence of potassium hydroxide with a catalyst. Each Kg of aldol formed liberates about 300 kilo-calories. The alkalinity and the temperature are the main factors for good operation. The process and some technical details are described. Some parts are illegible. The average composition of the crude aldol is given. It is then neutralized and distilled. The distillation process and equipment are described.

HYDROGENATION OF ACETALDOL INTO 1,3-BUTYLENE GLYCOL

(Date illegible.) F.10523-10563

A description of this process is given which is carried out with a copper chromium catalyst. The technical equipment and operation is described but partly illegible. It is also an exothermic process and liberates about 250 kilo calories from 1 Kg of aldol. The hydrogenation ovens of the Schkopau factory and its operation are described in particular. In addition to 1,3-butylene glycol there is a production of crude butanol which is a by-product of the butylene glycol distillation. This distillation of the crude butylene glycol, briefly called "Butol", is the next step and is extensively described. It yields a considerable and valuable quantity of ethylalcohol which is treated separately in a second distillation column. The operation of the two distillation processes and equipment is further explained, but the text is partly illegible. Analysis and yields are described in the paper and many interesting details, as for example, instructions for control analyses of the obtained products, instruction for the preparation of the butylene glycol catalyst, analysis of crude "butol" by distillation, etc. Some tables and charts complete the report.

Feb. 12 ALDOLIZATION F.10564-10569

The report gives a description of the operations and processes of a plant in Ludwigshafen designed for the production of 30,000 tons per year of Buna S, for which an amount of 68,800 tons of pure aldol or 48,160 tons of 100% aldol are required. The so-called aldolizator with its pumps, and other equipment, the neutralization process and equipment, crystallization tank for the phosphates, centrifugal equipment, the distillation equipment and process for the distillation of crude aldol are described, including the storage facilities.

DEVELOPMENT AND TEST METHOD FOR THE CATALYSTS OF THE REPPE PROCESS

July 29, 1944 F.10570-10573

Three catalysts for manufacturing butindiol, butanediol, and butadiene according to the method of Reppe are described in a lecture from which the paper reproduces only a part concerning the butindiol process by reaction of formaldehyde with acetylene. There are many problems which had to be solved before a continuous process and a reliable catalyst could be found. The development is briefly outlined and the final composition and test of the catalyst material is explained.

REEL NO. 105

November 29, 1944 — BUTINE DIOL PREPARATION — F.10574-10577

This paper is a part from a lecture describing the catalytic manufacturing process with three possible variations, which are commented on and described.

## THE MANUFACTURING PROCESS OF "BUTOL" WITH ITS BY-PRODUCTS

Aug. 12, 1944 — F.10578-10588

The product preceding butadiene in the four steps manufacturing process is 1,3 butylene glycol (butol). The crude-butol, has to be distilled and yields pure butylene glycol. This distillation produces a number of by-products listed and tabulated in F.N.15578-15579. The paper is concerned with some features of the operation and their effect on the quantity of resulting by-products. The best use of the various by-products is outlined while stressing mainly the advisability and means to reduce by products. A new by-product reducing process is mentioned but said to be not yet ready for technical use outside of the laboratory. The report contains tables with quantitative data of the various products.

## 1.3-BUTYLENE GLYCOL DISTILLATION AT HULS (IV. STEP)

May 13, 1942 — F.10589-10600

The entire manufacturing equipment at Huls and the operation of the distillation process of 1,3-butylene glycol and its by-products is very clearly described and differences as compared to the Schkopau plant are occasionally pointed out. The distillation of butanol, one of the by-products of the butol-distillation, is described including the plant equipment. While these are continuous processes there is also equipment for intermittent distillation of other by-products such as butanol-water mixtures, residues, etc. This operation and equipment is explained. Some tables with yield figures complete the report.

## DISTILLATION OF 1,3 BUTYLENE GLYCOL AT SCHKOPAU

March 26, 1942 — F.10601-10622

The plant equipment and operation of "butol" distillation at Schkopau is described in extenso. It is interesting to compare this report with the corresponding preceding report F.N.10589-10600. This paper (Schkopau) contains some more details about the requirements of steam, steam velocity, etc. As in the Huls report the distillation of the by-product-alcohol has to be carried out in a separate process with special equipment and is made the subject of part 2 of the Schkopau paper. Part III is concerned with the distillation of butanol, another by-product which requires separate treatment, distillation and hydrogenation. Part 4 is concerned with equipment for discontinuous distillations of various by products, the subject of part 5 is the treatment of Hexanetriol, a by-product from the residue of the butol distillation, which demands separate equipment and processing. Some descriptional details of other plant installments, pumps and pipelines etc. complete the paper.

April 1, 1942 — ALDOL-HYDROGENATION — F. 10623-10637

The so-called pure aldol has to be kept at about 30° and under a certain pressure before entering the hydrogenation process. The prehydrogenation equipment such as pump, supply lines and heaters are described. The hydrogenation oven is described in part 2. The hydrogenation process is a catalytic process in the upper part of the oven with the copper chromium contact already mentioned in former reports. This paper describes the operation of this process at Schkopau and some comments on particular experience are given. The catalyst is not manufactured at Schkopau. Part III describes the process after hydrogenation and supplementary equipment, illustrated by some sketches. A part 4 is concerned with the hydrogen circulation and part 5 explains the reduction cycle for the hydrogenation catalyst and some special equipment and operations. Part 6 describes the emptying and cleaning of an oven and part 7 the hydrogenation of butanol. Part 8 is concerned with the purification of hydrogen.

May 16, 1942 — ALDOL HYDROGENATION AT HÜLS — F. 10638-10643

This report gives a picture similar to the preceding report and refers to the plant operation at Huls. Plant equipment and process are described. The aldol undergoing hydrogenation consists of 74% aldol, 5% acetaldehyde, 1% croton, 2% residue, 18% water. Capacity of the plant and oven dimensions are given and operation is compared to the operation of the Schopau plant. There are some technical differences in the equipment and consequently in the operations though the principles are the same.

March 28, 1942 — ALDOL PLANT AT SCHKOPAU (AUSCHWITZ) — F. 10644-10655

This plant aldolizes acetaldehyde supplied by another manufacturing plant and stored in big tanks. The aldolization plant and process is described with the necessary equipment and operational details.

May 8, 1942 — ALDOL PLANT AT HÜLS — F. 10656-10666

This is the corresponding report of the plant at Hüls. Figure tables illustrate the output of the plant.

No date. — MANUSCRIPT FRAGMENTS — F. 10667-10685

Calculations of heat exchange. These notes contain calculations and ~~remarks on heat exchange and seem to refer to the dimensions of cooling surfaces~~ for some plant operations. The abstract theory however does not say to which particular cooling process the figures refer. Some sketches following seem to indicate that they refer to cooling during distillation.

HANDWRITTEN NOTES REFERRING TO THE BUTANOL DISTILLATION (SCHKOPAU)

Jan. 10, 1945 — F. 10686-10690

They are hard to read and seem to concern technical details of minor importance.

REEL NO. 105

March 12, 1943 ANALYSIS SHEETS (BUTOL - DISTILLATION) F. 10692-10705

These are analysis forms and instruction sheets for routine plant control analysis which should be carried out daily.

STYRENE DISTILLATION AT SCHKOPAU (BUNA - PLANT)

Nov. 11/12, 1940 F. 10706-10718

Styrene is synthetically obtained by catalytic dehydrogenation of ethylbenzene. Though known for quite a length of time it gained industrial importance only with the manufacture of synthetic materials, in particular for the manufacturing of "Trolitul" from polymerized styrene. The synthesis of styrene and the purpose of its distillation are briefly outlined. The steps of the distillation are described and illustrated by a sketch F. N. 10709. The equipment is discussed in detail. Two distillation columns are used as illustrated in picture F. N. 10713. The operations at the plant in Schkopau are described and favorably commented on.

Nov. 11/12, 1940 ETHYLBENZENE - DISTILLATION AT SCHKOPAU F. 10719-10725

Styrene is one component of Buna S. and obtained by catalytic treatment of benzene with ethylene with an aluminum chloride catalyst. This conversion is only a partial one yielding about 35% of ethylbenzene with 15% of alkylated by products and 50% of unchanged benzene. The ethylbenzene is separated by distillation. Three columns are required, benzene being distilled off in the first, ethylbenzene in the second column. The third column is a vacuum column in which the rest of the by-products are separated from the pure ethylbenzene. The paper gives a complete description of the outlay and operation of the plant, dimensions and output figures.

A KNOCK TEST WITH CAPTURED AMERICAN AVIATION GASOLINE

No date F. 10726 10727

The test is said to show very good knock stability and octane rating.

Feb.18,1944 TESTS WITH LUBRICATING OIL ADDITIVES IN "GENSHAGEN" F. 10728-10730

The additive is not specified except by a number. The bearings of the tested engines were inspected and the wear is discussed. The frame number 10731 and 10736 contain instruction how to use an additive for lubricating oils. Since the oil is not specified the specifications are of no great interest. A scheme for an oil mixing plant is annexed.

No date A TEST REPORT ON CYCLOHEXYLAMINE SALT F. 10737 10744

This salt was used as a gasoline additive and lowered the octane rating so as to be unsuitable. The chemical formula or characteristics are not given.

REEL NO. 105

COMPARATIVE TEST OF AMERICAN LUBRICATING OILS AND GERMAN AVIATION OILS

March 3, 1944 F. 10745 10748

The comparative tests are described. The results are discussed and the superiority of the American oil is acknowledged.

THE TECHNICAL CHARACTERISTICS AND REQUIREMENTS FOR GERMAN AVIATION GASOLINE

March 1944 F. 10749 10751

This is an instruction sheet containing the various requirements.

TEST REPORT ON THE VARNISHES "DESMOPHON" WITH "DESMODUR" AND "PLASTOPOL"

March 29, 1944
March 16, 1944 F. 10752-10754

These are two short reports on these chemically unspecified varnishes.

No date REPORT ON AN AMERICAN LUBRICATING OIL F. 10755 10757

This report comments on the same American oil from a Boeing bomber which is mentioned in F. N 10749 - 10757: Analysis showed that the American oil contained a bromine additive but no phosphorus or sulfur. The bromine additive is credited with the better result of American lubricating oil as compared to German oils that do not contain this additive.

EXPERIMENT OF DR. NITSCHMANN ON THE ATTEMPTED PREPARATION OF $BrCH_2 \cdot CH_2 - OC_2H_5$ from $CH_2 = CH \cdot CH_2OC_2H_5 + HBr$.

Dec. 1942 F. 10758-10801

This is a handwritten laboratory report which is very hard to read and contains a sketch of the experimental arrangement and chemical calculations. The experiment failed. The summary F. N. 10762 states that the addition of HBr could not be carried out but that instead cleavage took place at the ether linkage.

U. S. Patent 2.024.749 (F. 10764) on "Preparation of Halogenated Ethers" is a copy of an American patent and a German translation and several notes on experimental results, which are hard to read, show that the Germans tried to use the patent for hydrobromination experiments. F. N. 10775 mentions 1,3 bromopropane-ether and poor yields. The frames produce the notes in backward order. F. N. 10799 is the first sheet dated Nov. 3rd, 1947 and called first high-pressure experiment, the reports continue back to F. N. 10775. Several tables are contained in the report but evidently not in the right order.

No date TABLES FOR IRON-CONSTANTAN THERMO-COUPLES F. 10802-10803