Selected Abstracts

II-III. Isobutyl Alcohol and Isooctane from CO/H_2 Gas

Leuna - October 2, 1935 — Item #19

In a projected plant of 150,000 tons per year capacity the manufacturing cost of each of the following products is compared.

Water-free methanol $26 per ton (basis RM = $.25)

Water-free isobutyl oil $40 per ton

Fisher Motor fuel produced by $CO-H_2$ reaction (including realization from off gases) $49 per ton

Total capital outlays are $10,000,000, $14,000,000, and $22,000,000 respectively for methanol, isobutyl oil and Fischer gasoline plants.

Leuna - October 11, 1935 — Item #20

In a projected plant of 60,000 tons per year of crude isobutyl oil, the production cost of isobutyl alcohol and other alcohols is estimated as follows:

Water-free Alcohol	Wt. % of Crude Isobutyl Oil	Production Cost Dollars/ton*
Methanol	59.3	31-50
Propyl-	3.9	41-70
Isobutyl-	23.7	45-75
Amyl-Heptyl-	9.2	47-80
>Heptyl-	3.9	30
Total Isobutyl Oil	--	37-60

* These prices are based on the price of charge gases ($CO + H_2$) ranging from 0.62 - 1.25¢/cubic meter and of recycle gas ranging from 0.2-0.7¢/cubic meter.

Based on these same figures and a yield of 1 ton of isooctane per 1.5 tons of isobutyl alcohol, the manufacturing cost of isooctane is estimated to range from $90 to $130 per ton.

Oppau, Sept. 1, 1943 Item #27

Effect of Pressure on Synthesis of Butyl (Butylalcohol)

The effect of pressure on the production of butylalcohol was studied on a commercial scale at 240 and 310 atm. pressure, the reaction time being constant. The production decreased 50% when the pressure decreased from 310 to 240 atm.

Earlier experiments on a small scale with 30 cc contact space were also reviewed. The pressure varied from 75 to 250 atm., and the production of butyl alcohol increased from 0.35 to 3.58 g/hour correspondingly.

Oppau, Sept. 25, 1935 Item #47

A rough flow diagram showing steps in the conversion of 1544 kg/hr of isobutyl alcohol into 1000 kg/hr of iso-octane and indicating a yield of 84% of the theoretical.

Oppau, October 18, 1935 Item #21

Rough flow diagram similar to one dated September 25, 1935. Overall yield in this case was 90% theoretical.

July 6, 1936 Item #61

A more complete flow diagram than those dated September 25, 1935 and October 18, 1935 is given in kg per hour for a plant producing 4,000 tons per year of iso-octane from isobutyl alcohol. A copy of the diagram is attached.

Chg. of Isobutyl Alcohol (Distilled)	701.6	kg/hr	
Isobutylene from Dehydration of Alcohol (Chg. 936.7 liters/hr over 703 liters catalyst)	510	kg/hr	96% Theor.
Di-isobutylene from Polymerization (after topping) (Chg. 1390 liters/hr over 150 liters catalyst)	419	kg/hr	
Di-isobutylene from Cracking of Tri-isobutylene - Formed in Previous Step (Chg. 214 liters/hr over 400 liters catalyst)	39	kg/hr	
Total Di-isobutylene	458	kg/hr	90% Theor.

Iso-octane from Hydrogenation of Di-isobutylene (6560 m^3 H recycled per hr over 950 liters catalyst)	458 kg/hr 98.5% Theor.

Theor. Yield of Iso-octane from Isobutyl Alcohol = 96 x 90 x 98.5% = 85.0%

Iso-octane Yield (% by wt. isobutyl alcohol Chg.) = 65

Oppau, Dec. 8, 1942 — Item #49

Methanol Plant in Waldenburg

Coke-oven gas is desulfurized in treaters with Lauta filling (Lautamasse). The hydrocarbons present in the gas are then cracked with oxygen by Dr. Sachsee's method which produces a complete conversion of hydrocarbons into CO and H_2. The final desulfurization is accomplished by F- and M- charcoal. The S content in the final gas is 2-3 mgs S/m^3. This gas is compressed and passes to the methanol plant. The plant consists of three units of which two are in operation. The diameter of generators is 800 mm and the height is 12,000 mm; electrical heating is used. The capacity of the compressors is 1000,000 to 110,000 m^3. The pressure of operation is 300-325 atm. The temperatures are given in millivolts.

While the results in Unit 1 were erratic, Unit 2 operated quite satisfactorily. With 2.3 m^3 (3.42 ton) contact and 300 atm. pressure, the unit produced for 18 days up to 103 tons per day of raw methanol with maximum 8,000 N m^3 coke gas. The methanol contains 12% water. In addition, small amounts of dimethylether and ammonia are formed.

The following figures are given for the composition of the coke-oven gas, treated gas and the tail gas:

	CO_2	CO	H_2	CH_4	N_2	C_2H_4	O_2
Coke-oven gas	2.5	8.0	57.5	23.0	5.6	2.4	1.0
Treated gas	4.0	21.0	71.0	0.2	3.8		
Tail gas	0.5	6.6	76.0	1.0	15.9		

Leuna, March 22, 1937 — Item #57

Discussion on Isobutylalcohol

Information on reduction of the catalyst mass from isobutyl oil and methanol operations under pressure.

The recycle gas (20% CO, 70% H_2, 4-6% N_2, 1.5% CO_2, 2-3 mg organic sulfur per m^3; 0.7 mgs H_2S) was used. The volume of the contact mass is given as 2875 liters and that of the gas as 2,000-3,000 m^3 per hour. The temperature is given in terms of millivolts.

Oppau (Inference) - June 24, 1937 — Item #56

A detailed description of the distillation of the iso-butyl oil necessary to produce 4,000 tons per year iso-octane is given. The material concerns a plant to be built at Oppau and frequent mention is made concerning an iso-octane plant of this type already on stream at Leuna. The column corrosion encountered at Leuna from the crude isobutyl oil is to be reduced by neutralizing the isobutyl oil with 10% NaOH solution. The distillation takes place in seven continuous stills. The crude isobutyl oil is charged under 10-15 atm. pressure at a rate 6,500 liters/hour and isobutyl alcohol (16% by vol. chg.) is taken off at 1040 liters per hour. The description of the distillation is similar to that given below in Item 114 dated June 16, 1942.

Flow sheets and tables with material balances of the individual fractionators are attached. The legibility of the flow sheets is very poor.

Oppau, March 9, 1938 — Item #35

This memorandum, probably prepared for building permit purposes, refers to the butyl oil distillations in the projected 4,000 tons/yr iso-octane plant at Oppau. See Items 56 and 114, particularly the latter.

Mentioned, also, are the pressures involved in the subsequent reactions of the isobutyl alcohol to produce iso-octane.

Dehydration to isobutylene at 5 atm.
Polymerization to di-isobutylene at 25 atm.
Hydrogenation to iso-octane at 200 atm.

Oppau, February 10, 1937 — Item #59

The charge gas (CO + H_2) used to make isobutyl oil was passed over 715 g moist silica gel at 70 liters per hour and 20 atm. pressure to reduce NH_3 content from 3.09 mg/m^3 to from 0.14-0.26 mg/m^3. One hundred parts by weight of moist gel absorbed 10.2 parts by weight of NH_3.

Ludwigshafen, July 2, 1936 Item #62

The capacities of the reactors at the experimental plant are given. By comparison with those shown for a 4,000 ton iso-octane per year plant in Item #61 dated July 6, 1936, it could be estimated that these reactors were for a 1,000 tons iso-octane per year plant.

	Contact mass liters	Throughput Liters/hr	Kgs/hr
Dehydration of isobutyl alcohol	150	200 alcohol	160
Polymerization	55	138 di-iso	100
		37 tri-iso	21
Cracking	150	app.80 tri-iso	
Hydrogenation	240	160 di-iso	

Berlin, June 11, 1936 Item #63

The capacities of projected plants for iso-octane production are given with Goring's approval.

Leuna - 4,000 tons/yr, with further expansion to 8,000 tons/yr.

Oppau - 1,000 tons/yr, with further expansion to 4,000 tons/yr.

Herne, June 27, 1936 Item #64

Estimates are given for the installation of 4-20,000 tons iso-octane per year plants. Water gas is proposed as the source of CO instead of coking gas because of high N_2 content of the latter.

Costs of a Plant

$4,000 ton/yr (with recycling)	-	$3,100,000
8,000 ton/yr " "	-	5,100,000
20,000 ton/yr " "	-	11,100,000

A separate table, more detailed, gives the cost for 10,000 ton/yr (with recycling) - $8,500,000; 100,000 ton/yr (with recycling) - $54,500,000.

June 24, 1937 Item #71

Estimated production cost of di-isobutylene in a 1000 ton/yr plant is given as 10¢ per pound. This price includes a 10% amortization and a base price of isobutyl alcohol of 5.5¢ per pound. This is a one page note in longhand, unsigned.

Leuna, June 7, 1935 **Item #79**

Comparison is made of the production cost of 60,000 tons isobutyl oil per year for the synthesis of 5,900-6,700 tons iso-octane per year if done entirely at Leuna or split between Leuna and Waldenburg.

	Waldenburg and Leune	Leuna
Iso-octane	$275 per ton	$222 per ton
Methanol	61 per ton	59 per ton
Isobutyl Alcohol	120 per ton	96 per ton

Leuna, July 18, 1935 **Item #78**

Cost price of iso-octane in a projected plant for Waldenburg, costing roughly $3,900,000, is estimated at $230 per ton. Cost of isobutyl alcohol not given. This price includes 10% amortization and a 90% theoretical conversion of isobutyl alcohol to iso-octane.

Sales price, delivered, amounts to roughly $375 per ton.

Waldenburg, September 3, 1935 **Item #81**

Discussion of the relative cost of converting the ammonia plant at Waldenburg to a methanol or iso-octane plant. Former entails only minor changes of existing equipment, latter entails much change and doubles the necessary capital outlay.

January 12, 1938 **Item #80**

Flow diagram of the reaction under pressure of CO and H_2 to form isobutyl oil for 4,000 tons per year of iso-octane. These gases with the total content of such impurities as CO_2, N_2, O_2, S, and CH_4 reduced to about 1.5% are charged under pressure to the contact chamber at 15,000 cubic meters per hour, (including 5,000 m^3 recycle gas). The ratio of H_2 to CO is 2.2 by volume. About 2.5 tons of isobutyl oil is taken off per hour. For details see attached diagram.

Berlin, February 10, 1943 **Item #82**

Commissioner for the Four-Year Plan

Approval of Plant for Production of Intermediates for Ester Oils in Heydebreck

To: I. G. Farbenindustrie, A.G.,
Ludwigshafen/Rh.

The following alcohols are planned to be produced from residual alcohols of the isobutyl oil distillation:

Fraction	110°-165	35,000 ton/year
"	165°-180°	7,000 " "
"	180°-200°	2,900 " "
"	200°-250°	10,200 " "
"	over 250°	2,900 " "

These alcohols are initial materials for producing ester oils which are used for production of aero-oils, axle oils (for low temperatures), and motor oils for low temperatures.

The distillation will be carried out in atmospheric and vacuum fractionating columns. The quantities of the materials and metals required, the cost of construction, and other questions connected with the construction, are discussed.

Oppau, July 13, 1942 — Item #93

Material cost sheet for a 14,000 ton per year methanol plant. Total investment is $800,000; total steel requirement - 2,700 tons.

Berlin, June 16, 1942 — Item #113

Discussion on Butyl Oil Distillation in Oppau 557

Butyl oil distillation unit Oppau 557 produces 11.5% isobutanol at a capacity equal to 420 ton/day and 12.5% isobutanol with that equal to 350 ton/day. Thus the product loss at the capacity of 420 tons/day is equal to 1,400 tons/year of isobutanol or 1,000 tons/year of Tanol (330 days per year on stream). Planning and suggestions to increase the capacity.

Oppau, June 13, 1942 — Item #114

Isobutyl Oil Distillation Chart (Attached)

A. Stabilization Column (1)

Fixed gases, dimethyl ether, and traces of butanes and methanol taken off in overhead. Pressure equals 10-15 atm. Part of overhead passes to a side column (1a) from which a butane rich methanol cut is taken.

B. Main Methanol Separation Column (2)

Methanol taken off in overhead.

An intermediate cut is passed to a side column (2a) in which isopropyl ketone is separated from some methanol (overhead) and a residue which is recycled with the crude butyl oil.

The residue mixed with benzene is allowed to settle into a water rich layer and a low water content layer.

C. De-oiling Column (2b)

Water rich layer from settling chamber is separated into water (residue) and a butanol-water-propanol distillate. The latter is recycled with the crude butyl oil.

D. Water Removal Column (3)

The low water content layer from settling chamber is fractionated into a benzol-water-propanol overhead, which is recycled to the settling chamber, an intermediate cut containing propanol, isobutanol, and some higher alcohols, and a residue which contains most of the higher alcohols. This residue is distilled in a side column (6) in which a 110-200°C cut is taken off in the overhead.

E. Propanol Separation Column (4)

The intermediate cut from column (3) is fractionated into a propanol distillate and an isobutanol rich residue.

F. Isobutyl Alcohol Seperation Column (5)

The residue from column (4) is fractionated into an isobutyl alcohol distillate (105-108°C cut) and a residue containing some higher alcohols. The latter is recycled through column (3).

Berlin, June 15, 1942 — Item #115

Notes concerning isobutyl oil distillation at Oppau (See June 16, 1942, Item 114). This isobutyl oil consists of:

51-55% Methanol
10-13% Isobutanol
6.5-8.0% Higher Alcohols
20-25% Water

Oppau Item #117

Report on distillation of isobutyl oil at Oppau for the first quarter of 1942.

33,000 tons of crude isobutyl oil charged
18,400 tons (55.9%) Methanol
3,750 tons (11.36%) Isobutyl alcohol
2,300 tons (7%) Higher alcohols (approx.)

Oppau, January 16, 1942 Item #121

KW - Synthesis Gas - Plant Oppau 648
- Operation Results - 1941

The plant treats the gas for an acetylene unit (or temporarily for ammonia synthesis) by the "combustion" method ("Nachverbrennung") in order to eliminate methane. The gas from butyl units with methane (up to 25% of the total) was processed to produce the synthesis gas with CH_4 content from 0.2 to 0.5 per cent. The troubles and shut downs of the plant for 1941 are discussed. The results are summarized in two tables and a diagram.

Oppau, November 11, 1939 Item #231

The methane accumulated in the butyl oil synthesis can either be rerun in a second reactor to produce methanol or cracked to form hydrogen for synthetic ammonia.

Ludwigshafen, September 14, 1939 Item #234

In an iso-octane plant of undescribed size, roughly 81.10^6 K cal/hr can be obtained from the waste gases. About 140 tons/hour total steam is needed, of which 108 tons (48 tons of low pressure steam and 60 tons of high pressure steam) is used for distillation purposes. If the low pressure steam used for distillation is displaced by the hot waste gases, before they are burned under the steam boilers, an overall saving of 15% in coal consumption may be realized.

Selected Abstracts

Item #254

IV. Fischer-Tropsch Gasoline Process

Item 254 (copy attached) shows a schematic layout of a Fischer-Tropsch Plant of 75,000 tons yearly production at the Wintershall A. G. Works, Lutzkendorf. In the plant, the raw brown coal is gasified to produce a 1:2 mixture of carbon monoxide and hydrogen which is desulfurized by a two-stage process and then sent to low pressure converters. High melting point paraffin is obtained by periodic extractions of the catalyst. The volatile products pass to a stabilizer. The gaseous part containing crude gasoline enters activated carbon absorbers, the gasoline being absorbed while the fuel gas passes on to a gas collector; the condensate oil passes to a distillation column from which crude gasoline, kerosene, gas oil I and II, and paraffin cake bottoms are obtained. The crude gasoline from the activated carbon absorbers and the distillation column cut are combined. Gas oil I and II are sent to a cracking unit; the resulting products are fuel gas, gasoline, and residue which is sent to the hydrogenation plant. The kerosene cut is utilized as Diesel fuel. High MP contact paraffin is sold to a wax plant, and the paraffin cake bottoms are sent to a company producing fatty acids.

Lutzkendorf, Feb. 1, 1940 — Item #268

This is a flow sheet of the synthetic gas plant consisting of the following parts. See attached flow sheet.

1. Preheater of air fed to the heat regenerators by means of a blower. Temperature 1000°C., pressure 700 mm. water.

2. Two heat regenerators, one "off stream", the other "on stream" with top temperatures 1450°C and 1400°C, respectively, and pressures 270 mm and 580 mm water, respectively. The regenerators are heated by burning coal gas and tail gas in preheated air.

3. Two gasifiers in series in which the wet recycle gas (passing the regenerator) meets powdered coal. The pressure is 270 mm H_2O. The temperature at the exit from the second gasifier is 850°C.

4. Coal supply and grinding units.

5. Coal drying and dust separation systems in two synthetic gas ducts. At this stage the gas is cooled from 850°C to 180°C.

6. Two water washers, one for the recycling part of the gas, the other for the outgoing part of the synthetic gas. The temperature is 110°C at the bottom of the water washers where the gas enters. The finished synthetic gas (15-20,000 m^3/hr) is delivered at 20°C to the desulfurizing unit.

Item #253

Lutzendorf, Jan. 10, 1941

A variation of the synthetic gas plant diagram, Item 268, showing a different coal drying set-up, but having no operating data.

Lutzendorf, Oct. 1942 Item #252

Item 252 (attached) consists of a six-year actual and proposed production chart at the Winterschall A.G., Lutzkendorf Works. All figures are in tons.

Primary Products From Fischer-Tropsch	1941	1942	1943	1944 1945 1946 For Each Year
1) Gasoline	3,700	6,200	22,790	39,750
2) Diesel Fuel Oil	850	2,340	8,600	15,000
3) Kogasin II	1,050	2,340	8,600	15,000
4) Paraffin Wax Cake	626	820	3,010	5,250
Total	6,226	11,700	42,000	75,000
5) Contact Paraffin	182	230	860	1,500
6) Fuel Gas	--	--	2,960	6,000
Hydrogenation Plant				
Gasoline, approx. 45%	14,179	20,200	42,600	50,000
Diesel Fuel Oil, approx. 55%				
Crude Oil Refining With "G.B. Chem."	106,509	109,000	120,000	120,000
The demand was filed for				
Raw Coal	--	--	2,282,000	2,282,000
Dust Coal	--	--	78,000	78,000

Lutzkendorf, May 3, 1944 Item #278

This item is a plant report for the Lutzendorf Works for the month of April, 1944, and it deals with raw coal delivered and consumed, heating gas produced and consumed, synthetic gas ($CO + H_2$ =

75%; H_2/CO = 1.99) produced. The latter amounted to 45,912,900 cu. m. Along with make-up gas, circulating gas, carbon monoxide residual gas, a total gas supply of 50,964,100 cu. was available. Part of this gas was used in coal drying or preparation leaving a net supply of 47,024,300 cu. m.

From the synthesis (Fisher-Tropsch Process) the following primary products were obtained:

Gasoline (absorbed on activated charcoal)	1,769.87	tons*
Condensed Oil	1,242.64	"
Paraffin wax	23.00	"
Total	3,035.51	"

*Contains 125.02 tons Pentane

The hydrogen supply for the hydrogenation works was derived from 4,753,000 cu. m. of the 47,024,300 cu. m. gas supply mentioned above. The intermediate product, "A - Middle Oil," amounted to 2,706 tons, and 1,047 tons of marine fuel oil were shipped. There was no production of hydro gasoline.

The lubricating oil plant production was as follows:

Crude oil processed	3,891.33	tons
Gasoline	317.48	"
Kerosine	643.01	"

A summary of the finished products is given as follows:

Special Diesel Engine Fuel	572.70	tons
Kogasin II	462.12	"
Paraffin Cake	277.42	"
Fuel gas (gas oil)	13.59	"
AK-Bi Shipped (gasoline)	1,195.12	"
Condensate Oil	1,386.43	"

Lutzkendorf, May 6, 1944 Item #248

Report to the Combine for Hydrogenation
Synthesis and Low-Temp.
Carbonization
Branch Dolkau
Dolkau/Merseburg

Production Record

1) Synthetic Products

The fluid primary products in the month of April, 1944, amounted to 3,229 tons.

From working up a part of our stock the following was obtained:

Synthetic gasoline -	1,335 tons	(sp. gr. 0.695/15°C, octane number about 54.0, end-point about 168°C, vapor pressure about 0.49 kg/cm², about 35 vol. % distills at 75°C.)
Light Diesel fuel -	573 tons	(sp. gr. 0.743/20°C, ~~boiling range 162°C~~ to 246°C, flash point 42°C, in closed cup.)
Kogasin II -	462 tons	(sp. gr. 0.767/20°C, boiling range 235°C to 312°C.)
Paraffin wax cake -	277 tons	(sp. gr. 0.797/20°C, boiling range 318°C to 450°C.)

From the reactors, 23 tons of contact paraffin with melting point of about 100°C were obtained. The production and shipment of paraffin wax are given in the following statements:

<u>Paraffin Wax Cake</u>

In stock as of 1/4/44	556.65 tons
Production April, 1944	277.42 tons
Total	834.07 tons
Sale to Deutsche Fettsaure-Works Witten	63.17 tons
In stock as of 1/5/44	770.90 tons

<u>Contact Paraffin Wax</u>

In stock as of 1/4/44	24.81 tons
Production, April, 1944	23.00 tons
Total	47.81 tons
Sale to Luneburger Wachswerke, A.G., Luneburg	21.15 tons
	26.66 tons

The production of liquified gases was 28.6 tons. The proposed production of 4,500 tons of primary products will be reached by the 1st of June. In the month of May, because of the still existing difficulty in gas purification, the production will be the same as in the month of April.

2) <u>Hydrogenation Plant</u>

In the month of April, 1944, 2,706 tons of "A-Middle Oil" and 719.2 tons of Marine Fuel Oil were produced.

Lutzkendorf, May 4, 1944 **Item #276**

Item #276 is a monthly report of the Wintershall, A.G. Lutzendorf Works to the Chemical Production Board on the production for April, 1944, for the following:

(1) Synthesis (Fischer-Tropsch)

Production:	3,229 tons primary products
	23 tons contact paraffin wax
From further processing are obtained:	
	29 tons oven gas
	1,195 tons synthetic gasoline
	573 tons light diesel engine fuel
	462 tons Kogasin II
	277 tons paraffin cake
	216 tons light oil from oil wash
	2,752 tons

(2) Hydrogenation

Production:	2,706 tons A-Middle Oil
	719 tons Marine Fuel Oil

(3) Crude Oil Refining

Charge to:	
a) Crude Distillation	3,891 tons
b) Deasphalting & Deresinification	2,682 tons
c) Dewaxing	3,074 tons
d) Phenol-Refining	2,370 tons
e) Sulfuric Acid Refining	1,429 tons
Shipments	
f) Gasoline	291 tons
g) Kerosine	663 tons
h) Spindle Oil	1,021 tons
i) Machine Oil	895 tons
j) Motor Oil	
a. For general use	380 tons
b. For aircraft	none
k) Miscellaneous Petroleum products	1,659 tons
l) Marine Fuel Oil (from hydrogenation)	1,047 tons
TOTAL	5,956 tons

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Selected Abstracts

V. Oppanol

December 6, 1943 Items #193 and #205

I.G. discusses the increase of production of Oppanol to 700 t/mo. which requires working up 1200 t/mo. of isobutylalcohol. Oppau Wks should produce 450 t/mo. and Frose Wks 200-250 t/mo. Estimated allocation of Oppanol

For Army uses (OKW)	300 t/mo.
" rubber	100
" lead exchange (?)	100
" misc. uses	150
	650 t/mo.
Reserve	50
	700 t/mo.

Items #207, #208, #214, #215, #220, #221, #222, #223, #224.

Oppau, 1943

These items deal with the necessity of expanding the production of water-repellents for fabrics from Oppanol B (mol. wt. 100,000 to 200,000). Originally 10% solution of this resin in CCl_4 and gasoline were used. Even with the recovery of 50% of the solvent, too much solvent was lost. This led to the development of Oppanol B emulsions requiring only 1.6 parts of gasoline per 1 part of Oppanol. I.G. letter of Feb. 8, 1943, cites the method of production of such an emulsion at the W. Biener & Co., Rheydt, plant.

100 parts Oppanol B200 (MW 200,000) are digested for 48 hrs with
100 parts Gasoline and masticated for 45 min. with
40 parts Filler (30% Kaolin + 10% Titanium dioxide.
This homogeneous mass is again soaked 48 hrs with
60 parts Gasoline and again masticated for 45 min.,
7 parts Alkali-treated casein are added as well as
2 parts Emulgator (e.g. Nekal A).

The mass is put through a roll mill, a masticator and 100 parts water are worked in.

A depolymerization of Oppanol B from 200,000 M.W. to 100,000 MW takes place during the vigorous working. The emulsion is excellent, although I.G. indicates that they had some improvements with respect to emulsifier content, duration of mechanical working, gasoline savings, etc. What their Oppanol B Dispersion I and Oppanol Emulsion are, is not indicated, except that they contain 50% Oppanol. The production of Oppanol Emulsion at Oppau was 200 t/mo. in 1943 and correspondence shows that a second 300 t/mo. plant was considered for Heydebreck.

Oppau, Dec. 14, 1942 — Item #212

Oppanol "OK" foil is produced by incorporating 3 parts of powdered silica gel into 2 parts of Oppanol B, masticating and rolling into sheets at 120°C. Silica gel is previously heated to expel moisture and coated with 6-10% Lupolen N to prevent reabsorption of moisture. The sheets have a tensile strength of 15 kg/cm^2 min. and an elongation of over 300%. Uses not mentioned.

Oppau, Jan. 24, 1944 — Items #182 and #179

Estimate of I. G. Allocation of Isobutylalcohol for 1944 (except for motor fuels).

Group	Product	tons/mo.	Total t/mo.
(1) Buna extenders	Koresin	70	70
(2) Synthetic resins	Oppanol B	1180	
	Oppanol C	80	
	Polyvinyl ether	180	
	Other	68	1508
(3) Plasticizers	Isobutylphosphate	8	
	Palatinol JC	5	13
(4) Solvents	Diglycol acid ester	40	
	Intrasolvan E	88	128
(5) Misc.	Phenosolvan 2, etc.		153.3
			1872.3

This constitutes approximately 50% of total production of isobutylalcohol, the other 50% being used for the production of isooctane.