

TABLE 2 – I.G. RESEARCH ON PROCESSES USING IRON CATALYSTS FOR HYDROCARBON AN ALCOHOL SYNTHESIS

LUDWIGSHAVEN (Michael)						Oppau Duftschmidt		Merseberg Wenzel		Ammonia Laboratory Oppau Scheuerman	
Process	Gasoline	Synol	Diesel Oil	Gasoline	Synol	Hydrocarbon synthesis	Alcohol Synthesis	Gasoline & Diesel Oil	Synol	Wax	Olefin
Pressure ats.	20	20	20	20	20	25	180	19-25	19-25	12	12
CO:H ₂	1:1.2	1:0.7	1:0.8	1:0.8	1:0.7	1:0.82	1:0.82	1:0.72	1:0.72	1:2	1:2
Temp °C.	325	195	240-250	300-310	210	240-290	235-280	220-245	190-220	195-215	260
Type of Operation	Gas Recycle		Powdered Catalyst in Liquid Suspension			Oil Recycle		Gas Phase		Gas Phase	
Catalyst	Sintered Iron	3-5 mm. Synol Catalyst	Reduced Iron Oxide Catalyst Powder		Powdered Synol Catalyst	Fused Iron Oxide Catalyst		Fused Iron Oxide Catalyst		Precipitated Fe-Cu-K	Fused Iron Oxide Catalyst
No. of Stages	2	4	3	3	4	2	3-4	3	4	1(laboratory Scale)	1(laboratory Scale)
No. of CO ₂ Removal Washings	1	3	2	2	3	none	2-3	2	3	Yes, on plant scale	Yes, on plant scale
% Conversion	91-92	90	90	90	90	87	90	90-95	90-95	48(1 stage)	60(1 stage)
Gms of liquid Primary Product/ Nm ³	112	160	170	170	165	128	140	140	160	75	80
Cms C ₃ -C ₄ /Nm ³ (% Olefins)	35 (80)	15	5	5	12	22	50 (65)	14 (75)	16 (75)	-	-
Gms. C ₂ /Nm ³ (% Olefins)	13										
Gms C ₁ /Nm ³	35	10	6	10	6			27	26	10	15
Gasol & liquids calculated gms/Nm ³								181	190	170	130
<u>Liquid Product – Percent (volume or weight?)</u>											
% to 200°C. (% alcohols)	78 (30)		34	63	52	59 (8)	? (4.5)	40-64 (10-5)	44 (38)	15	50
% to 200 to 300°C. (% alcohols)	20		28	28	17	12 (2-3)	? (45)	18-30 (3-8)	18 (56)	15	15 (75)
% to 300 to 350°C. (% alcohols)					19	29		6-15 2-5	15 50-60		35 60
% to 350 to 400°C. (% alcohols)			38	9	12						
% over 400°C. (% alcohols)	2							12-15 (2-5)	23 (37)	4? (over 450°C.)	
Space Time Yield kg./liter of space/day	0.8	0.5	0.2	0.4	0.15	0.72	0.8	0.92	0.64	0.35-0.45	0.7
Space velocity M ³ /hr./M ³ of catalyst	250	120	100	200	40			250	150	180 to 240	480