

PLAINTIFF'S EXHIBIT

API-122

CATALYTIC CRACKING UNITS
American Petroleum Institute

SC-API-1907

Catalytic Cracking
(Feeder)
A.P.I. File

CATALYTIC CRACKING PLANTS

Inclair	Houston, Texas	11,000 B/5D T C C and	11,000 B/5D Houdry - E. Texas or Midcont.
hell	Houston, Texas	Fluid	use W. Texas 25,000 B/5D
Eastern States Petroleum	Houston, Texas	Fluid	7,500 B/5D
Sinclair	Marcus Hook	Fluid	25,000
Atlantic	Philadelphia	Fluid	22,000 B/5D
Gulf	Philadelphia	Fluid	23,000
Socony	Paulsboro	T C C	16,000
Sun	Marcus Hook	T C C	12,000
Socony	Paulsboro	Houdry	11,000
Sun	Marcus Hook	Houdry	16,000
Tidewater	Bayonne	T C C	12,700
Tidewater	Bayonne	Houdry	18,300
Esso	Bayway	Fluid	21,000
Pure	Newark, Ohio	Fluid (New)	5,000
Ashland	Catlettsburg, Ky.	T C C	11,000
SOHIO	Cleveland	Houdry	11,000
Sun	Toledo	Houdry	19,000
Gulf	Toledo	Fluid (5/1949)	15,500
Gulf	Cleves, Ohio	Fluid (6/1949)	15,500

Copied 2/4/1949

CALIFORNIA CAT. CRACKERS

<u>Company</u>	<u>Location</u>	<u>Type</u>	<u>Current Capacity (Per unit)</u>	<u>Completion Date</u>
Shell	Wilmington (L.A.)	FCCU	23,000 B/SD	1943
Texas	Los Angeles	FCCU	23,000	1944
Tidewater Assoc. Oil Co.	Avon (S.F.)	FCCU	30,000	1944
Wilshire Oil Co.	Norwalk (L.A.)	FCCU	7,500	1944
General Petroleum	Torrance (L.A.)	TCC	11,000 (4 units)	1944
Richfield	Watson (L.A.)	TCC	16,500 (2 units)	1944
Standard (Cal.)	Richmond (S.F.)	TCC	20,000 (2 units)	1945
Union	Wilmington (L.A.)	TCC	16,500 (2 units)	1944
Standard (Cal.)	El Segunda	Houdry	11,600	1942

L.A. Shell, Texas, General Petroleum, Union, Richfield

S.F. Standard (Cal.); Tidewater

Emeryville near S.F.

(copied
4/25/49)
AWH:fe

May 28, 1948

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Figure 1

Daily Life Breeding Cameritids

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The attached memorandum presents the latest capacity information on the Vial, Thermator, Mordry, Cyclotermion, and Empress catalytic cracking processes. Table I in the memorandum summarizes the capacities for the various processes by name. Table II gives the catalytic capacities alphabetically by catalyst and includes information on the status of each process. A detailed chronological record of capacity changes for each process is presented in Table III. Finally, the peak or catalytic capacity is shown

Exhausting the small amount of Cycloversic and
 Supergal capacity, 25,000 R/MB and 20,000 R/MB respectively,
 the amount of all computer capacities in 1,000 R/MB on a
 working basis for the world, ex. U.S.S.R., are as fol-

Year	Volume	Weight	Value	Value/Weight
1990	1,000	1,000	1,000	1.00
1991	1,000	1,000	1,000	1.00
1992	1,000	1,000	1,000	1.00
1993	1,000	1,000	1,000	1.00
1994	1,000	1,000	1,000	1.00
1995	1,000	1,000	1,000	1.00
1996	1,000	1,000	1,000	1.00
1997	1,000	1,000	1,000	1.00
1998	1,000	1,000	1,000	1.00
1999	1,000	1,000	1,000	1.00
2000	1,000	1,000	1,000	1.00
2001	1,000	1,000	1,000	1.00
2002	1,000	1,000	1,000	1.00
2003	1,000	1,000	1,000	1.00
2004	1,000	1,000	1,000	1.00
2005	1,000	1,000	1,000	1.00
2006	1,000	1,000	1,000	1.00
2007	1,000	1,000	1,000	1.00
2008	1,000	1,000	1,000	1.00
2009	1,000	1,000	1,000	1.00
2010	1,000	1,000	1,000	1.00
2011	1,000	1,000	1,000	1.00
2012	1,000	1,000	1,000	1.00
2013	1,000	1,000	1,000	1.00
2014	1,000	1,000	1,000	1.00
2015	1,000	1,000	1,000	1.00
2016	1,000	1,000	1,000	1.00
2017	1,000	1,000	1,000	1.00
2018	1,000	1,000	1,000	1.00
2019	1,000	1,000	1,000	1.00
2020	1,000	1,000	1,000	1.00
2021	1,000	1,000	1,000	1.00
2022	1,000	1,000	1,000	1.00
2023	1,000	1,000	1,000	1.00
2024	1,000	1,000	1,000	1.00
2025	1,000	1,000	1,000	1.00
2026	1,000	1,000	1,000	1.00
2027	1,000	1,000	1,000	1.00
2028	1,000	1,000	1,000	1.00
2029	1,000	1,000	1,000	1.00
2030	1,000	1,000	1,000	1.00
2031	1,000	1,000	1,000	1.00
2032	1,000	1,000	1,000	1.00
2033	1,000	1,000	1,000	1.00
2034	1,000	1,000	1,000	1.00
2035	1,000	1,000	1,000	1.00
2036	1,000	1,000	1,000	1.00
2037	1,000	1,000	1,000	1.00
2038	1,000	1,000	1,000	1.00
2039	1,000	1,000	1,000	1.00
2040	1,000	1,000	1,000	1.00
2041	1,000	1,000	1,000	1.00
2042	1,000	1,000	1,000	1.00
2043	1,000	1,000	1,000	1.00
2044	1,000	1,000	1,000	1.00
2045	1,000	1,000	1,000	1.00
2046	1,000	1,000	1,000	1.00
2047	1,000	1,000	1,000	1.00
2048	1,000	1,000	1,000	1.00
2049	1,000	1,000	1,000	1.00
2050	1,000	1,000	1,000	1.00
2051	1,000	1,000	1,000	1.00
2052	1,000	1,000	1,000	1.00
2053	1,000	1,000	1,000	1.00
2054	1,000	1,000	1,000	1.00
2055	1,000	1,000	1,000	1.00
2056	1,000	1,000	1,000	1.00
2057	1			

[illegible]

Although we have a fair amount of operating information on the fluid units, very little is known about the Thermoform and Hushby units. Recent literature has been reviewed and there is little justification for increasing the general capacity factors above 1.1 for these units at this time. Since the Hushby Process Corporation is inclined to publish the advantages of Thermoform cracking, it would appear that methods to improve the feed rates above design would now be warranted.

The method of presenting available operating data for the units appears to give a more realistic picture of the world catalytic cracking capacity than using the present factors throughout. However, the method probably still gives a conservative picture of the growth of Fluid over Thermoform and Houdry.

It is interesting to note that the world's fluid catalytic cracking capacity will pass the one million barrel per day figure about the end of 1948.

C. E. PAULES

Per:

B. L. Campbell

WGA/jcl
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cc: Messrs. P. J. Byrne
N. F. Myers
C. E. Paules

(A copy of this letter has also been sent to Mr. H. H. Meier of the Humble Oil & Refining Company)

May 7, 1948

MEMORANDUM

INFORMATION ON CATALYTIC CRACKING UNITS

MAIL _____ This memorandum brings up to date information on the
various catalytic cracking units employing the five commercial
cracking processes, namely:

☐ CEP _____
☐ PJB _____
☐ NFM _____
☐ _____
☐ GWR _____
☐ EHC _____
☐ PJH _____
☐ CAH _____
☐ EHK _____
☐ WRCM _____
☐ DDM _____
☐ JRS _____
☐ AJE _____
☐ CTH _____
☐ CFH _____
☐ LBM _____
☐ _____
☐ _____
☐ _____
☐ _____

Fluid
Thermoform
Mendry
Cycloversion
Bourgeoisoid

The information is presented in the attached three
tables as follows:

Table I -- Overall summary of total catalytic cracking
capacity - world wide.

Table II -- Information on existing and new catalytic
cracking units. (This table presents the
information alphabetically by company with
comments on the status of construction, etc.,
for the various units)

Table III -- Growth of catalytic cracking capacity. (This
table presents the detailed growth of cata-
lytic cracking chronologically.)

Future work calls for periodic revision of Table II
as changes in the construction status of the various units
develop. When justified by developments, the entire memorandum
will be revised.

The references used for this memorandum are as follows:

1. Esso Engineering Department Manufacturing Facilities
Study files including special library services.
2. Memorandum - E. V. Laster to H. E. Lewis, 8/11/47 -
"New Domestic Refining Installations".
3. Memorandum - C. E. Remington to R. P. Russell, 12/5/46
and 4/8/47 - "Catalytic Cracking Capacities".

4. T. C. Report No. EL-147-47 (52), 9/29/47 - "Recent Trends in Manufacturing Processes".

H. S. ANDERS

Standard Oil Development Company
Research Engineering Department
Elizabeth, New Jersey

MAA/mab
Attack.

May 7, 1948

**TOTAL CATALYTIC CRACKING CAPACITY
WORLD WIDE - K. U.S.G.R.**

1,000 B/SD AT YEAR END

END OF YEAR	HOURLY		P.C.C.		PLUMD		CUTO- VERSION		SUSPEN- SOLD		TOTAL	
	DOMESTIC	FOREIGN	DOMESTIC	FOREIGN	DOMESTIC	FOREIGN	DOMESTIC	FOREIGN	DOMESTIC	FOREIGN	DOMESTIC	FOREIGN
1937	14										14	14
1938	14	3									14	17
1939	116	3									116	119
1940	156	3									156	174
1941	191	3									191	214
1942	211	3			40						251	274
1943	282	3	147		117	16					446	493
1944	302		286		396	16					996	1,040
1945	302		325		396	32					1,035	1,095
Beginning of 1946 (1)	326		358		610	48					1,306	1,382
1946	326		363		701	48					1,402	1,478
1947	326		379		783	51					1,500	1,579
1948 (2)	326		389		954	76					1,669	1,793
1949 (2)	326		418		1,145	156					1,909	2,093
1950 (2)	326		418		1,145	256					1,909	2,193

NOTES:

(1) Represents design capacity up until beginning of 1946. From this date, capacity for motor gasoline estimated at 1.5 times design capacity for Fluid and 1.1 for Thermoform and Houdry except where operating information is available.

(2) Including new units.

Standard Oil Development Company
Esso Engineering Department
Elizabeth, New Jersey

May 17, 1948

BSA/maj

TABLE II (Continued)
 INFORMATION ON CATALYTIC CRACKING UNITS
 EXISTING AND NEW UNITS

COMPANY & LOCATION		CONSTRUCTOR	NO. UNITS	DESIGN CAPACITY B/SD	CURRENT CAPACITY B/SD	COMPLETION DATE	REMARKS
Bahrain Petroleum Co. Ltd.	Bahrain		1	16,500	25,000 (1)	1945	
Lago Oil & Transport Co.	Aruba		1	15,500	26,000	1943	To be expanded to 38,000 B/D
Sub-Total			2	32,000	51,000		
Imperial Oil Co.	Montreal, Can.	Kellogg	1		11,000	16/ 1948	Under construction
McCall Frontenac	Montreal, Can.	Kellogg	1		14,000	1948-49	Under construction
Sub-Total			2		25,000		
Total to End 1948			4		76,000		
Anglo-Iranian Oil Co.	Abadan	Foster Wheeler	1		29,000 (45% Conv.)	1949	Under construction - 24,500-55% conversion.
British-American Oil Co., Ltd.	Montreal	Kellogg	1		13,500	Early 1949	Authorized - Believe on drawing boards
Caribbean Pet. Co.(Shell)	Punta Cardon, Venez.	Foster Wheeler	1		25,000(3)	1949	Work begun
Sub-Total			3		67,500		
Lago Oil & Transport Co.	Aruba		-		12,000	1949	Expansion to 38,000 B/D Total
Total to End 1949			7		155,500		
DeBataafche Petroleum Maatschappij (Shell)	Balikpapan, Borneo	Foster Wheeler	1		25,000(3)	1950	Projected stage
DeBataafche Petroleum Maatschappij (Shell)	Wierne Holland (Near Rotterdam)	Foster Wheeler	1		25,000(3)	1950	Projected stage
Shell Oil Co.	England	Foster Wheeler	2		50,000(3)	1950	Projected stage - Shell has planned to build 2 refineries in England.
Yacimientos Petroleros Fiscales	La Plata, Argentina	Kellogg	1		-	1950	To have cat. cracker
Sub-Total			5		100,000		
Total to End 1950			12		255,500		

General

A) The following refineries plan catalytic cracking capacity but do not give type:

- 1) Champlin Refining Co., Enid, Okla.
- 2) Cooden Petroleum Co., Big Spring, Texas
- 3) Petro Carbon, Ltd., Manchester, England, 5,000 B/D
- 4) Scottish Oils, Ltd., Grangemouth, Scotland, Anglo-Iranian Subsidiary
- 5) Skelly Oil Co., Eldorado, Kansas

Notes:

- 1) Operating at this capacity.
- 2) Bahrain estimated as capable of handling 1.5 x design capacity. Now operating as crude distillation unit. May later be used as crude distillation and catalytic cracking unit.
- 3) Royal Dutch Shell, Caracas, S.W.I. has been dropped from records for lack of further information.
- 4) Foster Wheeler says these plants will be designed alike with minor changes. Plants will follow Houston plant design.
- 5) Consolidated Refineries, Ltd., Haifa, Palestine dropped from records because of curtailed construction program eliminating catalytic cracking.

BBA/hmk

May 7, 1948

TABLE 1
CAPACITY AT END OF YEAR (1,000 B/GD) (1)

COMPANY AND LOCATION	NO. OF UNITS	COMPLETION DATE	DESIGN CAPACITY 1,000 B/GD	Beginning of year									
				1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
FOREIGN													
Marathon Petroleum Co., Beaumont, Texas	1	10/63	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
Oil Co., Port Arthur, Texas	1	11/63	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0
General Petroleum Corp., Terrell, Calif.	2	2/64	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
Standard Refining Co., Houston, Texas	1	3/64	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
The Pure Oil Co., Houston, Texas	2	9/64	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Continental Oil Co., Tulsa, Okla.	3	5/64	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
Energy-Verona Oil Co., Ft. St. Louis, Ill.	1	5/64	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Energy-Verona Oil Co., Houston, Texas	2	6/64	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Energy-Verona Oil Co., Paulsboro, N. J.	1	8/64	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Standard Oil Co., Western, Calif.	2	9/64	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Standard Oil & Refining Co., Galveston, Texas	2	9/64	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Am Oil Co., Marcus Hook, N. J.	2	10/64	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Union Oil Co., Wilmington, Calif.	2	12/64	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Standard Oil Co. of Calif., Richmond, Calif.	2	1/65	88.0	88.0	88.0	88.0	88.0	88.0	88.0	88.0	88.0	88.0	88.0
Flintkote Assoc. Oil Co., Baytown, Texas	1	5/65	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Leonard Ref. Inc., Alton, Ill.	1	1967	30.6-5(5)										
Union Oil Co., El Dorado, Ark.	1	1967											
Total Foreign Constructed	32			47.0	48.0	49.0	49.8	50.7	51.2	51.7	52.1	52.6	53.1
Continental Oil Co., Denver, Colo.	1												
Energy-Verona Oil Co.,	1												
Standard Oil Co. of Calif.,	1												
Total Domestic	36			87.0	88.0	89.0	89.8	90.7	91.2	91.7	92.1	92.6	93.1

Also total capacity (ex. U.S.A.R.) since there are no foreign units known.

NOTES:

- (1) Represents design capacity up until beginning of 1966, from this date, capacity for motor gasoline estimated at 1.1 times design capacity except where operating information is available.
 - (2) Honey Pioneer, October, 1966.
 - (3) VVA rated design capacity at 29,000 B/GD stated that plants can attain 40,000 B/GD.
 - (4) Honey Pioneer, March, 1966.
 - (5) See heading 500 B/GD. Designed to handle 500 B/GD was grade is available (Energy Pioneer, October, 1967).
- Zero Engineering Department,
Standard Oil Development Company,
Elmhurst, Ill. 60120
May 7, 1968

Notes

2

[illegible]

SALE OF THE YEAR OF THE YEAR 1999

(1) Represents design capacity, as well, beginning in 1986. From this figure, capacity for water quality is estimated at 1.2 times design capacity except where specific information is available.

(2) Not operating as treated water. Estimated at 20,000 gpd at gas oil flow.

(3) Deposited.

Standard Oil Development Company
Petroleum Engineering Department
Akron, New Jersey

TABLE III RECORD OF CRITICAL CONCRETE CAPACITY

FLUID

CAPACITY AT END OF YEAR (1,000 B/D) (1)

ESTIMATED
CONCRETE
CAPACITY
1,000 B/D

Beginning
of
1966 (1)

1966 (1) 1967 1968 1969 1970

1971 1972

1973 1974

1975 1976

1977 1978

1979 1980

1981 1982

1983 1984

1985 1986

1987 1988

1989 1990

1991 1992

1993 1994

1995 1996

1997 1998

1999 2000

2001 2002

2003 2004

2005 2006

2007 2008

2009 2010

2011 2012

2013 2014

2015 2016

2017 2018

2019 2020

2021 2022

2023 2024

2025 2026

2027 2028

2029 2030

2031 2032

2033 2034

2035 2036

2037 2038

2039 2040

2041 2042

2043 2044

2045 2046

2047 2048

2049 2050

2051 2052

2053 2054

2055 2056

2057 2058

2059 2060

2061 2062

2063 2064

2065 2066

2067 2068

2069 2070

2071 2072

2073 2074

2075 2076

2077 2078

2079 2080

2081 2082

2083 2084

2085 2086

2087 2088

2089 2090

2091 2092

2093 2094

2095 2096

2097 2098

2099 2100

2101 2102

2103 2104

2105 2106

2107 2108

2109 2110

2111 2112

2113 2114

2115 2116

2117 2118

2119 2120

2121 2122

2123 2124

2125 2126

2127 2128

2129 2130

2131 2132

2133 2134

2135 2136

2137 2138

2139 2140

2141 2142

2143 2144

2145 2146

2147 2148

2149 2150

2151 2152

2153 2154

2155 2156

2157 2158

2159 2160

2161 2162

2163 2164

2165 2166

2167 2168

2169 2170

2171 2172

2173 2174

2175 2176

2177 2178

2179 2180

2181 2182

2183 2184

2185 2186

2187 2188

2189 2190

2191 2192

2193 2194

2195 2196

2197 2198

2199 2200

2201 2202

2203 2204

2205 2206

2207 2208

2209 2210

2211 2212

2213 2214

2215 2216

2217 2218

2219 2220

2221 2222

2223 2224

2225 2226

2227 2228

2229 2230

2231 2232

2233 2234

2235 2236

2237 2238

2239 2240

2241 2242

2243 2244

2245 2246

2247 2248

2249 2250

2251 2252

2253 2254

2255 2256

2257 2258

2259 2260

2261 2262

2263 2264

2265 2266

2267 2268

2269 2270

2271 2272

2273 2274

2275 2276

2277 2278

2279 2280

2281 2282

2283 2284

2285 2286

2287 2288

2289 2290

2291 2292

2293 2294

2295 2296

2297 2298

2299 2300

2301 2302

2303 2304

2305 2306

2307 2308

2309 2310

2311 2312

2313 2314

2315 2316

2317 2318

2319 2320

2321 2322

2323 2324

2325 2326

2327 2328

2329 2330

2331 2332

2333 2334

2335 2336

2337 2338

2339 2340

2341 2342

2343 2344

2345 2346

2347 2348

2349 2350

2351 2352

2353 2354

2355 2356

2357 2358

2359 2360

2361 2362

2363 2364

2365 2366

2367 2368

2369 2370

2371 2372

2373 2374

2375 2376

2377 2378

2379 2380

2381 2382

2383 2384

2385 2386

2387 2388

2389 2390

2391 2392

2393 2394

2395 2396

2397 2398

2399 2400

2401 2402

2403 2404

2405 2406

2407 2408

2409 2410

2411 2412

2413 2414

2415 2416

2417 2418

2419 2420

2421 2422

2423 2424

2425 2426

2427 2428

2429 2430

2431 2432

2433 2434

2435 2436

2437 2438

2439 2440

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2449 2450

2451 2452

2453 2454

2455 2456

2457 2458

2459 2460

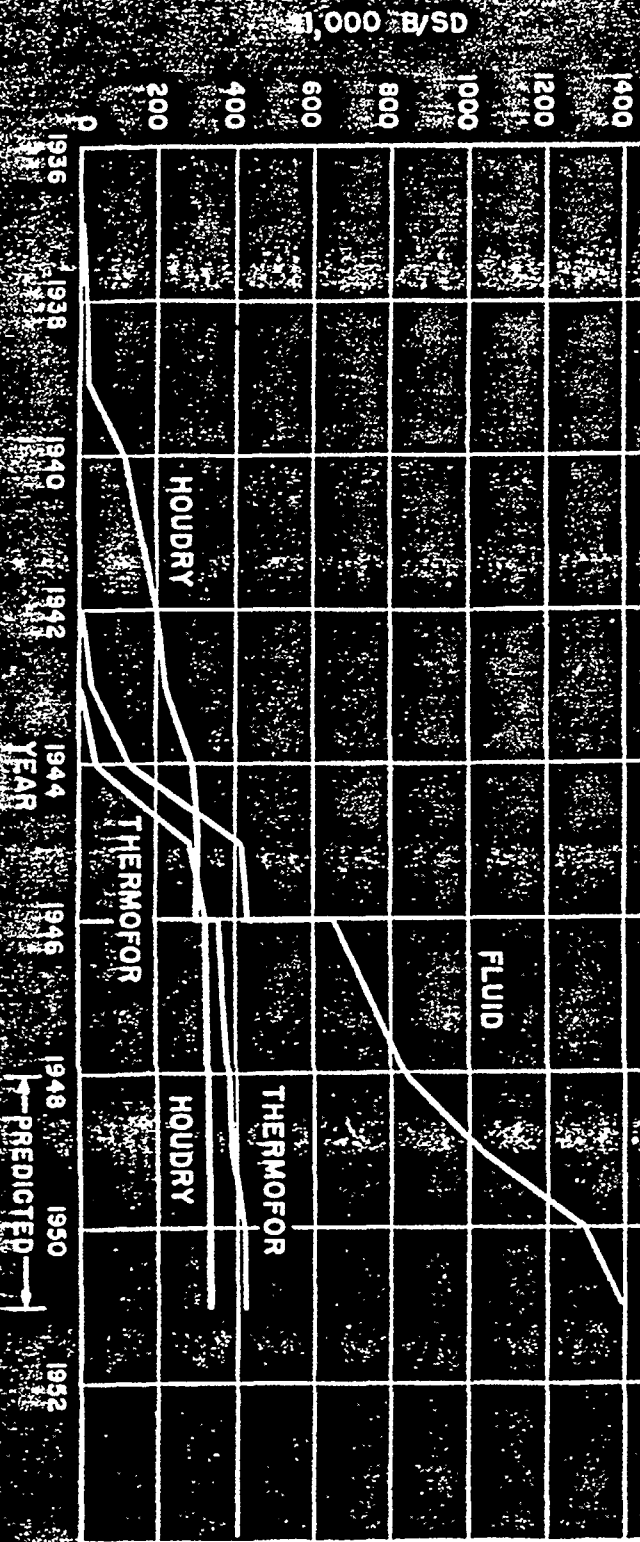
2461 2462

2463 2464

2465 2466

2467 24

FIGURE I
GROWTH OF CATALYTIC CRACKING
WORLD WIDE



Catalytic Cracking
Units (general)
A.P.I. file

CATALYTIC CRACKING PLANTS

Sinclair	Houston, Texas	11,000 B/5D T C C and	11,000 B/5D Houdry - E. Texas or Midcont.
Shell	Houston, Texas	Fluid	use W. Texas 25,000 B/5D
Eastern States Petroleum	Houston, Texas	Fluid	7,500 B/5D
Sinclair	Marcus Hook	Fluid	25,000
Atlantic	Philadelphia	Fluid	22,000 B/5D
Gulf	Philadelphia	Fluid	23,000
Socony	Paulsboro	T C C	16,000
Sun	Marcus Hook	T C C	12,000
Socony	Paulsboro	Houdry	11,000
Sun	Marcus Hook	Houdry	16,000
Tidewater	Bayonne	T C C	12,700
Tidewater	Bayonne	Houdry	18,300
Esso	Bayway	Fluid	21,000
Pure	Newark, Ohio	Fluid (New)	5,000
Ashland	Catlettsburg, Ky.	T C C	11,000
SOHIO	Cleveland	Houdry	11,000
Sun	Toledo	Houdry	19,000
Gulf	Toledo	Fluid (5/1949)	15,500
Gulf	Cleves, Ohio	Fluid (6/1949)	15,500

Copied 2/4/1949