

1999 Worldwide Refining Survey

Marilyn Radler
Economics Editor

All figures in barrels per calendar day

All figures are
as of January 1, 2000

LEGEND

Numbers identify processes in table

Coking

1. Fluid coking
2. Delayed coking
3. Other

Thermal Processes

1. Thermal cracking
2. Visbreaking

Catalytic Cracking

1. Fluid
2. Other

Catalytic Reforming

1. Semiregenerative

Cyclic

3. Continuous regen.

Catalytic Hydrocracking

1. Distillate upgrading
2. Residual upgrading
3. Lube oil manufacturing
4. Other
- c. Conventional (high-pressure) hydrocracking: (>100 barg or 1,450 psig)
- m. Mild to moderate hydrocracking (<100 barg or 1,450 psig)

Catalytic Hydrorefining

1. Residual desulfurization
2. Heavy gas oil desulfurization
3. Catalytic cracker and cycle stock treatment
4. Mid distillate
5. Other

Catalytic Hydrotreating

1. Pretreating cat reformer feeds
2. Naphtha desulfurizing
3. Naphtha olefin or aromatics saturation
4. Straight-run distillate
5. Pretreating cat cracker feeds

6. Other distillates
7. Lube oil "polishing"
8. Other

Alkylation

1. Sulfuric acid
2. Hydrofluoric acid

Polymerization/Dimerization

1. Polymerization
2. Dimerization

Aromatics

1. BTX
2. Hydrodealkylation

3. Cyclohexane
4. Cumene

Isomerization

1. C₄ feed
2. C₅ feed
3. C₅ and C₆ feed

Oxygenates

1. MTBE
2. ETBE
3. TAME
4. Other

Hydrogen

- Production:
1. Steam methane reforming
 2. Steam naphtha reforming
 3. Partial oxidation
- a. Third-party plant
- Recovery:
4. Pressure swing adsorption
 5. Cryogenic
 6. Membrane
 7. Other

NOTES

- A Flexicoking.
B Dewaxing.
C Deasphalting.
D LCGO.
E Houdry.
F VGO.
G Previously listed as Kaucuk s.p.
H Previously listed as Chemopetrol a.s.

- I Solvent extraction.
J TCC.
K High conv. soaker cracking.
L Steam LPG reforming.
M Eureka.
N Previously listed as Mitsubishi Oil Co. Ltd.
O Previously listed as Nippon Petroleum Refining Co. Ltd.
P Includes Kygnus Sekiyu Seisei KK refinery capacities.

- Q Previously listed as Ste. Cherifienne des Petroles.
R Estimate.
S RCC.
T Isomax.
U Demex.
V Residue.
W ROSE.
X MEK dewaxing.
Y Includes capacities from Pembroke Cracking Co.

- Z Previously listed as Santa Maria Refining Co.
AA Previously listed as Wood River Refining Co.
BB Previously listed as El Dorado Refining Co.
CC Previously listed as TransAmerican Refining Corp.
DD Previously listed as Pennzoil Products Co.
EE Isocracker.

- FF VGO/LCO.
GG HOC.
HH Mixed MTBE/TAME.
II Previously listed as Hess Oil Virgin Islands Corp.

Capacity expressed in barrels per calendar day (b/cd) is the maximum number of barrels of input that can be processed during a 24-hr period, after making allowances for the following:

- Types and grades of inputs to be processed.
- Types and grades of products to be manufactured.
- Environmental constraints associated with refinery operations.
- Scheduled downtime such as mechanical problems, repairs, and slowdowns.

Capacity expressed in barrels per stream day (b/sd) is the amount a unit can process when running at full capacity under optimal feedstock and product slate conditions. Most U. S. capacity figures have historically been reported in b/sd, but all capacities are reported in b/cd here, as they will be in following years.

Totals

When an asterisk (*) appears beside a refinery location, this indicates that the figure has been converted from b/sd to b/cd by using the conversion factor 0.95 for crude oil and vacuum distillation units, and 0.9 for all downstream cracking and conversion units.

Process definitions

- Hydrocracking includes processes where more than 10% of the feed is reduced in molecular size.
- Hydrorefining includes processes where 10% of the feed or less is reduced in molecular size.
- Hydrotreating includes processes where essentially no reduction in the molecular size of the feed occurs.
- Hydrogen volumes presented here represent either generation or upgrading to 90+% purity.

Catalytic reforming definitions

- Semiregenerative reforming is characterized by shutdown of the reforming unit at specified intervals, or at the operator's convenience, for in situ catalyst regeneration.
- Cyclic regeneration reforming is characterized by continuous or continual regeneration of catalyst in situ in any one of several reactors that can be isolated from and returned to the reforming operation. This is accomplished without changing feed rate or octane.
- Continuous regeneration reforming is characterized by the continuous regeneration of part of the catalyst in a special regenerator, followed by continuous addition of this regenerated catalyst to the reactor.
- Other includes nonregenerative reforming (catalyst is replaced by fresh catalyst) and moving-bed catalyst systems.

REFINERY SHUTDOWNS

ASIA

Mitsubishi Oil Co. Ltd. - Kawasaki, Japan. 75,000 b/cd capacity, September 1999.
Showa Shell Sekiyu KK - Niigata, Japan. 39,000 b/cd capacity, March 1999.

EUROPE

Shell U.K. Ltd. - Shell Haven, UK. 92,000 b/cd capacity, December 1999.

US

Ultramar Diamond Shamrock - Alma, Michigan. 51,000 b/cd capacity, October 1999.