

2007 and Beyond...

Context

- No grass root refineries have been constructed since Marathon's facility at Garyville, LA over 30 years ago (>100 environmental permits required)
- 149 refineries are operating in the U.S. today, 38 produce asphalt or asphalt related products
- Asphalt = \sim 3.2% yield of U.S. refinery system
- The asphalt consumption rate is projected to increase 1.2-1.3% annually through '09
- EIA data October '05 YTD vs October '06 YTD indicates asphalt supplied was down 4%

The Roofing Industry

- Consumes substantial amounts of asphalt (typical large shingle plant may use 100K+ tons/year)
- Indirectly competes with the paving industry for asphalt, primarily in the softer grade categories
- Often uses double digit percentages of polymer in their products
- Roofing flux (sweet resid, VTB's) is a preferred coker feedstock (more light ends)

The Roofing Industry



Geography (Census Bureau)



Definition

• 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. **Energy Information Administration (EIA)** data for asphalt capacity is reported in this format which has been converted to tons per stream day (t/sd) for this presentation...

- NEW ENGLAND (t/sd) = 0
- Maine
- Massachusetts
- New Hampshire
- Rhode Island
- Vermont

- NEW ENGLAND = 1,802 (tons/day)
- Maine 361
- Massachusetts 709
- New Hampshire 417
- Rhode Island 86
- Vermont 229

- MIDDLE ATLANTIC (t/sd) = 21,160
- Connecticut 0
- New Jersey 17,589
- New York 0
- Pennsylvania 3,571

- MIDDLE ATLANTIC (tons/day) = 11,520
- Connecticut 863
- New Jersey 2547
- New York 3780
- Pennsylvania 4330

- SOUTH ATLANTIC (t/sd) = 4,384
- Delaware 0
- Florida 0
- Georgia 4,286
- Maryland 0
- North Carolina 0
- South Carolina 0
- Virginia 0
- West Virginia 98

- SOUTH ATLANTIC (tons/day) = 15,441
- Delaware 316
- Florida 3,305
- Georgia 3,267
- Maryland 1,570
- North Carolina 2,982
- South Carolina 1,575
- Virginia 2,122
- West Virginia 304

- E. NORTH CENTRAL (t/sd) = 33,696 (-7,143 w/ ConocoPhillips coker on-line '09/'10)
- Illinois 11,964
- Indiana 11,732
- Michigan 4,107
- Ohio 4,554
- Wisconsin 1,339

- E. NORTH CENTRAL (tons/day) = 19,823
- Illinois 4,701
- Indiana 3,465
- Michigan 3,244
- Ohio 5,161
- Wisconsin 3,252

- E. SOUTH CENTRAL (t/sd) = 16,232
- Alabama 5,036
- Kentucky 4,107
- Mississippi 7,089
- Tennessee 0

- E. SOUTH CENTRAL = 8,871 (tons/day)
- Alabama 3,315
- Kentucky 1,640
- Mississippi 1,552
- Tennessee 2,364

- W. NORTH CENTRAL (t/sd) = 11,250
- Iowa 0
- Kansas 0
- Minnesota 11,250
- Missouri 0
- Nebraska 0
- North Dakota 0
- South Dakota 0

- W. NORTH CENTRAL = 13,097 (tons/day)
- Iowa 1,696
- Kansas 2,016
- Missouri 3,724
- Minnesota 3,706
- Nebraska 729
- North Dakota 572
- South Dakota 654

- W. SOUTH CENTRAL (t/sd) = 35,575 (-402 w/ Sinclair Tulsa, OK coker on-line '09/'10)
- Arkansas 2,411
- Louisiana 11,000
- Oklahoma 6,289
- Texas 15,875

- W. SOUTH CENTRAL = 11,156 (tons/day)
- Arkansas 466
- Louisiana 660
- Oklahoma 2,288
- Texas 7,742

- MOUNTAINS (t/sd) = 15,436 (-3,705 with Cenex Laurel, MT and Sinclair Rawlins, WY cokers online '07/'08)
- Arizona 0
- Colorado 2,187
- Idaho 0
- Montana 6,571
- Nevada 893

- New Mexico 1,071
- Utah 589
- Wyoming 4,125

- MOUNTAINS = 11,287 (tons/day)
- Arizona 2,930
- Colorado 2,233
- Idaho 1,004
- Montana 535
- Nevada 1,186

- New Mexico 2,101
- Utah 968
- Wyoming 330

- PACIFIC (t/sd) = 18,203
- California 14,542
- Oregon 1,250
- Washington 2,411

- PACIFIC = 12,163 (tons/day)
- California 8,184
- Oregon 2,065
- Washington 1,914

Disparities

• Disparities (tons/day)

New England Middle Atlantic South Atlantic East North Central East South Central West North Central West South Central Mountains Pacific

-1,802 +9,640-11,057 +13,873+7.361-1,847 +24,419+4,149+6,040+50,776

The Big Boys (tons/day)

- BP PLC Whiting, IN
- Flint Hills Resources (Koch)
- ConocoPhillips Wood River, IL
- ver, IL 7,142*

10,186^

7,232

- ^\$3 billion project to run additional 250K bbls/day of Canadian heavy crude ('11)
- *\$1 billion coker ('09/'10)

Asphalt Exporters to U.S.

	2006 tons/day	6 year avg
Canada	5,800	1,930
Mexico	0	130
Spain	0	126
Venezuela	2,175	3,081

Factors/Issues

- Logistics:
 - Truck: availability, travel distance
 - Rail: full corridors, local service, rates
- Crude Oil: sweet/sour differential incentives
- Refinery Economics: product mix
- Cokers: who, when
- Refinery Expansions: more output on same footprint

Factors/Issues

- RAP % average % in mix does not typically approach upper limit...
- Specifications restrictive?
- Pavement design vs. PCC; appropriate for traffic load?
- Budgetary impact AC, diesel, steel, labor costs...

Crude Oil Yield

- 47% motor gasoline
- 24% distillate fuel oil (diesel)
- 9.7% jet fuel
- 4% liquified petroleum gas
- 22% other (asphalt: 0% (syncrude) to >38% (Venezulean, heavy Canadian)

Coker Process



Typical Coker Yield

- 3% butane
- 3% fuel gas
- 11% gasoline
- 21% distillate (diesel)
- 29% gas oil
- 33% petroleum coke







- Energy Information Administration (EIA), Refinery Capacity Historical Data 2006
- Oil & Gas Journal, 2006 Worldwide Refining Survey
- Asphalt Institute 2005 Asphalt Usage Survey (Updated to 2006)
- U.S. Census Bureau (2000)