Expansion of the Panama Canal – A Game Changer: Port of Houston and Beyond

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The Panama Canal
How A Canal Works

PANAMA CANAL PROFILE

Sea Level Canal
Continuous Sea Level

Carving through uneven terrain unites the two bodies of water allowing for equal sea level passage

Suez Canal Type
Panama Canal Construction
The Panama Canal Connects 144 Trade Routes Across the Globe
The Port of Houston

- No. 1 U.S. Port in foreign waterborne tonnage
- Home to largest petrochemical complex in the U.S. (2nd largest in the world)
- 2.1 million jobs per year nationwide
- Generates $500 billion in annual economic activity nationwide

Annual Vessel Arrivals
Port of Houston

- 2011: 8,022 Ships
  - Tanker: 45%
  - Chemical Tanker: 13%
  - Bulk: 8%
  - Container: 11%
  - General Cargo: 11%
  - Pure Car Carrier: 1%
  - Pilot Moved Tug and Barge: 5%
  - LPG: 5%

- 2014: 8,338 Ships
  - Tanker: 34%
  - Chemical Tanker: 16%
  - Bulk: 12%
  - Container: 12%
  - General Cargo: 12%
  - Pure Car Carrier: 1%
  - Pilot Moved Tug and Barge: 5%
  - LPG: 7%
Houston Crude Oil Imports by Quality
In thousands of barrels

*Source EIA 2015
Estimated Petroleum Exports for the Port of Houston (MBD)

- **2003:** 200,000
- **2004:** 200,000
- **2005:** 200,000
- **2006:** 200,000
- **2007:** 200,000
- **2008:** 200,000
- **2009:** 200,000
- **2010:** 200,000
- **2011:** 200,000
- **2012:** 200,000
- **2013:** 200,000
- **2014:** 400,000
- **2015:** 1,200,000

*Source Greater Houston Port Bureau, EIA*
$100+ Billion of Planned U.S. Petrochemical Investments*

Houston Ship Channel and surrounding TX
- Ascend 2015 New propane PDH $1,200
- Celanese-Mitsui 2015 New methanol $800
- Celanese 2016 Methanol expansion unk
- Celanese 2018 New methanol unk
- CP Chemical 2017 New ethylene $5,000
- Chevron Phillips, Enterprise 2016 New PDH unk
- Equistar 2016 Ethylene unk
- Exxon Mobil 2017 New ethylene $3,000
- Exxon Mobil 2016 New polyethylene $3,000
- Formosa 2018 New ethylene $3,000
- Formosa 2017 New propylene $2,000
- Ineos 2017 Ethylene debottleneck unk
- LyondellBasell 2016 Tri-ethylene glycol exp. unk
- LyondellBasell 2019 Propylene oxide unk
- LyondellBasell 2017 Ethylene expansion 170
- Flint Hills 2018 New PDH unk
- FunP Connell 2018 Methanol expansion unk
- Oxy 2018 Ethylene expansion unk

Freeport – Old Ocean, TX
- BASF-Yara 2018+ New ammonia unk
- BASF 2019 Methane-to-propylene unk
- Dow 2017 New ethylene unk
- Dow 2015 New PDH unk
- Dow 2018 New propylene unk
- Dow 2017 Gas to liquids unk
- CP Chemical 2017 Ethylene expansion 923
- CP Chemical 2017 New polyethylene 6,000

Houston Ship Channel (cont.)
- Orascom (OCI) 2015 New fertilizer unk
- Iowa fertilizer 2015 New ammonia $1,800
- CF Industries 2015 Ammonia expansion $1,900

Oklahoma
- Koch 2016 Urea expansion $1,000
- LSB Ind. 2015 New methanol 275

Indiana
- Axiall/Lotte 2018 Ethylene expansion unk
- BioNitrogen 2015 New UAN $1,200
- Castleton 2018 New Methanol $1,000
- Commodities unk
- CF Industries 2015 Ammonia expansion $1,900
- Dyno Nobel 2016 New ammonia $1,000
- Eurochem 2017 New ammonia $1,500
- Leucadia (LCCE) 2017 Methanol expansion unk
- Methanex 2014 Methanol migration unk
- Methanex 2016 Methanol migration $550
- Methanex 2018 Methanol expansion unk
- S. LA Ethanol 2016 New methanol $1,200
- S. LA Methanol 2016 Methanol expansion unk
- Shell 2017 Ethylene expansion unk
- Valero 2018 New methanol 700

Lake Charles, LA
- Dow 2015 Ethylene expansion $1,060
- G2X 2017 Ethylene-to-gasoline $1,300
- LyondellBasell Late 2015 Ethylene expansion $430
- Sasol 2018 New ethylene $8,100
- Sasol 2016 New polyethylene $330

Sources: ICIS, Company announcements, Kirby Corp.
*Notes: Date reflects anticipated year in-service, red font reflects construction in progress, unk=unknown
US Producers to Target Key Markets

North America

Central & South America

Europe

Middle East

Asia Pacific

Surplus
Deficit
Trade Flows

.000 toneladas/año (Estimación)

Source: EIA, Platts
Waterborne Foreign Trade
Houston - Millions Metric Tons

---|---|---|---|---|---|---|---
Imports | 80 | 80 | 80 | 80 | 80 | 80 | 80
Exports | 20 | 20 | 20 | 20 | 20 | 20 | 20
Houston Total Trade | 100 | 100 | 100 | 100 | 100 | 100 | 100
The Canal Shifts the Market to the USGC/USEC

Cost Based on:
- 4,000 TEU Vessel
- Canal Tolls January 2011
- $467.00 / MT Bunker (HFO)
- Actual Charter Rate

Cost Based on:
- 8,000 TEU Vessel
- Canal Tolls January 2011
- $467.00 / MT Bunker (HFO)
- Actual Charter Rate
Challenges

- Predictability
  - Environmental
  - Safety
  - Security
  - Dredging
  - Efficiency
Dredging Challenges

- Harbor Maintenance Trust Fund
- PHA Study – Wider vs. Deeper Dredging
- Accommodating Post-Panamax Ships
Waterside Congestion

- Inefficient scheduling
- Increase in non-productive movements
- Increase in waterway congestion
Shoreside Congestion

- Insufficient Supply chain growth
  - Transportation
  - Work Force
  - Storage
Questions/Comments?