Los Angeles Refinery – Overview
Safe, Compliant, Reliable Operation

July 11, 2019
LAR overview

- Crude Capacity of approximately 363,000 barrels per calendar day
  - Produce transportation fuels for the Los Angeles area

- Site: 1000+ acres

- Personnel: 1620 employees
  - Contractors: 2000+

- Operations in Wilmington, Long Beach and Carson
What has Marathon done at the refinery to reduce emissions?
3.8 million pounds of NOX reductions

Marathon Los Angeles Refinery Complex
Total Annual RECLAIM NOx Emissions

NOx: 62% reduction since 1996-2022
Note:
-Total NOx emissions beyond CY 2018 are estimated value.
More than 3 million pounds of SOX reductions-

Marathon Los Angeles Refinery Complex
Total Annual RECLAIM SOx Emissions

SOx: 66% reduction since 1996-2019
Note:
- Total SOx emissions for CY 2019 are estimated value.
Technology to burn fuel cleaner

- Lower emission burners
- NOx removal equipment - Selective Catalytic Reduction (SCR)
  - SCR on Carson Fluid Catalytic Cracking Unit (FCC) is one of the largest in any refinery
Reducing emissions from flares

Flaring SOx Emissions by Refinery* and Category 2012-2016

FROM: SCAQMD 1118 staff report July 2017
Marathon Los Angeles Refinery flaring thru 2018

- Our Watson cogeneration facility provides reliability for electrical power and steam
- Quarterly flare reports are submitted to SCAQMD and are posted on the agency’s website
- We have a Flare Minimization Plan and provide annual reports to USEPA
WCWLB flaring – SOx emissions (from SCAQMD flare report at June CSC meeting)
WCWLW flaring & WCWLW on-road 2017 emissions
(June 13 CSC meeting)  (May 29 TAG meeting)

Nitrogen Oxides (NOx)

On-Road NOx

Wilmington, Carson, West Long Beach

1

NOx contributors

Flaring
On-road mobile
EPA benzene fence line monitoring

- Started monitoring in 2017
- USEPA action level is 2.8 ppb
- Concentration at our refinery fenceline is much less than the action level
Reducing fugitive emissions (LDAR)

- **About 650,000** fugitive components such as valves and pumps are monitored every 3 months.
- **About 9,500** drain system components are monitored monthly.
- Total Vapor Analyzers (TVAs) and FLIR cameras used to find leaks.
- **About 40 certified technicians** work full time to monitor these components.
- BACT is applied on valves, pumps, compressors, and drain system components.
- Closed loop sampling systems (Texas samplers) are used for sample collection.
- All leaks are repaired promptly. No delay of repair.
Reducing fugitive emissions (Tanks)

- All fixed roof tanks in hydrocarbon service are monitored every 3 months
  - Total Vapor Analyzers (TVAs) and FLIR cameras used to find leaks
- All floating roof tanks in hydrocarbon service are inspected every 6 months
  - Special tools are used to measure gaps in primary and secondary seals, leg socks and tank deck fittings
  - Lower Explosive Limit monitoring conducted
- Certified inspectors perform tank inspections
- All leaks are repaired promptly (within 72 hrs). No delay of repair
Other ways emissions are reduced

- **Flare Gas Recovery**
  - Reduces sulfur and VOCs
- **FCC Electrostatic Precipitator**
  - Reduces particulate matter
- **Electrification**
- **Use of lower emission construction equipment**
- **Storage Tank Doming and Fitting Upgrades**
  - Reduce vapor emissions
- **Vapor Recovery System**
  - Reduces tank emissions
- **Amine contactors**
  - Reduces sulfur in refinery fuel gas
- **Liquid Recovery Unit**
  - Reduces sulfur in refinery fuel gas
- **Voluntary Risk Reduction Plan**
  - Solar-powered light towers
  - Lower emission electrical power instead of diesel-generated power for temporary equipment
Optimization and Compliance
- Pipelines between Wilmington and Carson
- Shut down Wilmington FCC
- Ability to remove more sulfur from our gasoline product

Project Net Local Emissions Changes from CEQA

<table>
<thead>
<tr>
<th>Greenhouse Gases (Metric Tonnes/year)</th>
<th>Criteria Pollutants (Tons/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO$_2$e (70,000)</td>
<td>SO$_x$ (3)  NO$_x$ (56)  PM (1.5)  CO (85)  VOC 9*</td>
</tr>
</tbody>
</table>

*After offsets
What more is Marathon doing at the refinery?
### RULE 1180 fence line monitoring

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Criteria Air Pollutants</strong></td>
<td></td>
</tr>
<tr>
<td>Sulfur Dioxide</td>
<td>OP UVDOAS with Xenon</td>
</tr>
<tr>
<td>Nitrogen Oxides</td>
<td>OP FTIR</td>
</tr>
<tr>
<td><strong>Volatile Organic Compounds (VOC)</strong></td>
<td></td>
</tr>
<tr>
<td>Total VOCs</td>
<td>OP FTIR</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>OP FTIR</td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>OP FTIR</td>
</tr>
<tr>
<td>Acrolein</td>
<td>OP FTIR</td>
</tr>
<tr>
<td>1,3-Butadiene</td>
<td>OP FTIR</td>
</tr>
<tr>
<td>Styrene</td>
<td>OP FTIR</td>
</tr>
<tr>
<td>BTEX Compounds</td>
<td>OP UVDOAS with Xenon</td>
</tr>
<tr>
<td><strong>Other Compounds</strong></td>
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</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>OP TDLAS</td>
</tr>
<tr>
<td>Carbonyl Sulfide</td>
<td>OP FTIR</td>
</tr>
<tr>
<td>Ammonia</td>
<td>OP FTIR</td>
</tr>
<tr>
<td>Black Carbon</td>
<td>Point Aethalometer</td>
</tr>
<tr>
<td>Hydrogen Cyanide</td>
<td>OP FTIR</td>
</tr>
<tr>
<td>Hydrogen Fluoride</td>
<td>N/A (not used at this refinery)</td>
</tr>
</tbody>
</table>
RULE 1180 equipment and shelter
Projects under evaluation

- Retrofit heaters with new low NOx burners and/or SCR to reduce NOx emissions
  - Cost effectiveness for projects under evaluation
- Electrification projects to replace portable diesel powered air compressors to reduce NOx and diesel PM
- Diesel alternatives to portable diesel powered ICE’s
LARIC crude tank project at LAR

*reductions not accounted for in LARIC Environmental Impact Analysis

Marine Vessel Emissions Reductions in Tons *

<table>
<thead>
<tr>
<th></th>
<th>SO(_x)</th>
<th>NO(_x)</th>
<th>PM</th>
<th>CO</th>
<th>VOC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>200</td>
<td>8</td>
<td>25</td>
<td>36</td>
</tr>
</tbody>
</table>

- Designed to meet Best Achievable Control Technology
- Will enable marine vessels at Port of Long Beach to unload cargoes in one dock trip rather than making multiple trips and waiting at sea in between.
LAR Summer Youth Program

- We have had a Summer Youth Program for 27 years
  - More than 800 youth have participated
- This year we have a class of 33
  - All from our community of WCWLB
- The program teaches the necessary life skills needed to get a sound job.
  - We have a 1:1 mentor/youth ratio
- Summer Youth video
  https://vimeo.com/260131550
  Password: youth