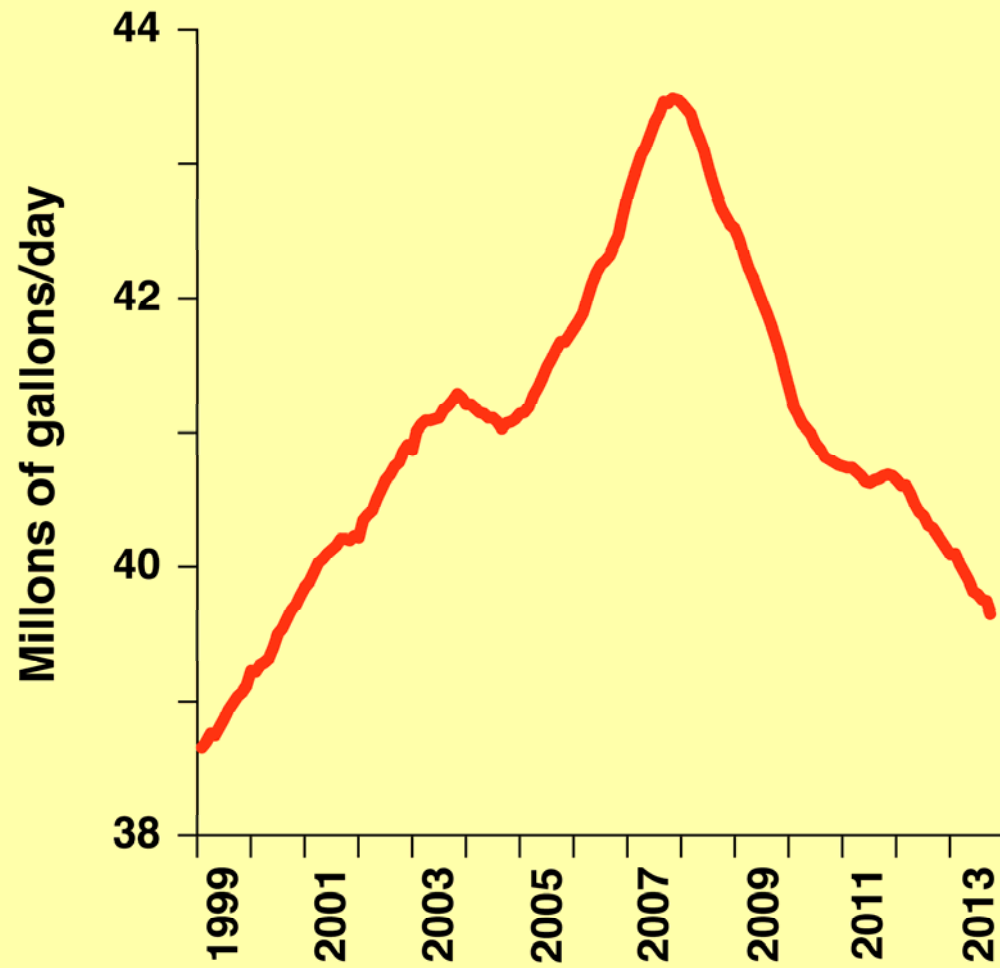
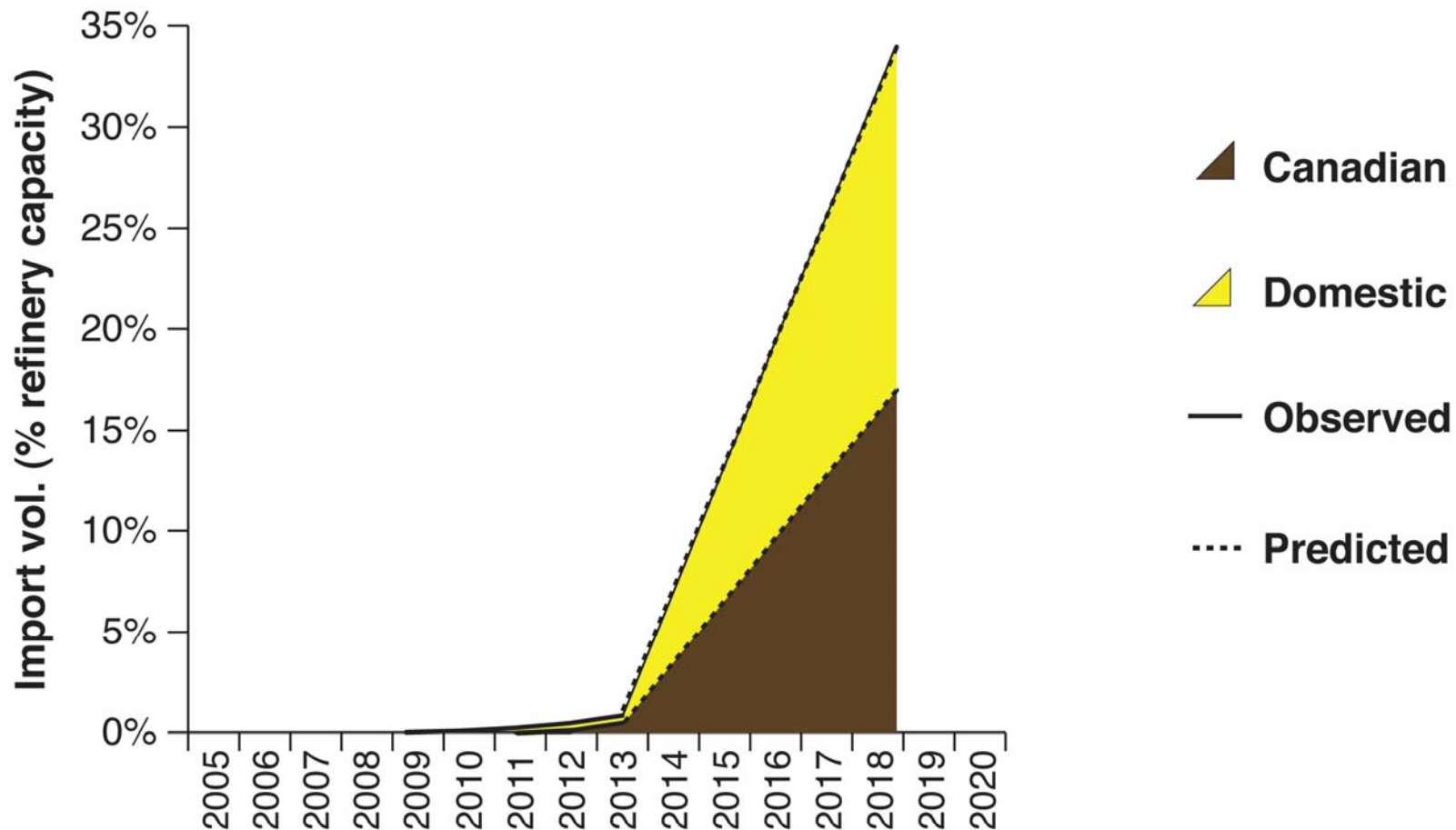


California Crude by Rail Workshop Berkeley, CA — 6/25/14

Presentation by
Greg Karras, Senior Scientist
Communities for a Better Environment



California gasoline sales, Jan 1999–Sep 2013
Data: U.S. Energy Information Admin. Chart: CBE.



California Crude Imports by Rail—observed / predicted

Observed (2009–2013): data from CEC (http://energyalmanac.ca.gov/petroleum/statistics/2013_crude_by_rail.html).
 Predicted based on utilization of capacity proposed for Alon Bakersfield, Plains Bakersfield, Phillips 66 Santa Maria, Valero Benicia & Wilmington, WesPac Pittsburg and Kinder Morgan Richmond (proposed and repurposed terminals).
 Percentage of refinery capacity based on 2014 statewide crude capacity reported in *Oil & Gas Journal* (2.03 MM b/cd).

Greater selenium concentrations in crude slates match greater Bay discharge rates for the four largest discharging refineries.

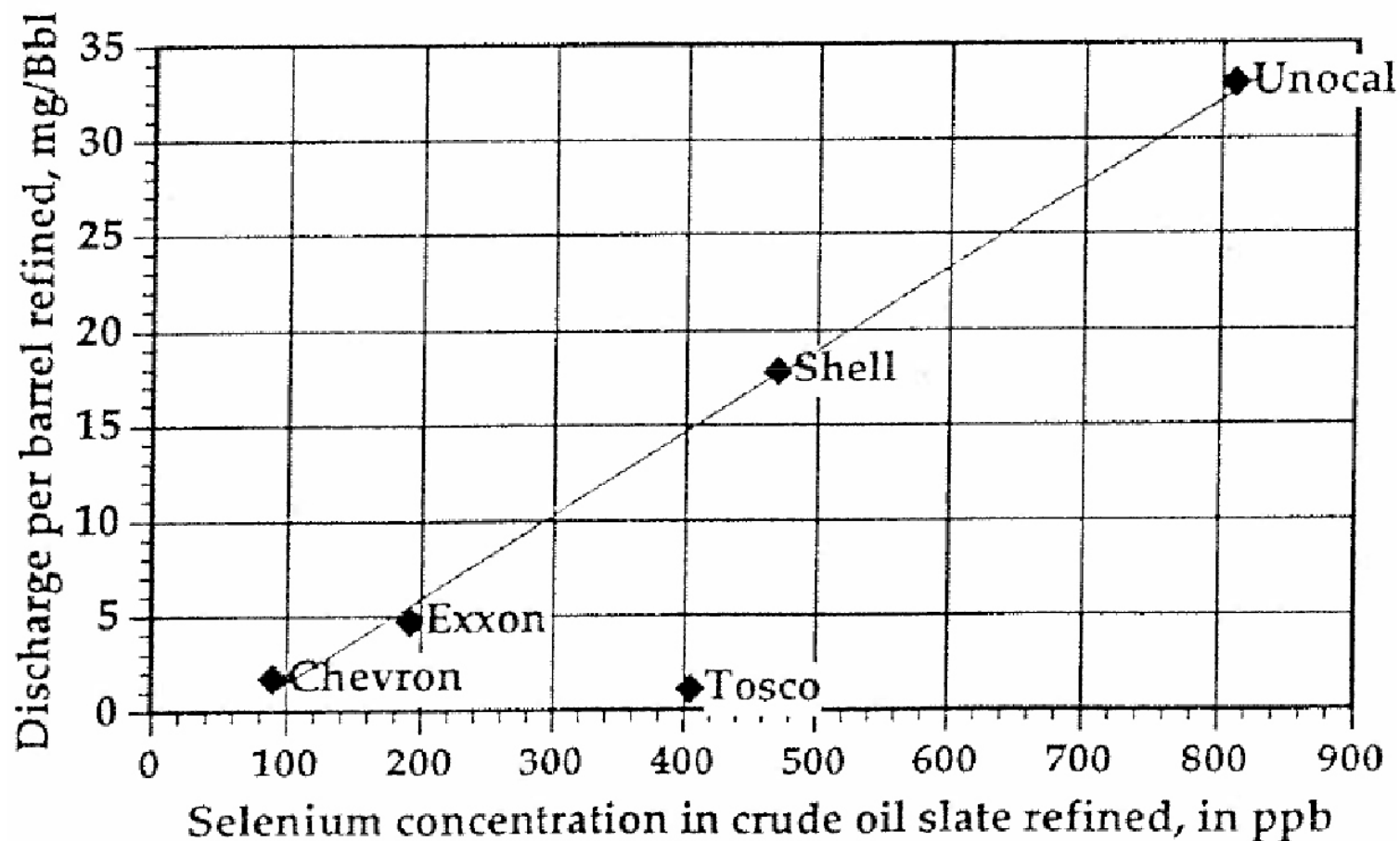
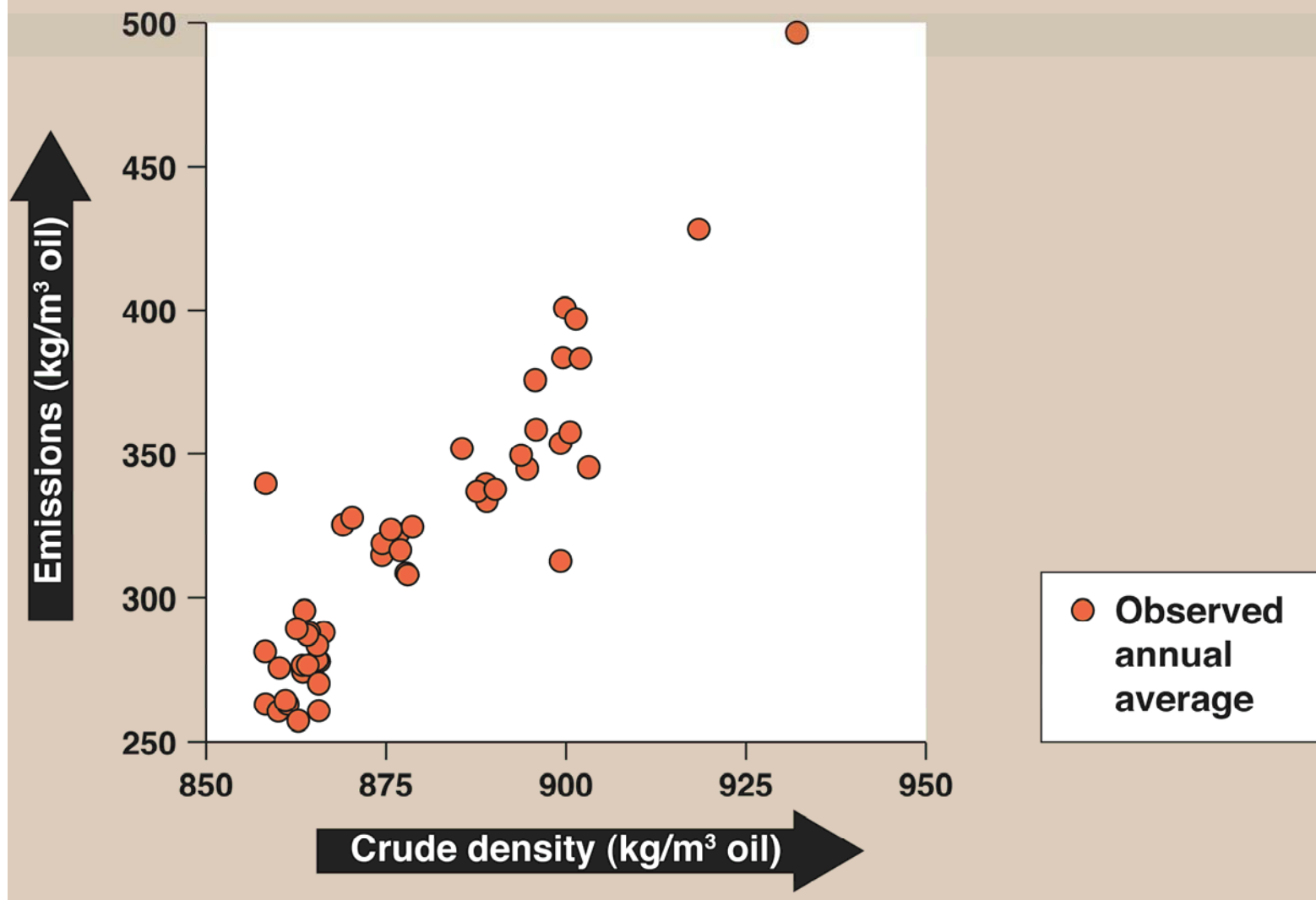


Chart from *Dirty Crude*; CBE Report No. 94-1. CBE, 1994.

Refinery CO₂ emissions v. crude feed density

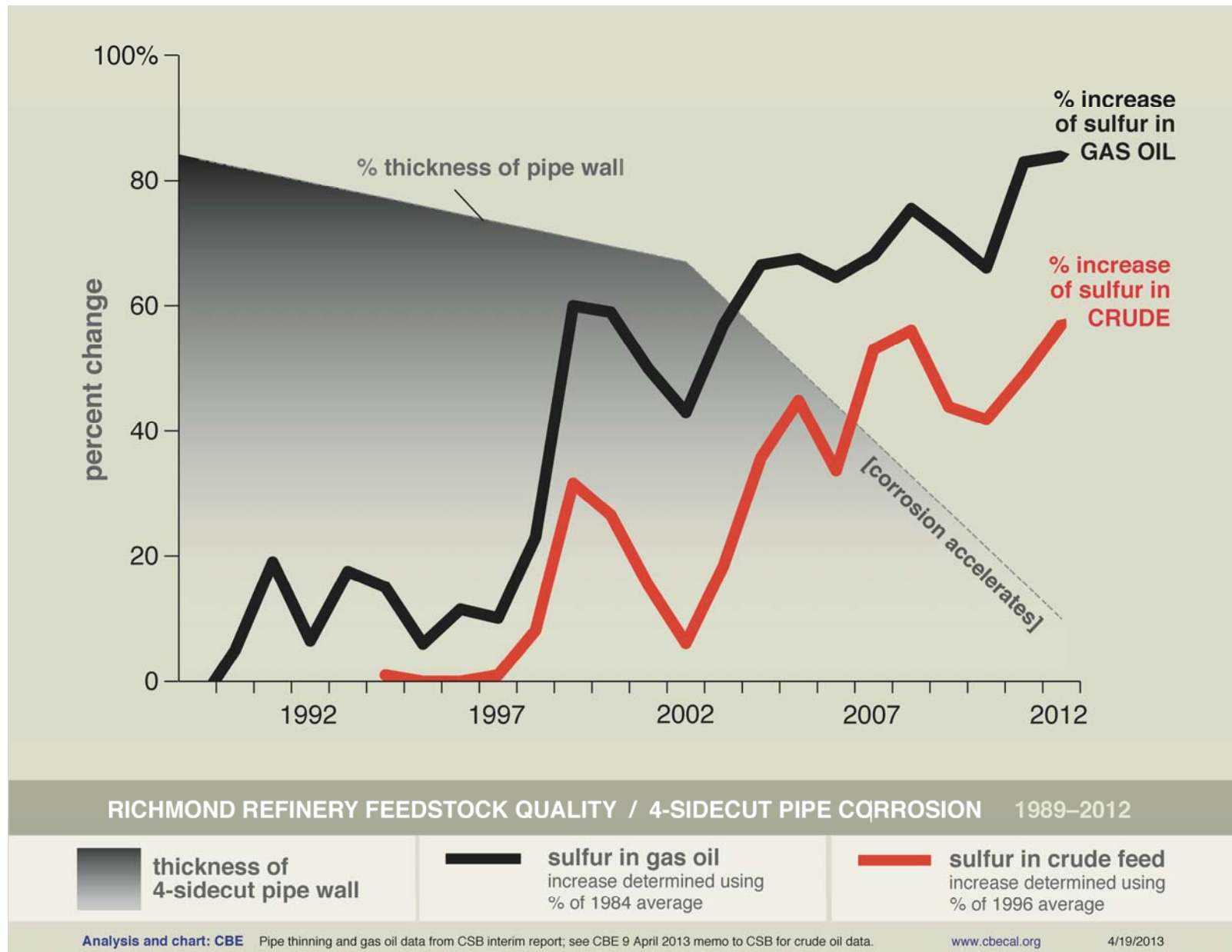


American Chemical Society (2010) & Union of Concerned Scientists (2011) data.

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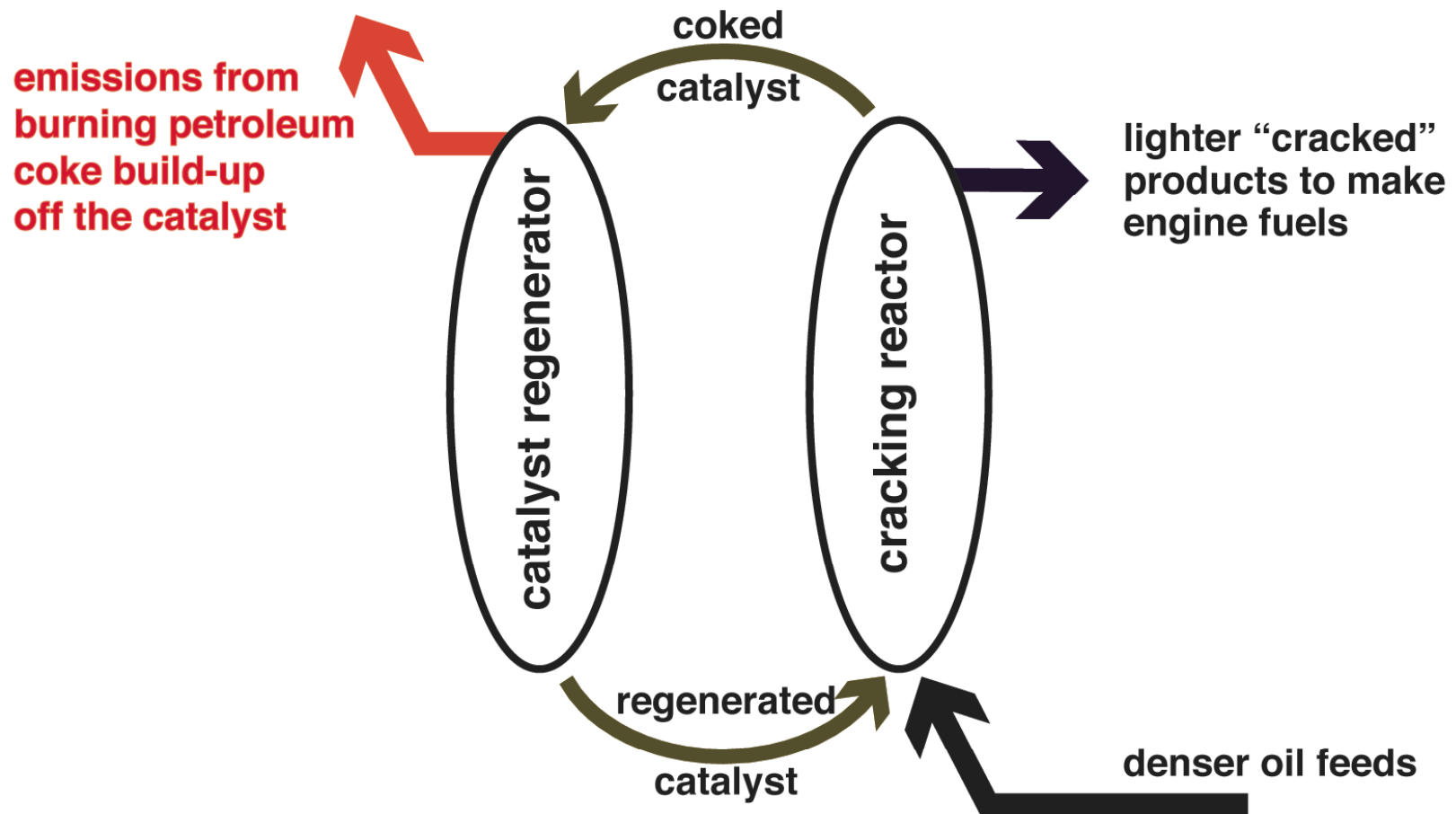


Shale oil deposits removed from pipeline

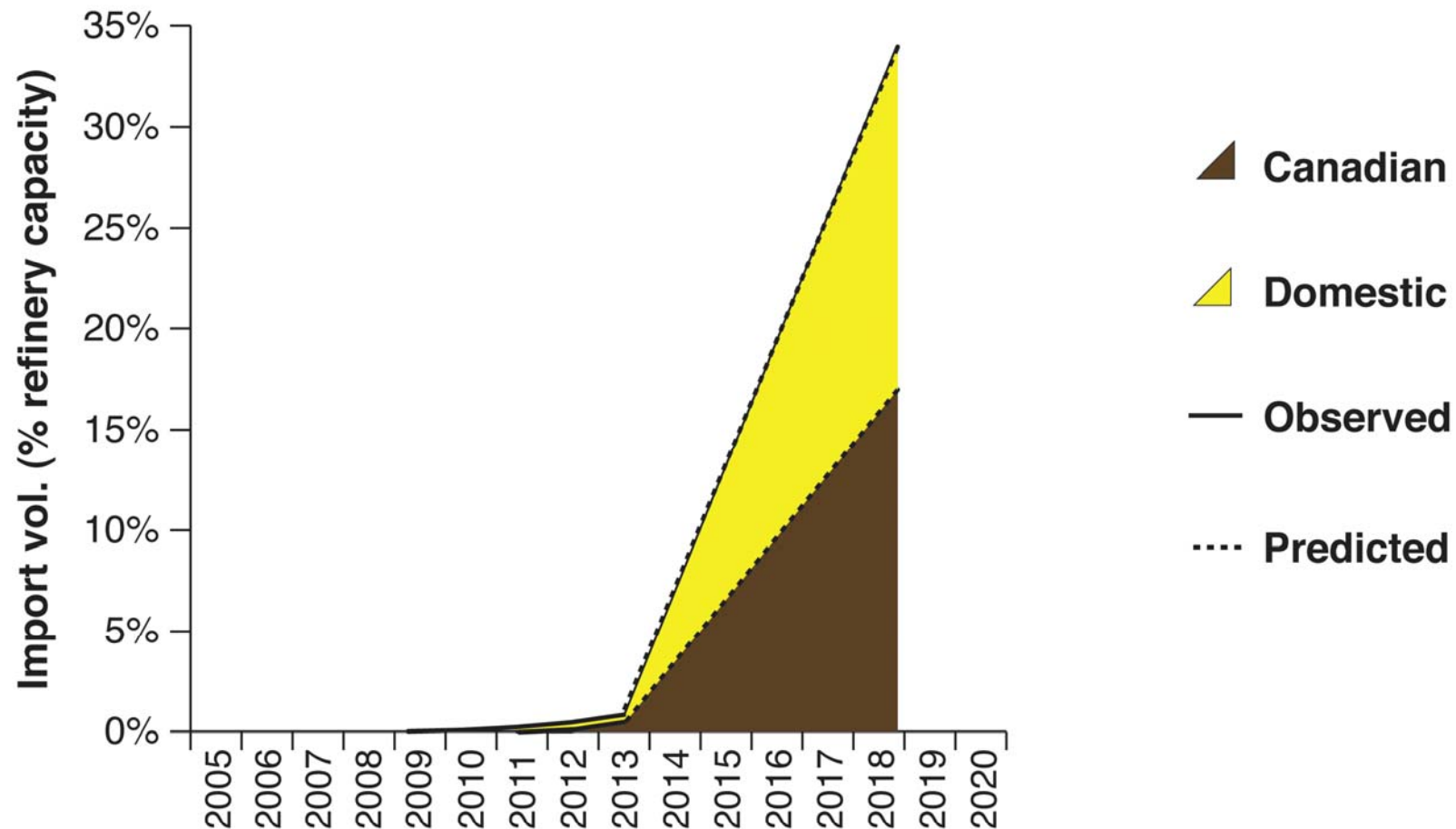
Potential hazards in refining shale oils include:

- **‘Waxy’ and scale deposits, plugging, flocculation, fouling, amine-chloride underdeposit corrosion, sulfidic corrosion, and (in blends with heavy oils) increased coke formation.**

(Source: <http://www.hydrocarbonprocessing.com/Article/3223989>)



Catalytic cracking of heavy gas oil creates and burns coke



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