



Case Study: The Richmond, Chevron Refinery Fire



Chemical Facility Safety in an Era of Climate Change: Training for Worker Participation and Community Engagement

April 8, 2013

NIEHS & UCLA LOSH

Mike Wilson, PhD, MPH

Chief Scientist

California Dept of Industrial Relations

mwilson@dir.ca.gov

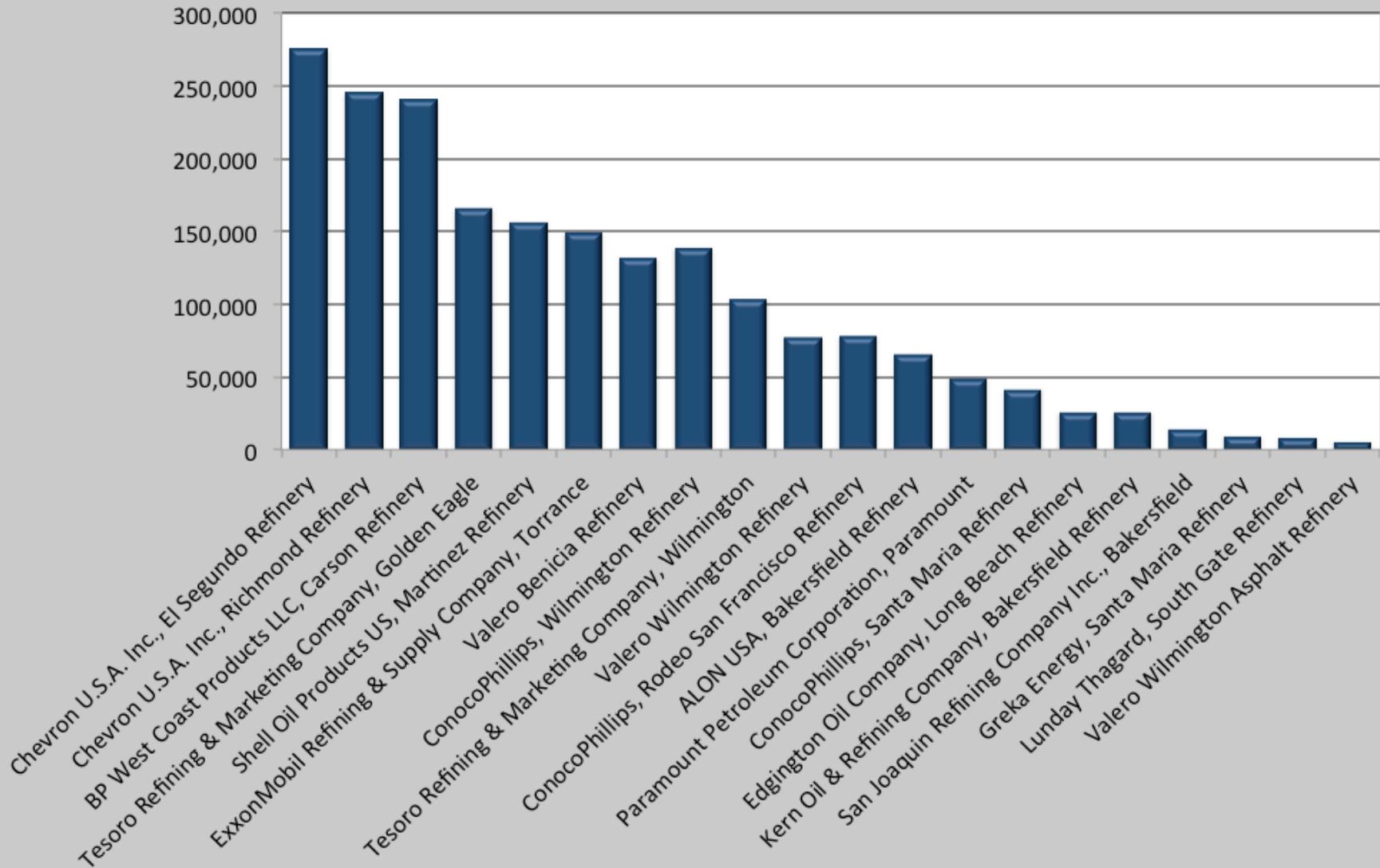
California's Oil Refineries & Terminals



- Number of major refineries: 14
- Refineries in 1980s: 32
- Other CA Hazardous Process Safety sites: ~1,900
- Crude oil refined per day: 2 million barrels
- Daily gasoline production: 45 million gallons (5,600 tanker trucks)
- Daily diesel production: 14 million gallons
- After Texas, California is nation's 2nd largest oil refining state.

Source: Western States Petroleum Association (WSPA) 2013

Barrels/day



Of top six producers, 3 are in Bay Area, 3 in LA area. Chevron Richmond (#2) processes 250,000 barrels of gasoline and diesel fuel per day.



Like most refineries in California, the 2,900 acre Richmond Chevron Refinery is co-located with low income urban neighborhoods.



First step in refining: Crude oil is cleaned and heated in the crude unit before entering a distillation tower, where it is boiled, producing jet fuels, diesel and fuel oil that are sent through “side-cut” pipes to other sections of the refinery.



August 6, 2012: A catastrophic failure occurs at an 8" side-cut pipe on distillation tower #4, containing fuel oil at 640 degrees F

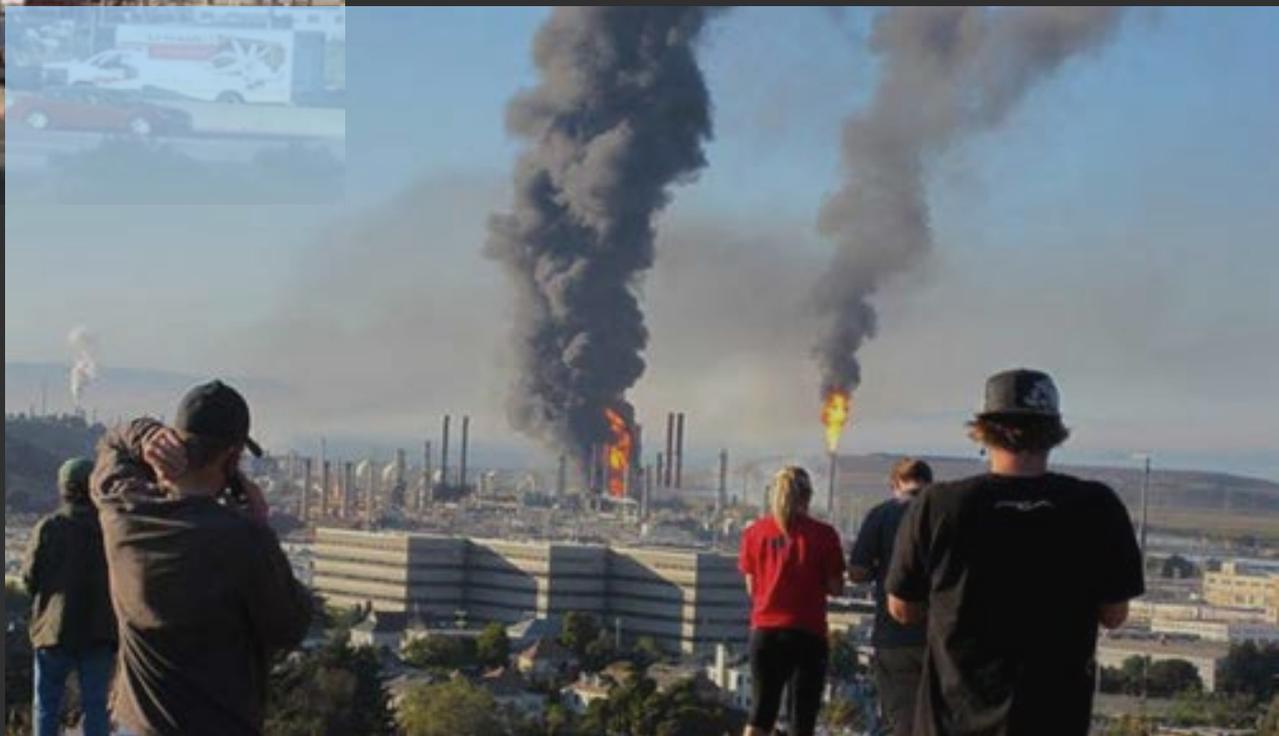
The pipe failure produced a massive hydrocarbon and steam vapor cloud, which ignited after about 90 secs.

Hydrocarbon and steam cloud



Ignition









Video had been removed

U.S. Chemical Safety Board Animation of Aug 6, 2012
Chevron, Richmond Incident



- Technical cause: Sulfidation corrosion
- Workers: 19 escaped vapor cloud by ~45 seconds
- Community: 15,000 local residents sought medical attention
- Public expenses: Fire, police, public health services
- Public transit: BART shut down outside Richmond station
- Agencies: Public communications break-downs, lack of coordination

Various Outcomes



- Air District: \$25,000 fine
- Cal/OSHA: ~\$1 million citations
- District Attorney: \$2 million criminal misdemeanor, probation
- Chevron medical reimbursements paid to residents: \$10 million
- U.S. EPA: Violations in process
- City of Richmond: Lawsuit pending
- Private actions: Lawsuits pending

Hearing Were Held: Joint Senate-Assembly Field Hearing in Richmond





© Eric Slomanson | slomophotos.com

A Social Movement Emerged



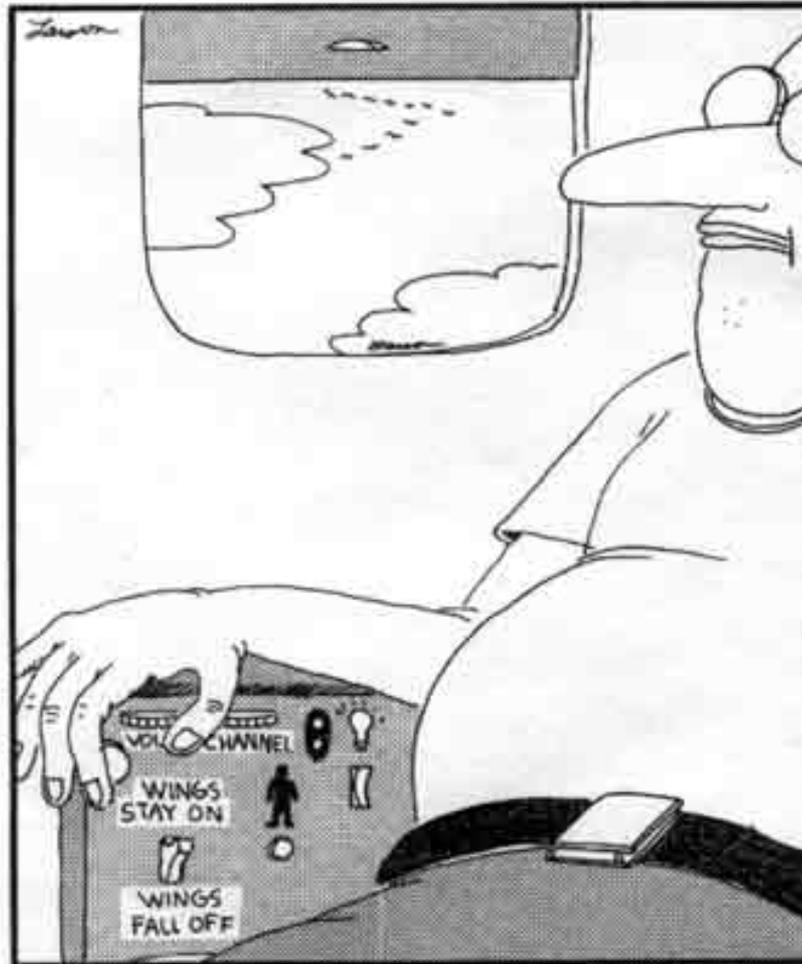
Streets Were Blocked



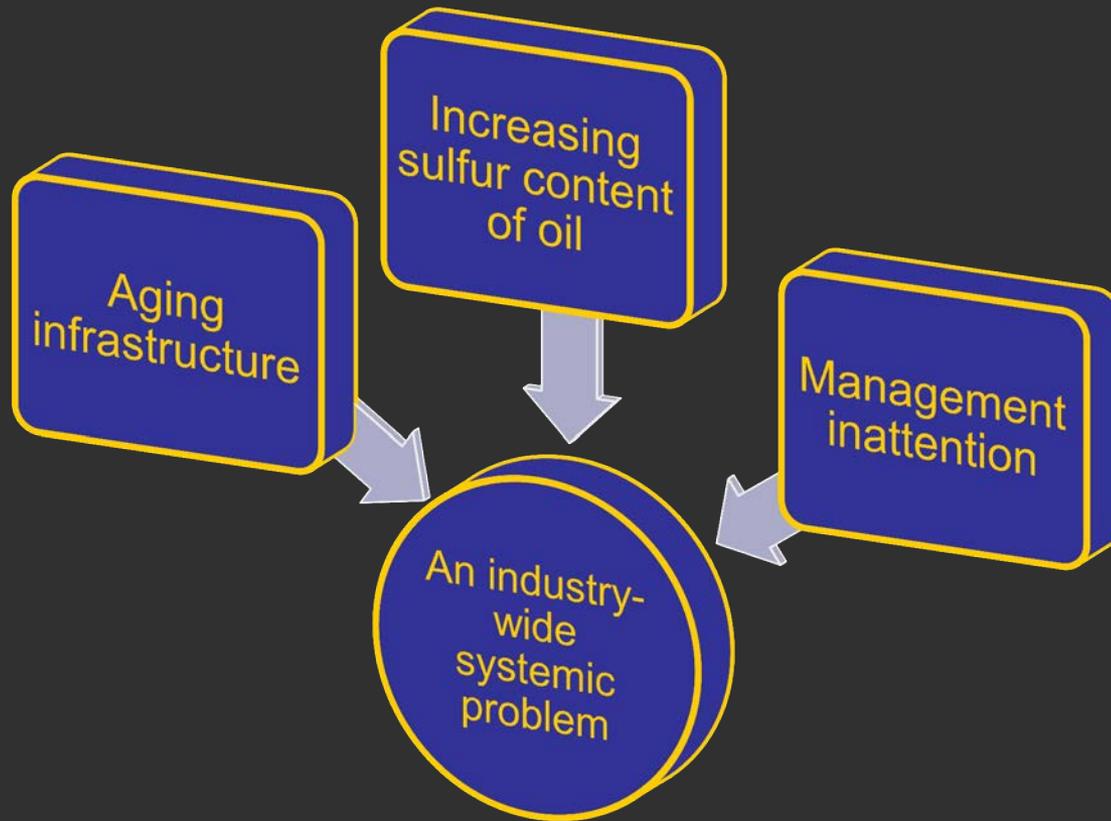
A Refinery Action Collaborative was organized, Nov 15, 2012 with USW Local 5, USW International, CBE, APEN, BlueGreen Alliance, NRDC, LOHP

A Question was Posed:
Was the incident:

- 1) An unpreventable accident, or
- 2) an indicator of deeper, systemic problems in the California refinery sector?



Fumbling for his recline button,
Ted unwittingly instigates a disaster.



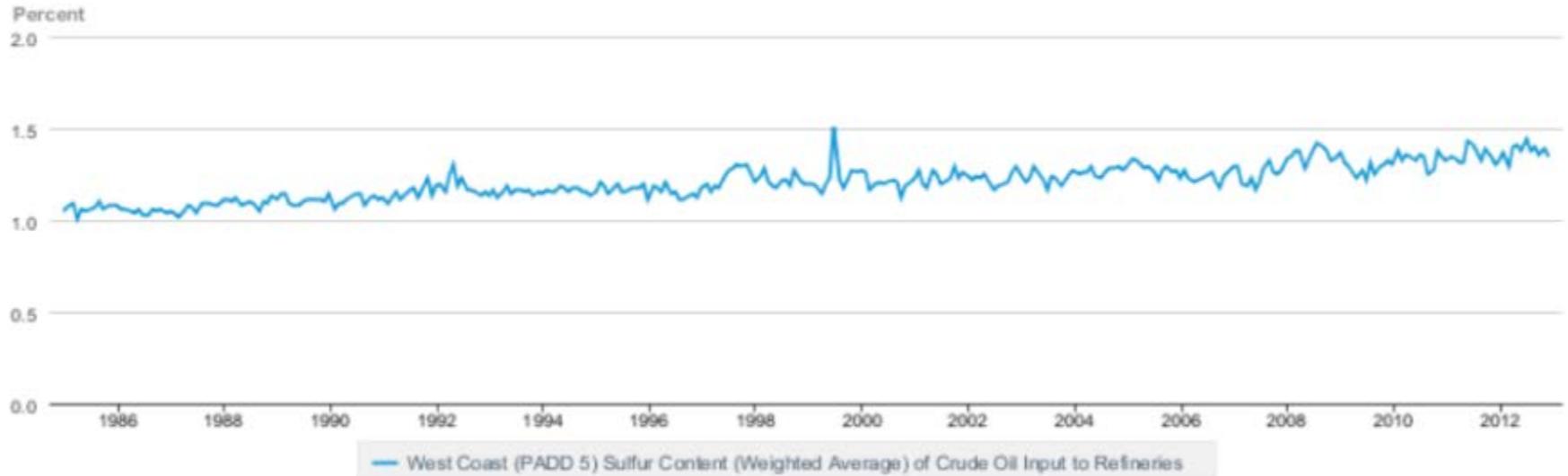
At least three indicators of an industry-wide systemic problem have become evident

Increasing sulfur content of oil



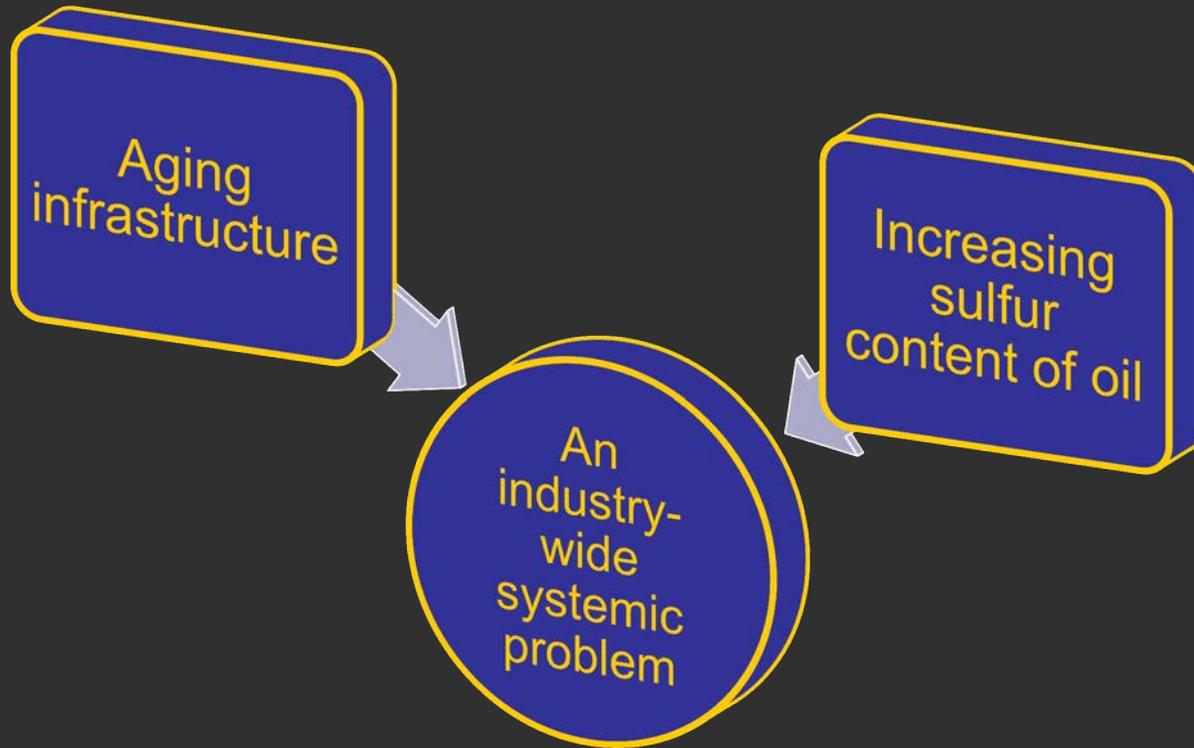
An industry-wide systemic problem

West Coast (PADD 5) Sulfur Content (Weighted Average) of Crude Oil Input to Refineries



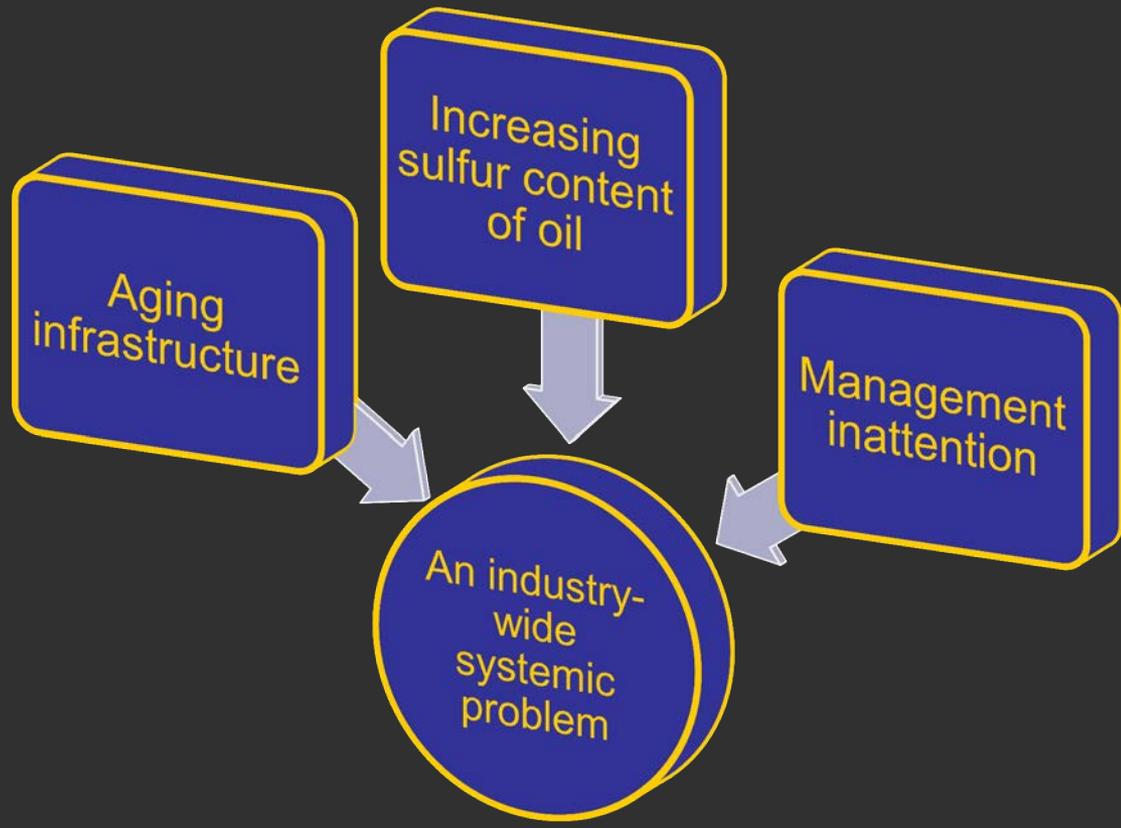
Source: U.S. Energy Information Administration

West Coast Sulfur Content (Weighted Average) of Crude Oil Inputs to Refineries rose from about 1% to 1.5% between 1996 and 2012





The Richmond Refinery was established in 1902. Carbon steel piping installed in the 1970s is susceptible to corrosion from hydrocarbons containing sulfur.





U.S. Chemical Safety Board Hearing,
Richmond, Chairman Raphael
Murre-Eraso



U.S. Chemical Safety Board:

Management inattention:

Chevron management ignored at least six recommendations between 2002 and 2012 by Chevron's own technical personnel to upgrade the metallurgy and/or increase pipe inspections, including at the 4-sidecut piping where the failure occurred.



U.S. Chemical Safety Board

Management inattention:

Catastrophic failures due to sulfidation corrosion were occurring regularly in the refinery industry, including:

- Chevron's El Paso, Texas 1988
- Chevron's Pascagoula, Mississippi 1988 & 1993
- Chevron's Salt Lake City, Utah 2002
- Chevron's Richmond, California 2007
- Silver Eagle in Woods Cross, Utah 2009
- Regina, Saskatchewan, Canada 2011
- BP Cherry Point, Washington 2012



U.S. Chemical Safety Board

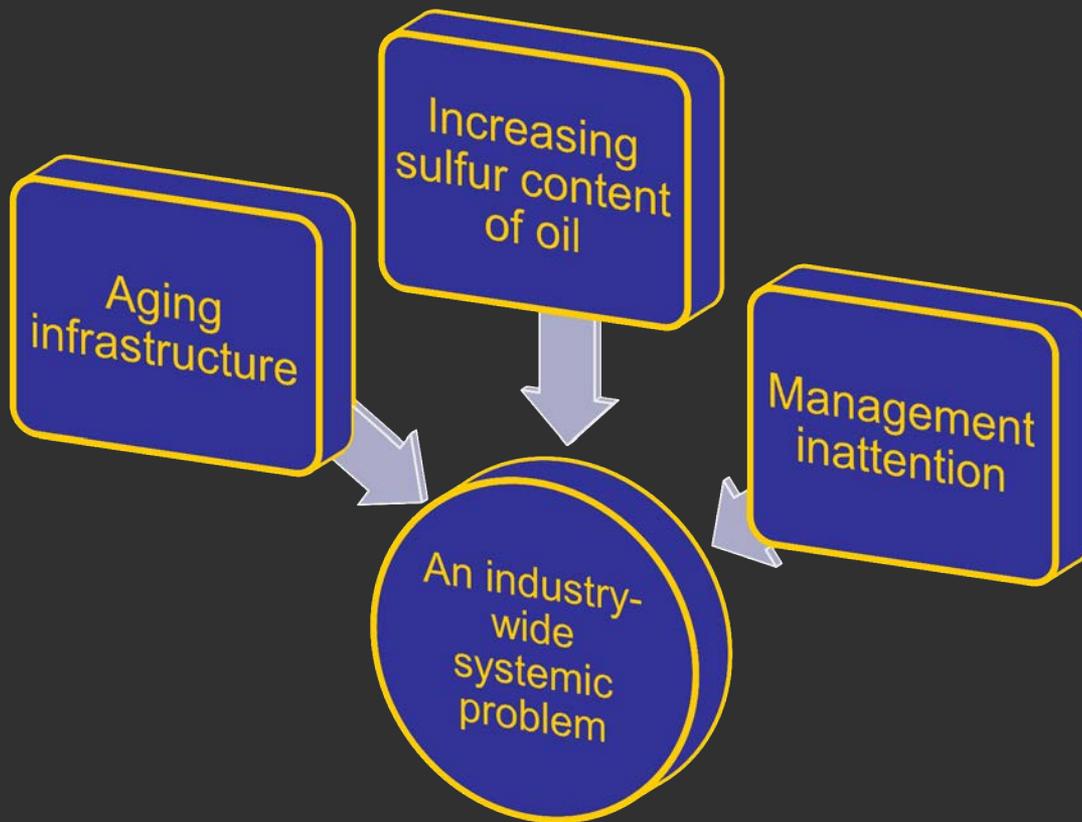
Management inattention:

The recommended inspection program for high-risk piping “was not implemented at Richmond; therefore, the thin-walled, low silicon 4-sidecut piping component remained in service until it catastrophically failed on August 6, 2012.”

Chevron’s reliance on over 100 temporary “clamps” on hydrocarbon and other process piping components “raised serious questions about its mechanical integrity program.”

A continuing indicator:

In the 5 months after the August 6, 2012 Chevron fire and January 14, 2013, the California refinery industry reported 20 to 25 upset events to the U.S. Department of Energy, including fires, hydrogen sulfide releases, unexpected flare events, mechanical break-downs and others.



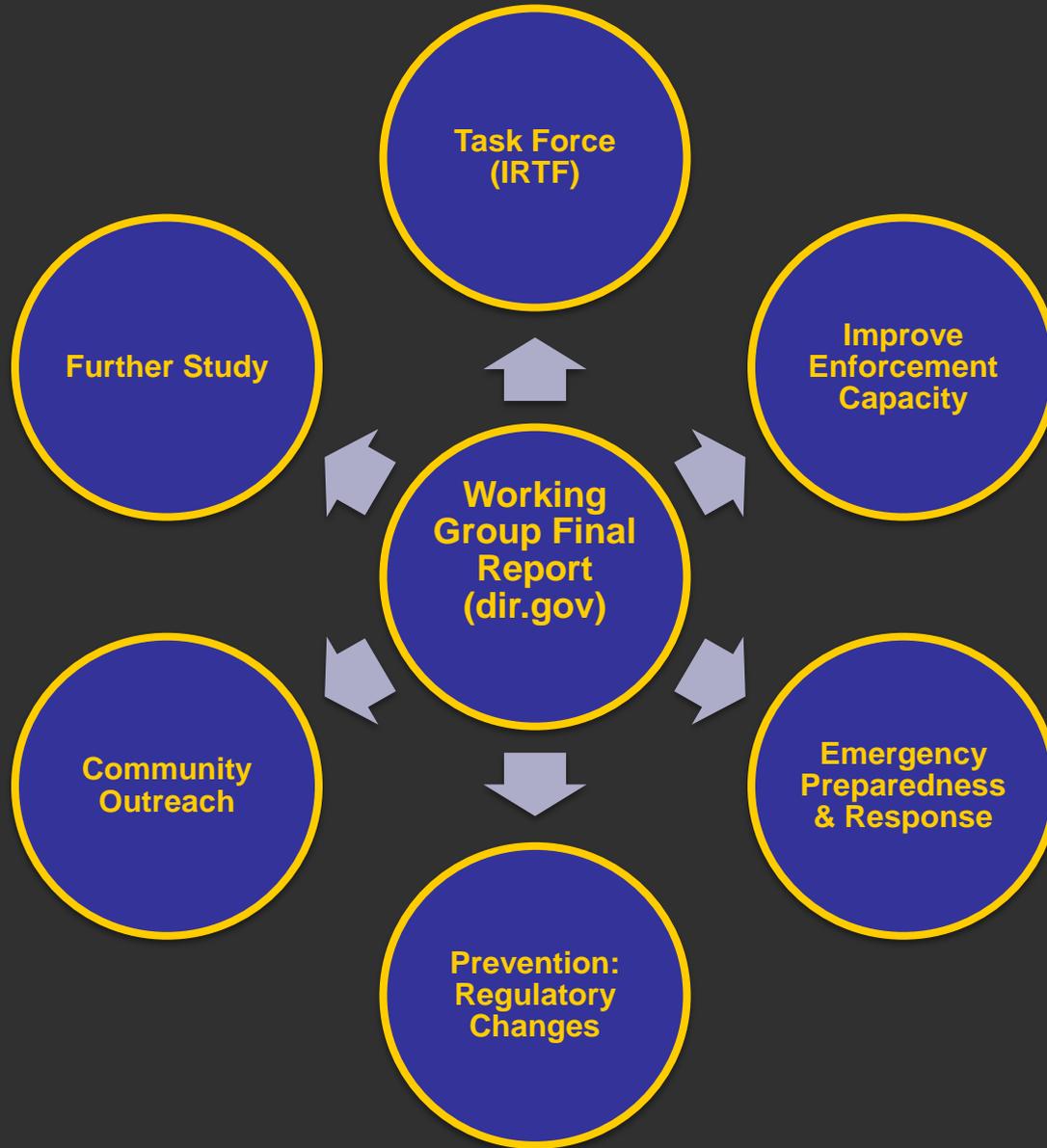
Systemic problems require systemic solutions.

Governor's Interagency Refinery Safety Working Group

- Governor Brown established the Interagency Refinery Safety Working Group following the August 2012 Chevron fire.
- Participating agencies and departments:
 - California Environmental Protection Agency (Cal/EPA); Air Resources Board (ARB); Department of Toxic Substances Control (DTSC); State Water Resources Control Board (SWRCB)
 - Labor and Workforce Development Agency (LWDA); Department of Industrial Relations (DIR) Office of the Director; Division of Occupational Safety and Health (Cal/OSHA)
 - Governor's Office of Emergency Services (OES)
 - California Energy Commission (CEC)
 - California Technology Agency (CTA)
 - Department of Finance (DOF)
 - Department of Public Health (DPH)
 - Office of the State Fire Marshal (OSFM)

Governor's Interagency Refinery Safety Working Group : *Outreach & Fact-Finding*

- 15 outreach meetings in Northern and Southern CA with:
 - State and local agencies
 - Labor, community organizations
 - Refinery managers
 - Local and state fire agencies
- Evaluated Cal/OSHA investigative findings
- Evaluated U.S. Chemical Safety Board findings
- Evaluated Chevron's internal investigation
- Consulted with PSM experts



Governor's Interagency Refinery Safety Working Group

Key prevention finding

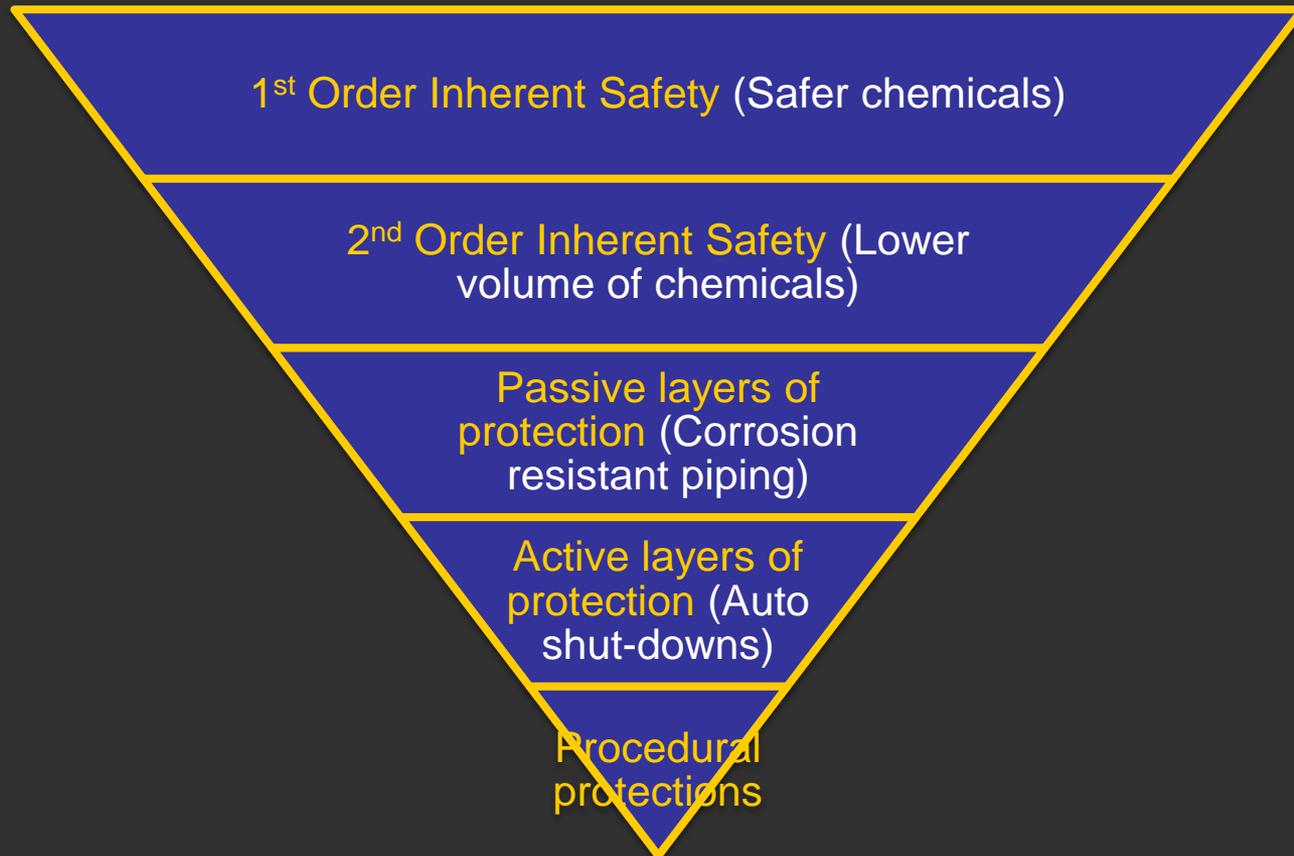
“The PSM regulation and the CalARP program do not explicitly authorize Cal/OSHA or the CUPAs to evaluate and enforce the following aspects of process safety:

- inherently safer systems;
- use of indicators to evaluate performance;
- the impact of human factors on safe operations;
- management of change when applied to organizational changes;
- damage mechanism hazard review as part of the standard process hazard analysis; and
- assessment of the safety culture at the facility”

(page 21)



Industry-wide systemic problems of corrosion, aging infrastructure and management inattention require solutions based on inherent safety in the hierarchy of controls







Thank you!