

District History with HF

- 33 years of safe operation
- In 1993, Valero and District entered MHF MOU
 - SCAQMD agreed not to ban if Valero installed ReVAP
 - Valero spent over \$230 million for the ReVAP project
- 2016 District initiated new MHF ban
- 2 ½+ year process reviewing the same information evaluated by the SCAQMD back in early 1990's and fully considered in SCAQMD's prior MOU and CEQA process

District CEQA review found MHF environmentally superior to Sulfuric

Hazardous Chemical Comparison

		<u>HF</u>	<u>Cl₂</u>	<u>NH₃</u>
Boiling Point	°F	67	-30	-28
Molecular Weight		20.01	70.91	17.03
Density	lbs/ft ³	0.072	0.18	0.045
Solubility in water	g/100cc	Infinite	1.46	89.9

- Physical properties of HF are similar to other hazardous industrial chemicals used in the Southern California
- In fact a number of properties result in less significant releases
 - Boiling Point – HF is higher than both Cl₂ and NH₃
 - Solubility – HF is infinitely soluble making water mitigation systems extremely effective in containing release
 - Volatility – Chlorine and ammonia are more volatile
 - Disassociation at warmer temperatures and becomes buoyant

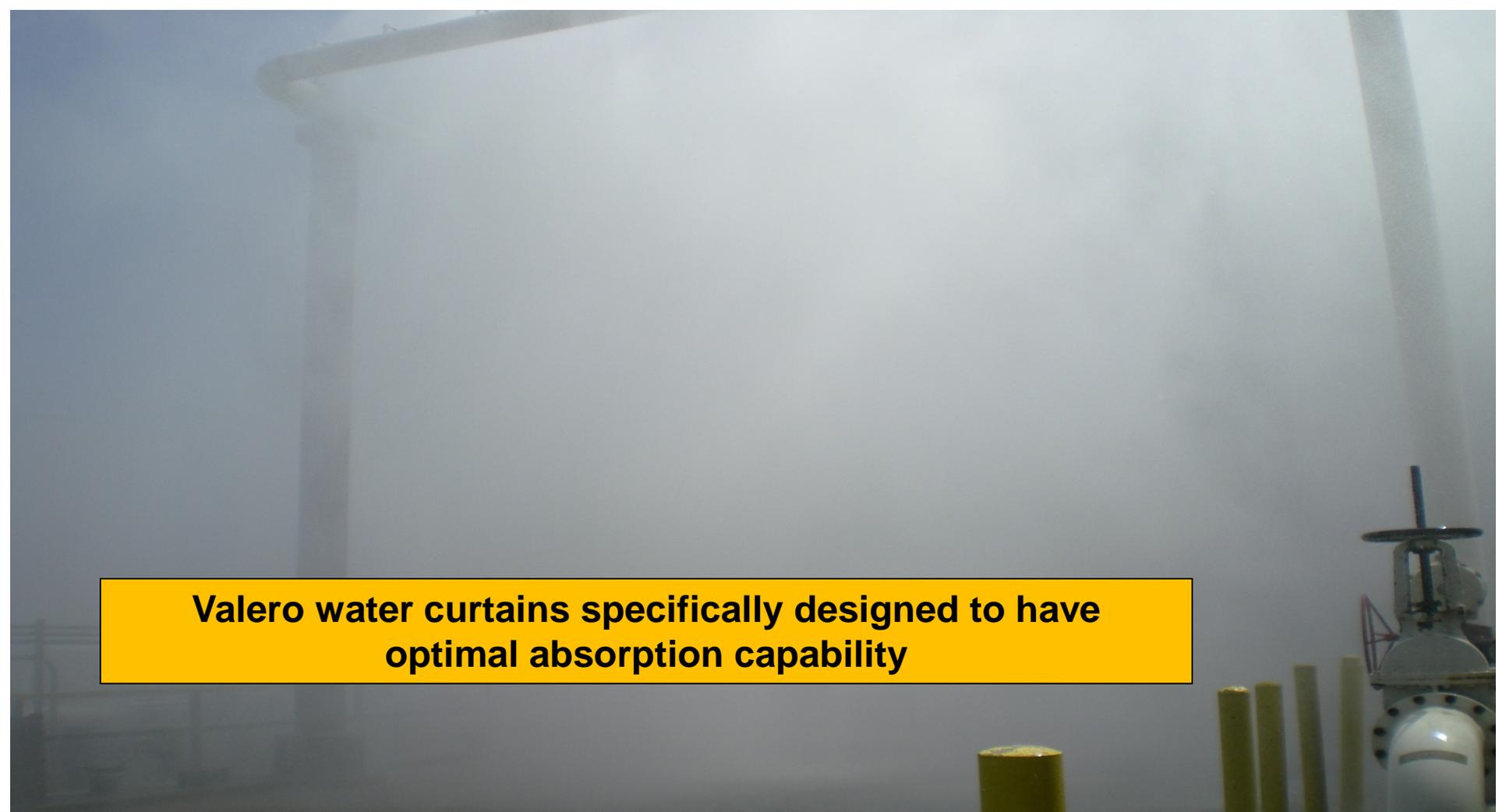
Unlike Chlorine (Cl₂) and Ammonia (NH₃) – HF can be contained with water

Relative Acute Exposure Limits Used by OEHHA

Chemical Name	Relative Acute REL
Arsenic and Arsine	1,200
Nickel and Nickel Compounds	1,200
Mercury (Inorganic)	400
Toluene Diisocyanates (2,4 and 2, 6)	120
Acrolein	96
Phosgene	60
Hydrogen Selenide	48
Sodium Hydroxide	30
Methylene Diphenyl Diisocyanate (MDI)	20
Polymeric Methylene Diphenyl Diisocyanate	20
Benzene	8.8
Chloropicrin	8.2
Vanadium Pentoxide	8
Hydrogen Sulfide	5.7
Formaldehyde	4.4
Nitric Acid	2.7
Ethylene Glycol Monomethyl Ether	1.7
Copper and Copper Compounds	2.4
Oleum	2
Sulfates	2
Sulfuric Acid	2
Ethylene Glycol Monoethyl Ether Acetate	1.7
Chloroform	1.6
Ozone	1.3
Chlorine	1.1
Benzyl Chloride	1
Hydrogen Fluoride	1

Office of Environmental Health Hazard Assessment (OEHHA)

Valero Water Curtains

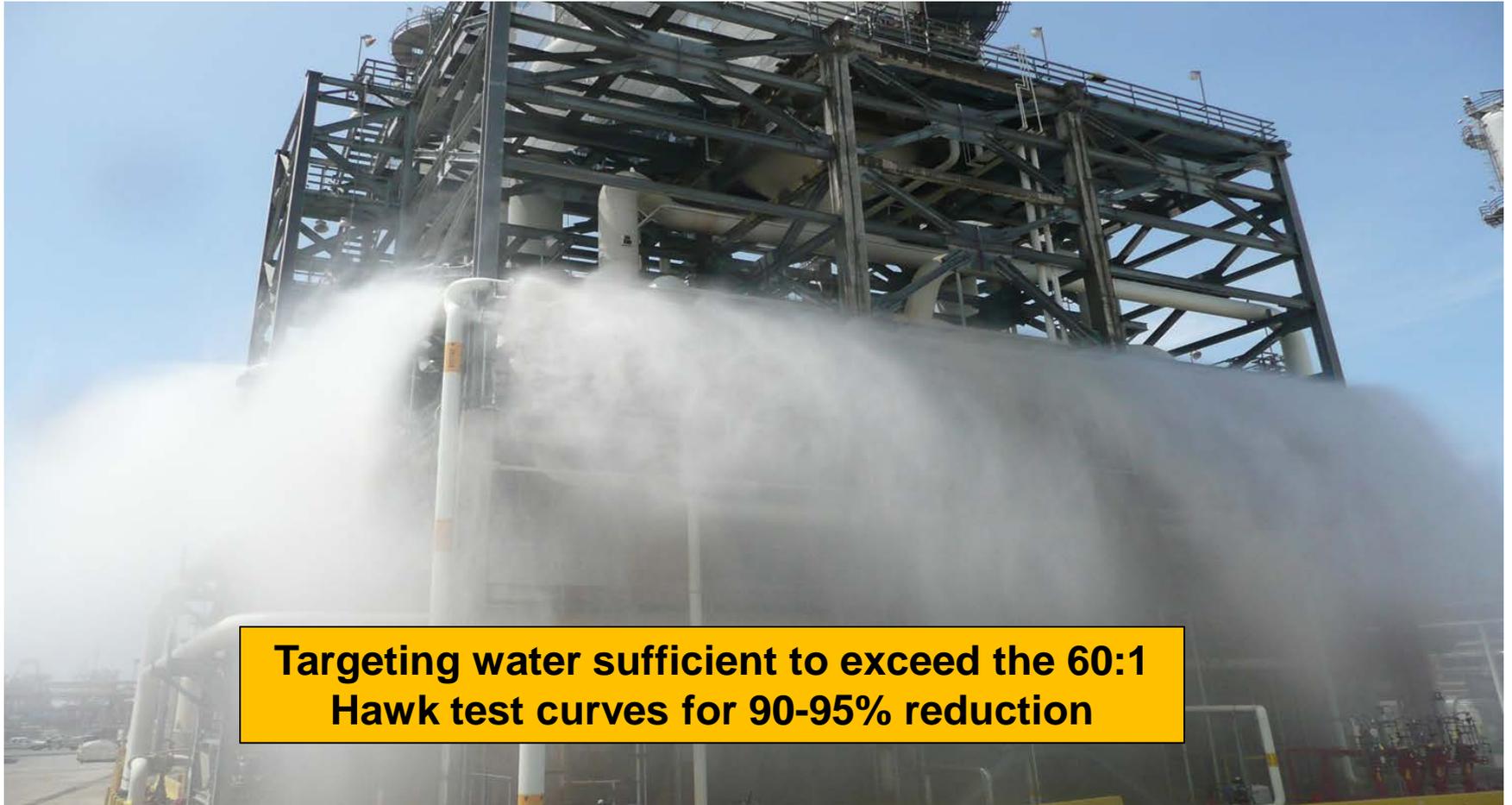


Valero water curtains specifically designed to have optimal absorption capability

Valero Water Curtains



Valero Water Curtains



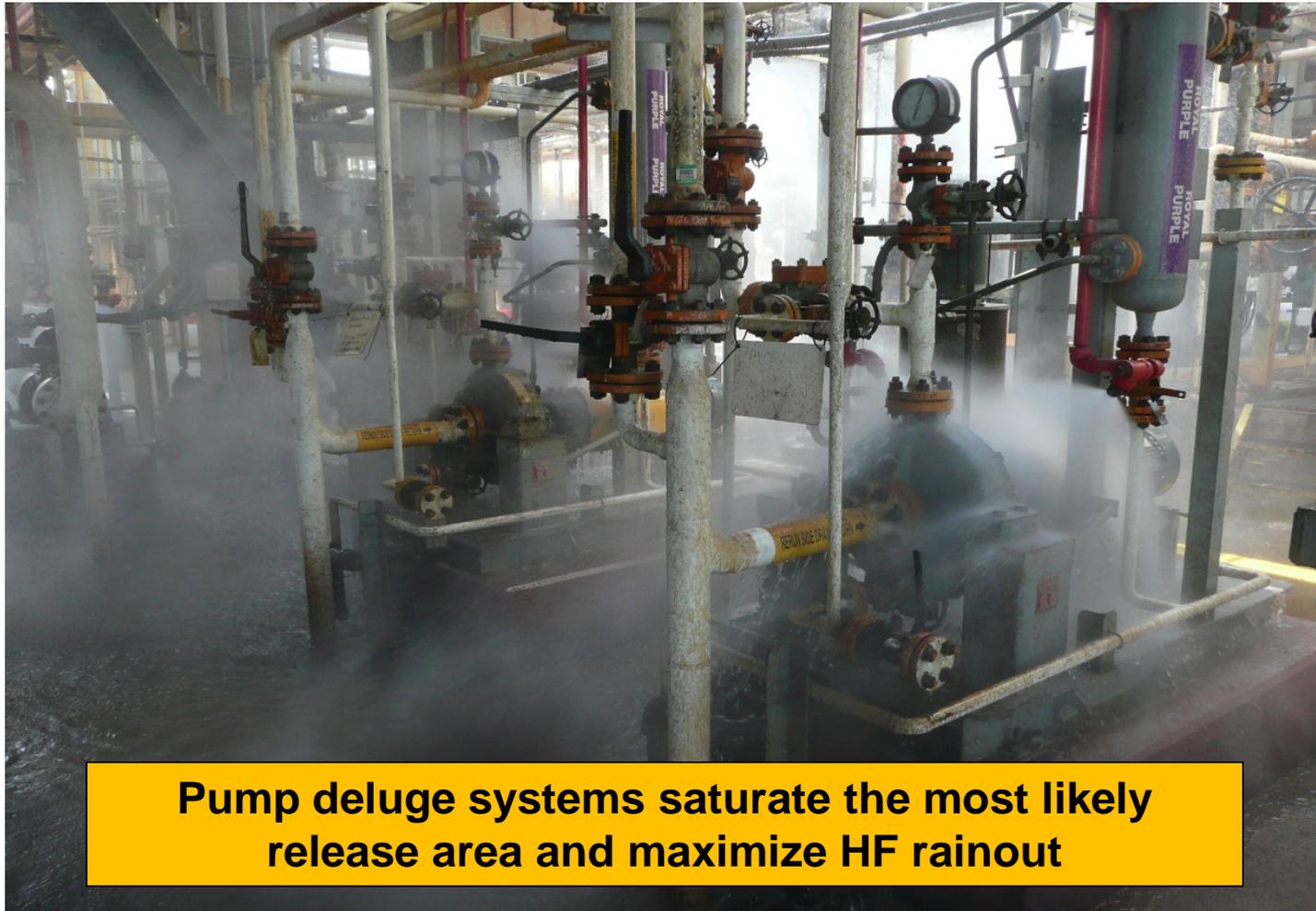
**Targeting water sufficient to exceed the 60:1
Hawk test curves for 90-95% reduction**

Valero Point and Shoot Water Cannons



**Multiple remotely controlled water cannons
engineered specifically for HF**

Valero Pump Deluge System



Valero's Existing Mitigations

- Comprehensive Mechanical Integrity Program
- Use of Acid Indicating Paint
- High Definition Surveillance Cameras / Control Room Monitor
- Point Sensors
- Emergency Remote Isolation Valves
- Emergency Remote Pump Shutdowns
- Uninterruptable Back Up Power Supply
- Emergency Generator
- Settler Inventory Management Baffle
- Multiple Water Curtains
- Remotely Activated Elevated Water Cannons
- Pump / Area Water Deluge Systems
- Use of Tandem Sealed or Seal less Pumps
- Rapid Acid Transfer System
- Remote Isolation of Truck Off Loading System
- Acid Cooler Barrier Shrouds

Valero's Proposed Additional Mitigations

- Additional Open Path Detection for HF
- Additional Point Sensors
- Additional high resolution cameras
- Installation of Flange Guards on all HF service flanges
- Automatic Activation of the Water Curtain
- Installation of Additional Barriers and momentum breakers for rainout
- Installation of an engineered debris grid

Performance Standard

- Positions we believe the Staff and Valero have in agreement:
 - **Release Scenarios**
 - 4 highest potential consequence (but improbable) releases
 - **Model** – EPA PHAST and option to use 3D modeling if necessary
 - Qualified 3rd party - ABS
 - Credit for all mitigations
 - **Water Mitigation Performance**
 - Hawk study performance curves (water to HF ratios) on designed systems
 - Response times for automatic and manual systems
 - **Modifier**
 - Additive/momentum breakers performance – minimum 50% for combined according to public patent data
 - **Duration of Scenarios**
 - Quantities, remote isolation, dump systems and configuration limits release scenarios to less than 10 minutes
 - Adequacy of monitoring

Performance Standard

- Positions not agree:
 - **Modeled hole size**
 - **Receptor**
 - **Performance Target**
 - Agree on AEGl as the standard but not on which threshold level or dosing application

Industry Leak Probability Data

- Leaks begin gradual and not sudden
 - Certainly do not result in sudden holes greater than 1"
 - This is particularly true in high inspection regime services
- Benchmarking historical industry leak data – API RP 581 for Risk Based Inspection, 2016 3rd Edition

Equipment Type	Size	Hole Size	Frequency
Pipe	1"	1/8" – 1/4"	2.00E-05
Vessel (RX, Drums, etc..)	Undefined	1/8" – 1/4"	2.00E-05

- **Realistic leaks due to a Pipe Crack = 1/8" opening**
- **Realistic leaks due to a Pipe Corrosion = 1/4" opening**

1" release hole size is not probable or credible, however in MOU Valero offers to model 1" hole size

Appropriate Receptor Criteria

- AEGs are used for modeling potential **community** impacts
- Agencies that use AEGs for disaster or incident planning **use nearest residence**
- Nearest Residence is defined as the nearest **permanently occupied dwelling** consistent with EPA Risk Regulations
- International Risk Management Requirements such as UK HSE COMAH Safety Case and the Norwegian Protection Directives (both among the most stringent)
- Not work place or **industrial impact** standards
- Not ambient standards applicable under the Clean Air Act which operate off of **fence lines**

AEGs were developed around community impacts for all populations in residence and should not be applied to fence line or industrial locations

Appropriate Threshold Criteria

- AEGL 3 for HF provides
 - Any person (including sensitive populations) could be exposed to **170 ppm for up to 10 minutes before any potential** for life-threatening impacts could manifest
 - This is both a **duration** and **dose** standard
 - The standard is set very conservatively by the US EPA for acute exposure
 - AEGL 3 is typically calculated as an **average exposure** threshold over the duration of the exposure
 - AEGL 3 is designed for very low probability events, because to use more restrictive levels for events that are never probable would result in an irrational allocation of emergency response resources
 - Use of dose without duration significantly tightens the standard

AEGL 3 170 ppm is the correct standard

Effects of Physical Structures

- Refinery vessels and equipment will impede cloud travel significantly reducing the distance of a release
- Structures outside the refinery property boundary will have the same reduction effect (warehouses, transport containers, etc.)
- Waterways



A Chlorine Leak from a Railcar Demonstrates the Effect Physical Structures Have on a Toxic Cloud's Speed of Travel

Wilmington Property Boundary & Surrounding Area



Representations are General Approximations and Not Absolute Boundaries

Valero Ready

- Valero has proposed and is ready to enter an Addendum to our MOU:
 - Commit to enhanced controls
 - Commit to model top (but improbable) potential releases
 - AEGL 3 170 ppm
 - Nearest permanent residence
 - 3rd Party using EPA PHAST 2018 Dynamic Model
 - Design performance for mitigations and additive
 - Commit to other provisions consistent with our discussions with Staff