

U.S. Chemical Safety and Hazard Investigation Board



CSB Public Meeting
ExxonMobil Refinery Explosion
Torrance, California
January 13, 2016



Agenda

- **Board Opening Remarks**
- **Statements from Elected Officials**
- **Investigation Team Presentation**
- **Board Questions to Team**
- **Torrance Refinery Action Alliance**
- **Break**
- **PSM Panel**
- **Board Questions to Panel**
- **Public Comment**
- **Closing Comments**



Board Opening Remarks



Statements from Elected Officials



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Investigation Team Presentation



Investigation Presentation

- **Background and Process Description**
- **Incident Description**
- **Modified Hydrofluoric Acid Near Miss and Off-site Consequences**
- **Key Issues**
- **Path Forward**
- **Obstacles**



Background and Process Design



Torrance Refinery History and Statistics

3 Million Dollar Refinery to Go Up Here Immediately

General Petroleum Announces Construction of First Units of New Plant in Torrance; Surveyors Now at Work

Immediate construction of the first two units of its three million dollar refinery at Torrance was announced yesterday by the General Petroleum Corporation, subsidiary of the Standard Oil Company, of New York.

Surveyors were at work today on the company's 1000-acre site here and ground for the new units and additional storage will be started at once.

The immediate program of building calls for construction of a new 30,000 barrel refinery and an addition of 1,200,000 barrels storage on the site. The expenditure will aggregate \$2,800,000. The new refinery will consist of two distillation units. The additional storage will comprise nine new tanks, each with a capacity of 134,000 barrels.

The new refinery at Torrance will be in operation by Feb. 15, it is anticipated.

Construction of the refinery is in line with the company's announced policy of building its huge ten million dollar plant by gradual stages. The company's great refinery at Vernon will eventually be replaced by the larger plant at Torrance. When the Torrance units are all in operation several thousand men will be employed.

Commenting on the G. P. announcement the California Oil Worker of this week says:

"Two years ago the G. P. purchased 500 acres to be used as a refinery site and tank farm at some future date. The plan at that time was to remove the Vernon refinery to the new concentration point. The unexpected influx of new fluid production from the two big fields of Los Angeles Basin has anticipated this move by several years, and a complete new refinery will be built instead.

"The work to be undertaken at the present time will include two crude distillation units with a total capacity of 30,000 barrels per day, with necessary run-down tanks, boilers, gasoline treating apparatus, pump houses, and office buildings. The plant will be completely equipped with foam fire protection.

"The program will call for an expenditure of about \$3,000,000.

"In addition to the refinery plans, contracts have been let for the erection of nine 134,000-bbl. steel tanks to be erected on the refinery site to supplement the four 30,000-bbl. tanks already in place. These 134,000-bbl. tanks establish a new record in point of capacity for steel tanks on the Pacific Coast. Heretofore, 100,000-bbl. tanks have been the limit in capacity. This will give the G. P. an additional storage capacity of 1,200,000 barrels, and very likely additional tankage will be erected shortly after the first of the year.

"According to present plans the new refinery will be in full operation by Feb. 15, 1929. This will be in time to assist in handling the expected increase in production resulting from completion of the 50 deep-zone wells the General Petroleum is now drilling in the Santa Fe Springs and Signal Hill fields."

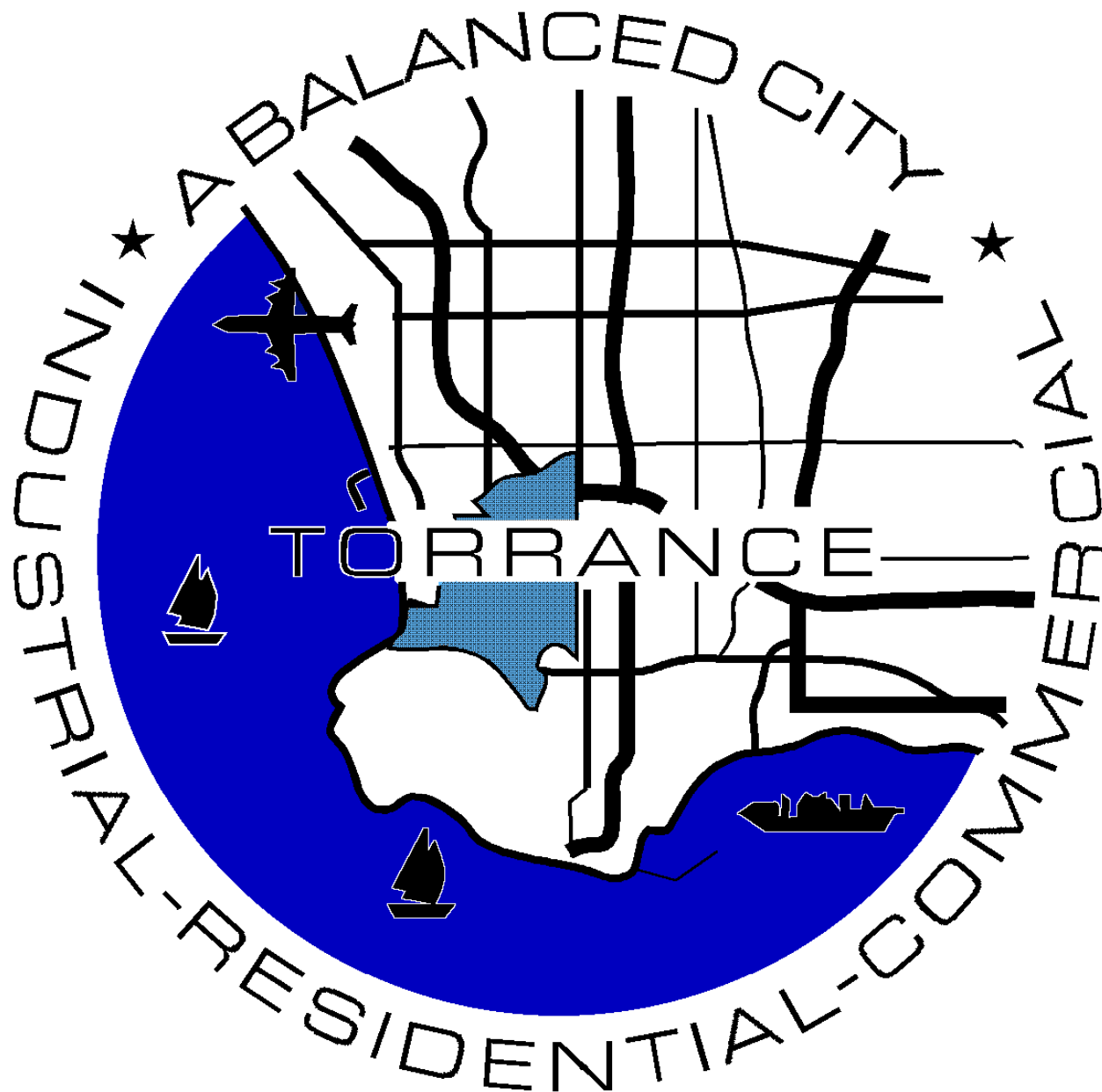
Refinery was constructed in 1928-29

The Torrance Refinery represents about 1/5th of southern California's fluid catalytic cracking capacity





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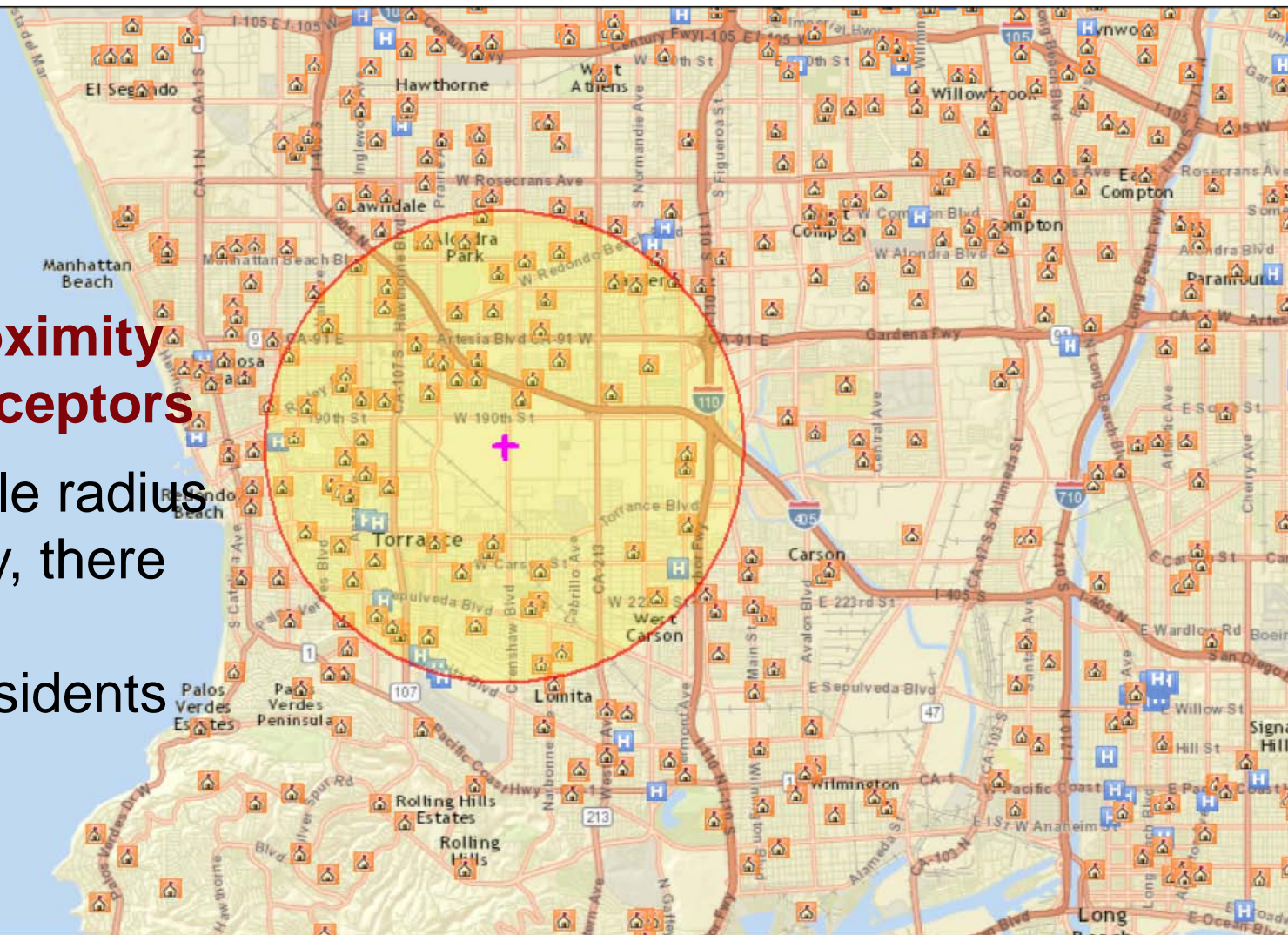




Refinery Proximity to Public Receptors

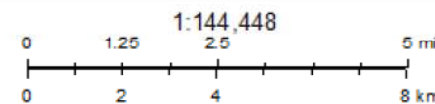
Within a 3-mile radius of the refinery, there are:

- 330,000 residents
- 71 schools
- 8 hospitals



January 4, 2016

- Digitized Point
- Hospitals
- Buffer Area
- Schools

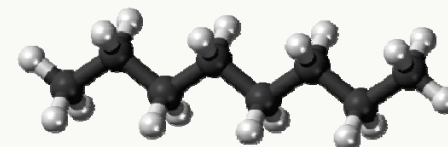
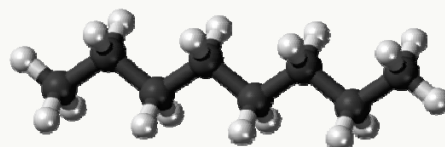
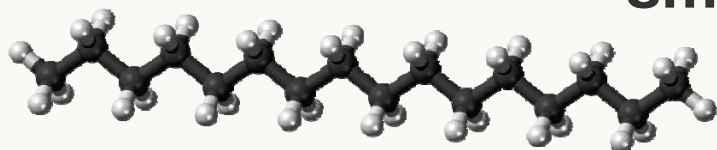


Sources: Esri, HERE, DeLorme, USGS, Intermap, Incorem P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



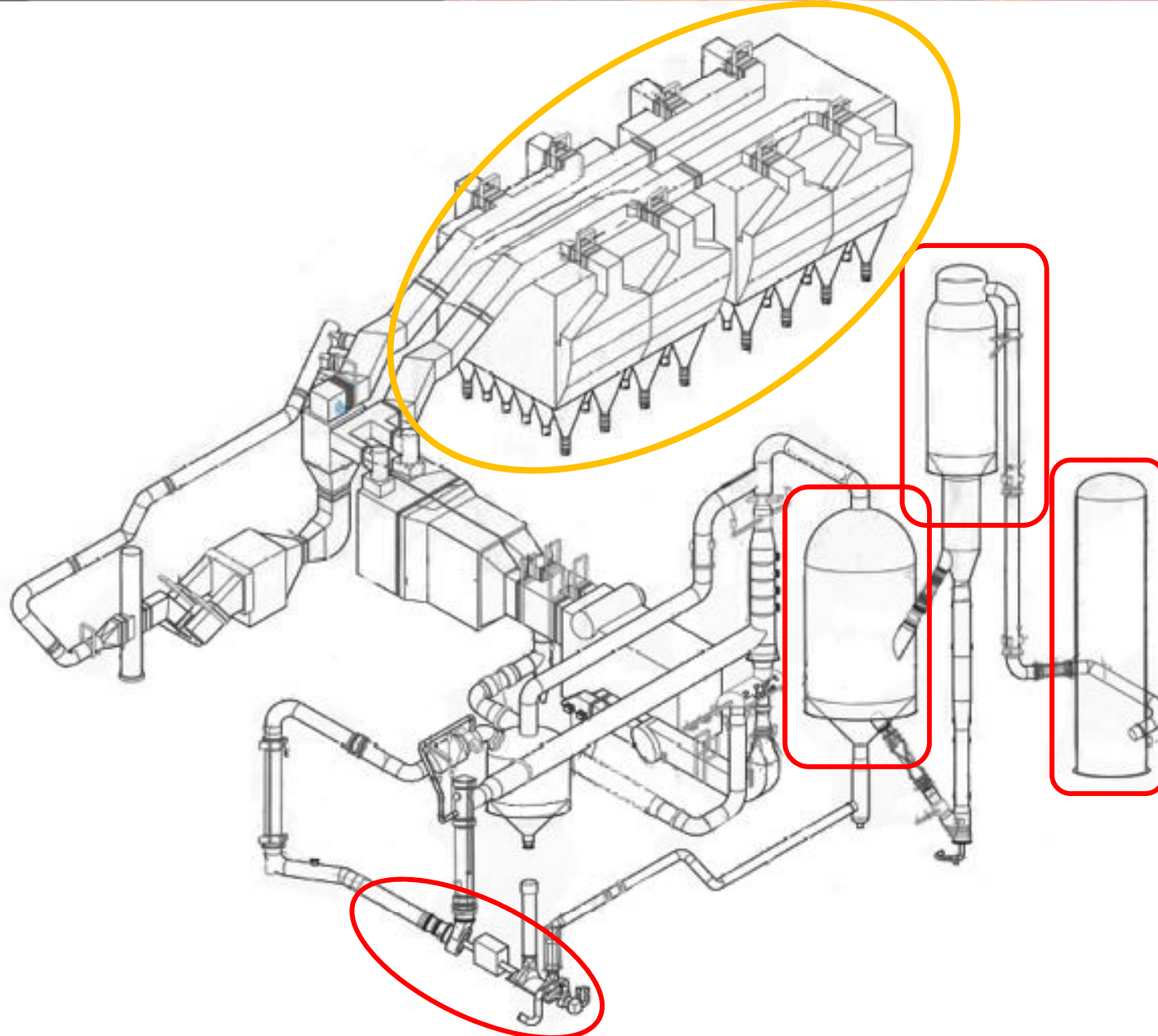
Fluid Catalytic Cracking (FCC) Unit

The FCC converts low-value, thick oil to higher value gasoline by “cracking” the large molecules apart into smaller molecules



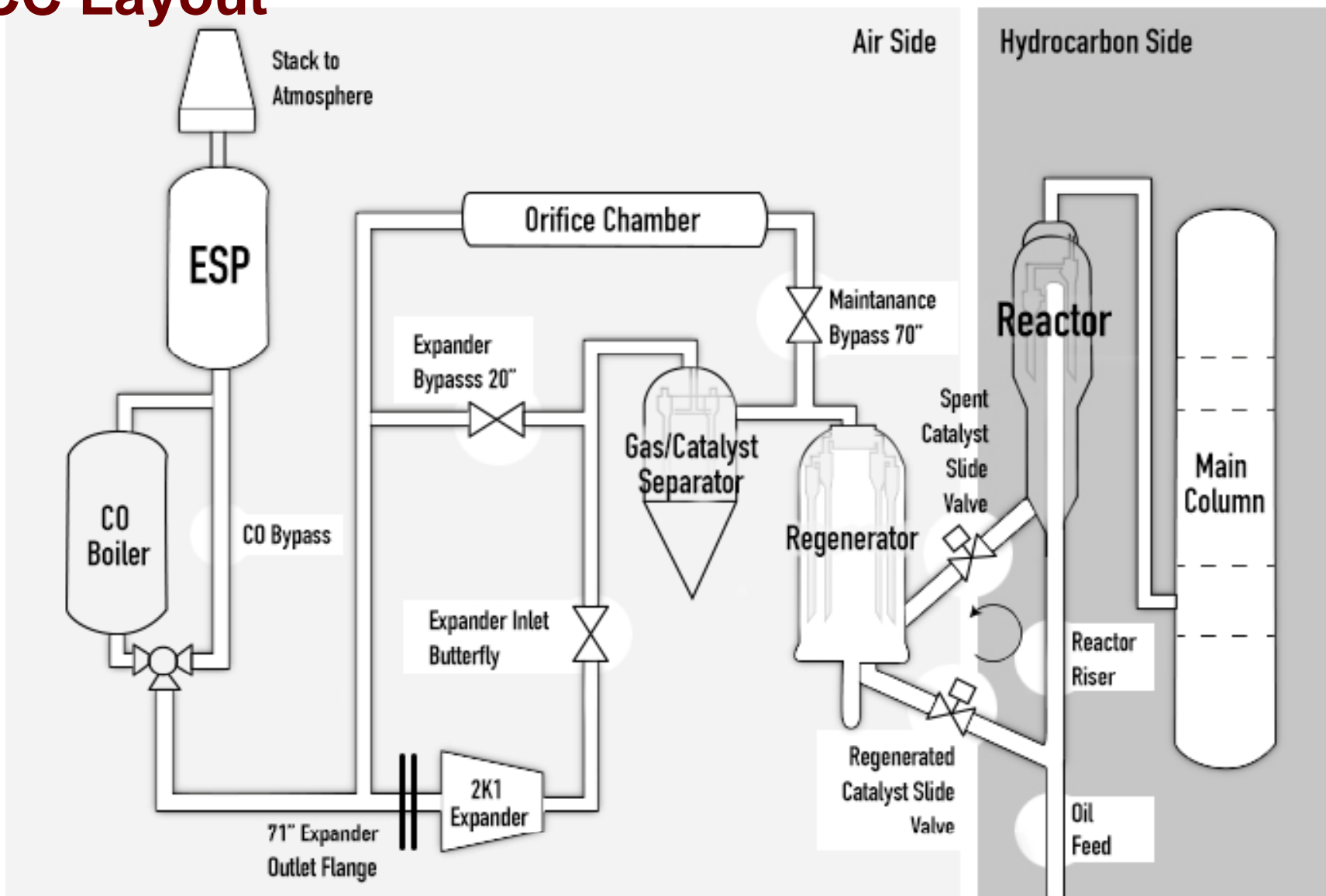
Catalytic Cracking







FCC Layout



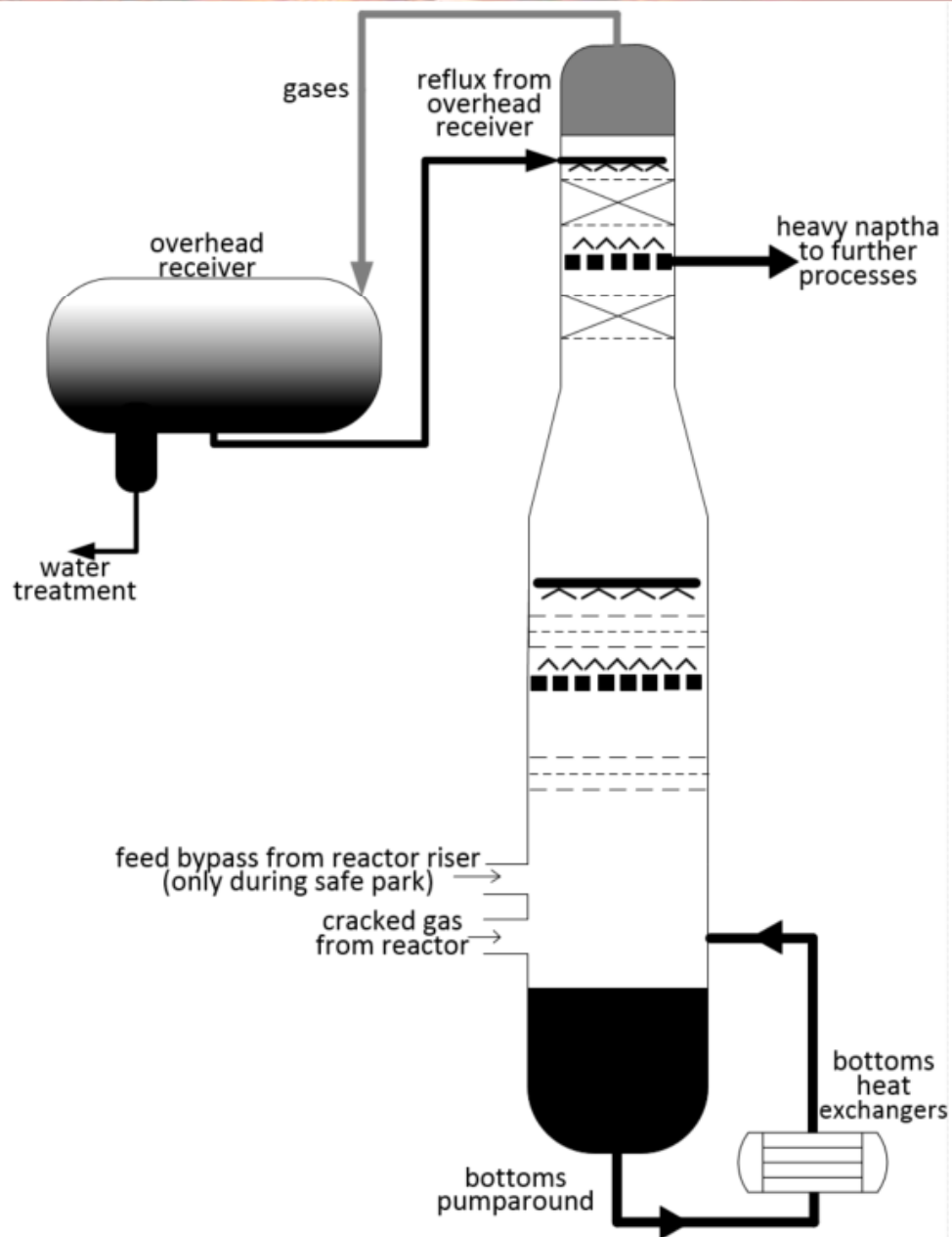


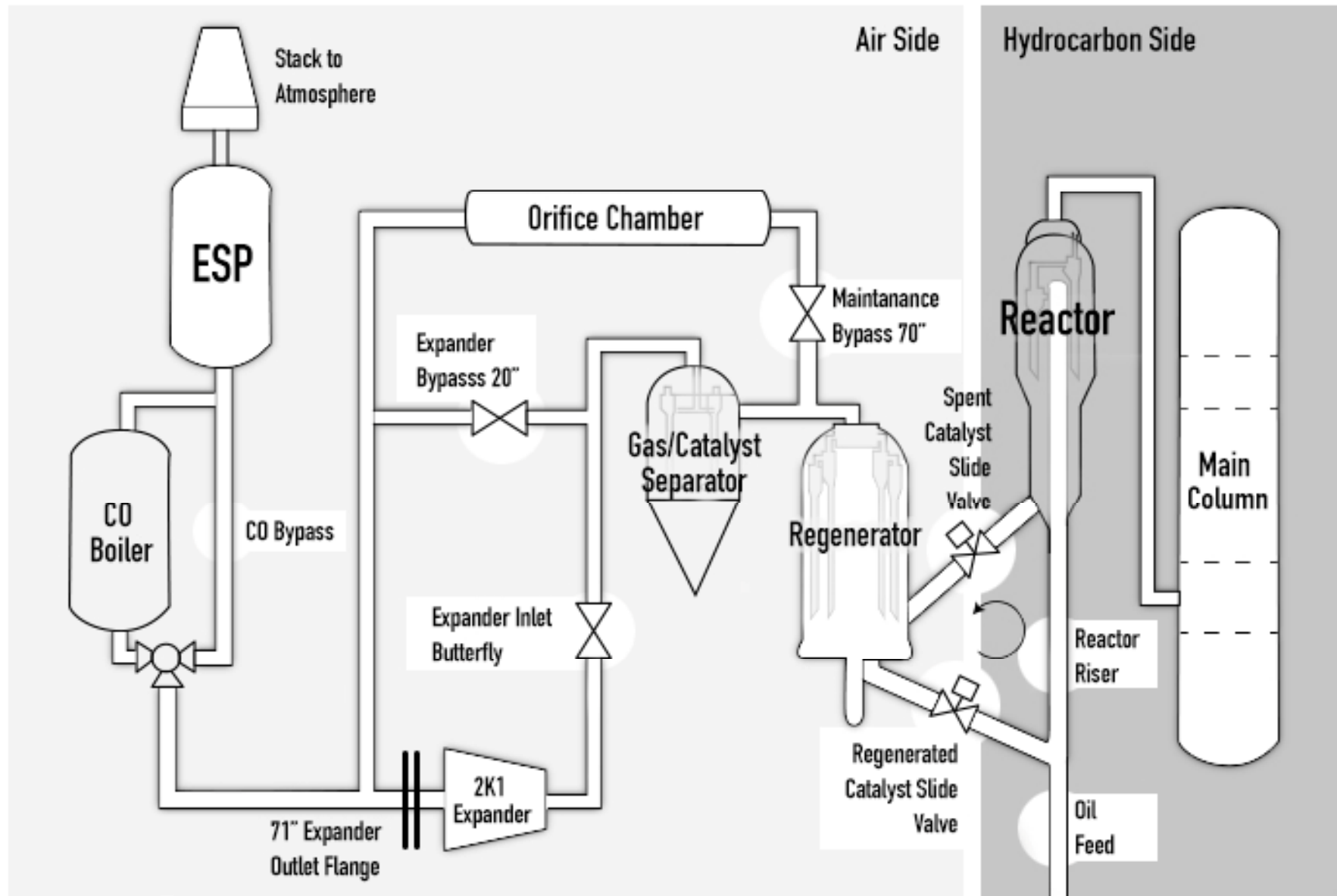
Catalyst

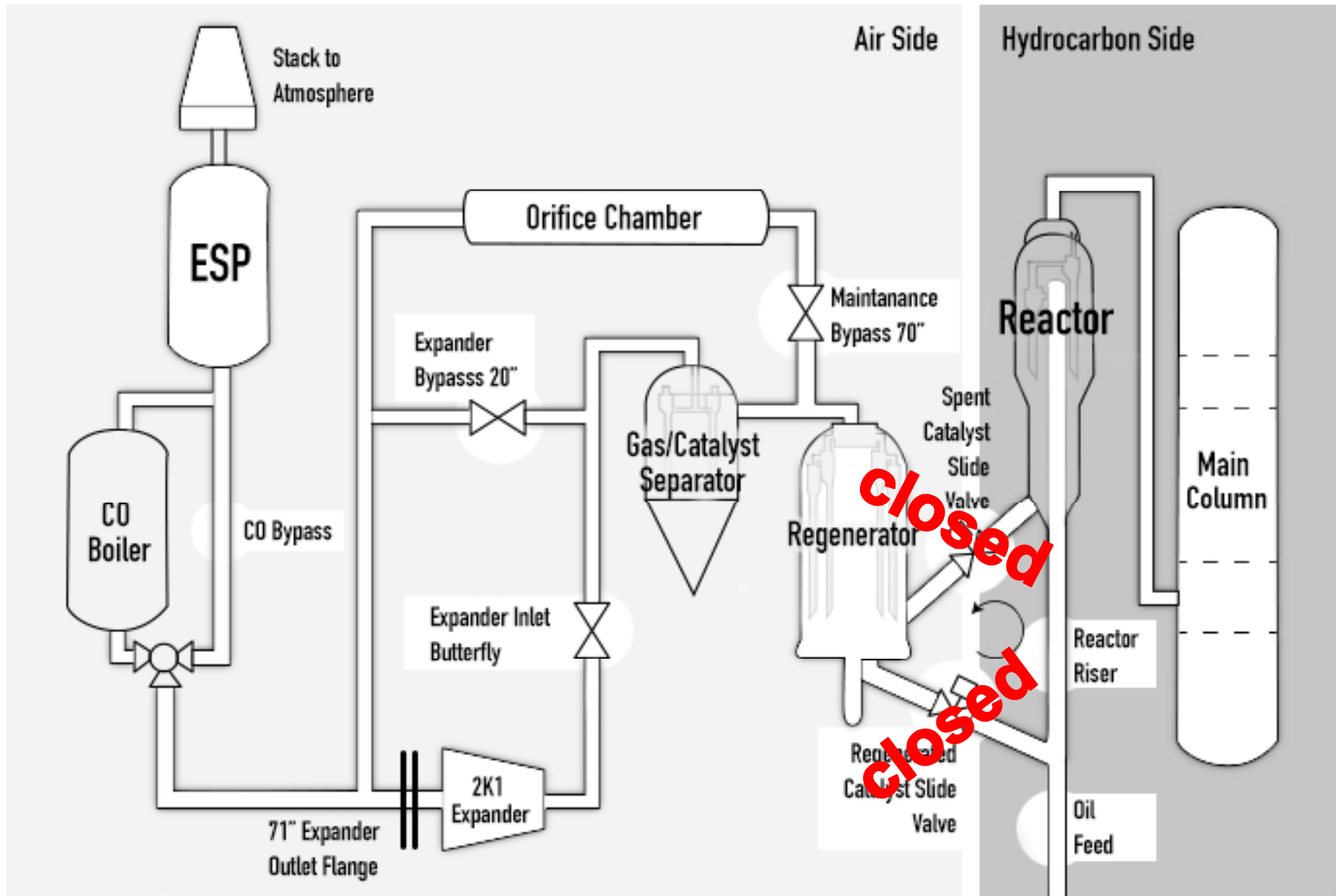


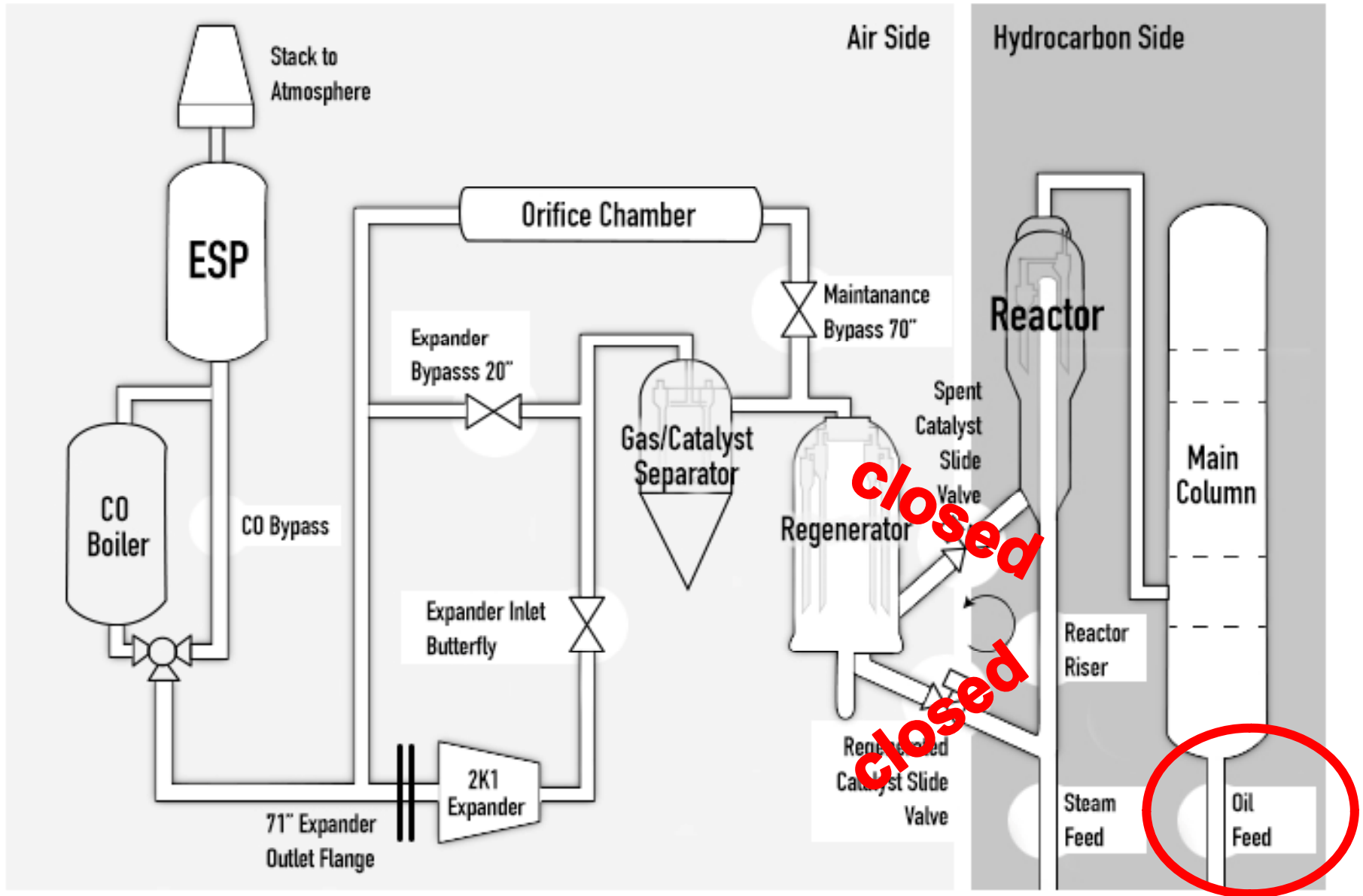


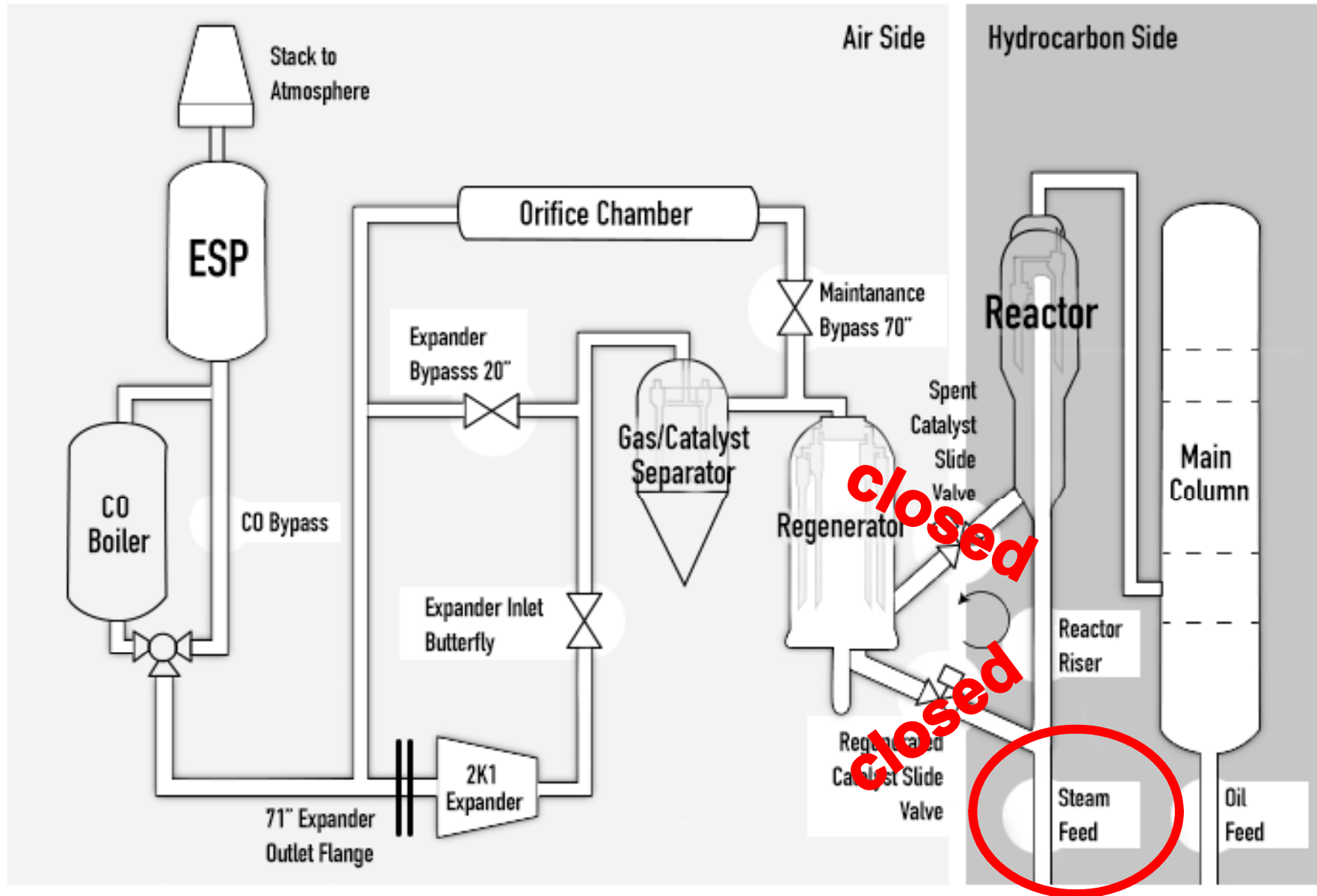
Main Column Operation

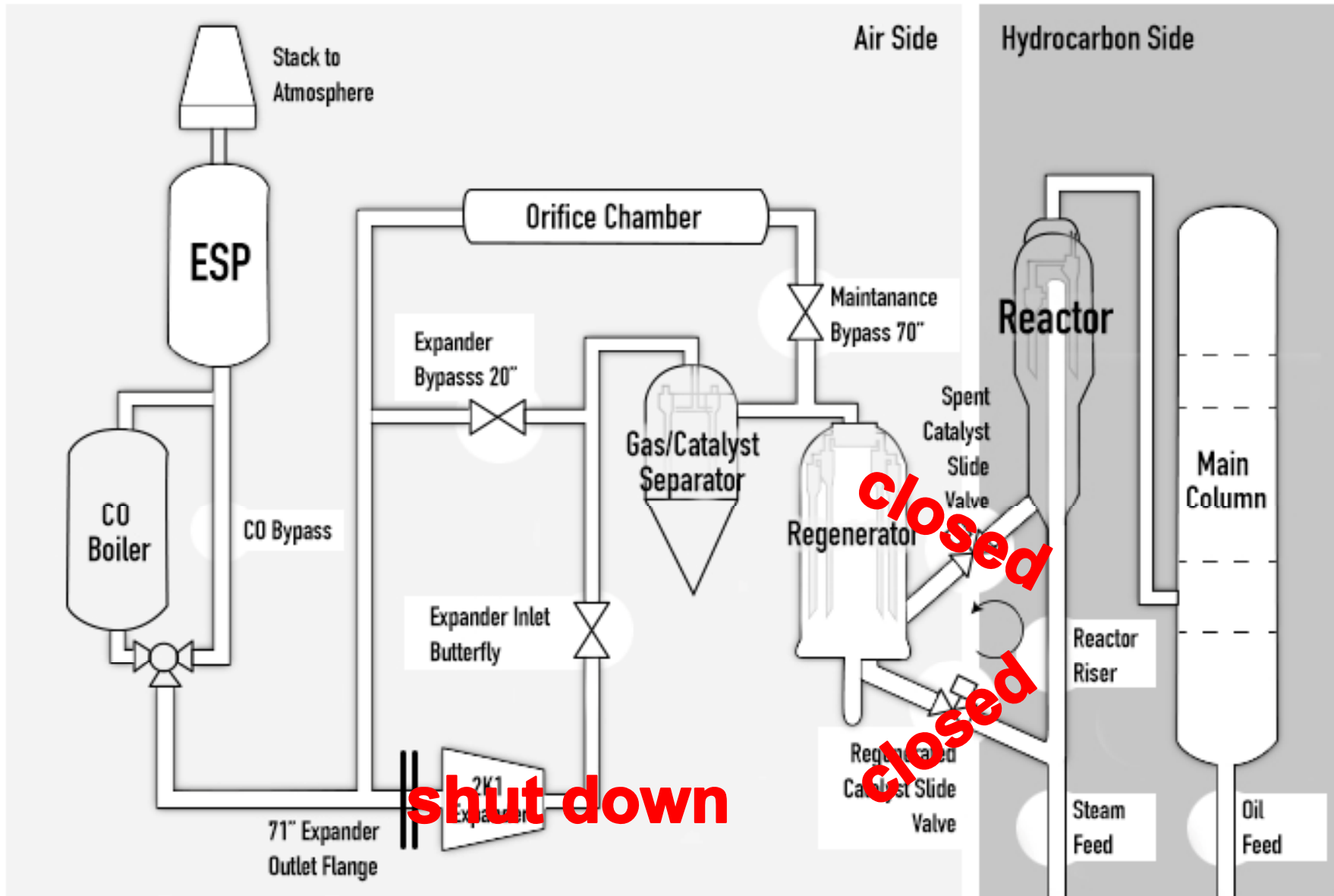


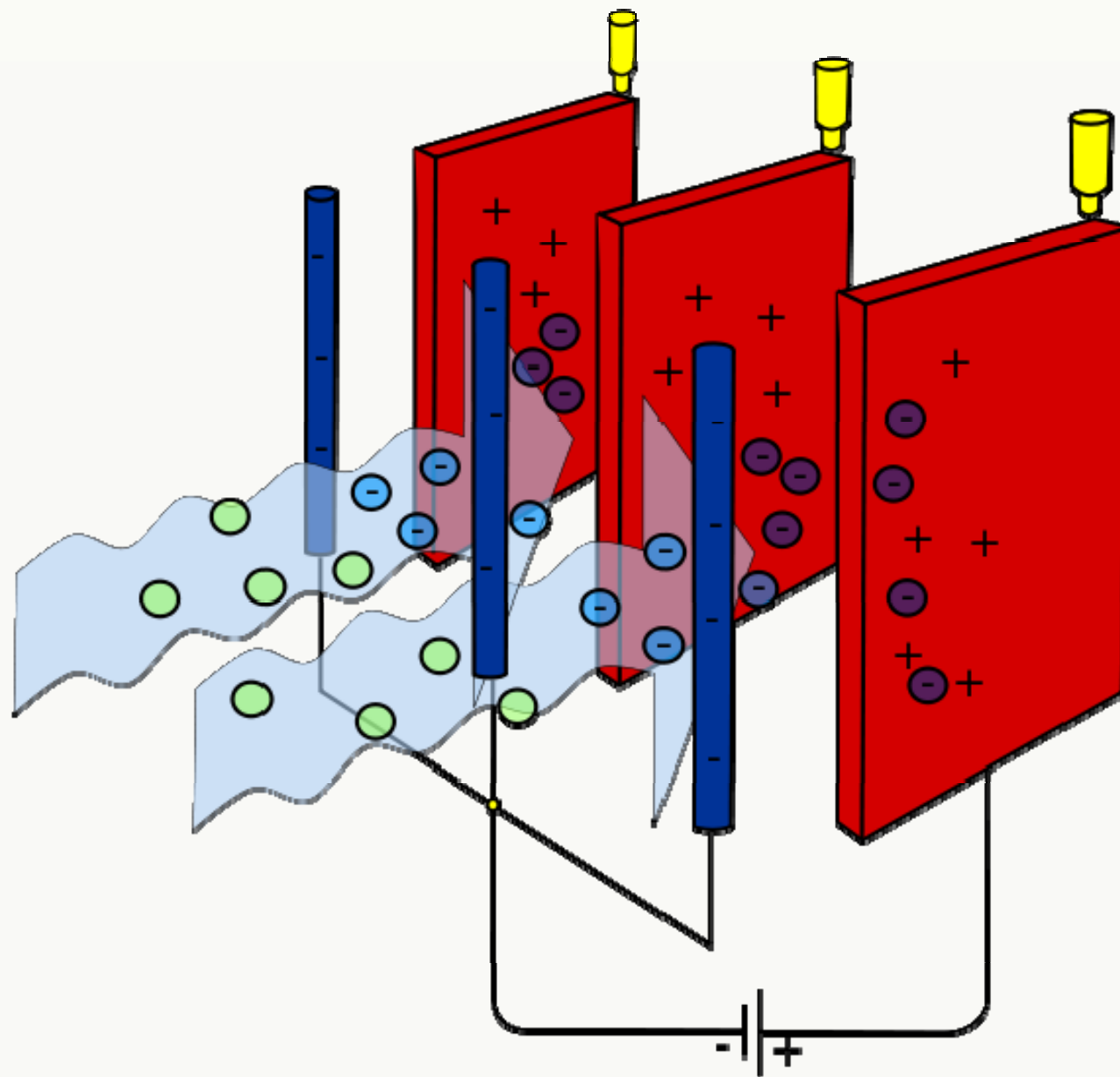










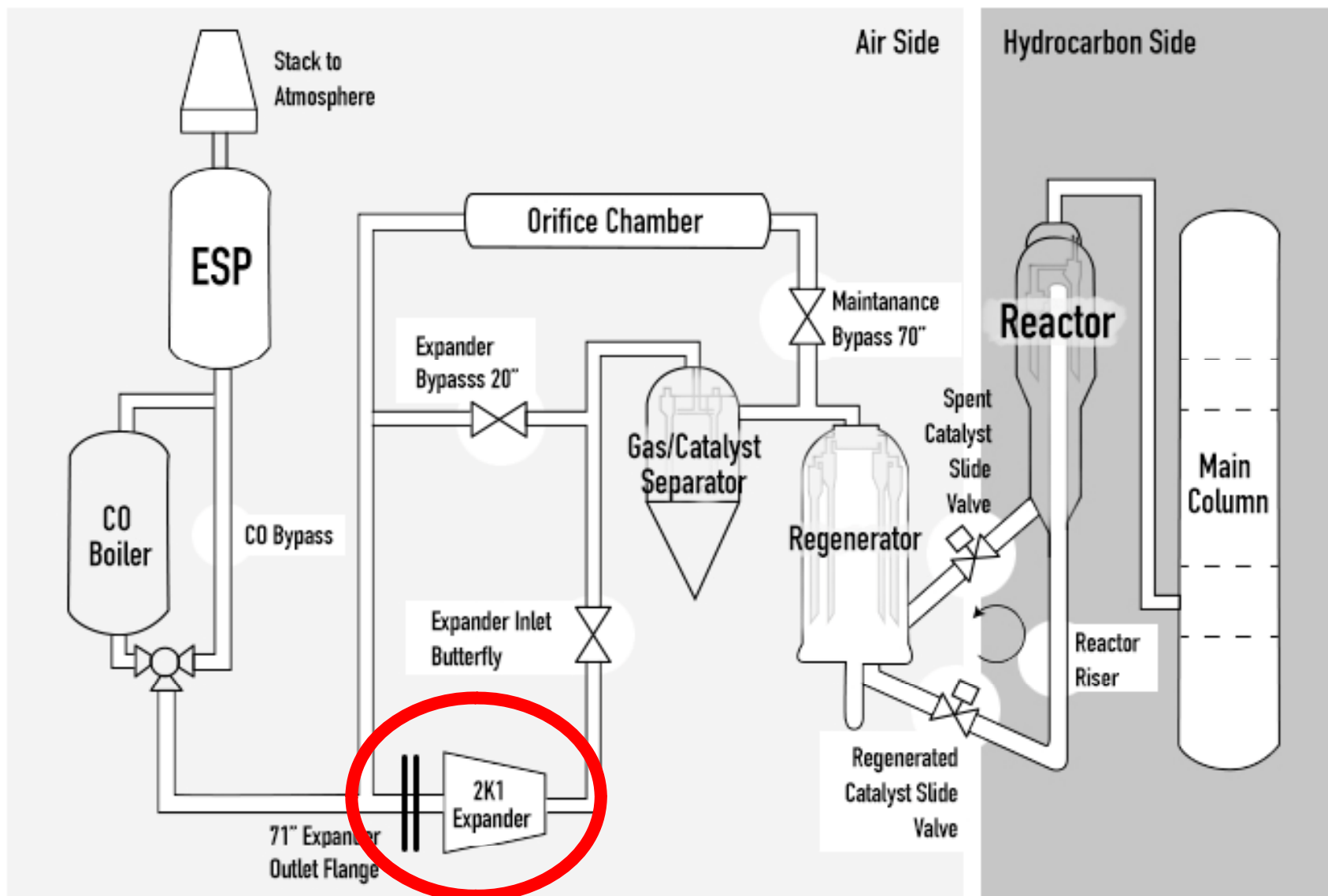




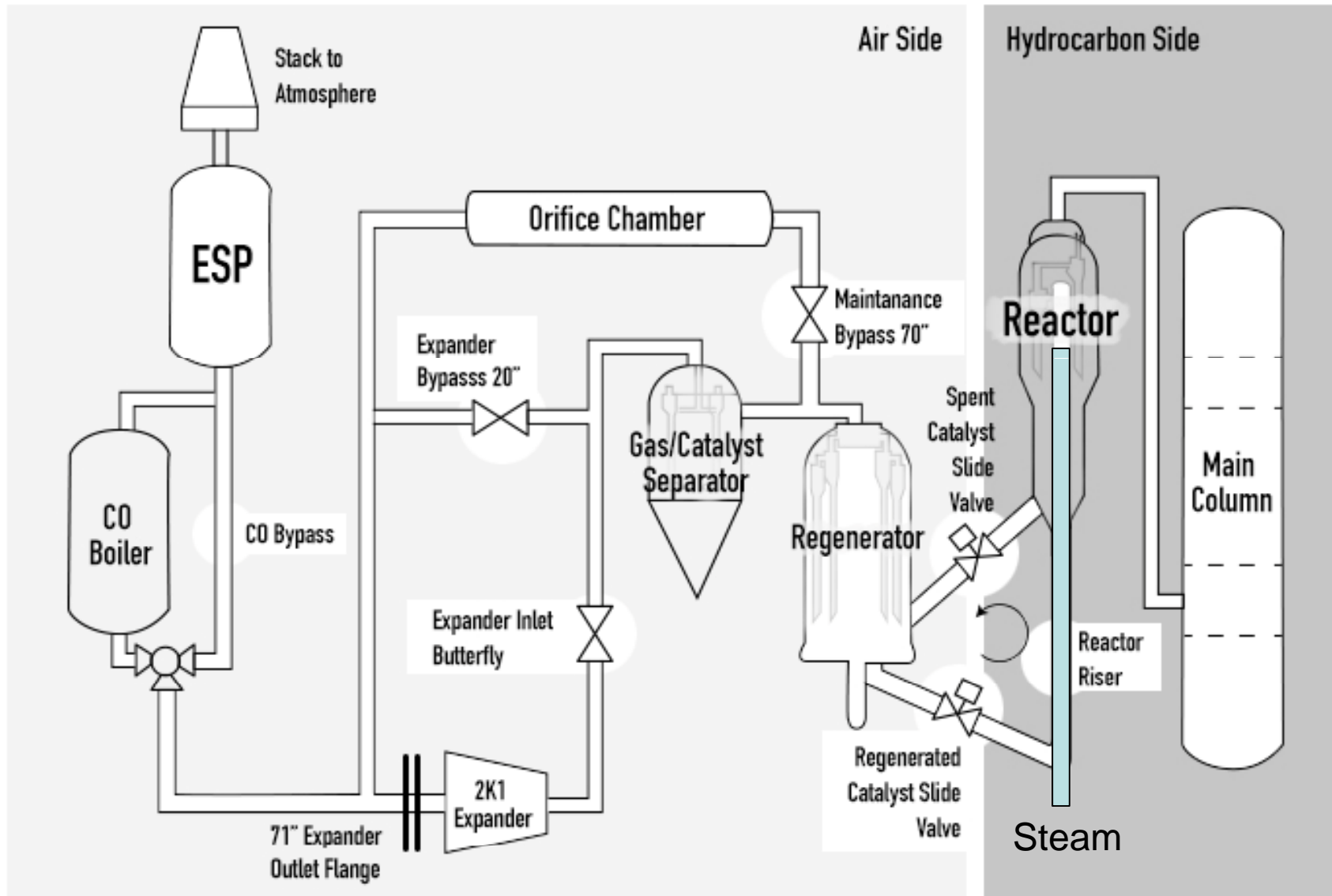


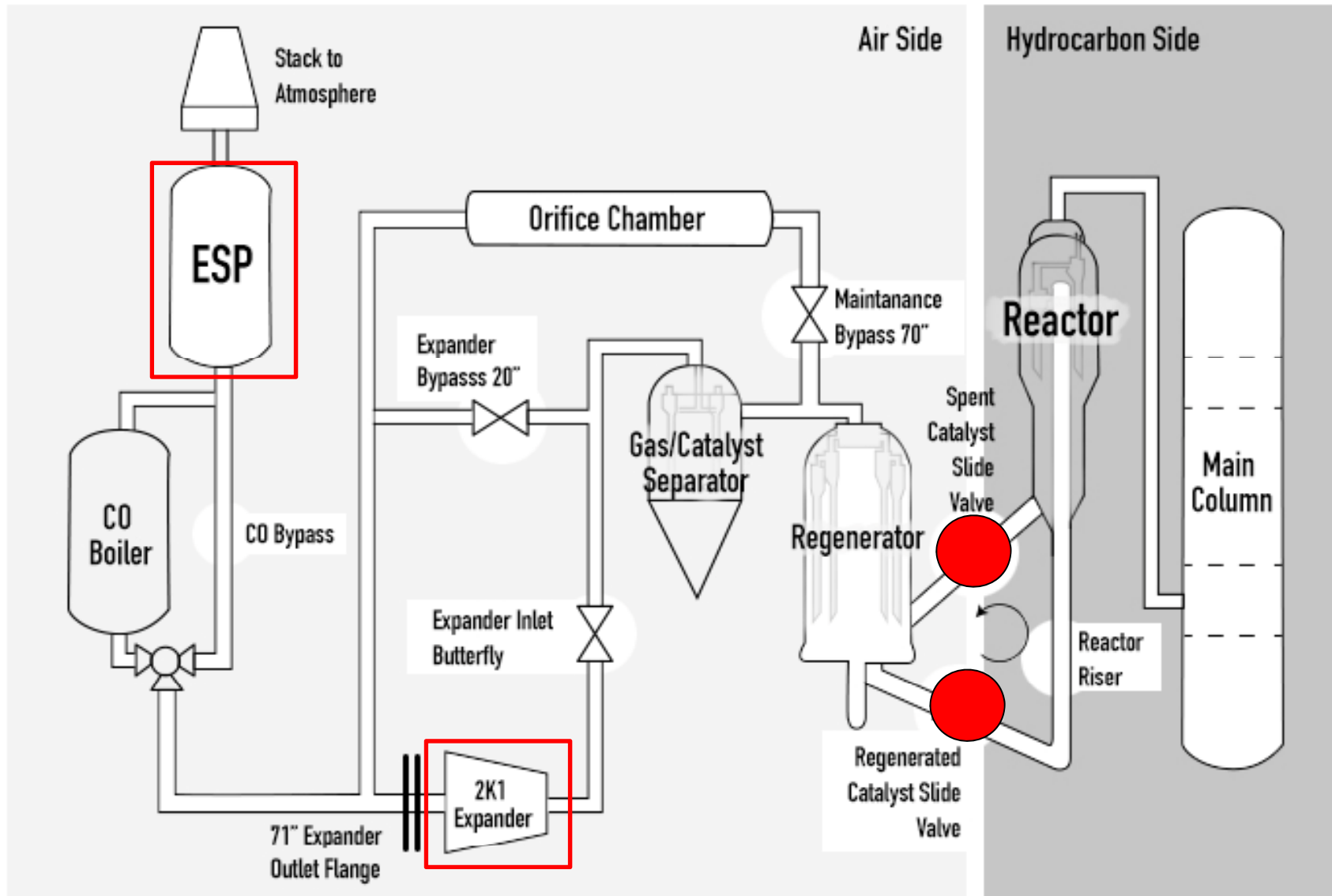
Incident Overview

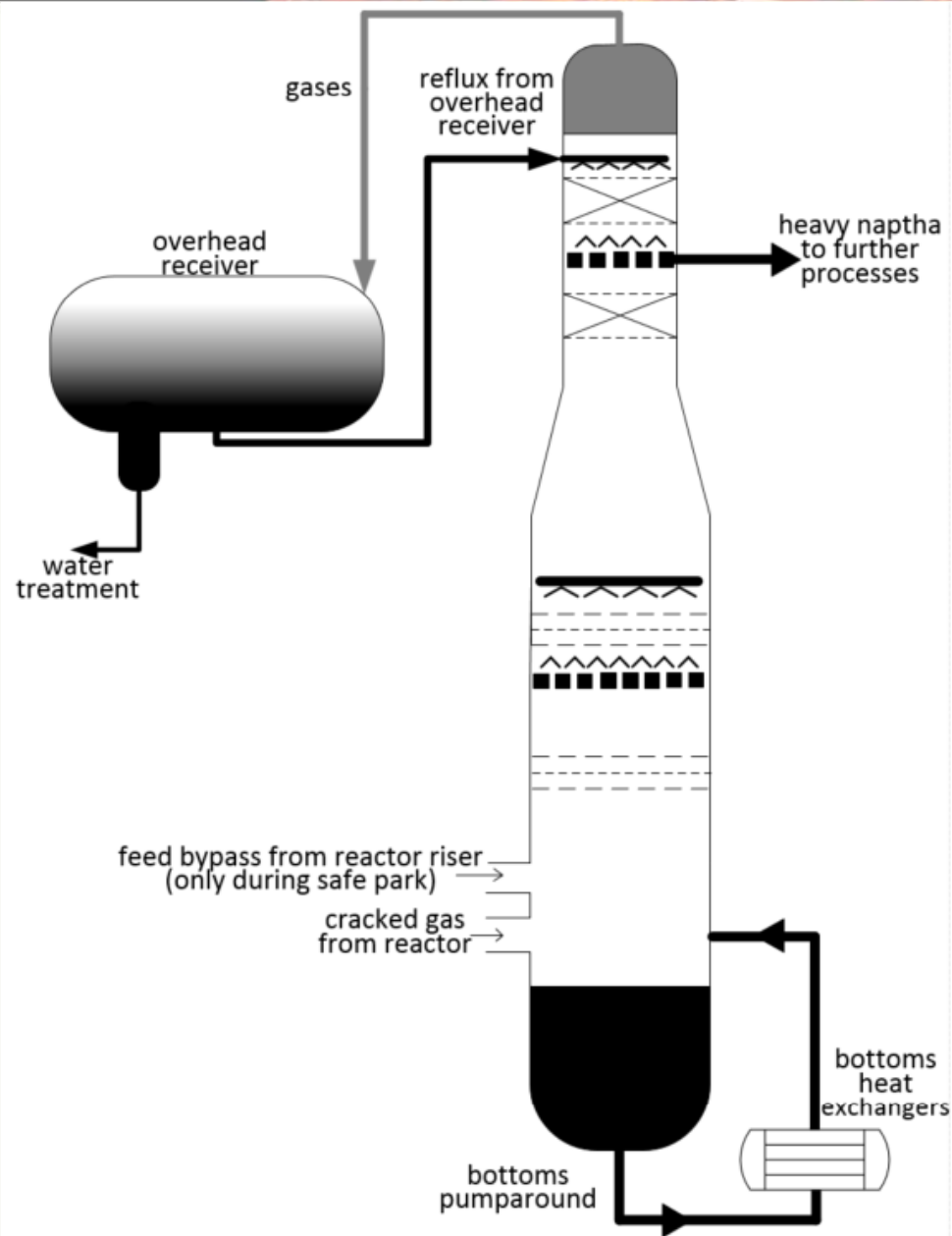
- **February 11 – FCC expander began to experience vibrations**
- **February 16- Expander vibrations exceeded limit and unit was automatically put in “safe park” by logic controls**







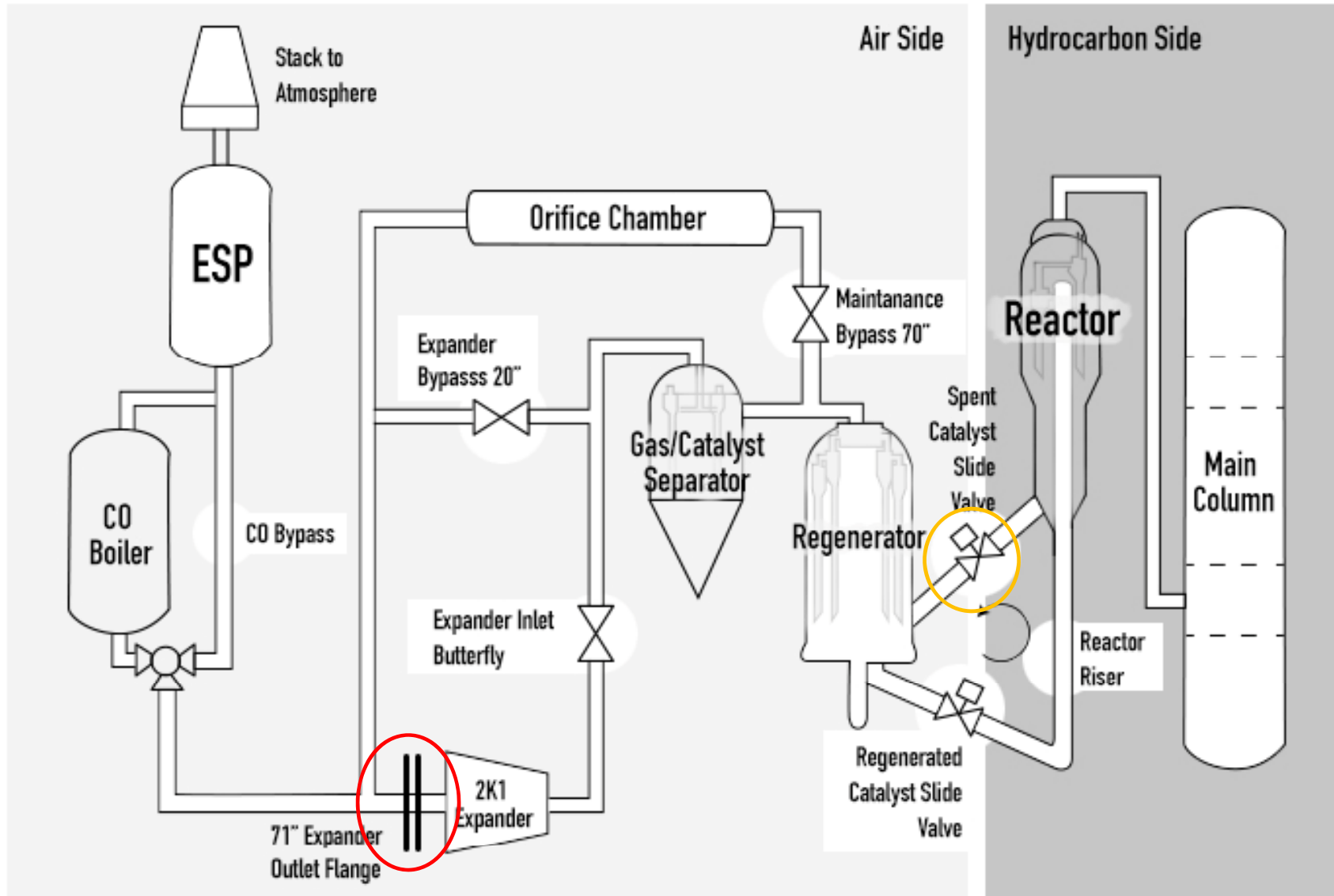






Incident Overview

- Incident Response Team formed to deal with expander issue
- IRT ultimately decided to use same plan from 2012 to go into expander and clean it, staying in safe park





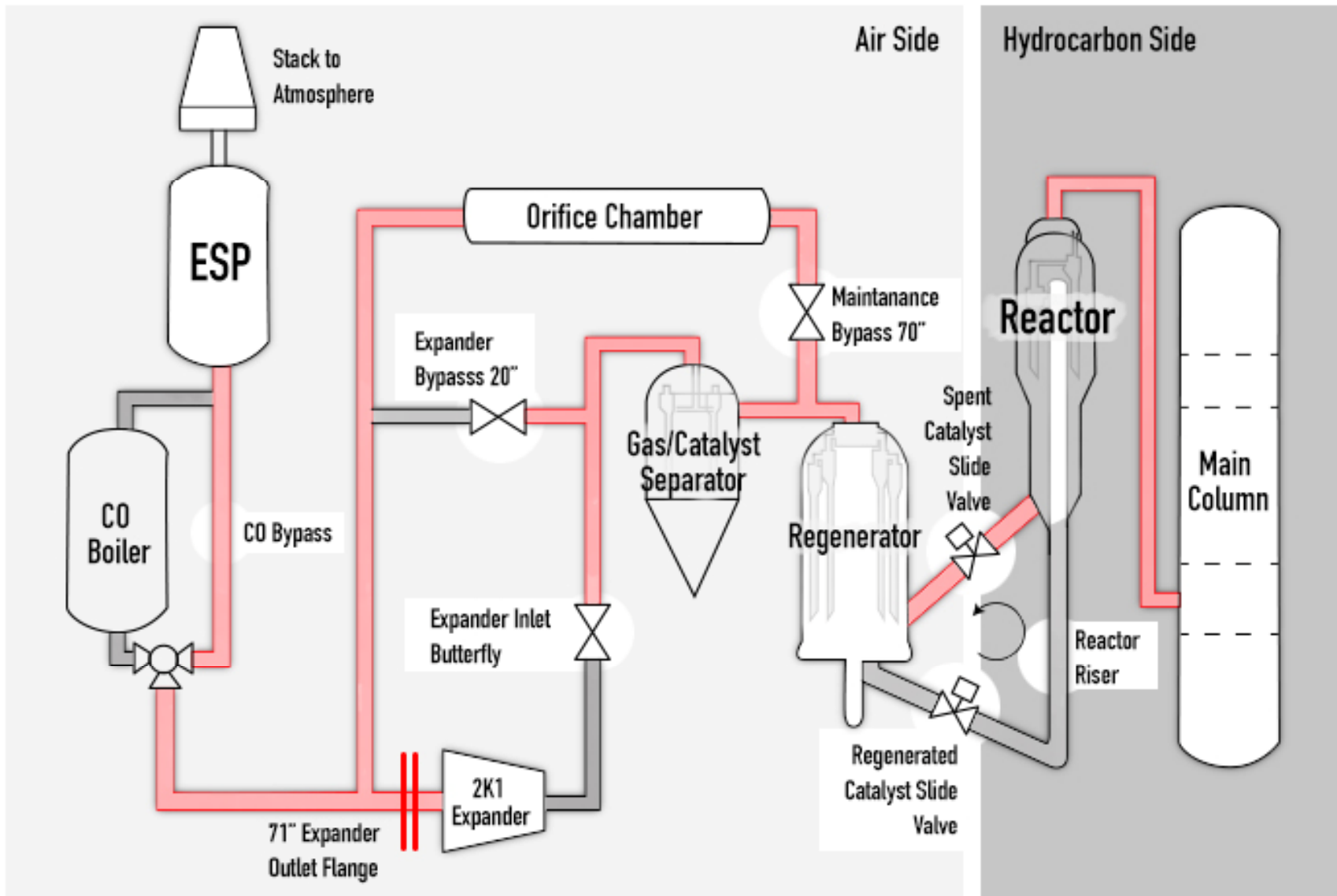
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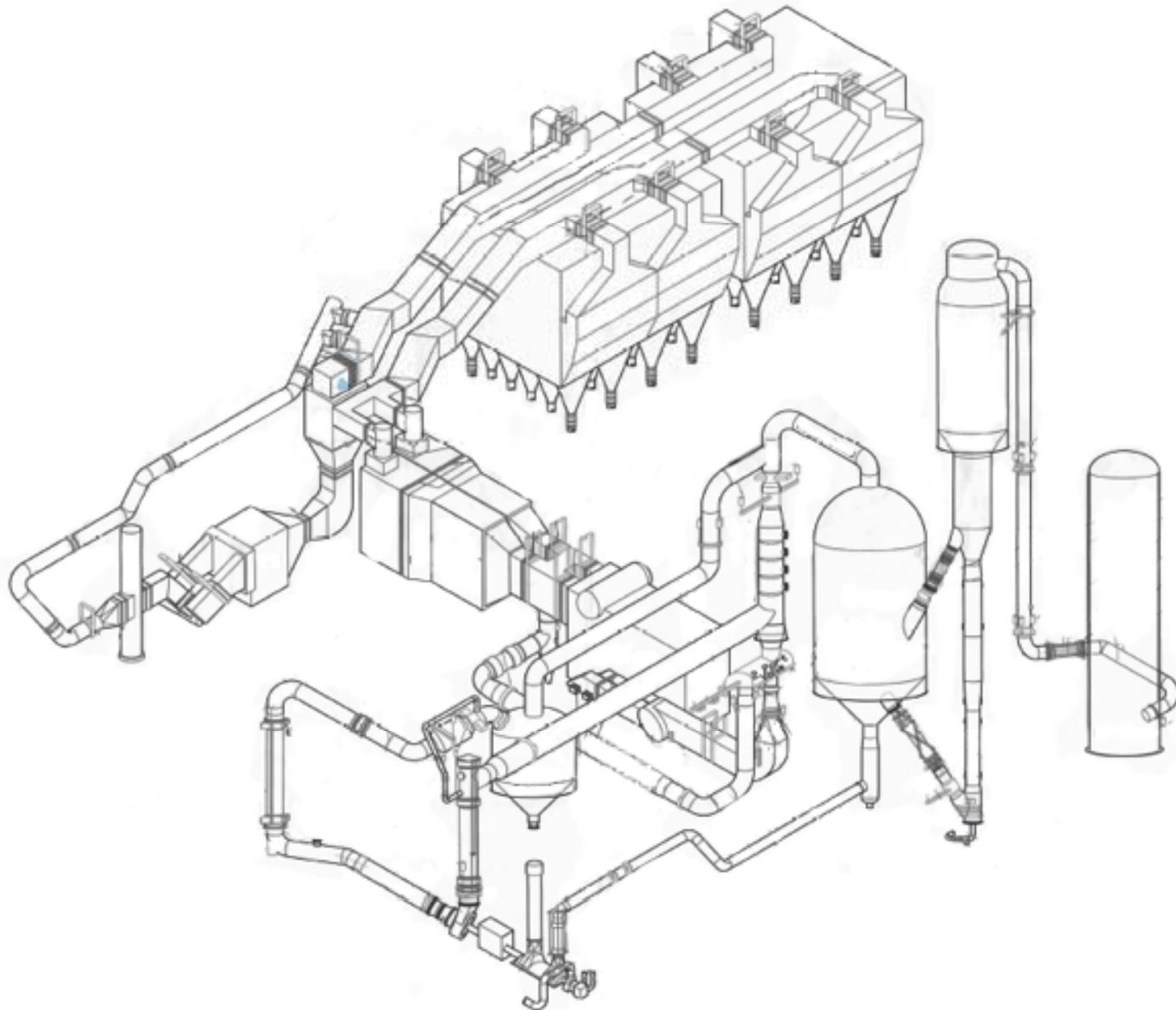


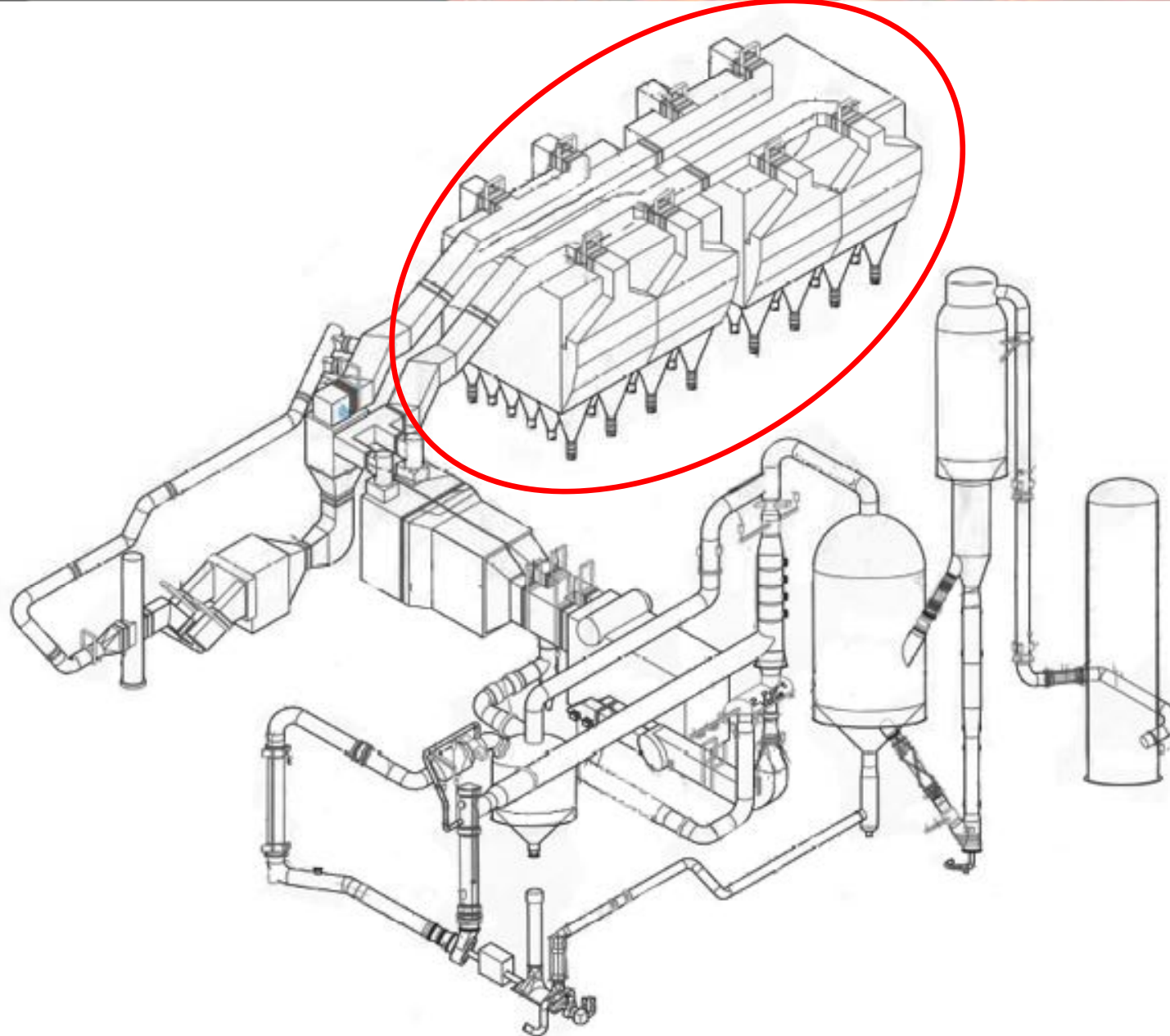


Incident Timeline

- Early on February 18, maintenance workers who were to blind the expander outlet became concerned due to steam coming out of expander
- Steam reduced, allowing hydrocarbons to flow from main column to flue gas piping
- Workers started getting hydrogen sulfide alarms and exited the unit

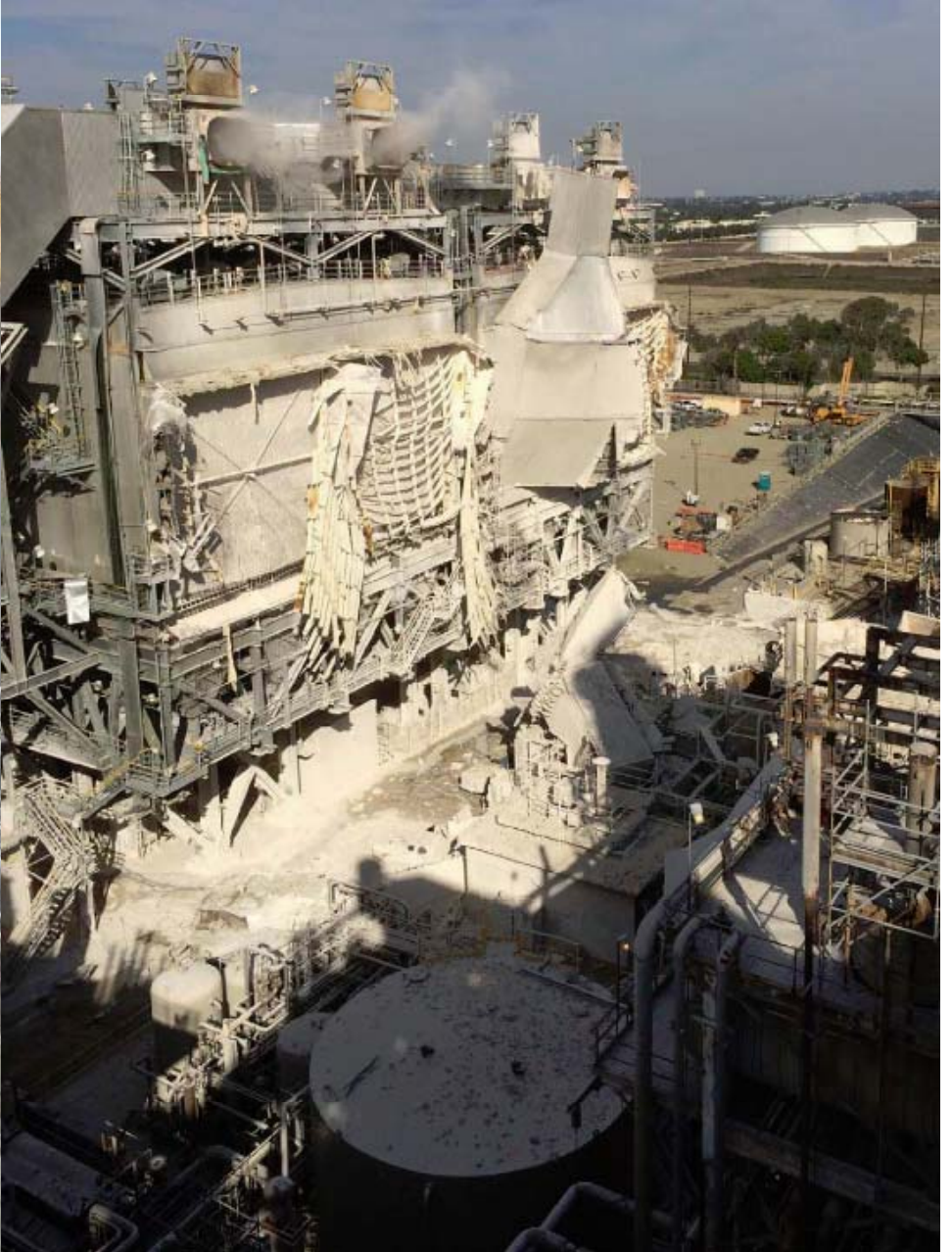








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Modified Hydrofluoric Acid Serious Near Miss

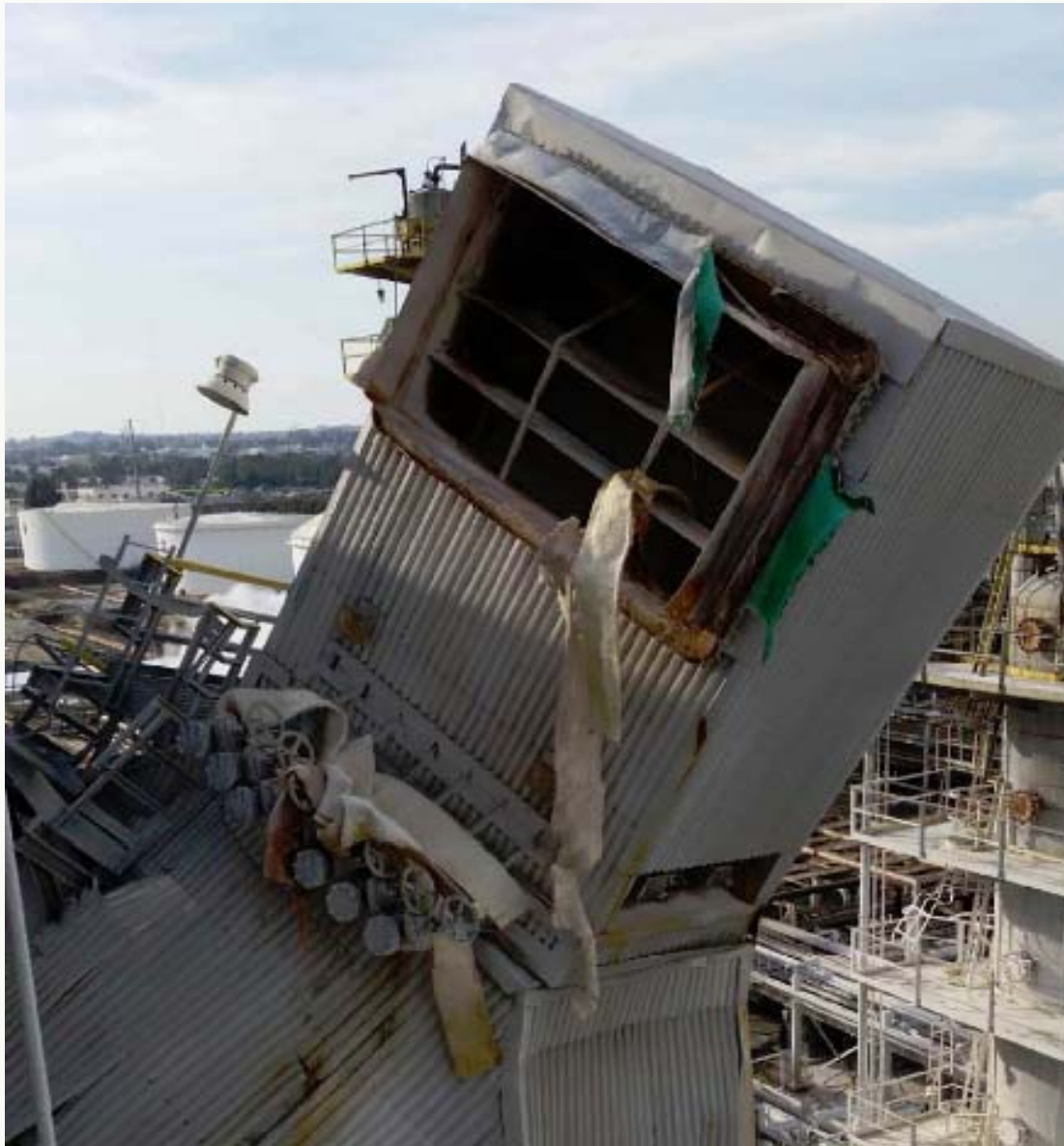
**“Dropping loads or other falling objects
within damage range of equipment
containing flammable or toxic material”
-ExxonMobil Corporate example of a
near miss incident**

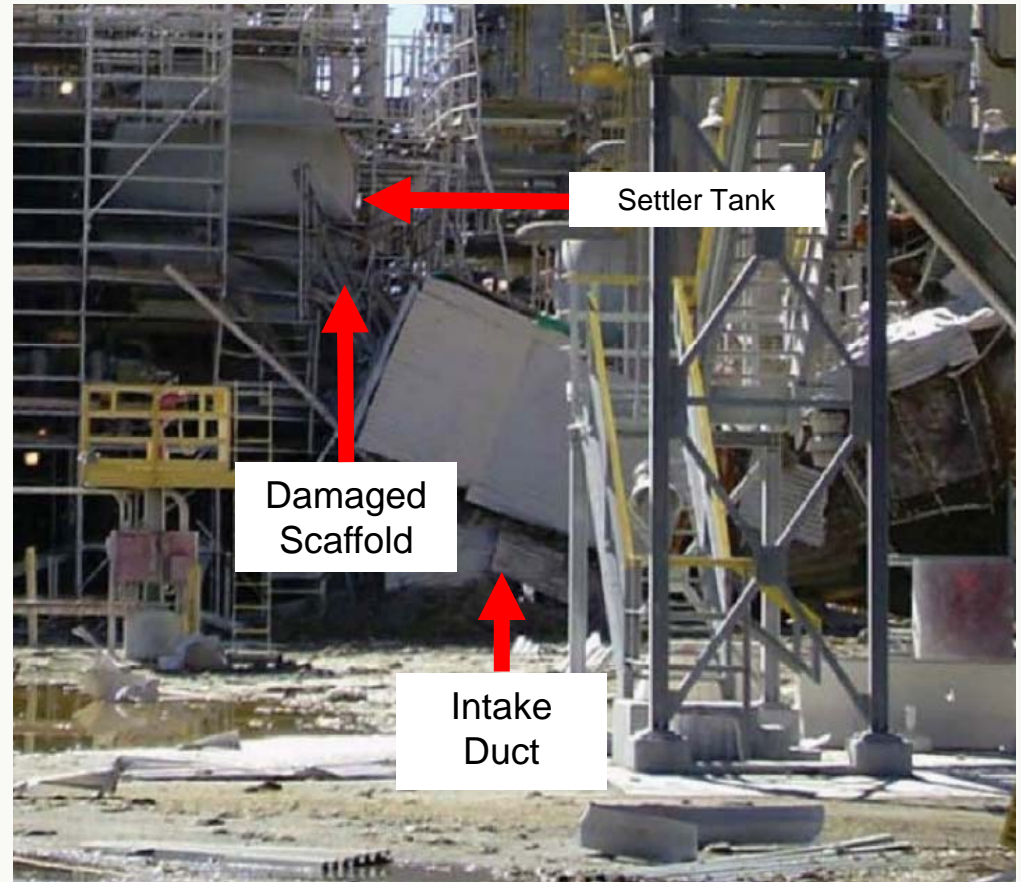
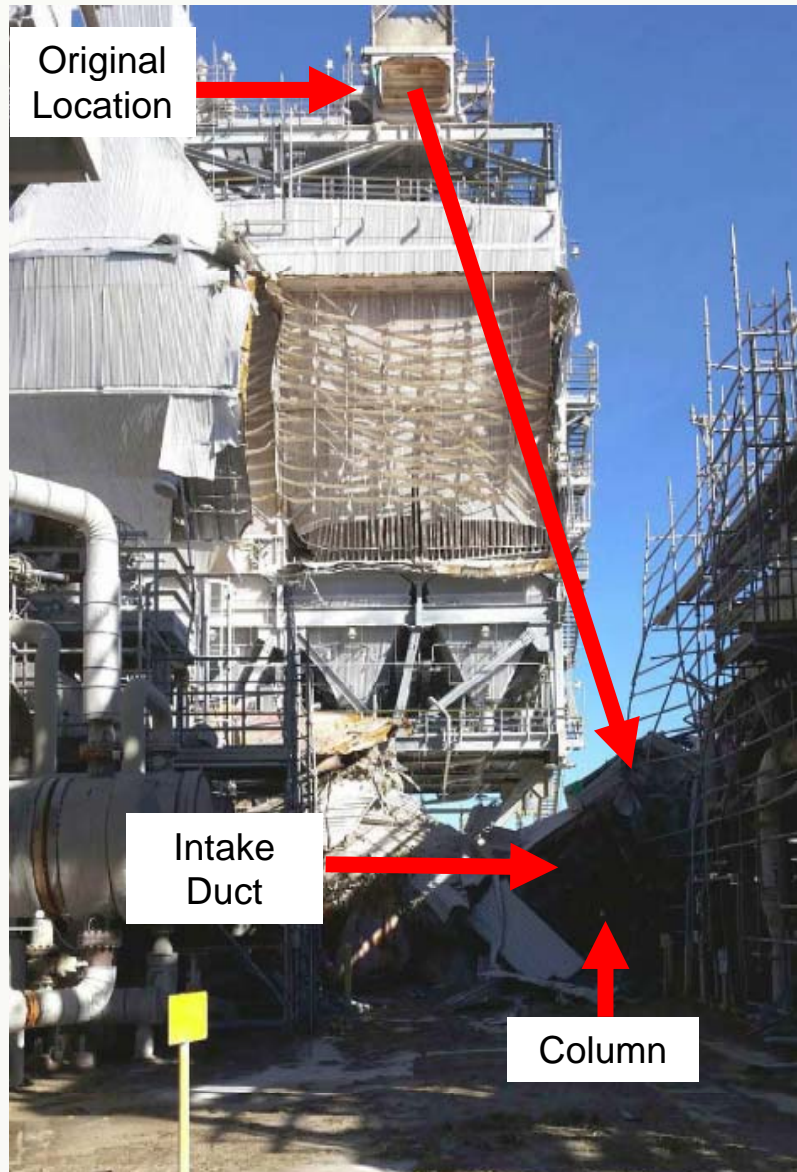


Settler tanks

- Two tank system
- Approximately 80 feet south of the ESP
- Still outside of ExxonMobil's minimum equipment spacing requirement















Potential Health Effects of HF and MHF

- HF acid is a toxic chemical and poses a severe hazard to the population and environment when a release occurs
- Causes severe damage to skin, respiratory system, and bones after exposure and can lead to death
- Large release could impact hundreds of thousands of residents



Community Exposure

- A large quantity of catalyst dust was released due to the ESP explosion
- Catalyst dust fell in the nearby communities as far as a mile away
- SCAQMD report can be found on their website: <http://www.aqmd.gov/>



Key Issues Identified in Investigation

- Implementation of ExxonMobil Operations Integrity Management System (OIMS)
 - Process Hazard Analysis
 - Mechanical Integrity
 - Worker Participation
- Process Safety Regulatory Gaps
- Community Impacts



Issue: Process Hazard Analysis

- **PHA failed to adequately consider hydrocarbons reaching the ESP**
 - PHA only considered carbon monoxide entering the ESP
 - As a result, detectors used to shut down the ESP were only calibrated to read carbon monoxide
- **Investigation team is currently working to determine rationale behind the ExxonMobil PHA process**



Issue: Process Hazard Analysis Cont.

- **Spent Catalyst Slide Valve not maintaining catalyst level**
- **Hydrocarbons in main column**
- **No analysis of steam flow rate needed into column**



Issue: Mechanical Integrity

- Pressure transmitter in the main column
- Expander
- CO gas detectors
- Heat exchangers leaking naphtha
- Valves attached to these heat exchangers



Issue: Worker Participation

- Hourly workers were not included in Incident Response Team
- Input was not given for the variance
- Workers expressed concern for actions being taken
- Concerns by operators are handled in a Job Safety and Environmental Analysis (JSEA), however a JSEA was not done.



Issue: Lack of Hierarchy of Controls Analysis

- Could have prevented incident through utilization of passive barriers.
 - Shutting all valves leading to the ESP, or
 - A blind at the top of the main column.
- HOC Principles could have been applied.
 - Design of SCSV
 - Removing HC from MC
 - Evaluate the use of modified HF



Process Safety Management

- A safety management system approach focused on the prevention and mitigation of catastrophic releases of chemicals or energy from a process associated with a facility.
- Elements of PSM include:
 - Process Hazard Analysis (PHA),
 - Operating Procedures,
 - Management of Change (MOC), and
 - Employee Participation.



California Process Safety Management (PSM) Reform

- Some PSM failures would not have been identified under the current CA PSM regulation.
 - Certain PSM elements fail to require an assessment of their adequacy of completion.
 - Current PSM regulation also lacks key process safety requirements
- CA draft PSM regulations will be discussed in a later panel tonight



Previous CSB investigations

- Previous CSB reports have identified similar regulatory gaps in CA and other jurisdiction's PSM regulations
 - [Chevron Refinery Fire](#) (2012)
 - [Tesoro Refinery Fatal Explosion and Fire](#) (2010)



Additional Issues

- Organizational Failures
- ESP Siting
- Non-routine operating conditions
- Safety Critical Equipment Management



Investigation Obstacles

- ExxonMobil refusing to provide safety-related documentation
- ExxonMobil subpoena responses:
 - 51%-Fully Responsive
 - 24%-Partially Responsive
 - 25%- Not Responsive



Path Forward

- Incorporate/Investigate Public Input from this Meeting into the Investigation
- Finalize Investigation and Plan for Report
- Issue Report with Recommendations
- Safety Video
- PSM Advocacy Efforts



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Board Questions for Investigation Team



Break



PSM Panel



Bibliography

http://2010.igem.org/User:Meagan/Oil_Sands (black oil picture)

"Electrostatic precipitator" by Evan Mason - Own work.
Licensed under CC BY-SA 3.0 via Commons -
https://commons.wikimedia.org/wiki/File:Electrostatic_precipitator.svg#/media/File:Electrostatic_precipitator.svg