

ExxonMobil FCCU Restart Status Update

Stationary Source Committee
April 15, 2016

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ExxonMobil Explosion (Feb. 18, 2015)



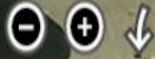
ExxonMobil Explosion

- On February 18, 2015, the Electrostatic Precipitator (ESP), which controlled the PM emissions from the Fluid Catalytic Cracking Unit (FCCU) exploded
- As a result of the explosion ESP became inoperable and the FCCU along with a number of other process units were shutdown
- The FCCU and other process units have been shutdown since February 18, 2015 and refinery has operated below 20% of its capacity since

ExxonMobil FCCU ESP



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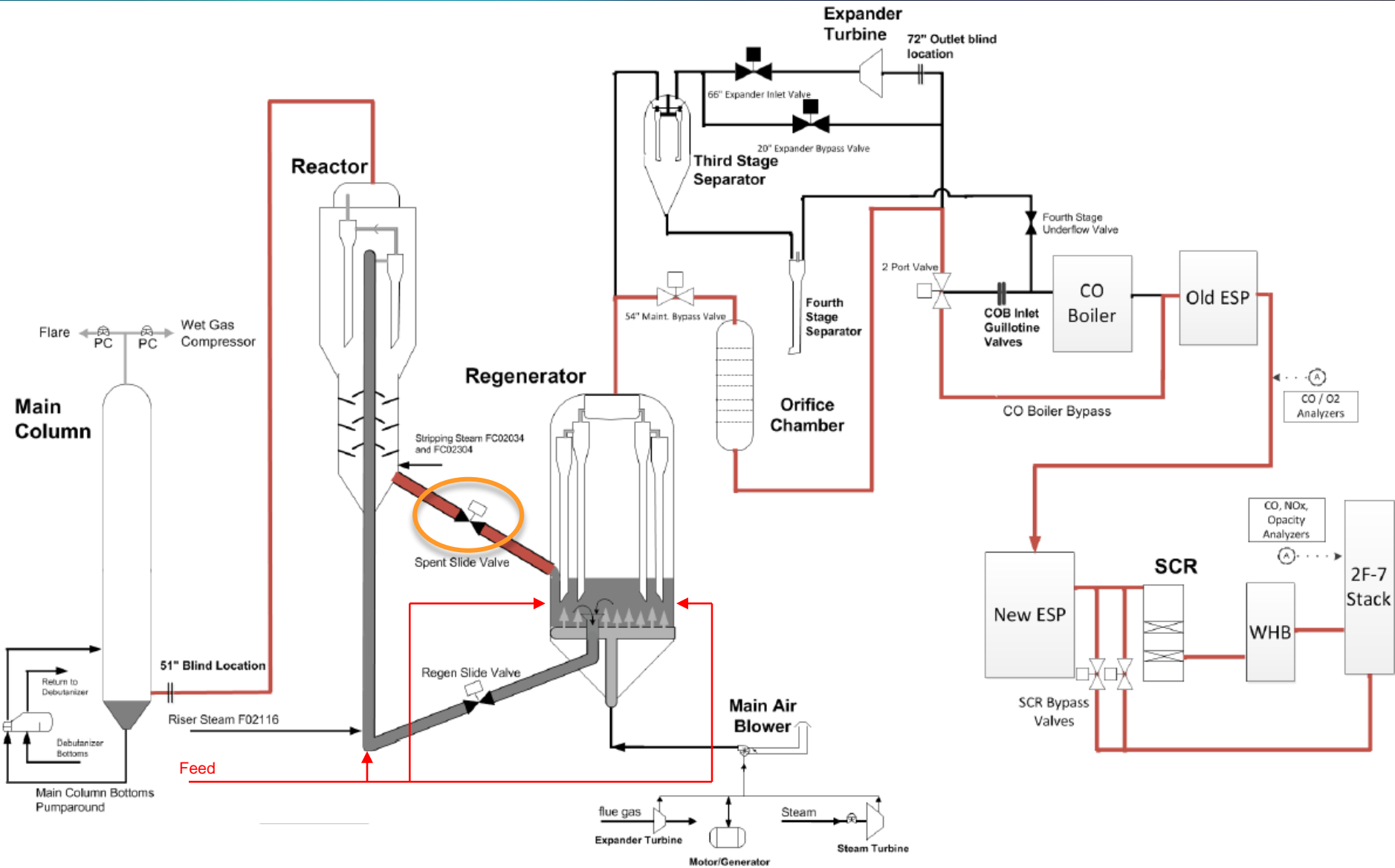




Cause of ESP Explosion

- FCCU was in hot standby mode while repairs were being done on an Expander
- Steam pressure barrier was lost
- No catalyst seal was established at the spent catalyst slide valve
- Hydrocarbon flowed back from the main column and ignited in the ESP

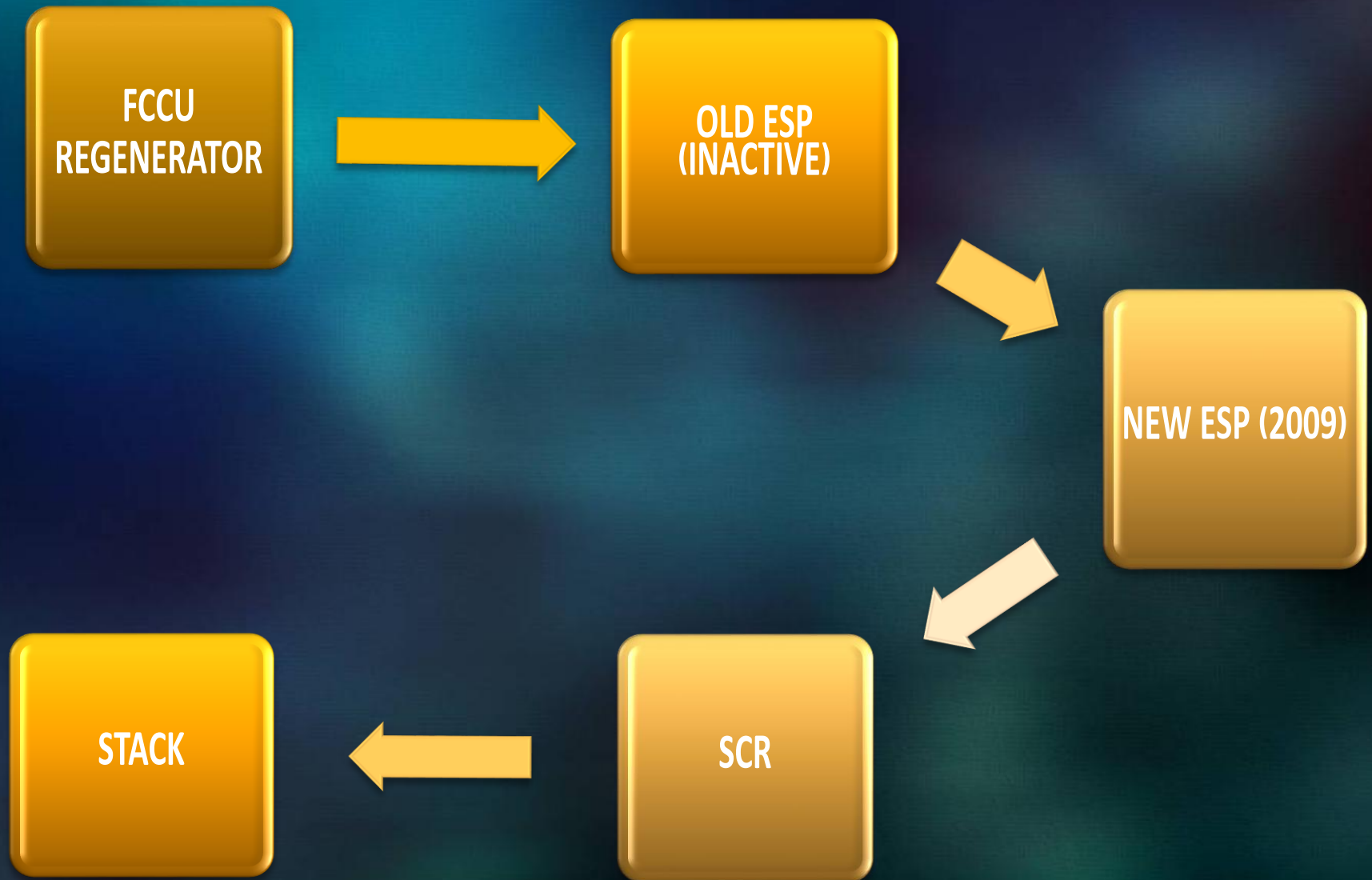
FCCU Process Flow Diagram



What is an FCCU?

- Fluid Catalytic Cracking Unit
- Most important conversion process used in petroleum refineries.
- Convert the heavier liquid (high-boiling, high-molecular weight hydrocarbon fractions of crude oils) to lighter gasoline, diesel, and other products.
- Electrostatic Precipitator (ESP) is used to control Particulate Matter (PM) emissions

FCC/ESP Flow Diagram (existing)

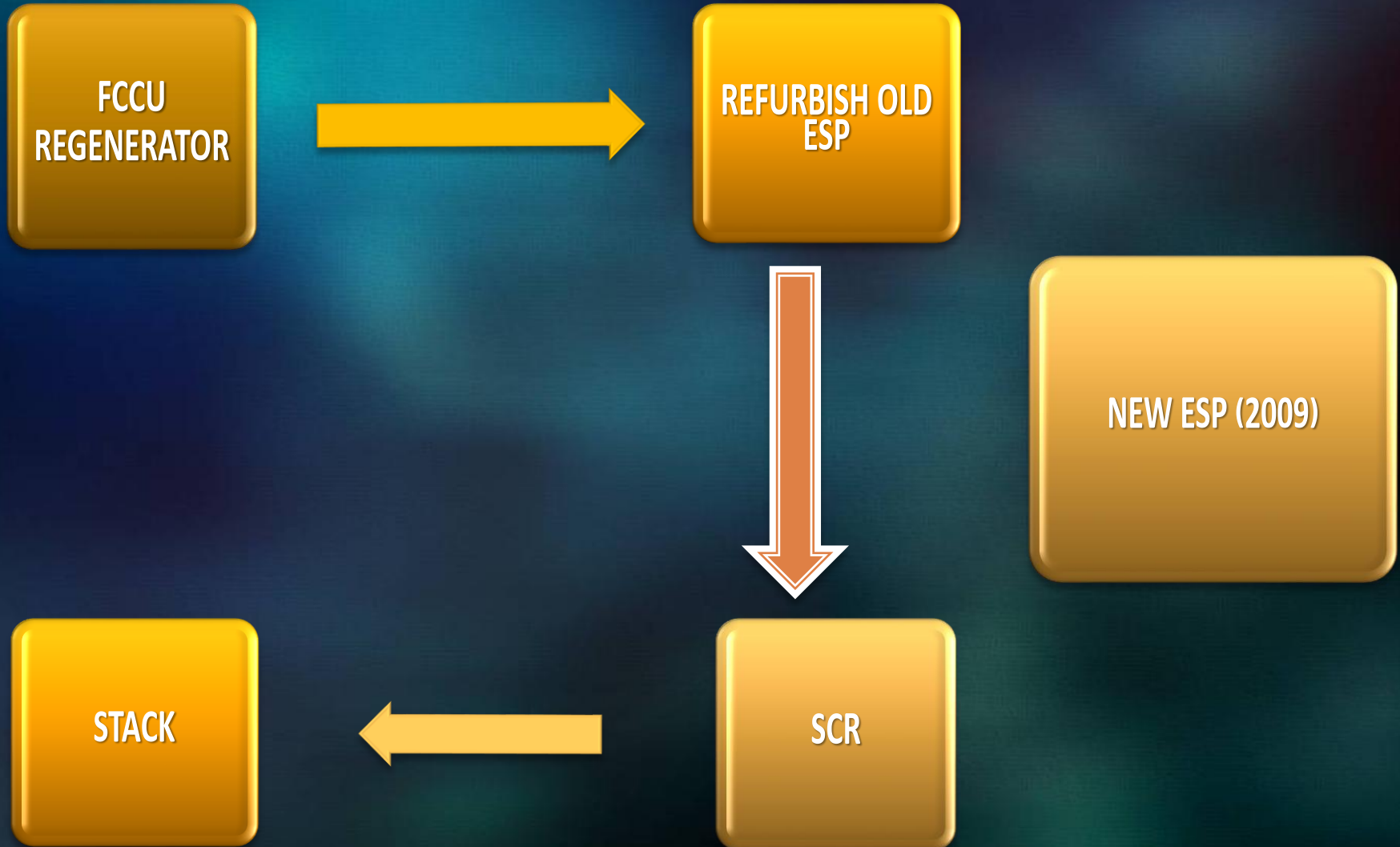


ExxonMobil's Proposed Interim Operation (8/2015)

- Refurbish and use the Old ESP while the New ESP undergoes repairs
- Unit feed rate at minimum; ~ 65 kbd fresh feed
- Excess PM10 emissions during the interim operation
- Retrofit cooling tower to reduce PM emissions
- **Not implemented – SCAQMD not agreeable to proposed operations**

FCC/ESP Flow Diagram

(proposed interim operation – 8/2015)



Safety Improvements

- Define minimum steam flow target and set alarms
- Installed new instruments to monitor catalyst level above slide valve
- Updated main air blower control logic to de-energize ESP upon emergency shutdown
- Updated procedures covering normal shutdown, emergency shutdown, and normal startup
- Completed comprehensive training for all FCCU personnel on new and updated procedures

New FCCU Start-up Procedures

- ExxonMobil completed repairs to the new ESP and requested to restart FCCU
- ExxonMobil modified the FCCU Start-up Procedures to include periods when ESP is not in operation to eliminate possible source of ignition
- Initial proposal was to de-energize ESP throughout most of the start-up process (48 hours)
- Discussion with ExxonMobil resulted in reducing ESP downtime to 6 hours

Start Up Order of Abatement

- Hearing on Stipulated Order of Abatement held on April 2, 2016 at Torrance City Hall
- Excess PM and PM10 emissions higher than previous startups are expected during the 6-hour ESP off period
- Mitigation measures:
 - Cooling towers with new high efficiency mist eliminators
 - Shut down two coker heaters during FCCU start up
 - Limit the crude unit to 100 kbbl per day
 - Maintain min. inlet velocity to primary internal cyclones
 - Surrender NOx RTCs
 - Street sweeping

Other Requirements

- Notify SCAQMD in advance of all major steps of start up procedure
- Conduct source tests during start up
- ExxonMobil to notify neighbors with door to door notices 48 hours prior to start up
- Limit the time for de-energized ESP to 6 hours
- Introduce torch oil to the FCCU during the hours between 7 pm and 7 am

Emission Mitigations Summary (6 hrs)

	Excess Emissions (lbs)				
	PM	PM ₁₀	CO	NOx (12 hrs)	
Unmitigated Excess Emissions	848	225	144	467	
Mitigations	(137)	(96)	-	-	From Cooling Towers retrofit
	(17)	(16)		(53)	From Coker Heater 21F-7 shutdown
	(8)	(7)		(77)	From Coker Heater 22F-3 shutdown
	(54)	(51)		-	From limiting the Crude Unit to 100 kBD
	-	-	-	(337)	From RTC surrender
Net	632	55	144	0	

- Excess emissions during 6 hrs when ESP not fully utilized
- Uncontrolled emissions when ESP is not in full operation do not exceed short term health standards

Emission Mitigations Summary (24 hrs)

	Excess Emissions (lbs)				
	PM	PM ₁₀	CO	NOx	
Unmitigated Excess Emissions	848	225	144	467	
Mitigations	(548)	(384)	-	-	From Cooling Towers retrofit
	(68)	(64)		(106)	From Coker Heater 21F-7 shutdown
	(32)	(28)		(154)	From Coker Heater 22F-3 shutdown
	(216)	(204)		-	From limiting the Crude Unit to 100 kBD
	-	-	-	(337)	From RTC surrender
Net	(16)	(455)	144	(130)	

- PM Emissions fully mitigated over one day

Current Status

- Completed refractory dry out
- FCCU start up scheduled for early May
- SCAQMD will conduct ambient PM monitoring in the vicinity downwind
- Staff continues to monitor operations