A **Different Approach** to an Old Problem

Learning Objectives

FCC Safety Workshop evolution
Industry Body of Knowledge, Practice Share
Roadshow Methodology

How can we improve what we have already been doing?

- FCCs in Industry
  - Safety Considerations

- Existing Industry Resources
  - Getting information to the right people
- Practice Share Documents
  - Improving on existing resources
- Safety Roadshow
  - Existing Information & Documents

- Exercise · Jeopardy

AFPM **Antitrust**

AFPM takes its antitrust compliance obligations seriously and our antitrust policy goes beyond the minimum requirements.

To ensure compliance with the antitrust laws and avoid any appearance of anticompetitive activity, every participant in AFPM meetings and AFPM activities must adhere to the AFPM antitrust guidelines.

As a general matter, the antitrust laws prohibit competitors from agreeing on the prices they will charge, the products they will offer, the customers they will serve, or the markets in which they will compete. Therefore, there should be no discussion or disclosure of information with respect to:

(a) expected profits, premiums, prices, surcharges, or discounts;

(b) specific customers or classes of customers, or whether you will or will not do business with them;

(c) proposed product offerings;

(d) allocation of geographic or product markets;

(e) any refusal to deal with a customer or supplier;

(f) how to deal with the market behavior of a competitor; or

(g) any other topic involving a potentially anticompetitive practice.

These documents are meant to share information on process safety practices in order to help improve process safety performance and awareness throughout industry. The goal is to capture and share knowledge that could be used by other companies or sites when developing new process safety practices or improving existing ones. The documents being shared have been used by an industry member, but this does not mean it should be used or that it will produce similar results at any other site. Rather, it is an option to consider when implementing or adjusting programs and practices at a site.

BY THEMSELVES, THESE DOCUMENTS ARE NOT STANDARDS OR RECOMMENDED PRACTICES. THEY ARE NOT INTENDED TO REPLACE SOUND ENGINEERING JUDGMENT. THEY DO NOT PRECLUDE THE USE OF ALTERNATIVE METHODS THAT COMPLY WITH LEGAL REQUIREMENTS. A SUBJECT MATTER EXPERT SHOULD BE CONSULTED PRIOR TO DETERMINING WHETHER A PRACTICE CAN BE USED IN ANY SPECIFIC SITUATION.

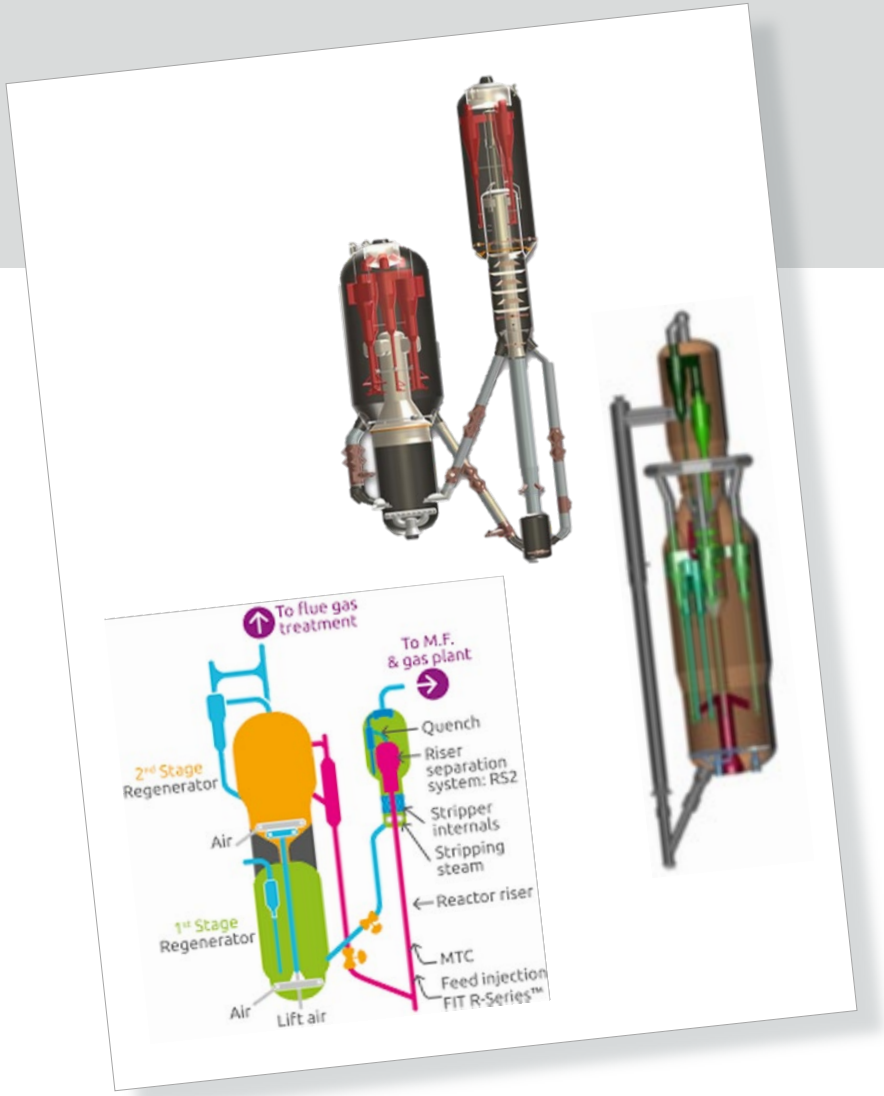
The Role of the **FCCU**

1969 Newspaper Photograph
Bayway FCCU (now P66)

Developed by a consortium of groups to commercialize a process that would provide higher yields of aviation fuels (1938).

(After four years of forming the consortium, first unit started up in 1942).

The FCCU started off processing atmospheric and vacuum gas oils, but feeds today can also include deasphalted oils, coker products, resids, tight oils, and syncrudes.



Many Types of FCCUs **Are in Operation**

Every combination has been used in terms of relative vessel positions and unit layouts.

Reactor higher elevation than regenerator and vice versa, or directly stacked on each other.

Multiple risers and reactors, multiple standpipes, multiple regenerator vessels.

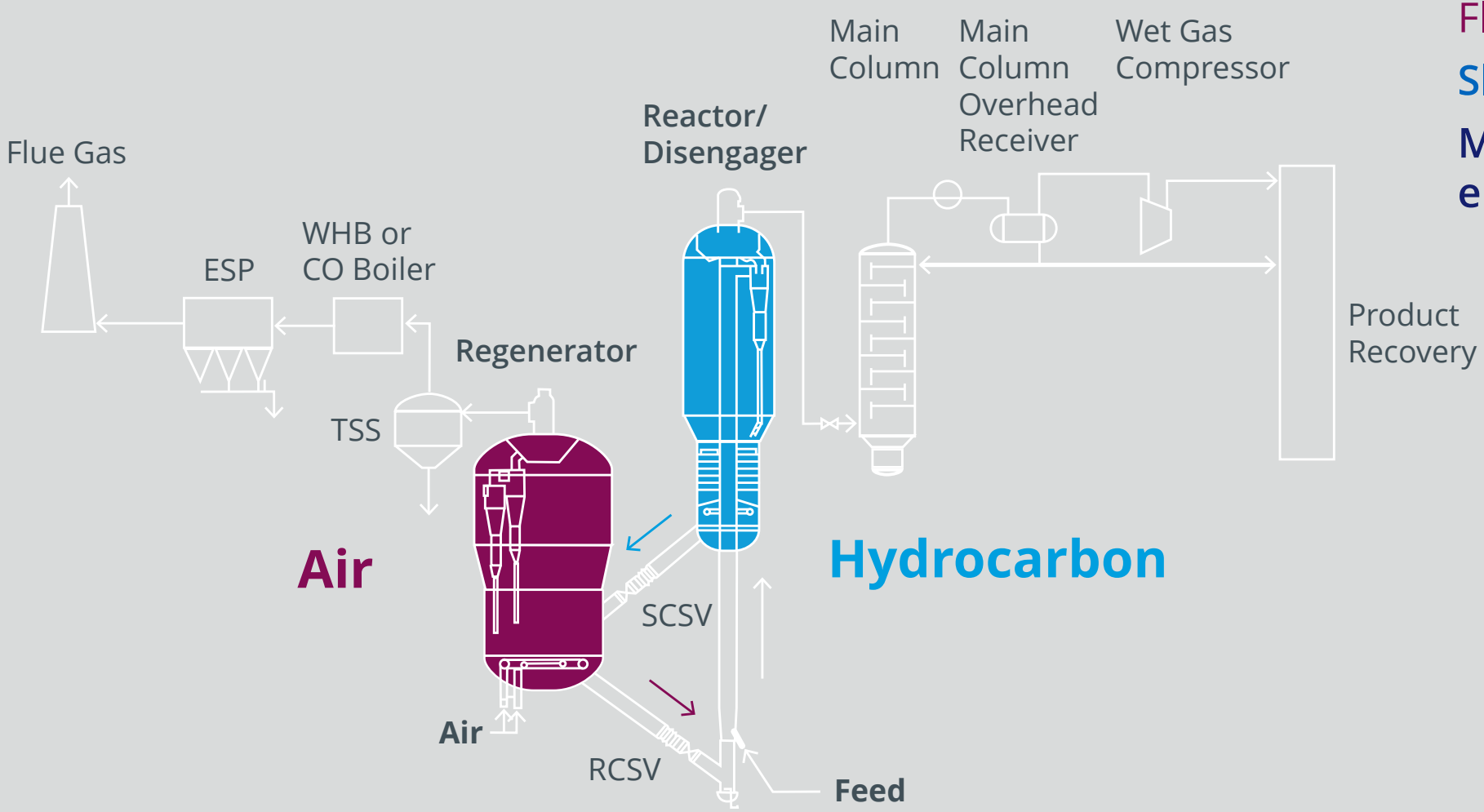
All units inject air to the regenerator for coke combustion.

Erosion is a concern for long term reliability and can impact the ability to control catalyst circulation or catalyst retention.

Downstream of the reaction section, the main column and vapor recovery unit separates the reactor effluent into desired product streams.

During upsets, start up, shutdown, or 'standby' modes, unit layout differences do not change the fundamental safety goal of keeping the air and hydrocarbon sides of the FCCU separated from each other.

Safety Considerations Unique to the FCCU



Fluidized Bed Process

Slide / Plug Valve Condition

Main Column Bottoms Circuit erosion due to solids

Keep them Separate

Process Safety **Committees**

Safety Council

No one company can have complete knowledge of these plants. Therefore, it is hoped that the collective experience of this group can help improve safety of these facilities.

Safety Council cannot develop products.

AFPM Committee

Takes knowledge to develop products for the AFPM Safety Portal.

Ramped up efforts five years ago to address recent learning from significant events.

Industry **Know-How** and **Body of Knowledge**

Books and Manuals

Fluid Catalytic Cracking Handbook

Fluid Catalytic Cracking: Role in Modern Refining

GRACE Handbook

Many others

Company and Supplier Workshops

What Is Already Out There?

CSB Reports

CSB Husky Report
CSB Torrance Report

Sampling of AFPM **FCC Toolbox**

AFPM Presentations and Papers (Sampling)

AFPM QA Database from 10 years of Conferences

Legacy Items and Incident Examples – ISC 3rd party training presentation

Transient Operation (Standby, Startup, Shutdown) – AFPM Summit P&P

Reducing the Risks of Fires and Explosions in ESPs – 2009 NPRA

Emergency Interlock System Application – AFPM Presentation by UOP

AFPM Webinars

Safeguarding the FCCU during Transient Operations

FCC Summit QA Follow-up

FCC Process Safety Resources

FCC Actuator Systems: Past Present and Future – Part 1 and 2

FCC Startup, Shutdown and Standby Monitoring Best Practices – Oxygen Monitoring

FCC Non-Routine Operations Standby Checklist

AFPM FCC Documents

HAZID - Flammable Mixture Accumulation in FCC

HAZID - Main Frac Bottoms Safety

Safety Bulletin – Flammable Mixture Accumulation in FCC Units during Non-routine Operations

Practice Share (PS) – Oxygen Monitoring During Standby Operations

PS – Preparing for PHAs and Consequence Safeguard Table

PS– Pre and Post Action Review

PS– Slide Valve for Safe and Reliable Operation

PS– Safe Torch Oil Operations

PS – Reactor Isolation Valve Justification

PS – Safe Direct Fired Heater Operation

PS – Shift Handover Checklist while in Standby

PS – Simplified DCS Screen for Standby Operations

PS – Standby Operations Monitoring Checklist

PS – Safety Assessment Survey

PS – Safe ESP Operations

PS – Safety Interlock Systems

FCC Process Safety Regional Workshops

The Problem

- Body of knowledge is everywhere
- Much of the knowledge is geared towards engineers, not the people working on the equipment
- People doing the work are typically not the ones attending conferences

The Solution

- Take the message to the people that can make the change
- Aggregate body of knowledge in one place and make it accessible to everyone
- Present content in easy to digest format in an engaging way

Practice Shares Sessions

Monitoring in Transient Operations

Startup, Shutdown, Emergency Procedures

Safety and Supporting Information

Air and Hydrocarbon

Focus Implementation Area

Practice Share **documents facilitate change to four areas.**

Training

Piping Systems and Equipment Design

Procedures

Control and Shutdown System

List of Practice Share

Important Procedure Elements

Safety Bulletins

Oxygen Monitoring During Standby Operations

Preparing for PHAs and Consequence Safeguard Table

Pre and Post Action Review

Safe Torch Oil Operations

Reactor Isolation Valve Justification

Safe Direct Fired Heater Operation

Shift Handover Checklist while in Standby

Simplified Screen for Standby Operations

Standby Operations Monitoring Checklist

Safety Assessment Survey

Slide Valve Online Erosion Monitoring

Safe ESP Operation

Slide Valve Purge for Safe and Reliable Operation

Safety Interlock Systems

More on these later....

Workshop **Presentation Method**

Each section **communicates** specific **learning objectives**, easy to **understand**, **memorable**, and **engaging**.

Learning Objective

Flavor of Detailed Individual Content

Deep Dive Related Selected Individual Content

Exercise Related to Deep Dive

Implementation **Workshops Learnings**