



Crude Oil Quality Group (COQG)



CRUDE OIL QUALITY

What it is

Why it is important

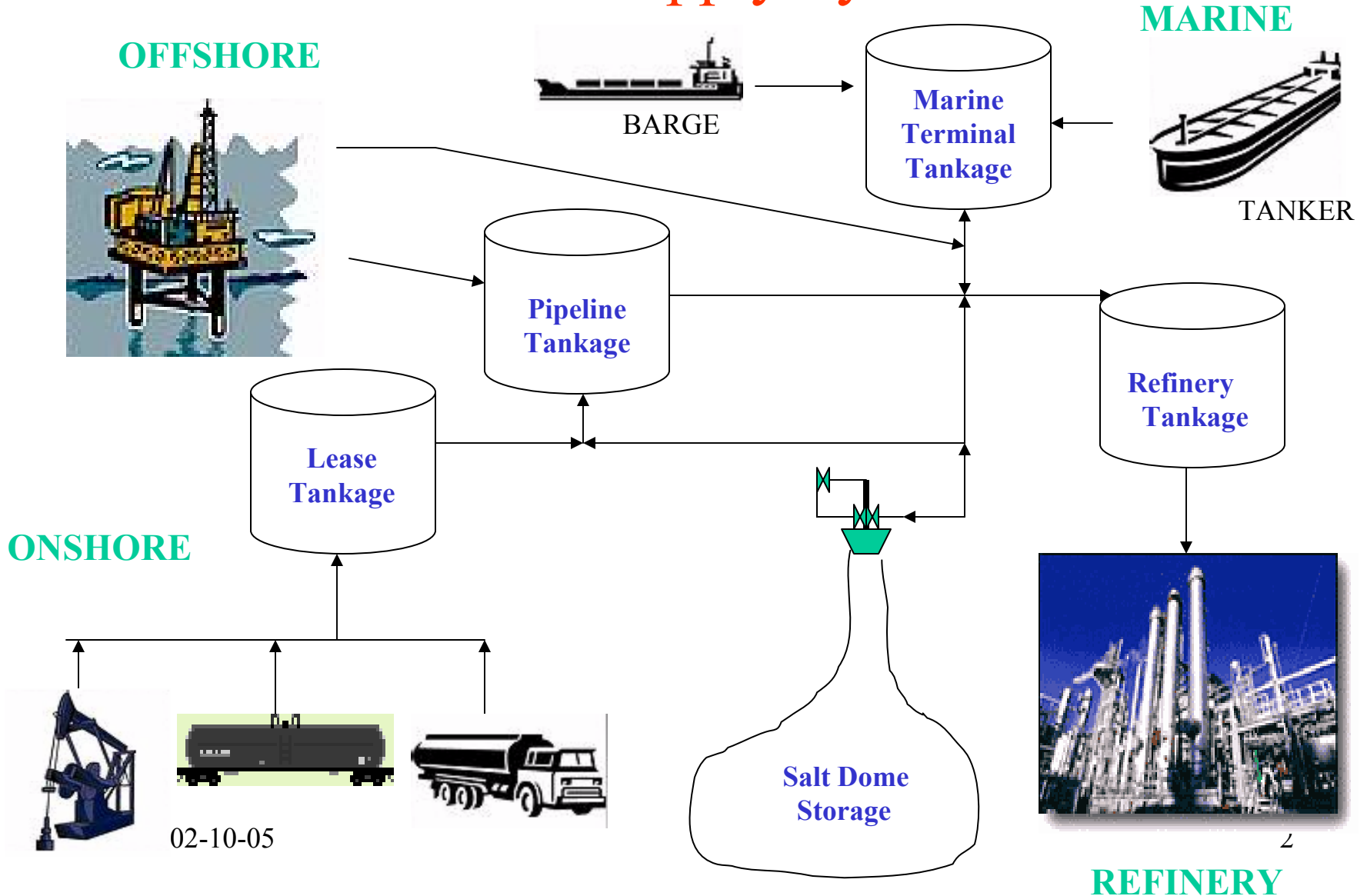
What we can do to make it better

Who needs to act

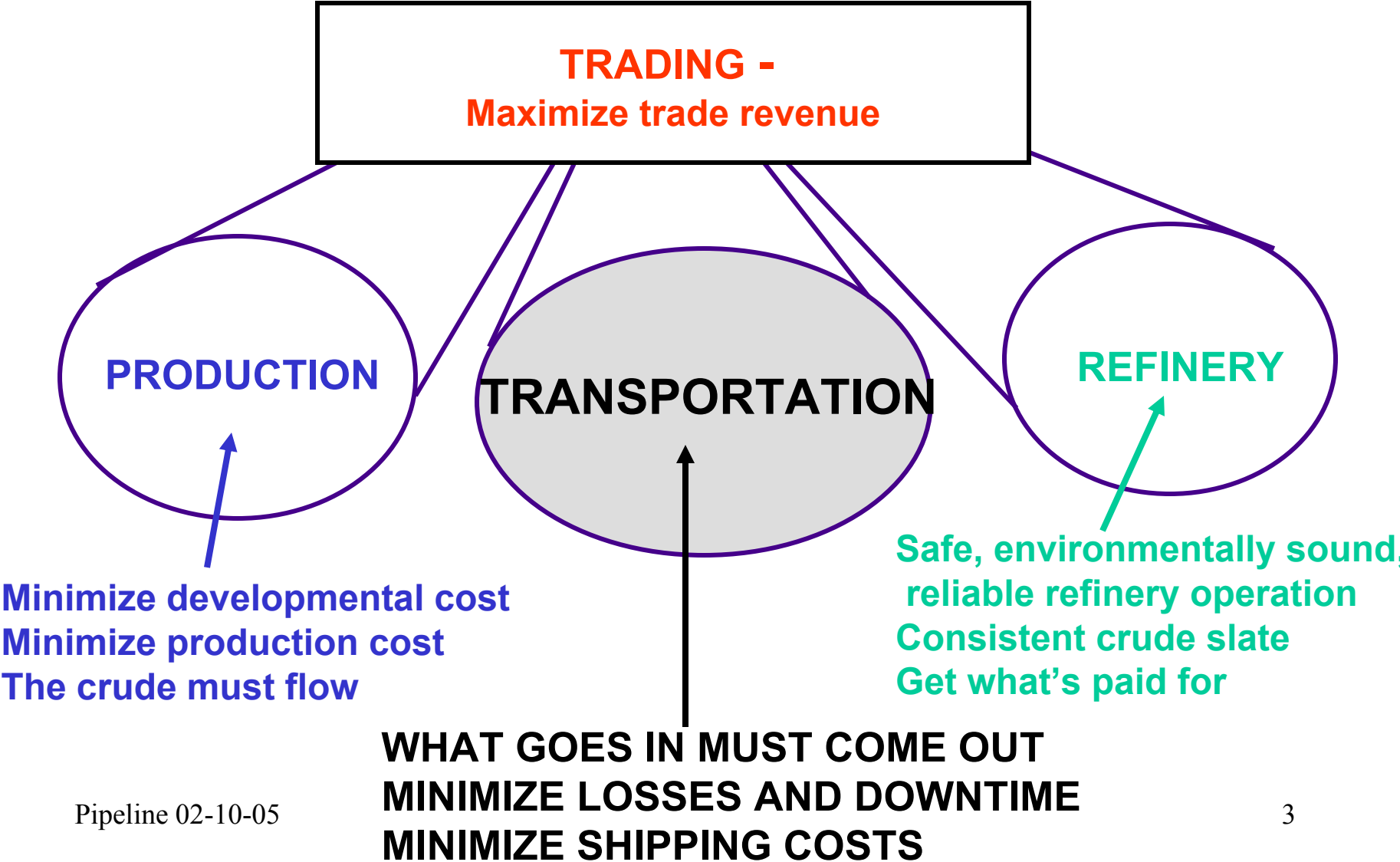


Crude Oil Quality Group

Crude Oil Supply System

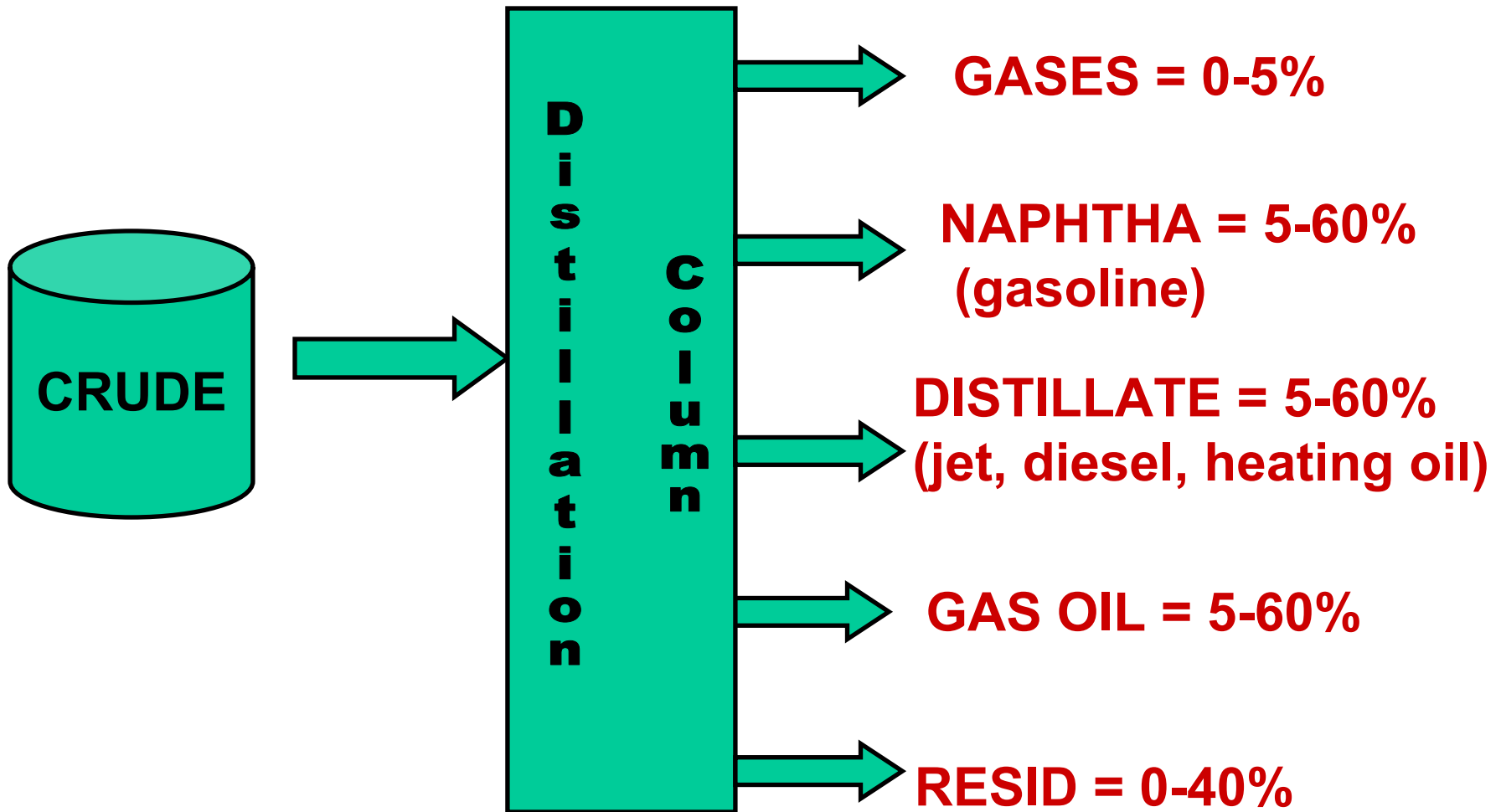


Driving Forces By Industry Segment



What is Crude Oil?

A mixture of hydrocarbons



What Is Crude Oil Quality?

- Maintaining the integrity and consistency of the refining characteristics of a crude oil stream
- The commonly used industry standards of gravity and sulfur, while important, do not adequately define a crude oil
- Crude oil quality is achieved through identification of a crude's important characteristics and by protection of those parameters

What Is Crude Oil Quality?

- It's about getting what you paid for
 - Consistent hydrocarbon distribution
 - No surprises (atypical metals, sulfur, acidity, etc.)
 - No contamination (chemical wastes, production wastes, transportation wastes)
- Our definition of QUALITY does NOT mean light vs. heavy or sweet vs. sour – it refers to the expected vs. the unexpected and the typical vs. the inconsistent

What Can Happen to Crude Oil to Change its Quality?

- DEGRADATION - Normal operations
- CONTAMINATION - Outside ingredient NOT normally used
- ALTERATION - Outside ingredient, but used in normal operations
- BLENDING - Mixing of different crude streams, particularly streams with very different properties or values.

What happens to Crude Oil BEFORE the Pipeline System?

CONTAMINATION (*NOT normal*)

- Cleaning wastes
- Chlorinated solvents
- Butanes
- Plant by products
- Natural gasoline

**Pipelines can communicate
contamination**

What happens to Crude Oil BEFORE the Pipeline System?

ALTERATION (*normal*)

- Salt Water (completion fluids, cavern brine, ship ballast, slops)
- Production Chemicals (methanol, acids, drilling fluids, anti-foams)

**Pipelines can communicate
alteration**

Let's Talk About Blending...

- Crude oil is intrinsically a complex mixture of hydrocarbons
- Sometimes, two or more crudes (each a complex mixture) are deliberately blended to form a new variety of crude
 - Some of these blends are transparent
 - Well head driven
 - Logistics driven
 - Refinery charge driven
 - Some of these blends are NOT transparent
 - Dumbbell crudes (blended to meet a target such as gravity)
 - Economically driven blends (spiking sour into sweet to take advantage of a price spread)
- Heavy crudes can be blended with a density / viscosity reducer (natural gasoline, synthetic and processed crudes, butane)
 - The Canadian and Venezuelan oil industries have extensive experience in bitumen dilution

What Happens to Crude Oil in the Pipeline System?

DEGRADATION (*normal operations*)

- Tank heels
- Tank bottoms
- Interfaces
- Water slugs
- Line fill

**Degradation can be managed
by the pipeline**

What Happens to Crude Oil in the Pipeline System?

CONTAMINATION (*NOT normal*)

- By-products from refinery or chemical plant
- Tank and line cleaning chemicals
- Used motor oil
- Chlorinated solvents
- Hydrotest water

**Pipeline can control
contamination of oil in its
custody**

What Happens to Crude Oil in the Pipeline System?

ALTERATION (*normal*)

- Drag reducing agents
- Corrosion inhibitors
- Pour point depressants

Pipeline can control alteration of oil in its custody

What's a Pipeline to Do?

- **Communicate** with shippers
- **Work** with refineries to manage quality
- Make only **authorized** additions
- **Manage** the quantities of any additions deemed necessary
- Work with producers to **minimize** problem areas
- **Communicate** known substances in receipts

PIPELINE CHAIN OF COMMAND

– **COMMUNICATION IS KEY**

- Field personnel
- Scheduler
- Oil movement coordinator
- Oil movement management

What's a Pipeline to Do?

– **COMMUNICATE WITH SHIPPERS**

- One refinery estimates it lost \$1,000,000 in just three months when a heavy crude was blended into a lighter crude. Don't assume crudes are all the same.
- Tell the shipper of known alteration and unavoidable degradation
- Let the shippers know when they are the problem (small batch size, unreasonable delivery schedules, etc)

What's a Pipeline to Do?

– **WORK WITH REFINERY AND SHIPPER TO MANAGE QUALITY**

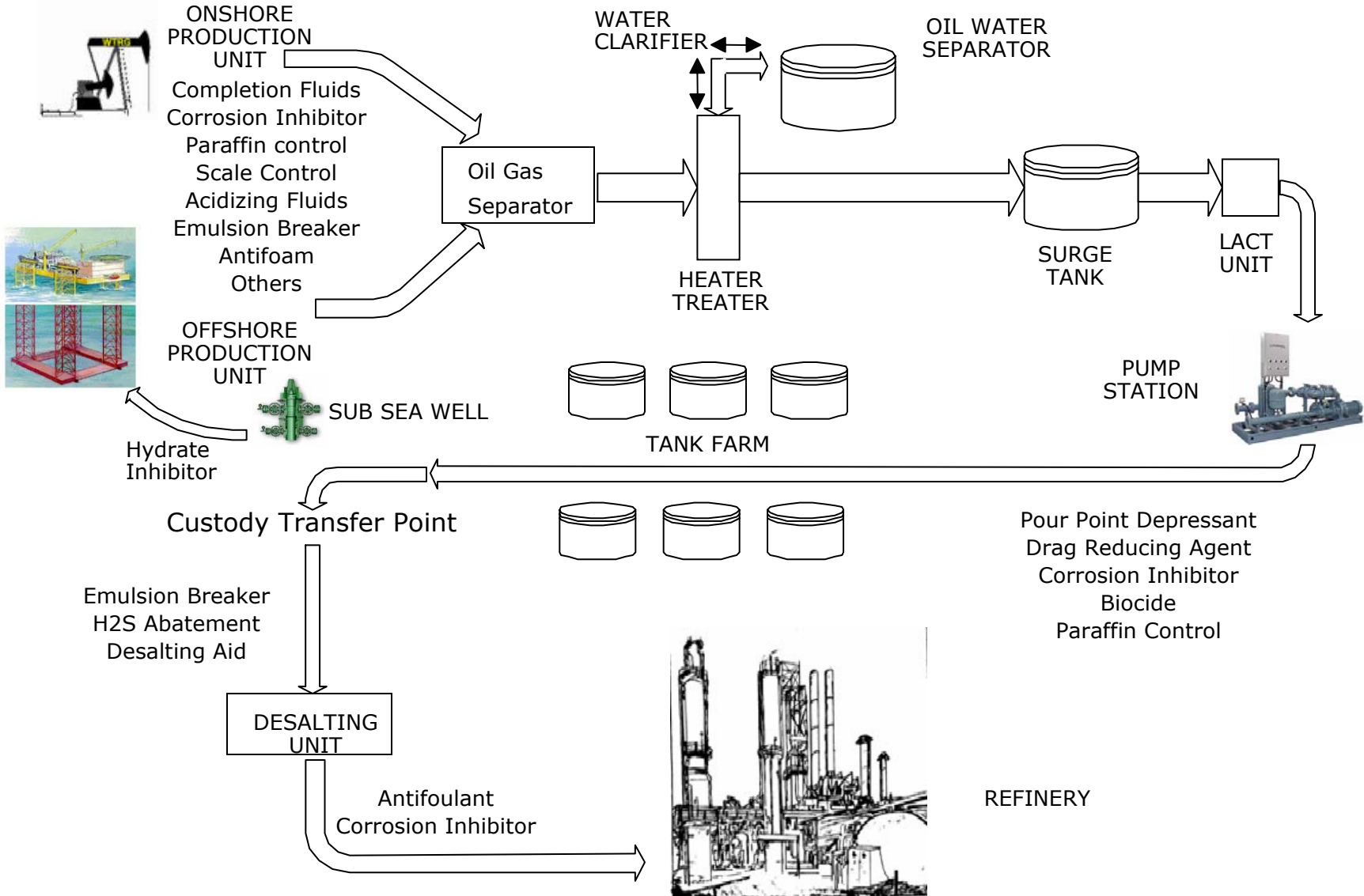
- Ask the refinery to tell you about problem chemicals
- Ask the refinery to tell you of known incidents of inconsistent crude that created problems (both economic and safety-related)
- Ask the refinery to cooperate with the pipeline when a problem occurs - pipelines can't get rid of it; the refinery needs to be involved in any mitigation

What's a Pipeline to Do?

– **MAKE ONLY AUTHORIZED ADDITIONS**

- Be part of the solution not the problem
- Don't “dump” anything in the crude stream without checking first

Additives can be introduced anywhere - from the well to the refinery



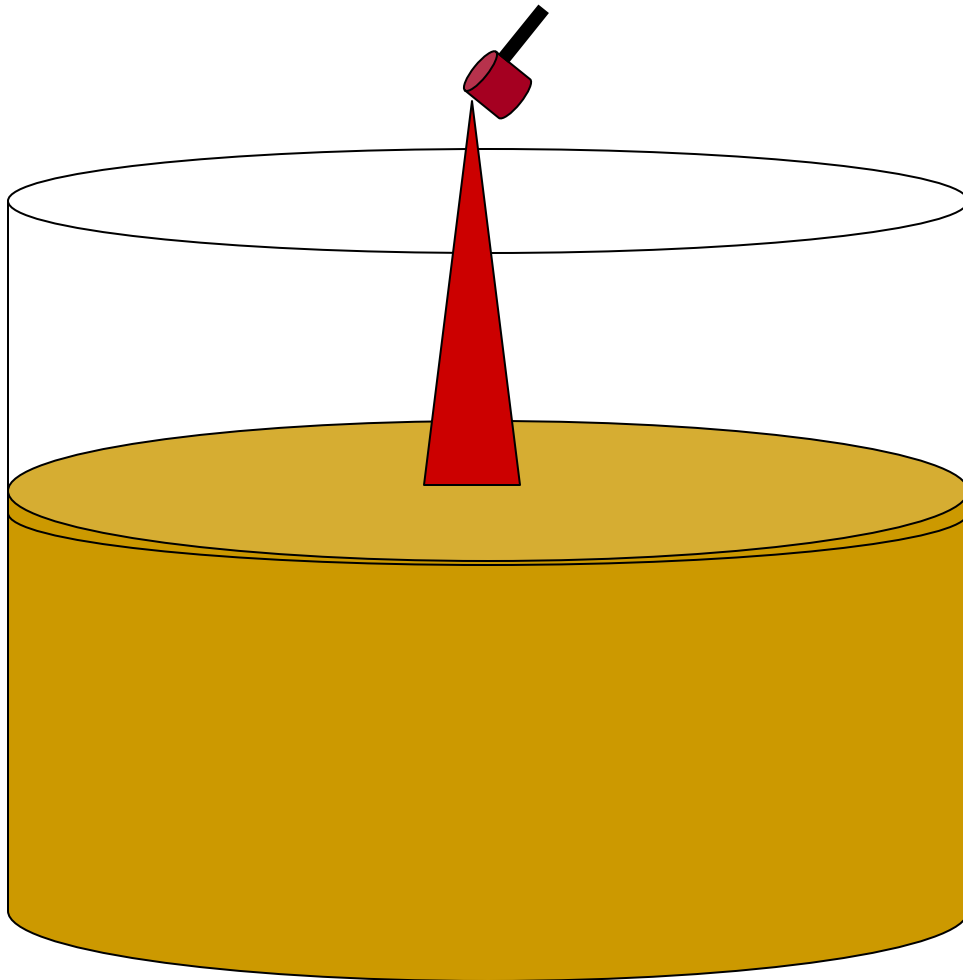
REMEMBER: Even typical additives sometimes cause refinery problems...

- Coordinate all pipeline additive use with refineries
- Facilitate communications between refineries and
 - Producer
 - Shipper
 - Truck
 - rail
 - marine
 - connecting pipeline

What's a Pipeline to Do?

- **MANAGE THE QUANTITIES OF ANY ADDITIONS**
 - A little bit goes a long way
 - Remember the cumulative effect of adding even approved chemicals several places along the line

A little bit goes a long way !!!

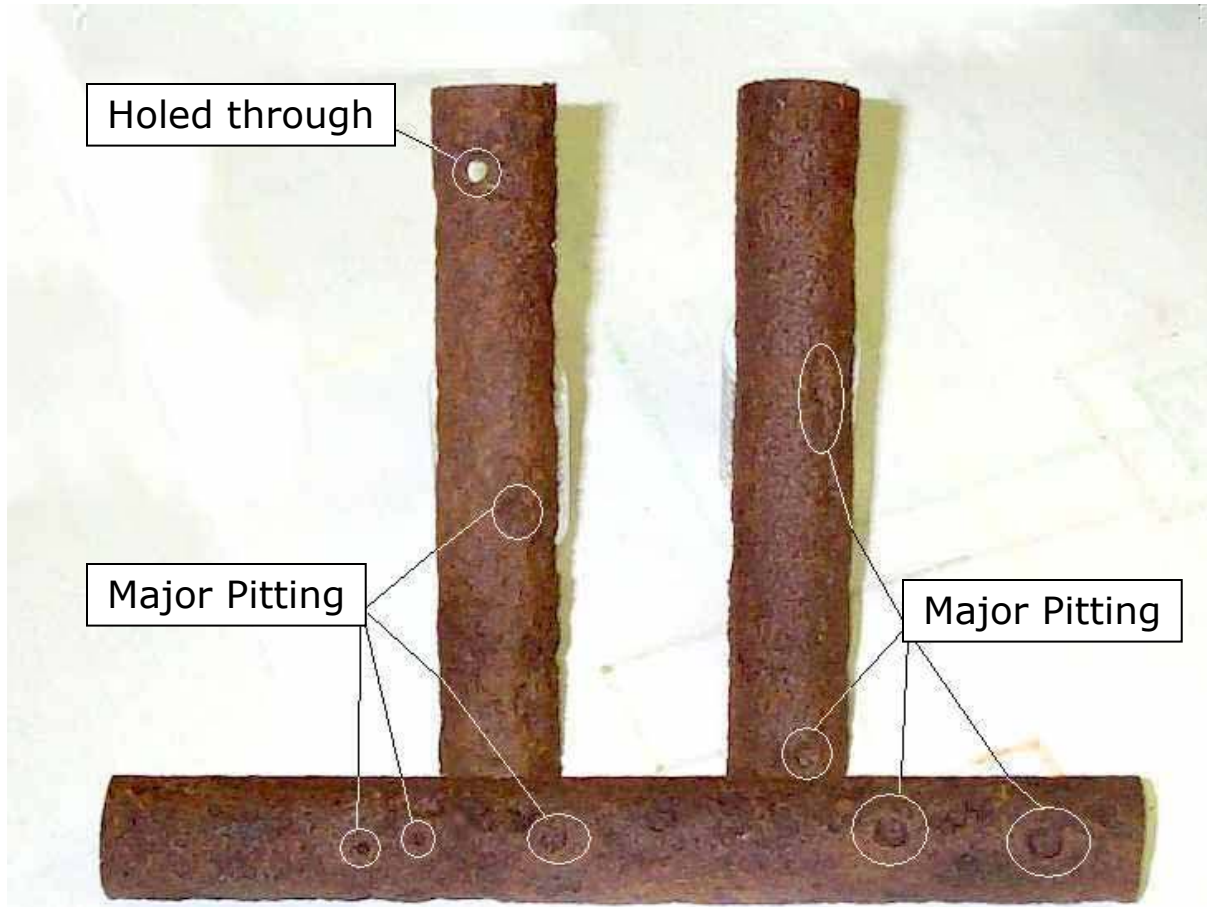


One cup of
organic chlorides
can contaminate
2500 barrels
of crude oil

Chlorinated Solvents in Crude Oil

- Are particularly damaging to refineries
- Form Hydrochloric Acid upon heating and subsequent decomposition
- Cause CORROSION- resulting in serious safety and environmental problems

Corrosion can cause damage beyond repair



Corrosion of heat exchanger tubes

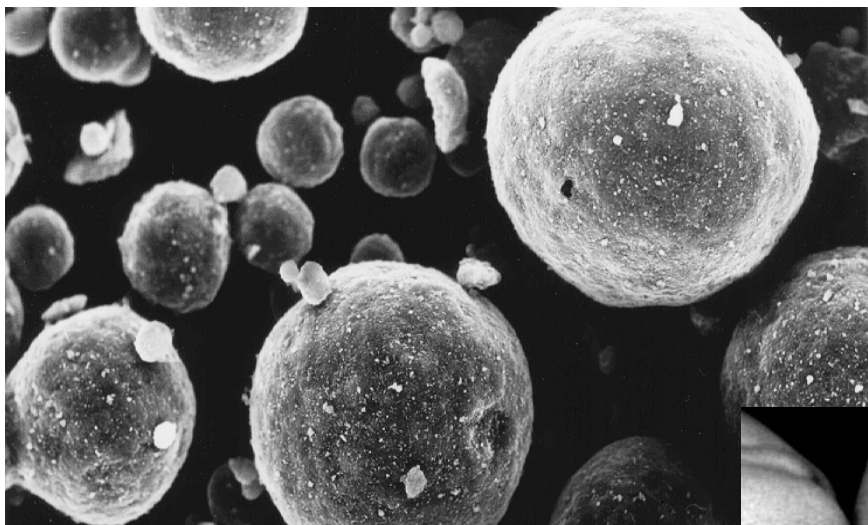
NOTE: raw crude oil flows inside the tubes while crude overhead (naphtha) flows on the outside of the tubes

What's a Pipeline to Do?

– **WORK WITH PRODUCERS TO MINIMIZE PROBLEM AREAS**

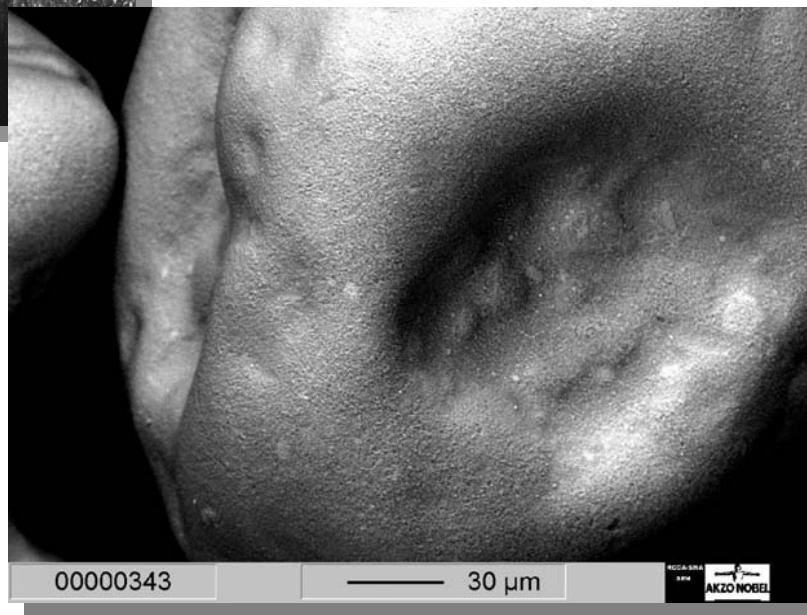
- Ask the producers to be forthcoming about what is being added and how the crudes are changing
- Field personnel see what is going on - communicate the issues

Even small amounts of contaminants can poison refinery operations



•Normal catalyst

•Catalyst contaminated by high calcium



What's a Pipeline to Do?

– **COMMUNICATE KNOWN SUBSTANCES IN RECEIPTS**

- Tell the shipper when you know there is a chemical being introduced into their crude oil.
 - ? Can they manage the situation ?
- Tell the producers when a problem occurs.
 - ? Can they do better in the future ?
- The pipeline is the middleman; refiners rely on you

What Next?

1. Education for producers, transporters and refiners
2. Would a database of problem chemicals help?
3. What do you, a pipeline professional, need to know to better manage crude oil quality?

**EDUCATION
WORKS**



Crude Oil Quality Group (COQG)

Mission Statement

The Crude Oil Quality Group (COQG) is dedicated to the belief that maintaining the integrity and consistency of the refining characteristics of crude oil streams is of importance to all parties involved in crude oil activity, from production locations to the refinery. The COQG believes the commonly used industry standards of gravity and sulfur do not adequately define crude oil quality, and should be expanded to include other characteristics. The COQG is opposed to the alteration of crude oil streams, such as through the injection of processed gas liquids, without the knowledge and consent of the parties involved.

To promote these beliefs, the COQG will strive to:

- Communicate our beliefs to the oil industry at large;
- Create and sponsor forums for open communications and the sharing of information and ideas to better educate the crude oil industry;
- Be pro-active in the advancement of our beliefs with all areas for the crude oil arena, including production, transportation, trading, and refining sectors;
- Improve the overall quality of crude streams through the promotion of crude quality programs on common carrier transportation systems; and
- Be closely involved with various industry associations to further promote our beliefs.