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Gas Detection for Refining

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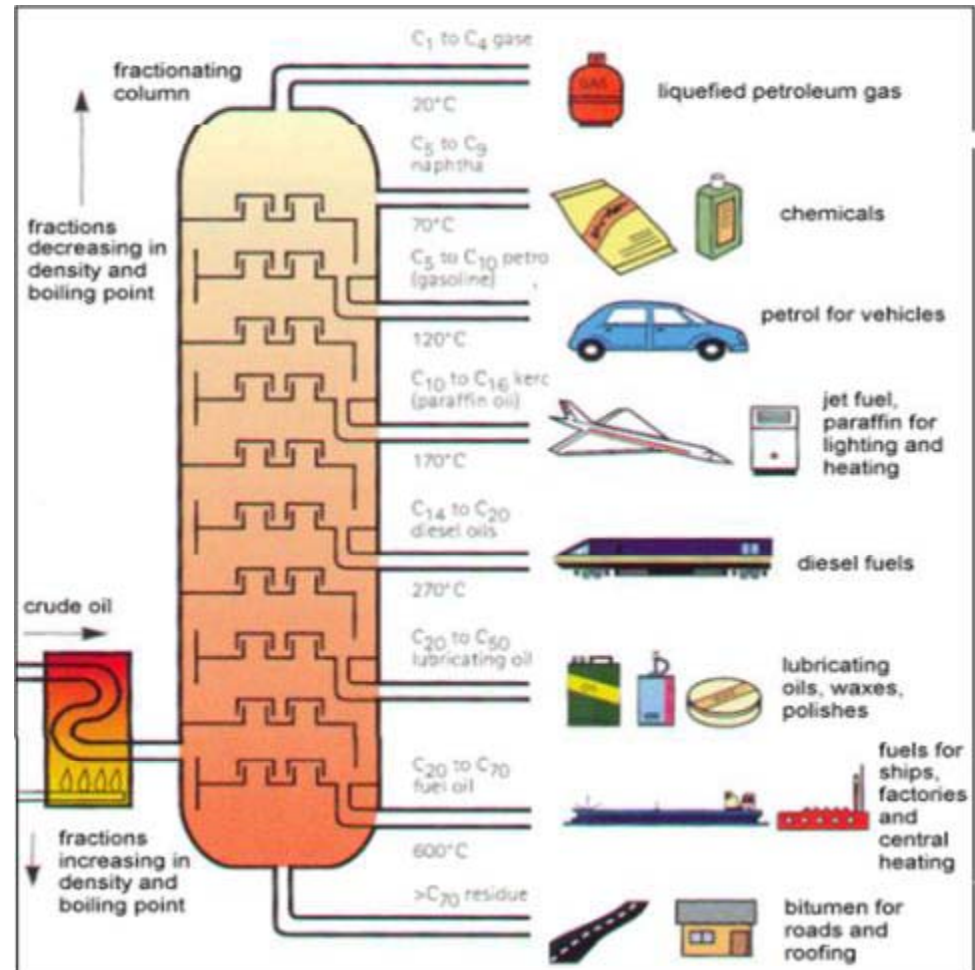
Refinery Process and Detection Needs

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- Refining Crude Oil

- Final Products

- Coke Asphalt
 - Waxes, Lubricating Oils and Greases
 - Kerosene, Jet Fuel, Diesel Fuel, Home Heating Fuel
 - Petro-Chemical Feedstocks
 - Gasoline
 - Fuel Gas
 - Liquid Petroleum Gases



<http://science.howstuffworks.com/environmental/energy/oil-refining4.htm>

How it works...

1. You **heat** the mixture of two or more substances (liquids) with different boiling points to a high temperature. Heating is usually done with high pressure steam to temperatures of about 1112 degrees Fahrenheit / 600 degrees Celsius.
2. The mixture **boils**, forming vapor (gases); most substances go into the vapor phase.
3. The **vapor** enters the bottom of a long column (**fractional distillation column**) that is filled with trays or plates. The trays have many holes or bubble caps (like a loosened cap on a soda bottle) in them to allow the vapor to pass through. They increase the contact time between the vapor and the liquids in the column and help to collect liquids that form at various heights in the column. There is a temperature difference across the column (hot at the bottom, cool at the top).

Source: <http://science.howstuffworks.com/environmental/energy/oil-refining4.htm>

How it works...

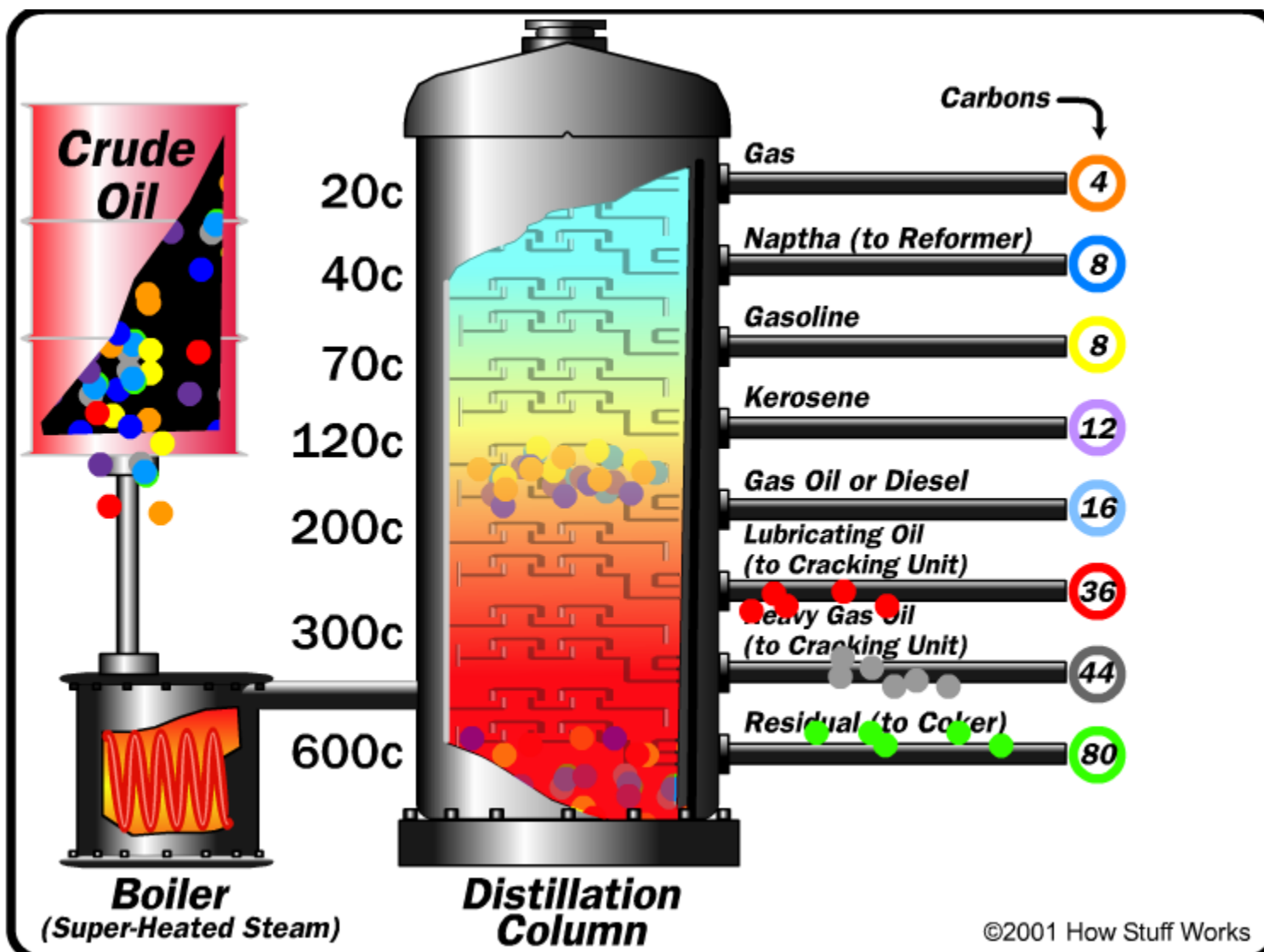
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4. The **vapor rises** in the column.
5. As the vapor rises through the trays in the column, it **cools**.
6. When a substance in the vapor reaches a height where the temperature of the column is equal to that substance's boiling point, it will **condense** to form a liquid. (The substance with the lowest boiling point will condense at the highest point in the column; substances with higher boiling points will condense lower in the column.).
7. The trays **collect** the various liquid fractions.
8. The collected liquid fractions may pass to condensers, which cool them further, and then go to storage tanks, or they may go to other areas for further chemical processing

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Refinery Process and Detection Needs

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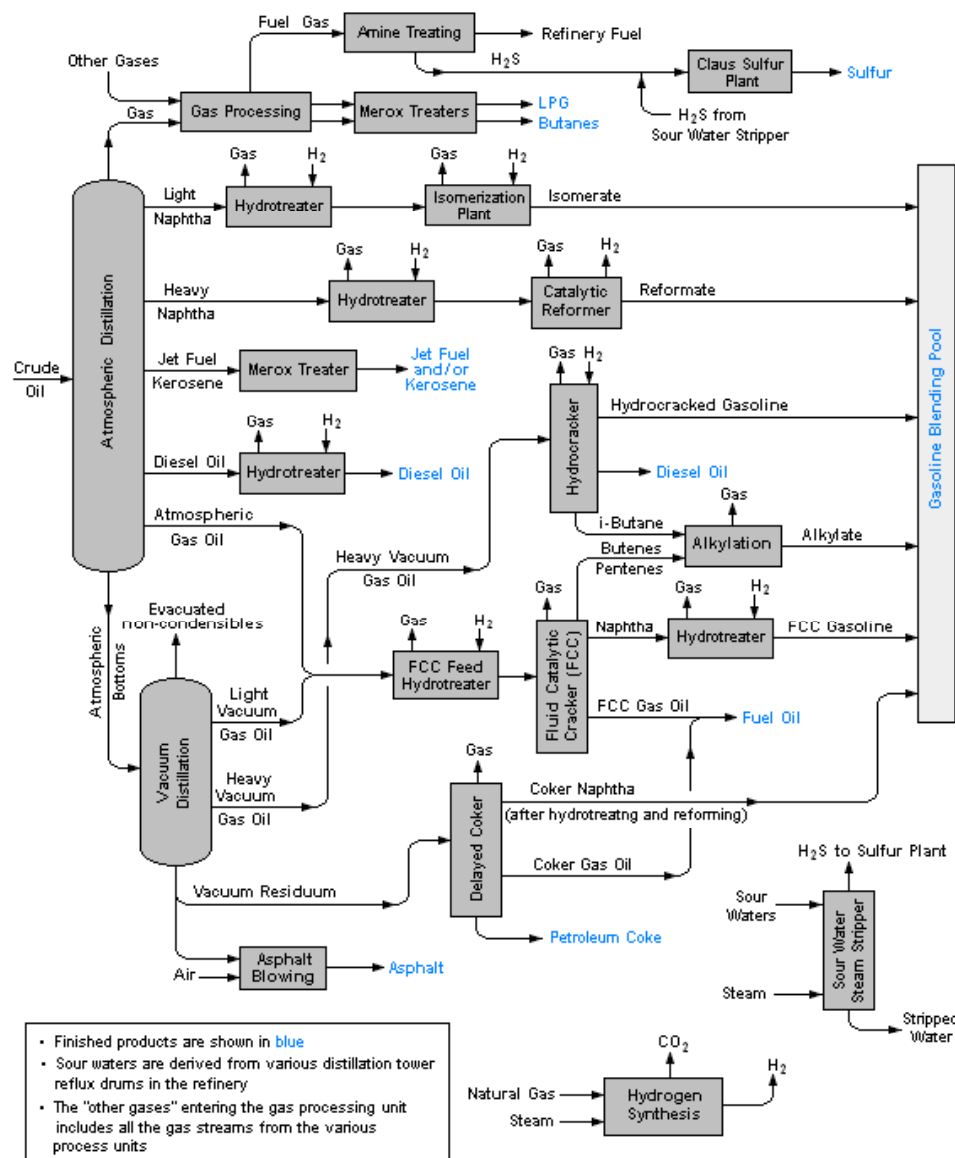
Source: <http://science.howstuffworks.com/environmental/energy/oil-refining4.htm>

Refinery Process Breakdown

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- **Typical gases**

- Hydrocarbons
- H₂S
- LPG
- LNG
- Butanes
- Jet Fuels
- Kerosene
- Diesel
- CO₂
- Hydrogen

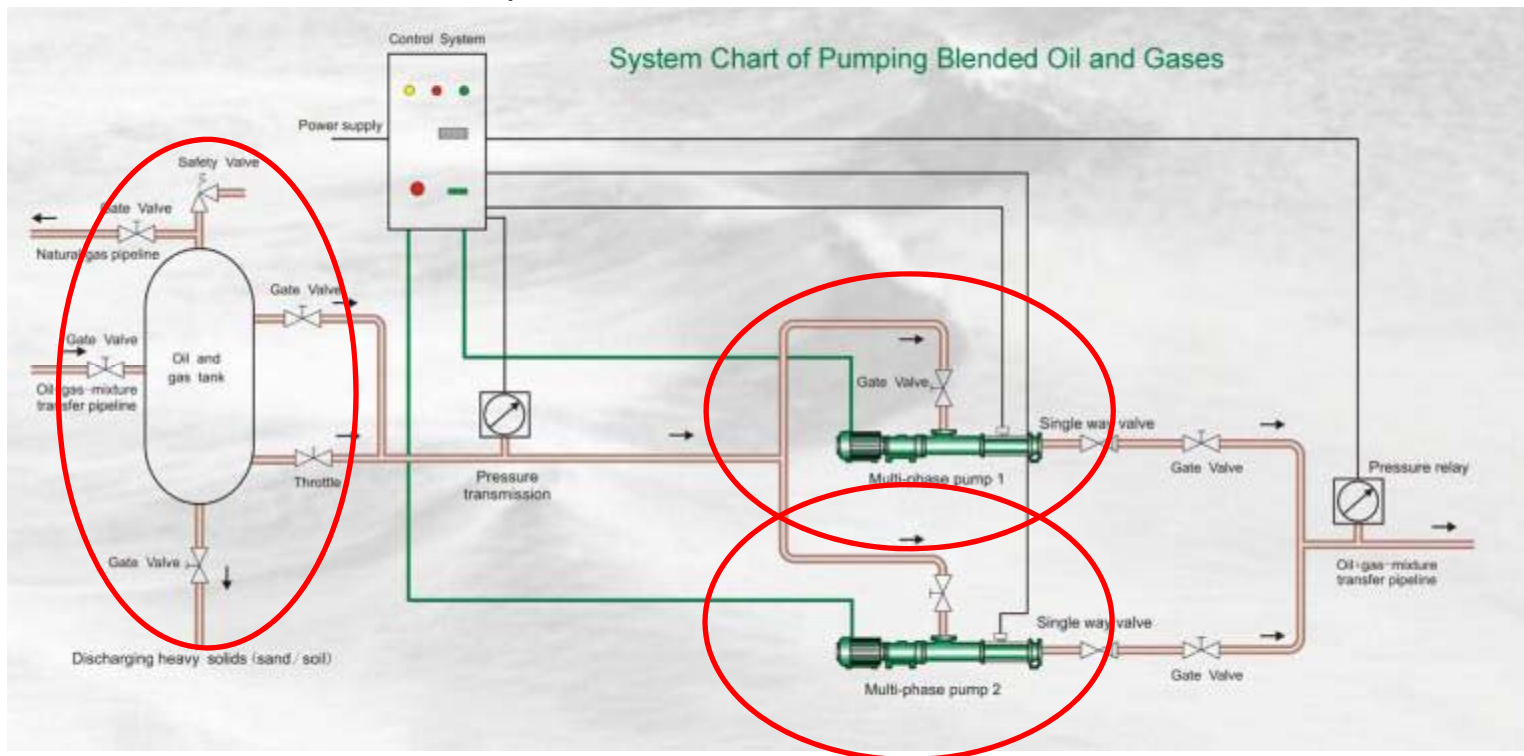


Why?

- **Process**

- Process phases

- Cracking – heating of the crude
 - Connections - Leak potentials
 - Pumping – moving of the product
 - Connections/pressures - Leak potentials
 - Blending
 - Valve networks – leak potentials



Product Selection

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- Solution #1
 - XNX-IR w/ Optima Plus
 - XNX-EC
 - FS24x Flame detector
- Solution #2
 - XNX-IR w/ Optima Plus
 - XNX-IR w/ Excel
 - XNX-EC
 - FS24x Flame detector
- Common gases
 - Vary based on process location
 - Hydrocarbons
 - H₂S
 - LPG
 - LNG
 - Butanes
 - Jet Fuels
 - Kerosene
 - Diesel
 - CO₂
 - Hydrogen





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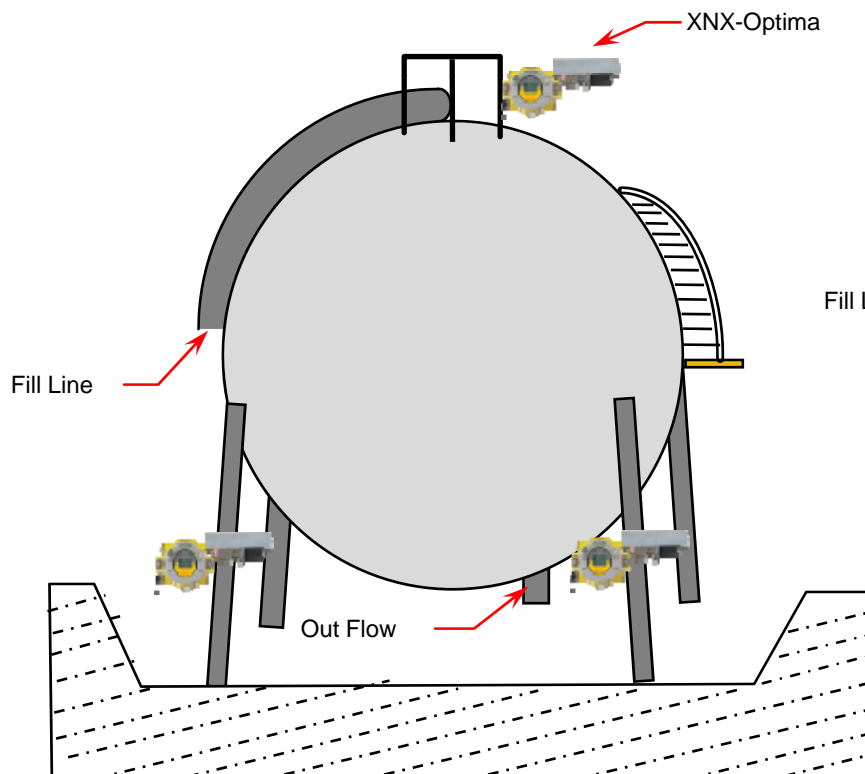
Gas Detection for Tank Farms

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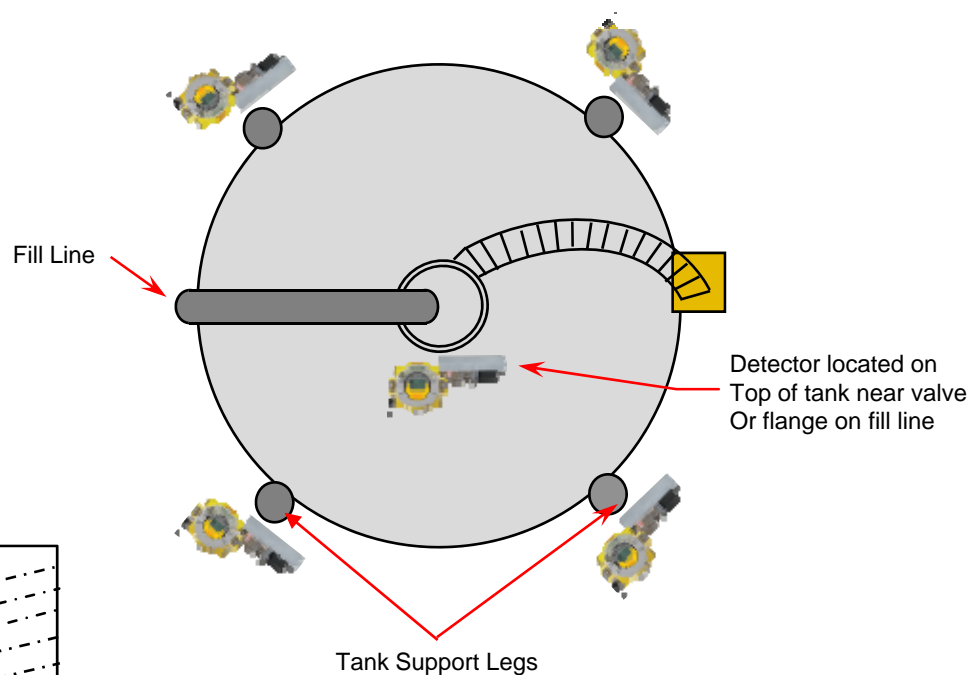
Tank Farms

- **XNX with Optima Plus**

- Hydrocarbons
- Located close to any potential leak source
- Located below top of dyke wall for vapors heavier than air
 - Approx 12-18 in above grade



SIDE VIEW OF STORAGE TANK

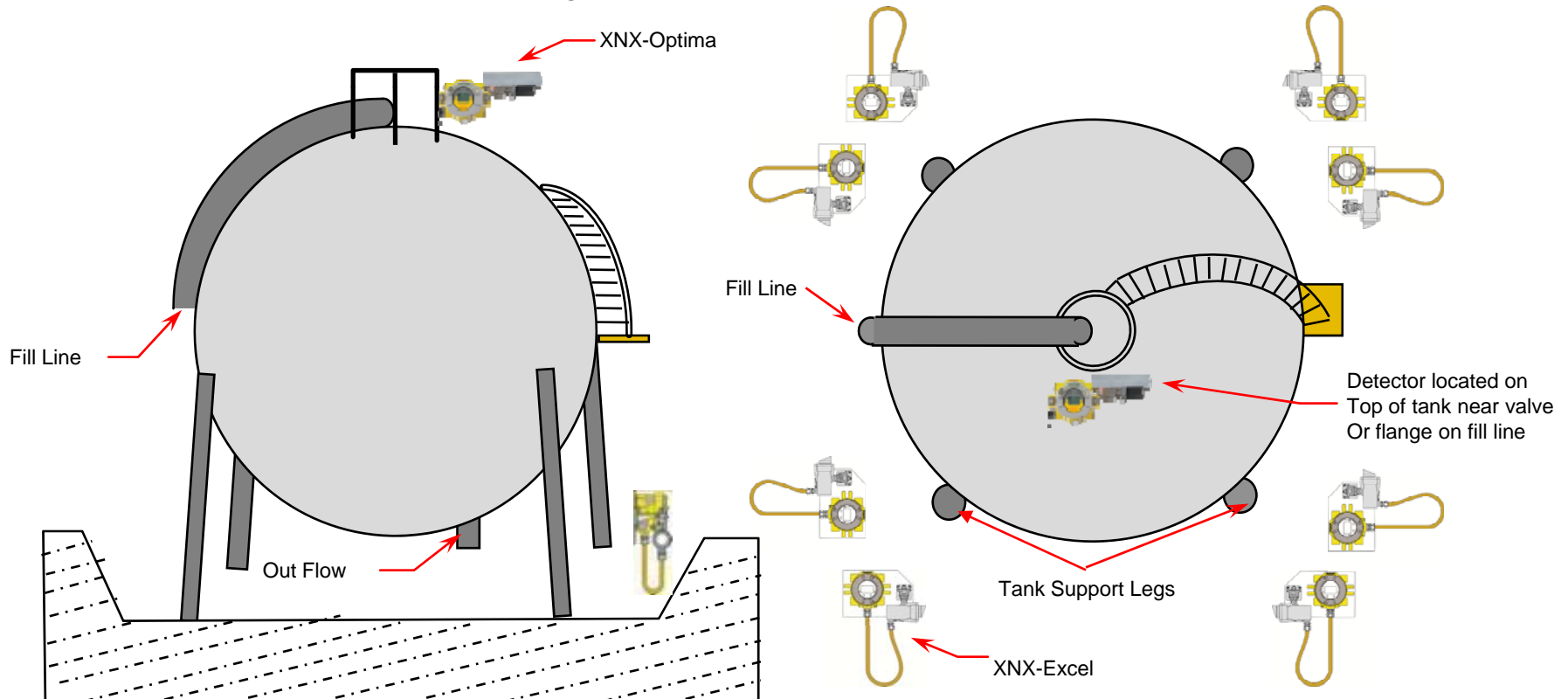


TOP VIEW OF STORAGE TANK

Tank Farms

- **XNX with Excel**

- Hydrocarbons
- Located close to any potential leak source
- Located below top of dyke wall for vapors heavier than air
 - Approx 12-18 in above grade

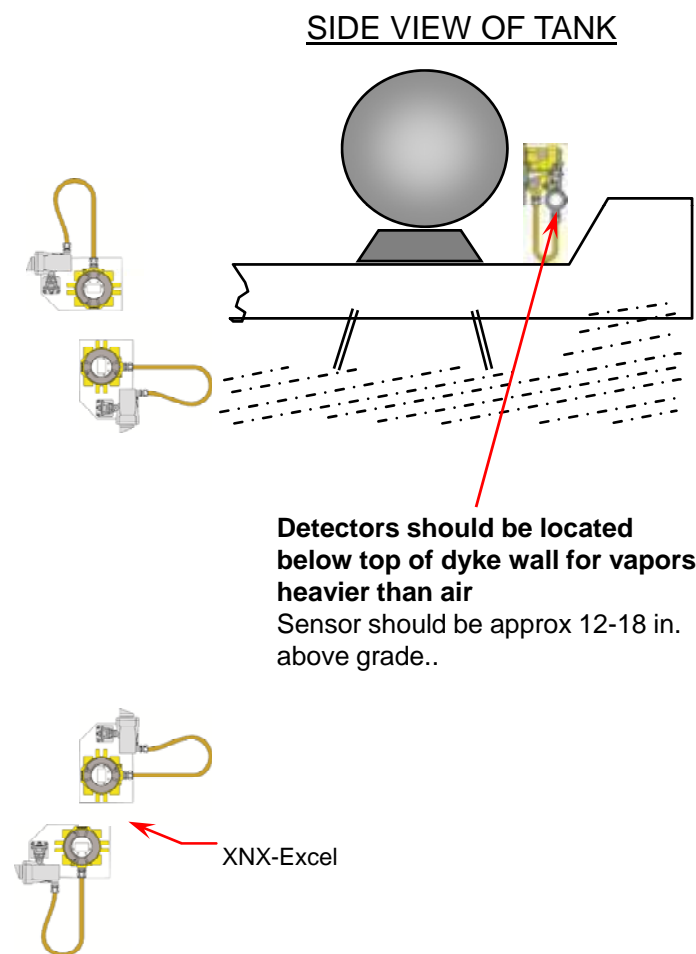
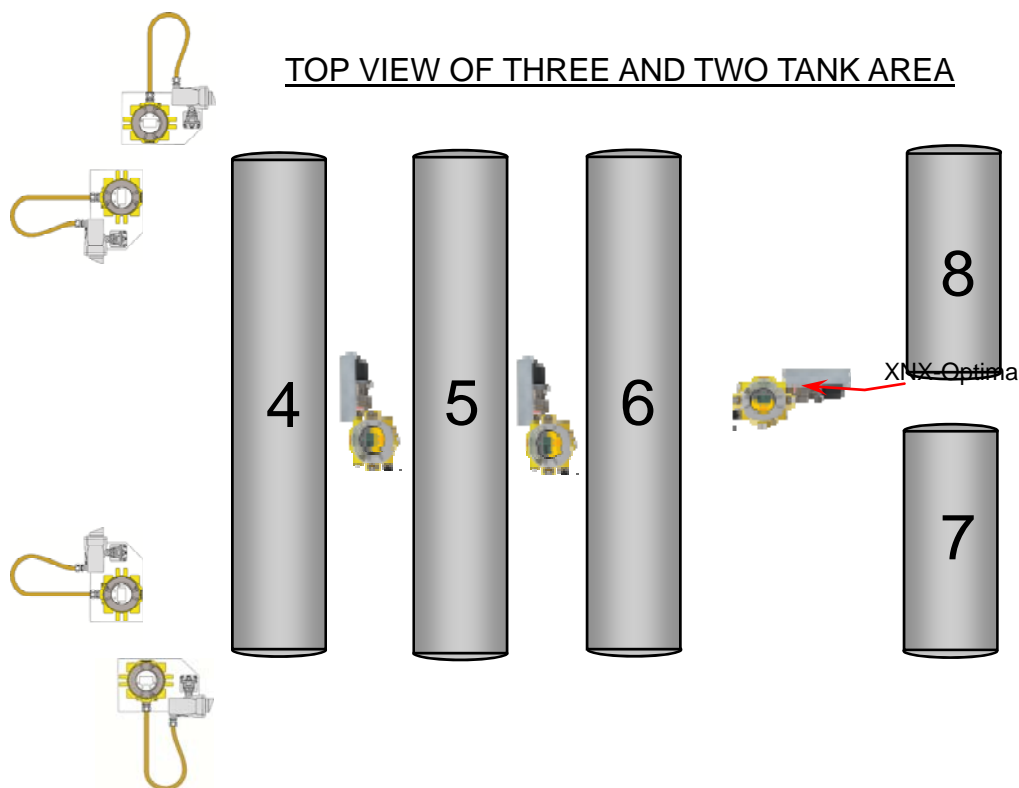


SIDE VIEW OF STORAGE TANK

Tank Farms

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- General Application Note ONLY not sole source of information for determining quantity and location of detector placement
- XNX with Optima Plus
 - Near leak points
- XNX with Excel
 - Ensure perimeter is properly covered



Product Selection

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- Solution #1
 - XNX-IR w/ Optima Plus
 - XNX-IR w/ Excel
 - XNX-EC
 - FS24x Flame detector
- Solution #2
 - XNX-IR w/ Optima Plus
 - XNX-EC
 - FS24x Flame detector
- Common gases
 - Vary based on tank farm contents





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Gas Detection for Pipeline Industry

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Types of Pipelines Facilities

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Petroleum Pipelines:

These are commonly referred to as “crude” pipelines. They contain liquid petroleum products such as gasoline, jet fuel, kerosene, diesel, heating oil, paraffin's and residual gases. They may also contain refined products.

Gas Transmission Pipelines:

Most gas transmission companies transport natural gas to various customers.

Midstream Operations:

Most of these companies are involved in gathering oil and gas from well heads. They process the oil and gas and ship it to customers through pipelines or other means.

Applications

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Gas Detection

- Hydrocarbon Application with Optima Plus (Infrared) or MPD (Catalytic Bead)
- Fence Line Monitoring with Excel (Open Path Infrared)
- Some Facilities may require H₂S detection (XNX or XCD)
- Compressor Decks and Buildings
- Process Areas



Flame Detection

- Floating Roof Tanks and Bulk Storage
- Metering Yards and “pigging” locations
- Loading Racks
- Process Areas



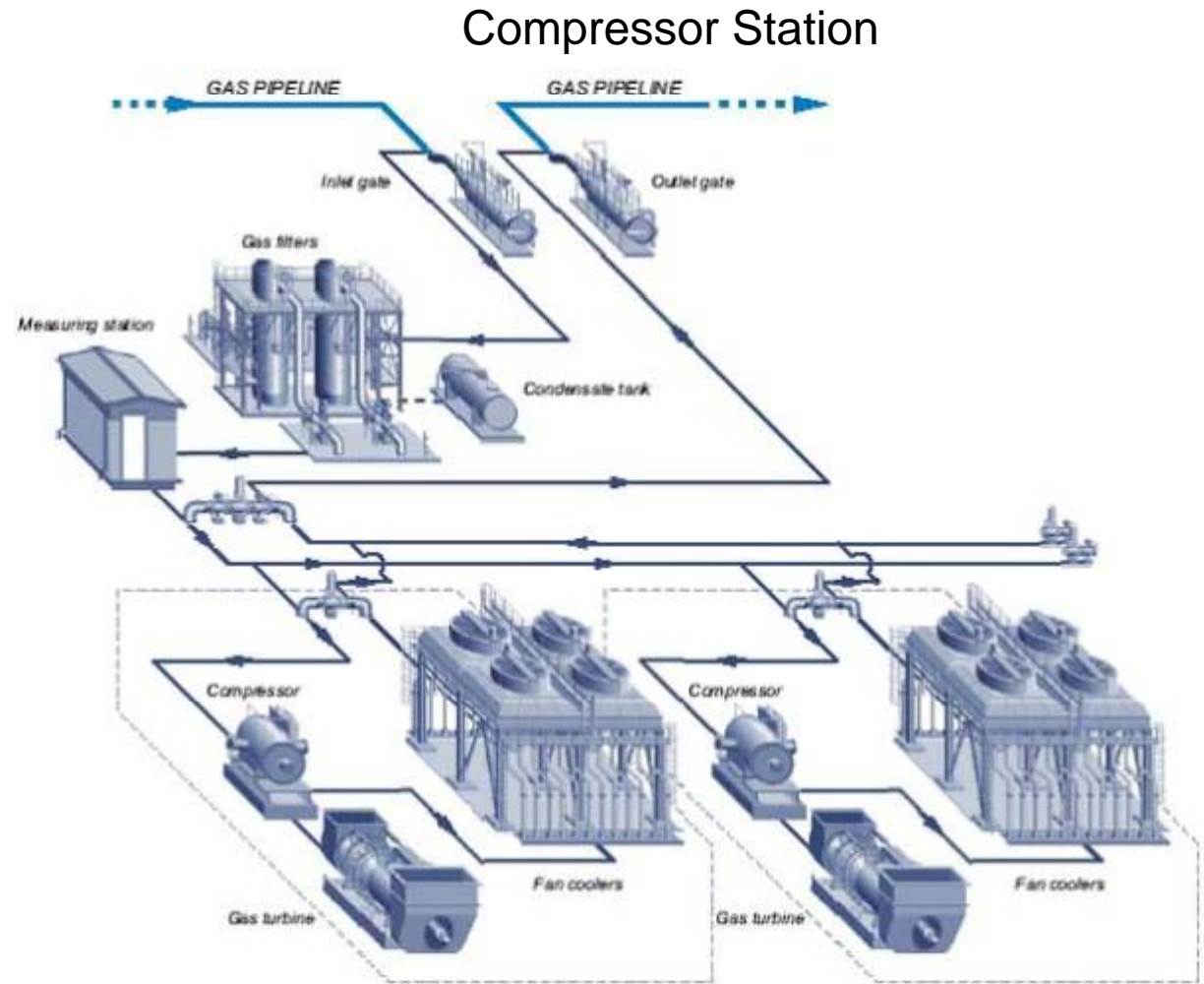
Pipeline Facts

- Pipeline compressor stations are typically located 50-100 miles apart along the pipeline
- There are many “unmanned” assets located along the pipeline that require protection
- Most facilities are located in remote areas but some stations are close to populated areas



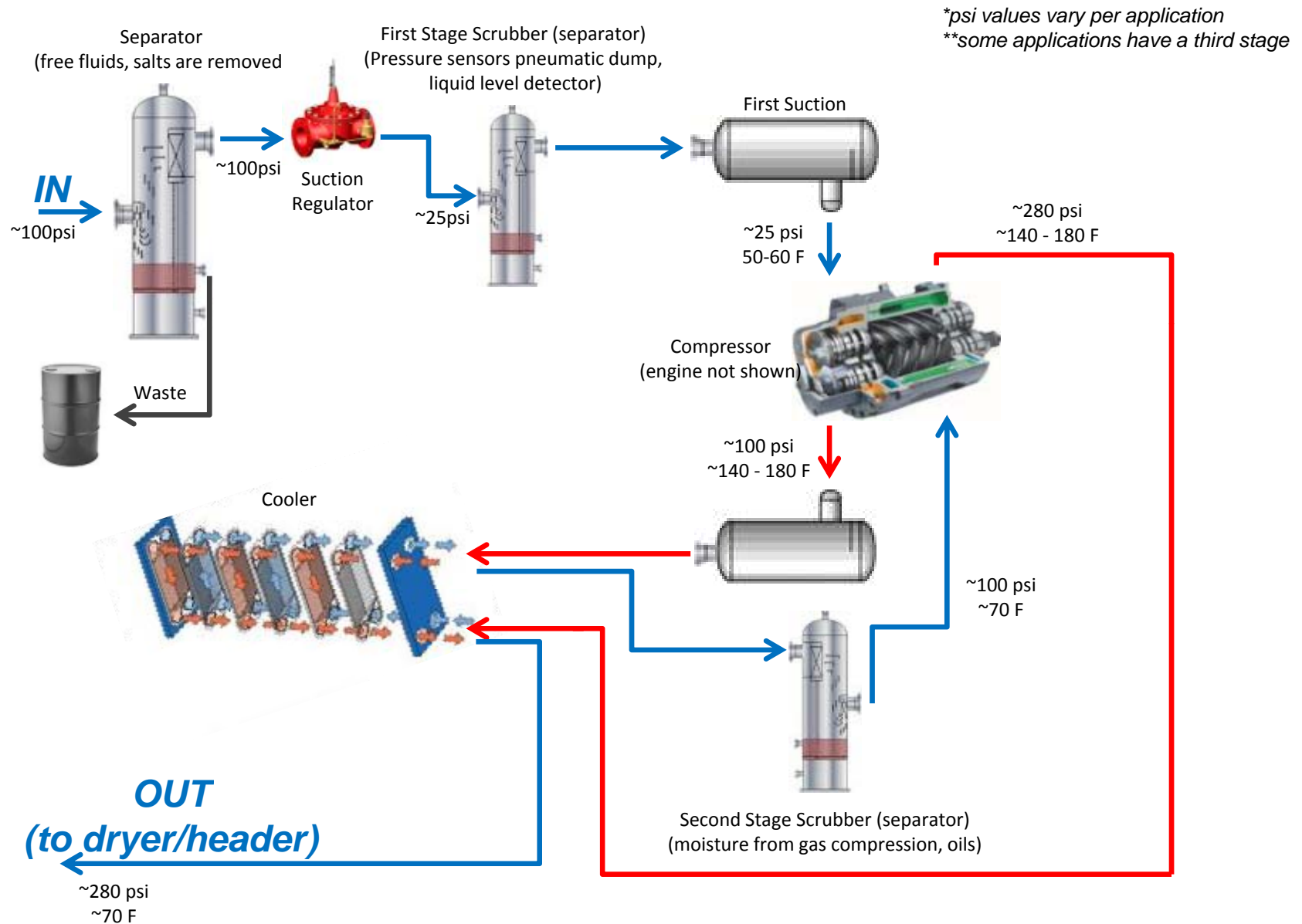
Pipeline Facts

- Normally have a regional safety representative and a local safety technician
- Most facilities have 1-2 individuals responsible for gas detection
- Pipeline gases are under high pressure, the smallest of leaks can escalate quickly
 - >1000psi



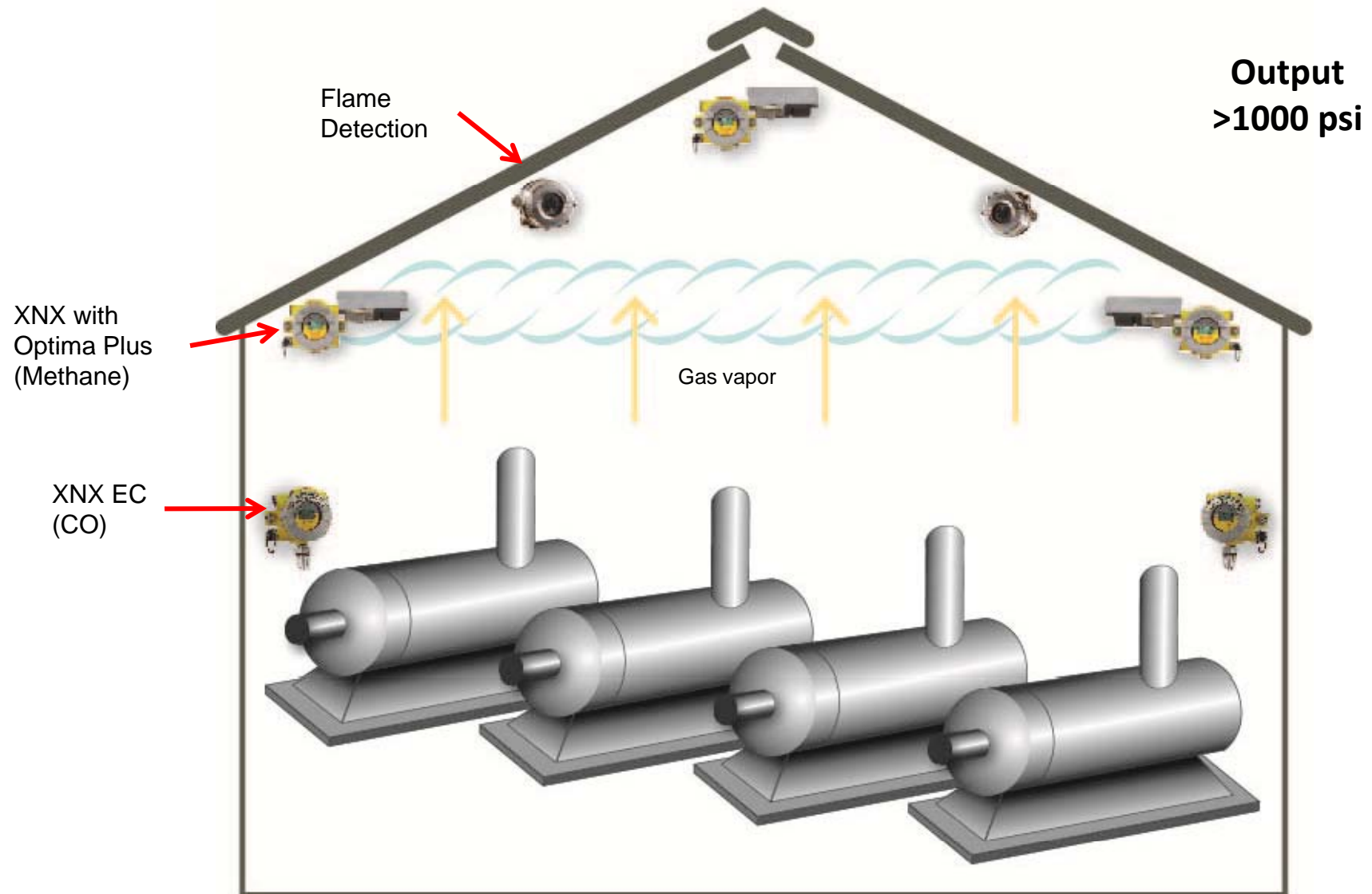
Compressor Skid Basics

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Closed Building Construction #1

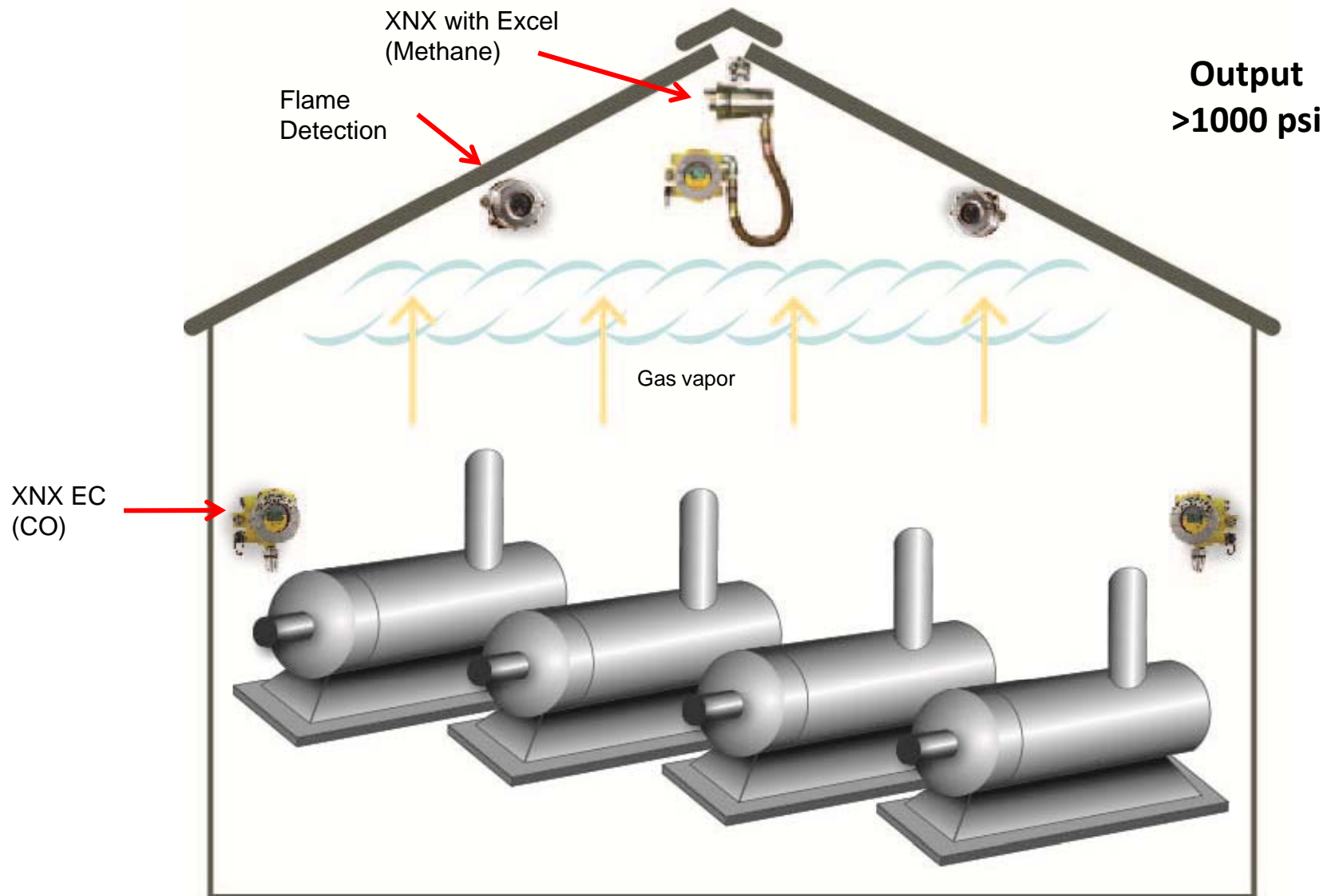
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Compressor House
4 skid layout

Closed Building Construction #2

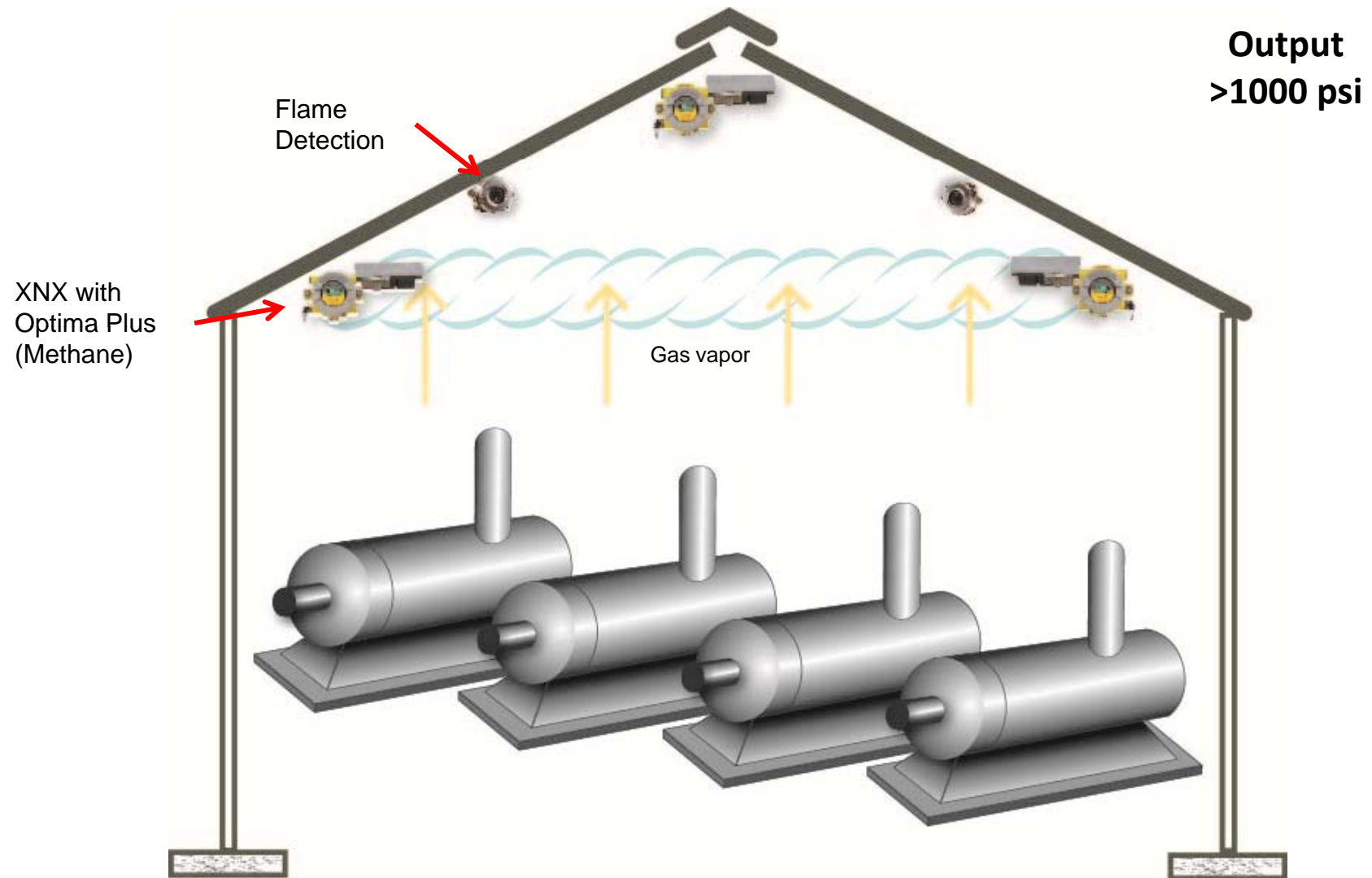
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Compressor House
4 skid layout

Open Wall Construction with Roof

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Compressor Shelter
4 skid layout

Product Selection

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 - FX20x Flame detector
- Solution #2
 - XNX-IR w/ Optima Plus
 - XNX-IR w/ Excel
 - XNX-EC
 - FX20x Flame detector
- Common gases
 - Natural gas (LNG)
 - CH₄
 - Gasoline
 - CH₄
 - Jet fuels
 - Diesel
 - Kerosene
 - H₂S
 - CO



North American Pipeline Map

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