Flare Systems

for the Chemical and Petro-chemical Industry

Flare systems to ensure maximal safety for industrial and production plants

Gas flaring is the process of excess gas burning from chemical and petrochemical plants, including wells, gas-oil production and refineries, hydrocarbon processing plants.

Flare systems are used to relieve pressure and safely destroy waste gases that cannot be processed, reducing risks for the plant and operators.

Flares are combustion devices designed to safely burn in an open flame the hydrocarbon gas excess which cannot be recovered or recycled.

Flare systems are intended as alternative to releasing the waste gases and pollutants directly to the atmosphere.

Waste gases can consist of a mixture of different gases which composition will depend upon the source of the gas going to the flare system. In oil-gas production, waste gases mainly contain natural gas, ethane, propane and other hydrocarbons.

Waste gases can occur in case of unplanned shutdown, start-up and transitory operation, in case of fire, valves or compressor failure and any urgency case with leakage of gases from the process.

The flare system should be always in operation and perfectly maintained with high reliability in order to efficiently operate and to grant the plant safety at any time and in any condition.

Flaring systems can be installed on different location at onshore and offshore plants, on transport ships, at seaport facilities, on storage tank and along distribution pipelines.

Offshore flare

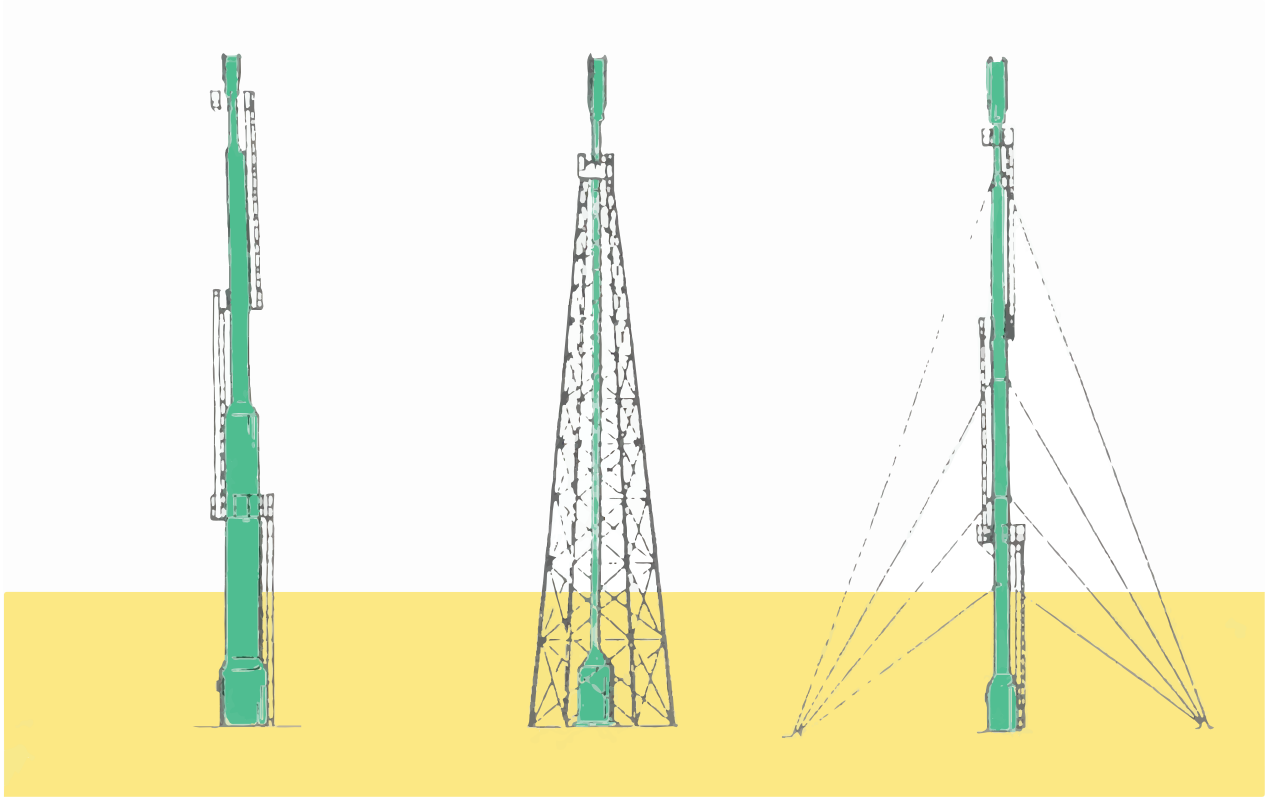
Configuration and design criteria of the flare system

Elevated flares are composed by a vertical riser stack, the burner tip installed at the top, the set of equipment to control the ignition system and network of piping to collect the waste gases from various sources.
The basic criteria for the design of an efficient flare system takes into consideration the following:
•Efficient combustion of waste gases to minimize emission of toxic gases
•Heat radiation and noise at ground level
•Minimize natural gas consumption and CO2 emission from pilot burners

Riser stack

The riser stack is the body and support of the flare, flares can be configured with different supporting design

- Self-supported flare, the riser stack is self-sustained
- Guyed-supported flare, steel wires are used to anchor the riser stack at ground
- Derrick-supported flare, the riser stack is supported by a steel structure “derrick” when there is not enough space to anchor the steel wires at ground



Self-supported flare *Derrick-supported flare* *Guyed-supported flare*

Flare tip

The core part of the flare system is the tip burner, the final part at the end of the stack where the burning of waste gas take place.
Flare tip is designed to optimize the combustion efficiency, to minimize waste gas-methane leaks and emissions of toxins like benzene, hydrogen sulfide, toluene, xylene and volatile organic compounds.

Injection of auxiliary fuel or steam or combustion air can be adopted to maximize the mixing and determine complete burning of waste gases.

Smokeless combustion can be obtained by injection of steam at the burner tip to support completion of combustion and reduce visible smoke.

Smoke formation occurs when there is insufficient amount of oxygen for a complete combustion, therefore it is required a continuous steam supply to optimize the combustion process.

Mixing of waste gas and steam shall be optimized to get the maximal efficiency and smokeless combustion.

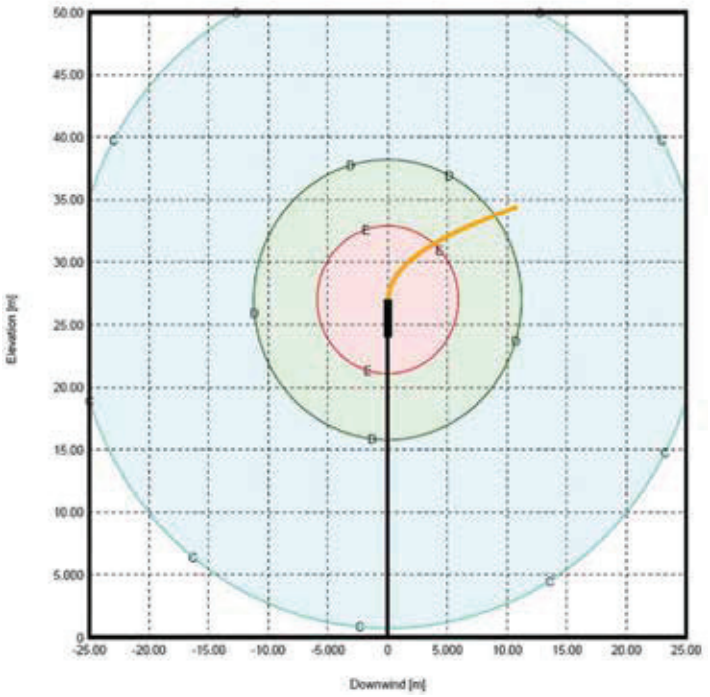
Steam is injected directly into the root of the flame by means of a series of nozzles installed around the top of the flare tip.

Heat radiation and noise at ground level are considered when designing a flare system to prevent any risks to people and operators.

Heat radiation from open flame at the burner tip can be quite important and dangerous in the area surrounding the flare stack.

All flare systems shall run safely and with minimal impact on the community and the environment.

Tip burner



Flare radiation map

Flame sealing system

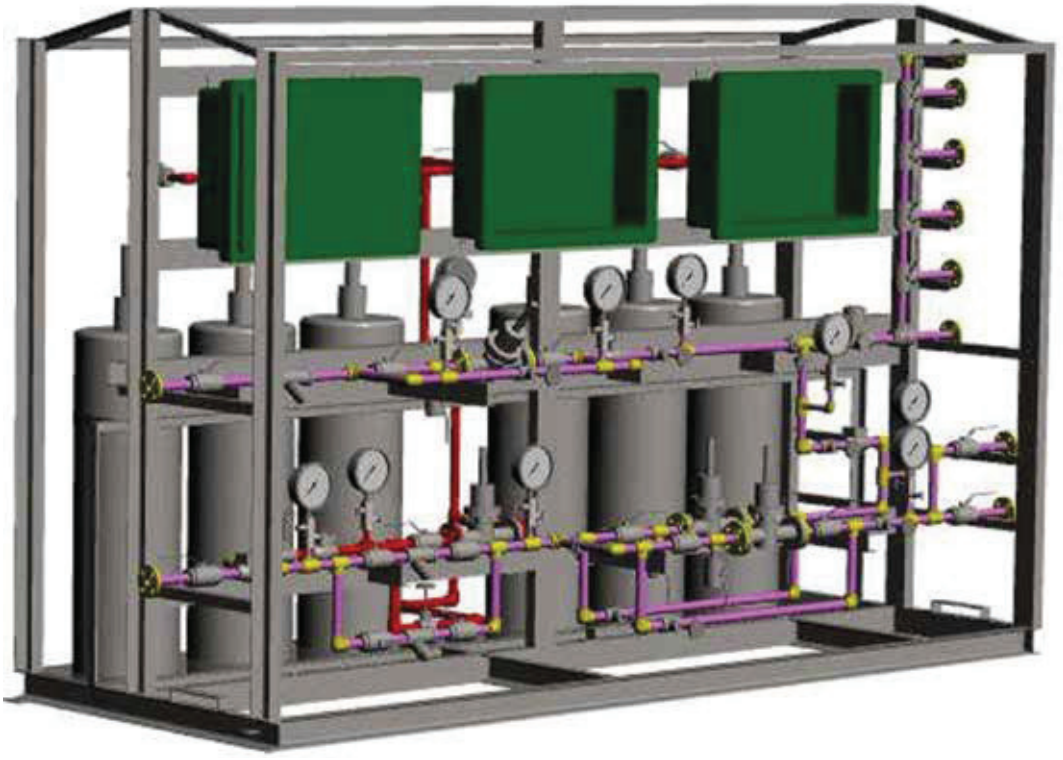
Flame sealing is foreseen to avoid the flame flashback, different systems are available to create the sealing of the tip burner from the raiser stack

"dynamic" sealing system based on a Venturi design of the burner tip inner part with addition of purging gas typically nitrogen N_2 or carbon dioxide CO_2, purge gas constantly flows ensuring that air infiltration and flame flashback does not take place

"molecular" sealing system based on a labyrinth design of the burner tip inner part, this system does not require addition of purging gas reducing the overall operating costs ensuring as well that air infiltration and flame flashback does not take place

Pilot burners and ignition system

Each flare tip is equipped with pilot burners to provide a constant source of ignition.
Pilot burners shall provide reliable ignition and a stable burning even under the most difficult climate conditions.
The flare ignition system shall be designed to achieve the maximal efficiency to minimize consumption of fuel gas to the pilots, reduce environmental impact and CO_2 emission, ensuring efficient, clean and smokeless combustion.
Electrical HE high energy ignition system is typically installed to start the pilot burners.



Control unit for ignition system

Water sealing drum

The water sealing drum is a vessel located close to the base of the flare stack to separate liquids from the waste gas stream and prevent irregular combustion at the burner tip.
Low pressure pipe flares are not designed to handle liquids together with the waste gas and do not burn efficiently when hydrocarbon liquids are contained in the flare system.

Airprotech srl

Airprotech is a leading company in the design, manufacturing and turnkey supply of systems and plants for air and gaseous effluent treatments for the chemical, petrochemical, pharmaceutical, printing and paint industries. Airprotech offers a comprehensive selection of flares and flare systems for several applications, including air-assisted flares, steam-assisted flares, gas-assisted flares, high pressure / low pressure staged flares, elevated and enclosed ground flares.

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