



TCD ITALIA

**COMBUSTION
EQUIPMENTS**





FACILITIES

HEAD OFFICE

In the commercial office located in Porto Mantovano (MN) Italy, TCD Italia's staff is responsible for the drafting of tenders, sizing of equipments, job order management and engineering assistance pre and post sales.



WORKSHOP

In our workshop located in Governolo (MN) Italy, TCD Italia develops the production and assembly of the different equipments. Located 15 Km away from Mantova and next to the ship canal Fissero- Tartaro and the Mincio River, it is in a strategic position for a fast and easy transportation by land or in case of extra large equipments, by boat to the main ports of northern Italy.



FLARE SYSTEM

There are several types of support methods for elevated flares

TCD Italia optimizes the structural impact by careful consideration of all relevant factors as a first step to an economic final solution.

TCD Italia has the experience to propose any type of flare supporting structure and it is in a position to provide the structural and mechanical design, fabrication, trial assembly and erection.

Design is in accordance with all worldwide current used codes employing advanced finite elements and dynamic simulation techniques.

The types of structures are:

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

A thorough evaluation of the specific needs will ensure that economic and operational considerations are fully taken into account before one comes to a decision.

Supporting structures

Self Supported

A mechanically and structurally designed stack supports the flare tip without any extra support.



Guyed Supported

A mechanically and structurally designed stack supports the flare tip without any extra support.



Derrick Supported

The derrick-supported structure is used for very tall systems where the use of a guy wire is not allowed due to space and erection problems. The flare riser is housed within and supported by a

braced framework. The flare burner can be maintained by lowering it by a davit or a crane. The derrick structure allows the installation of several flares together.



Ignition System

Flame Front Generator - FFG

The self-inspiring ignition system utilizes fuel gas at a moderate pressure (1,53 barg) to inspire ambient air into a Venturi mixer.

The resulting gas/air mixture passes through an ignition chamber and the relevant ignition line (in this system the ignition line dia. is 2 or 3 inches) up to the pilot nozzle.



High Energy - HE

The TCD Italia high energy ignited pilot consists of a direct electric ignition of the flare pilot.

The sparking head is enclosed in a stainless steel tube positioned on pilot nozzle.

All the electronics are located remote from the flare pilot. The high energy spark is not influenced by local factors such as dirt, humidity, ice, aggressive gases or oil and consequently this system is particularly suited to flare pilots both onshore and offshore applications.



Pilot Burners

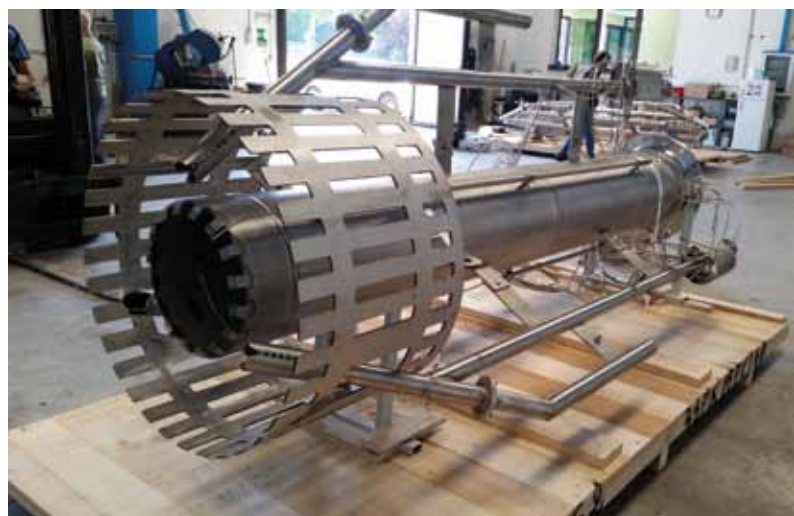
The TCD Italia flare pilots are suitable to be lit via a traditional FFG (Flame Front Generator) system and/or via a HE (High Energy) electronic system. It is well known that safety of flaring depends on the performance of flare pilots. As flare pilot failure can compromise safety and performance of the entire flare system, it is extremely important to detect the pilot flame quickly and accurately. These reasons make the pilot ignition system and pilot flame monitoring one of the crucial components of any flare system. TCD Italia has developed a wide range of tested and proven flare pilot systems suitable to satisfy all flaring scenarios even in extreme weather conditions.



Tip Models

Barrel

The TCD Italia Barrel Flare Tip is a general purpose flare burner for use when smoke suppression is not required either because the gas to be flared is not an inherent smoke producer or environmental conditions permit some smoke to be tolerated.



Tip Models

Smokeless by Steam

The TCD Italia's steam-assisted tip is a smokeless flare burner suitable for use with a wide range of gases. Steam is injected directly into the root of the flame by means of numerous nozzles positioned around the top of the flare tip, so that the jetting effect also draws air in the surrounding to produce more rapid and cleaner combustion.



Smokeless by Air

The TCD Italia range of air flare tips is designed to provide for the smokeless combustion of subsonic flaring gases where no steam is available. The flare utilizes a secondary energy source such as low pressure air to provide a percentage of smokeless combustion. Air and waste gas are mixed at the tip outlet achieving an efficient combustion process. Smokeless combustion is achieved through the injection of combustion air (primary air) often supplied via axial or centrifugal blower located at the grade. The quantity of primary air can vary from 20 to 50% of stoichiometric (it depends on gas composition).

Secondary air to complete the combustion of the flaring gases is entrained by the turbulent discharge from the tip.



Tip Models

Sonic

The TCD Italia Sonic Flare Tip is designed to burn high pressure gas at high velocity promoting the entrainment of air for efficient combustion.

The turbulence created by the sonic nozzle entrains sufficient air prior to entering the combustion zone resulting in a clean aerated combustion, short and low radiation flame.

The stability of this sonic combustion is ensured by diverting a portion of the high pressure gas in a low pressure stream passing a fixed independent

stabilizing jet located in proximity of the sonic nozzle.



Smokeless by Steam / Air

The TCD Italia's HES/A Flare Burner is designed to provide maximum smokeless burning at reduced noise levels in a more efficient manner than a traditional smokeless steam assisted flare tip.

Smokeless combustion is achieved through a lower steam manifold, an upper steam manifold and centre steam nozzle.

The lower steam manifold supplies a number of special steam ejectors which use the steam pressure to inspirate atmospheric air into the internal mixing tube. The resulting steam/air mixture is ejected from the tubes into the core of the flaring gas just at the top exit of the flare burner creating a turbulent smokeless flame.

In addition, the upper steam manifold

incorporates special steam nozzles that increase the smokeless capacity of the flare tip.

The combined operation of lower steam manifold and upper steam nozzles results in a greater smokeless capacity than other flare burners.



Liquid Seals and Knock-out Drums

KO Drum

K.O. Drums are designed to remove effectively entrained liquid droplets from the flaring gases. Removal of entrained liquid from the flaring gas is very important for two reasons. Primarily, the presence of liquid in the flaring gas promotes intense smoke during combustion. Also, if liquid passes through the flame at the flare burner

it will cause “flaming rain” onto the ground below causing a serious safety problem.

The design of these drums is based generally on the criteria defined in API RP-521 and it considers residence time and drop-out velocity of the liquid particles in the vapour flow.



Liquid Seals and Knock-out Drums

Water Seal

The liquid seal drum is utilized to provide positive pressure on the flare gas relief header and to act as a flame arrestor in the event a flashback occurs in the flare stack.

The liquid seals have special designed internals with an anti-pulsation device

in order to insure a steady flow of flaring gases to the flare burner thus increasing the smokeless performance and decreasing the noise caused by uneven combustion.

Liquid seal is preferably installed vertically at flaresystem base.



VENT STACK SYSTEM

Venting is the controlled release of gases into the atmosphere in the course of oil and gas production operations

The cold vent stacks (cold flare systems / vent systems) designed and manufactured by TCD Italia can discharge the gas of a section of a plant, for the needs of maintenance and emergency.

On the normal operating status, the cold vent stack has not gas in it; only when the depressurization system of the plant operates the gas is discharged through the cold vent stack at atmospheric pressure. Vent Systems dispose of gases that are not burned in a flare or incinerator. Vent Systems disperse these gases into the atmosphere to ensure the gas concentrations are below combustible or toxic levels.

Designing Vent Systems requires software and expertise in dispersion and concentration analysis. TCD Italia staff have extensive experience in design, fabrication, and operation of Vent Systems. We can also supply vent snuffing systems for extinguishing vents that happen to ignite.

Applications:

Offshore platforms

LNG terminals

Hydrogen plants

Small gas plants

BURN PIT SYSTEM

A burn pit is an area devoted to open-air combustion of hydrocarbons

Burn Pit is defined as a shallow depression or pool structure intended to catch and store hydrocarbon liquids which are discharged from units such as processing plants, pipelines or pumping stations with the intention that they shall be burned naturally and openly and with no smoke suppression or other assistance.

Most Burn Pits are intended to handle a combination of liquid and vapor relief from a common pipe inlet. This inlet is referenced herein as the Flare Burner.

The location of a Burn Pit should be carefully selected giving due consideration to a variety of factors.

Any Burn Pit should be sited:

- **Outside of all normal work areas and operational plant.**
- **Where smoke and the associated thermal plume will not be a hazard to personnel or traffic, or cause damage to equipment.**
- **Where neither local nor general environmental considerations, as outlined herein, limit placement.**

Hydrocarbons combustion at ground

The main use of a burn pit is to dispose of liquid or mixed liquid-vapours relieves as emergency flows or on an intermittent basis when blowing down pipelines or vessels.

The pit is simply a shallow depression or hole in the ground which acts as a reservoir for the waste liquid. Burn pits may be manufactured with concrete and/or refractory bricks lining. Very large burn pits are frequently left as a natural excavation and surrounded by an earth or rock bund wall.



The liquid in the pit burns and supports its own combustion by radiating heat back from the flame into the liquid at the top of the pool which then vaporizes and heats up further before burning in the flame. The shape of the pool should be selected in order to meet the following constraints:

The burn pit burner must be angled downwards to ensure that natural drainage occurs and often liquid relief or residual oil carry-over cannot remain in and it burns inside the pit burner.

- The pit burner should be buried in the back-wall of the dike protected by a refractory block in order to minimize heat exposure.
- The pit floor should be sloped away from the flare so that residual burning liquid is kept away from the pit burner.
- The pit length must exceed the pit burner flame length based on (flashed) vapour.
- The pit volume must be sufficient to contain the anticipated liquid loads accumulating over the design hold-up period.



LIQUID BURNER

High destruction efficiency of liquid hydrocarbons

The liquid burner was developed to flare liquid hydrocarbons without liquid fallout or soot formation (smoke).

These burners provide excellent service for various Flare-systems/ onshore-offshore-flares" onshore applications that require high destruction efficiency of liquid hydrocarbons.

When oil is flared, a high pressure media such as an air, gas, or steam is required to mechanically atomize the heavy hydrocarbons for proper and stable combustion.

Liquid hydrocarbons combustion at ground

The main use of a LIQUID BURNER is to dispose of liquid or mixed liquid-vapours relieves as emergency flows or on an intermittent basis when blowing down pipelines or vessels.

The Burner was developed to flare liquid hydrocarbons without liquid fallout or soot formation (smoke).

These burners provide excellent service for various onshore applications that require high destruction efficiency of liquid hydrocarbons. When oil is flared, a high pressure media such as an air, gas, or steam is required to mechanically atomize the heavy hydrocarbons for proper and stable combustion.



The liquid in the BURNER and supports its own combustion by radiating heat back from the flame into the liquid at the top of the pool which then vaporizes and heats up further before burning in the flame.

The shape of the pool should be selected in order to meet the following constraints:

- The Liquid burner must be angled to ensure that natural drainage occurs and often liquid relief or residual oil carry-over cannot remain in and it burns inside the burner.
- The pit floor should be sloped away from the flare so that residual burning liquid is kept away from the pit burner.
- The pit volume must be sufficient to contain the anticipated liquid loads accumulating over the design hold-up period.



FLARE SYSTEM

Flaring gas, biogas, digester and landfill gas

Flaring and venting systems are used globally to burn off waste gas, excess gases and are also a means to protect process equipment, the system's processes and the environment.

Flaring systems are used extensively in wastewater treatment, landfills and farming operations.

With a focus on reducing greenhouse gas emissions, flaring the gas provides an opportunity to reduce emission

A gas flare is used to burn off gas that cannot be used by the plant. The gas – methane – is burned because it would otherwise harm to the atmosphere. During combustion the methane gas is converted into carbon dioxide as part of the natural cycle.s.

Biogas Flare

Enclosed Typ. – Mod. HE

This type of flare is designed in order to obtain a high combustion efficiency and thus obtain values of CO and NOx downstream of the combustion, very low and traceable through dedicated nozzle accessible from outside.

The high efficiency flare consists of a burner installed at the base, equipped with a high-energy ignition Pilot and a flame detection system via UV scanner.

The combustion air is conveyed by means of an automatic damper which by means of a Thermocouple immersed into the combustion chamber zone, automatically modulates the appropriate air flow, ensuring the constant combustion temperature up to a maximum of 1.200 °C (visible and adjustable from control panel).



Hidden Typ. – Mod. FE

This type of flare is designed for the purpose of containing the flame in order not to make it visible from the outside and is adopted when a high combustion efficiency and its traceability are not required.

The flare consists of a burner installed at an elevated position, equipped with a high-energy ignition Pilot and a flame detection system via UV scanner. The combustion air is naturally conveyed from the bottom part of the flame shield. In case of specific request, it's possible to get a control system by installing an automatic damper via Thermocouple immersed into the combustion chamber zone, automatically modulating the appropriate air flow, ensuring the constant combustion temperature up to a maximum of 800 °C (visible and adjustable from control panel).



Elevated Typ. – Mod. EL

The flare consist of a burner installed at elevated position, equipped with a high-energy ignition Pilot and a flame detection system via Thermocouple. The combustion air is natural conveyed from the bottom part of flame shield and the combustion temperature will be max. di 800 °C .

The height of this flare are calculated according to the heat radiation released from burning to the ground and that will ensure an adequate level of protection to people and equipments that are within range of the flare. This type of Flare develops a luminous flame which extends beyond the top part, so the combustion temperature and emissions monitoring are difficult to control.

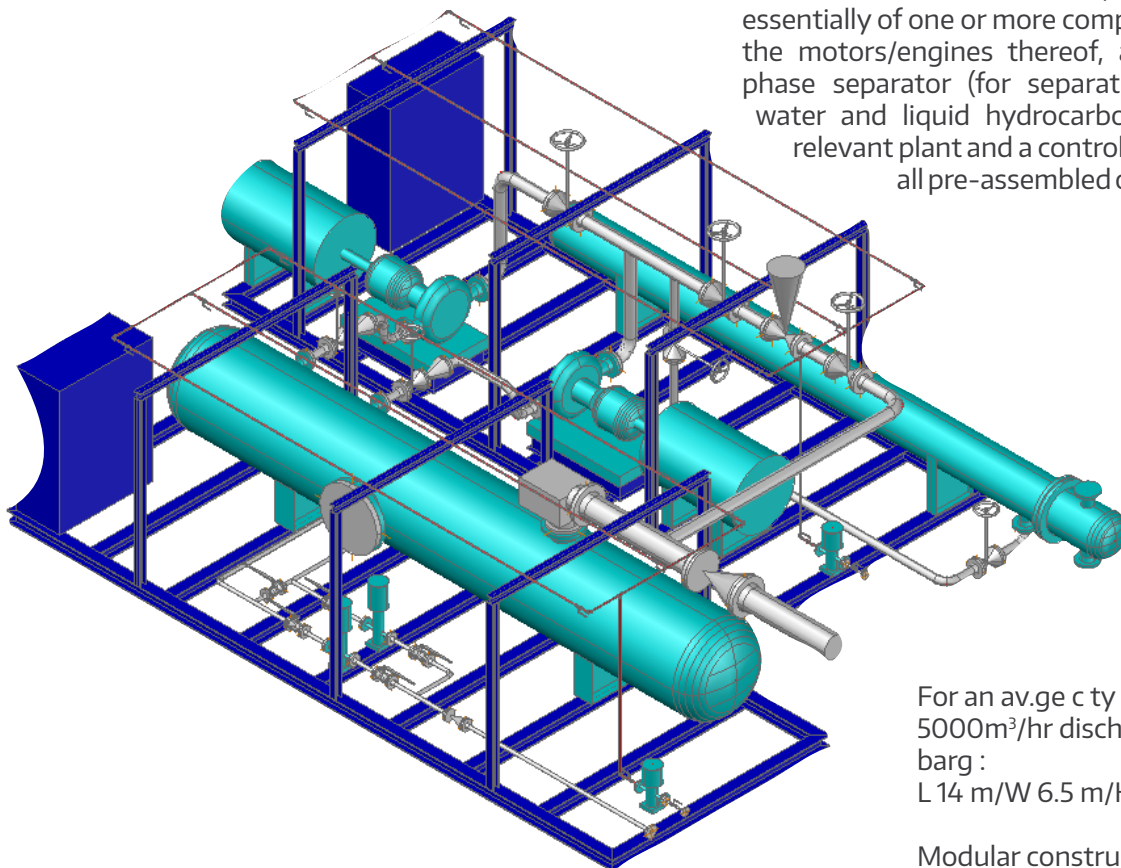


Typical Unit for Flare/Associated Gas Recovery (Skid mounted FGRU)

The FGR systems, constructed in accordance with API 521, consist essentially of one or more compressors, the engines thereof, of a three-phase separator (for separating gas, water and liquid hydrocarbons), the relevant plant and a control system, all pre-assembled on a skid

Skid mounted FGRU. In configuration with 2 compressors

Typical FGR unit, constructed in accordance with API 521, consist essentially of one or more compressors, the motors/engines thereof, a three-phase separator (for separating gas, water and liquid hydrocarbons), the relevant plant and a control system, all pre-assembled on a skid.

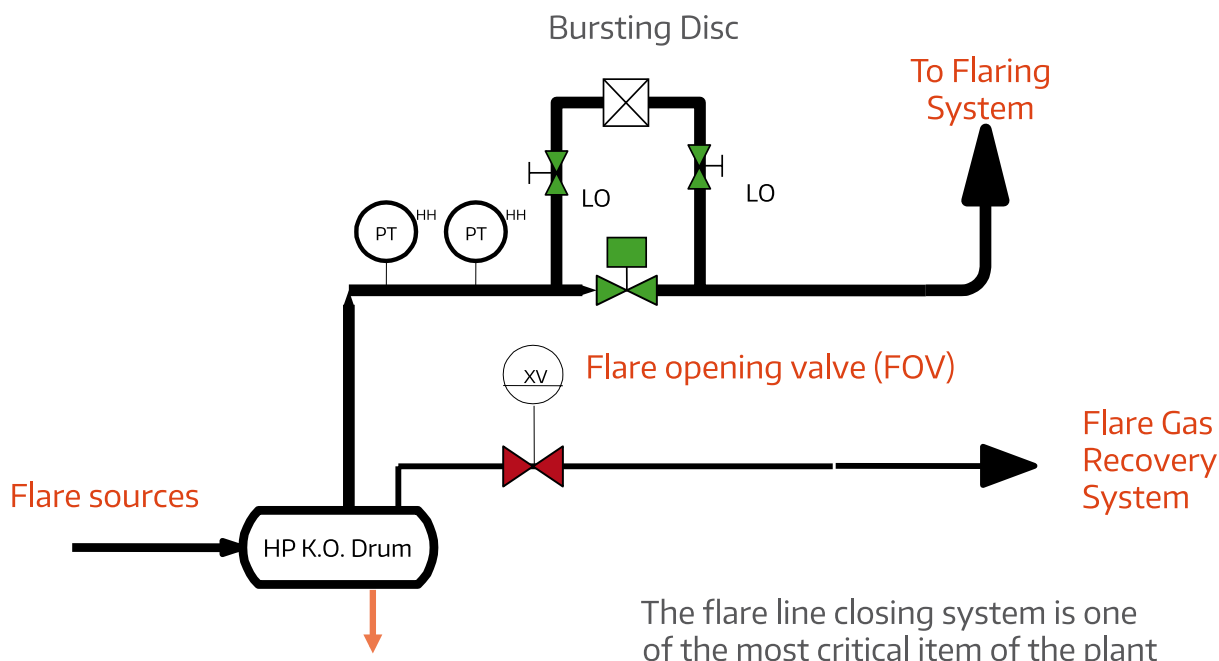


For an av.ge c ty of
5000m³/hr disch. of 6
barg :
L 14 m/W 6.5 m/H 4 m

Modular construction for
ctr. shipment & easy/fast

Key components in designing a FGRS

In designing FGRS TCD SpA is able to provide advanced security systems in line with the most recent API standards



The flare line closing system is one of the most critical items of the plant

Main Features required by the machinery used in FGR ONSHORE

Based on project conditions, we operate an evaluation/selection amongst various types of compressors, addressed to ensure best efficiency/lowest operating cost. Our criteria being: the most suitable compressor for each application.

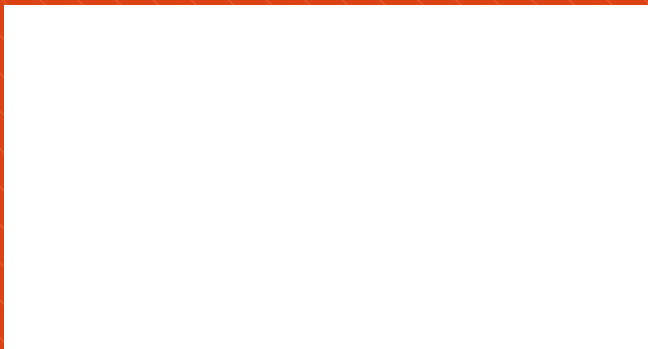
Operating cost makes a lot of difference by the end of the year

- They have to work with "dirty" gases (in the presence of water/steam, sludge, sand, hydrocarbons, corrosive, toxic acids)
- Capable of inlet gas flow rates up to 10,000 Am³/hr (sometimes also beyond that)
- Withstand variations in the molecular weight of the inlet gas
- Simple and flexible flow control
- High turn-down ratio
- Low noise emissions
- Low energy requirements
- Do not contaminate gas with oil





TCDitalia^{srl}
www.tcditalia.it



TCD Italia srl
via Bachelet 81/83
46047 Porto Mantovano
Mantova (MN) - Italy

ph. +39 0376 408149
info@tcd-italia.com
www.tcditalia.it

