MFS

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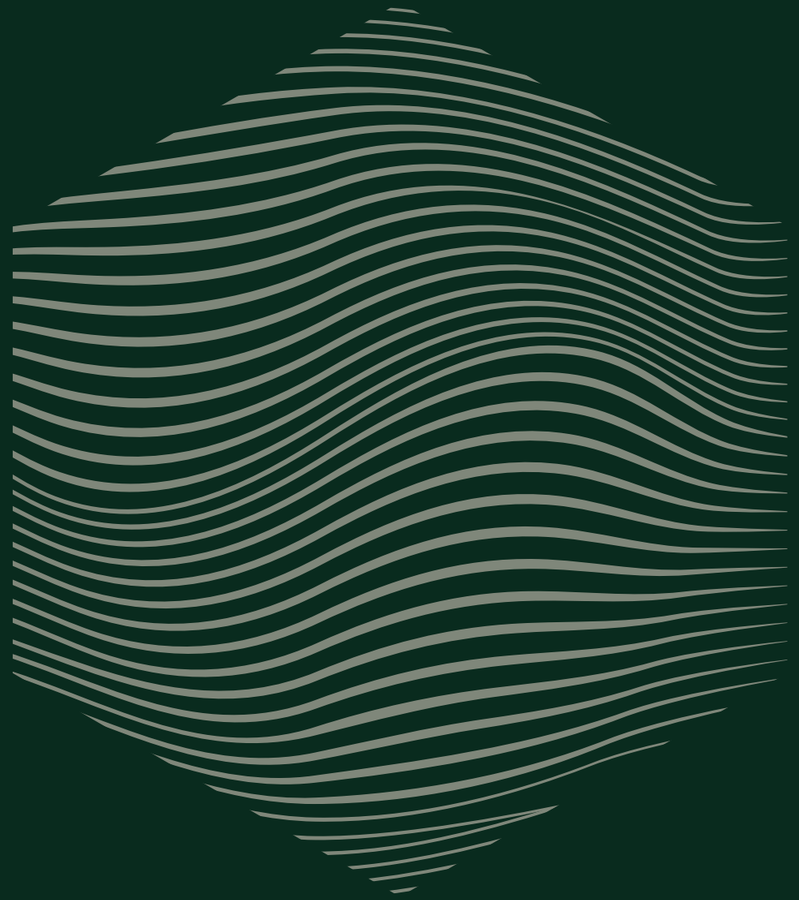

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Flare Systems

MFS-CO.COM

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DESIGNER AND MANUFACTURER OF
MECHANICAL,PROCESS EQUIPMENT AND **PROCESS SKID PACKAGES**
FOR OIL, GAS, PETROCHEMICAL, POWER AND
UTILITIES INDUSTRIES

FLARING SYSTEMS

MFS designs and manufactures flare systems, from design through fabrication, installation, commissioning, and maintenance for production field and gas plants. From simple utility flares to large air assist flares, MFS supplies optimized flares toward low emission and high thermal efficiency, making them well-built flares guaranteed to work.

MFS flare support structures include:

- Self-Support
- Guyed wire Support
- Derrick Support
- Guyed & Derrick Combustion Support

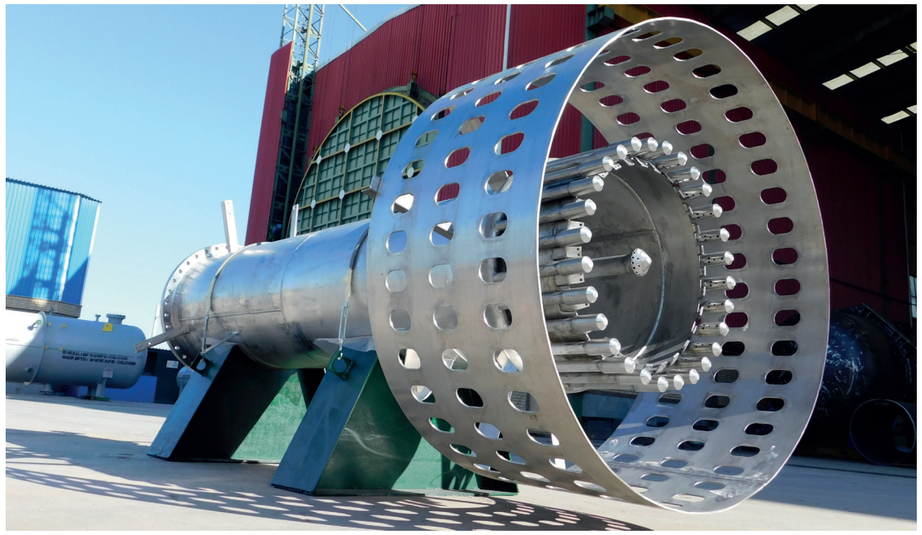
Based on our client's requirements, MFS supplies ancillary items, including:

- Knock Out Drum
- Control System (manual or automatic) for Hazardous or Non-hazardous Areas
- Radiation Shield
- Seal Drum
- Flame and Detonation Arrestors

MFS supplies different types of flares including:

- Low and High-pressure Utility (pipe) Flares
- Air Assisted Flares
- Steam Assisted Flares
- Gas Assisted Flares
- Sonic Flares
- Ground Flares
- Specialty Flares for Ammonia, H2S, LNG and Lean Waste Gas
- Mobile Flare Systems – for Purchase, Lease or Rental
- Ancillaries such as Pilots, Ignition Systems, Pilot Detection, KO Drums, Water Seals, Molecular Seals and Conical Purge Seals
- Supporting Structures including Derricks, Demountable Riser type Derricks, Guy Wire Support Systems, plus Self-supporting Flares
- Enclosed Ground Flares with Single or Multiple Burners

MFS can also provide inspections, maintenance, refurbishment, and replacements for any flare system or components and, in some cases, can supply rental flares during maintenance interventions.



1.

UTILITY FLARES

Utility Flares (Pipe Flares) are the most basic flare design available, providing a robust, reliable and flexible solution for flaring large volumes at low pressure.
Smokeless operation whether it requires Waste Gas, Air, Steam or without assisting medium can be designed by MFS. Operation is reliable at both full load and partial load.

2.

STEAM ASSISTED FLARES

Steam assisted flares enable the smokeless combustion of low pressure waste gases at installations where high pressure steam is available. A steam manifold along with jets integrated into the flare tip design inject high pressure steam into the flame. The steam jets entrain ambient air at the base of the flame, providing additional turbulence and resulting in smokeless combustion. Steam can also act as a catalyst in the overall combustion process.

3.

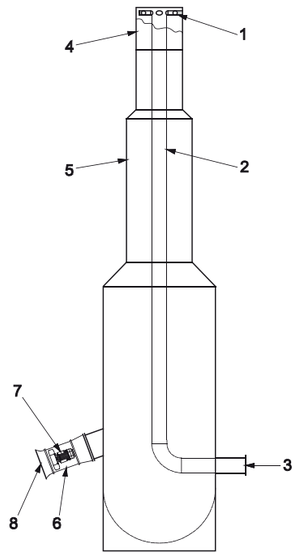
AIR ASSISTED FLARES

Air assisted flares enable the smokeless combustion of low pressure waste gases. Air (or gas) assisted flares can be used when no steam is available on site. Air assisted flares use forced draft air or gas to create turbulence, ensuring that sufficient primary combustion air is supplied to the flame. The amount of air and the size of the tip and riser depend on the degree of smokeless operation required and the maximum flow for smokeless operation.

Not all plants have large amounts of steam available for use by the flare. Some plants prefer not to use steam to avoid freezing problems, or others cannot commit water to make steam for smoke control. To meet this need, a series of air assisted flare designs are available.

Key

1 gas discharge ports
2 gas riser
3 flanged inlet for gases being flared
4 stainless steel flare burner
5 low-pressure air riser
6 vaneaxial low-pressure air burner
7 two-speed motor
8 inlet bell



4.

HIGH PRESSURE FLARES

High Pressure Flares use the actual pressure of the waste gas to create turbulence, entraining combustion air into the base of the flame to obtain smokeless combustion. MFS has a full range of high-pressure flares including HP pipe flares, sonic flares and HP assisted flares. HP sonic flares are the ideal solution when low radiation within a smokeless operation is desired.

5.

ENCLOSED GROUND FLARES

MFS Enclosed ground flares are suitable for thermal destruction of a wide range of waste gases, including rich and lean gas mixtures. The burners are housed in a cylindrical vessel, keeping the combustion process out of sight and more controllable in comparison to elevated flares. Enclosed ground flares can also be designed with or without temperature control. With temperature control, a minimum residence time at a specific combustion temperature can be set and guaranteed. Consequently, temperature-controlled ground flares, also called combustors or thermal oxidizers, can meet the most stringent emission values. The emissions can be monitored with chemical emission monitoring (GEM) units.

Various designs of ground flare are available. The type, which has been used almost exclusively at MFS, is the MultiJet flare. Smokeless operation can generally be achieved, with essentially no noise or luminosity problems, provided that the design gas rate to the flare is not exceeded.

BURN PIT FLARE

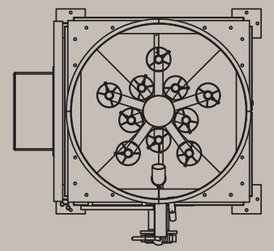
MFS burn pit flares are generally selected and designed to combust a mixture of vapor and liquid from a single source. While mostly designed to operate non-smokeless, smokeless operation can often be achieved using various burn pit flare technologies. The burn pit flares are usually constructed with an excavation lined with a non-combustible rock or refractory material. Often coupled with a pit liner, pit flares can be a cost-effective combustion option for an environmentally conscious user.

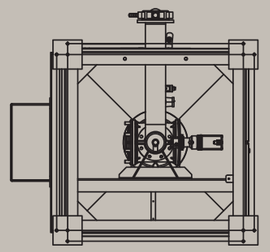
Applicable Design Codes and Standards:	**Design Software's:**
API 521, API 537, HEI, ASME	Flaresim, PV-Elite, SAP 2000, TEKLA, In-house Calculation Software

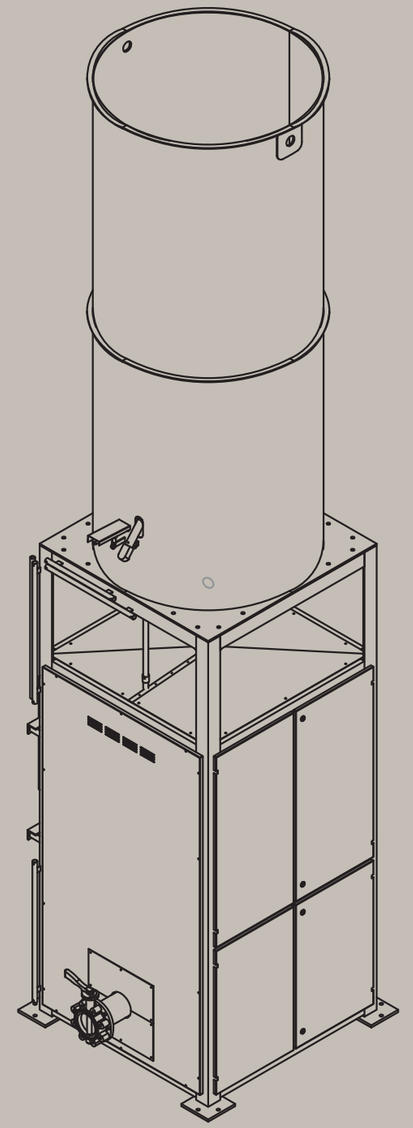
BIOGAS FLARE

Biogas generally is considered a gas with primary constituents of methane and carbon dioxide resulting from the decomposition of organic matter, which occurs in an anaerobic (without oxygen) atmosphere. Typical sources for biogas production include biological degradation of refuse, or municipal solid waste (MSW) in landfills along with agricultural waste, livestock waste, and organic waste from sewage in a digestion process. The four main types of biogas flares are passive, elevated, enclosed, and low emission flares. These flares are applicable for all biogas applications including landfill, agriculture, industrial wastewater, and municipal wastewater.

However, the majority of the time, enclosed flare devices will offer a larger earning of credits. This operating temperature of the Enclosed Flares can be selected by the user and modified to achieve various emissions. Enclosed flares have sample ports toward the top of the stack for emission testing and MFS can offer Biogas Flare with superior performance.





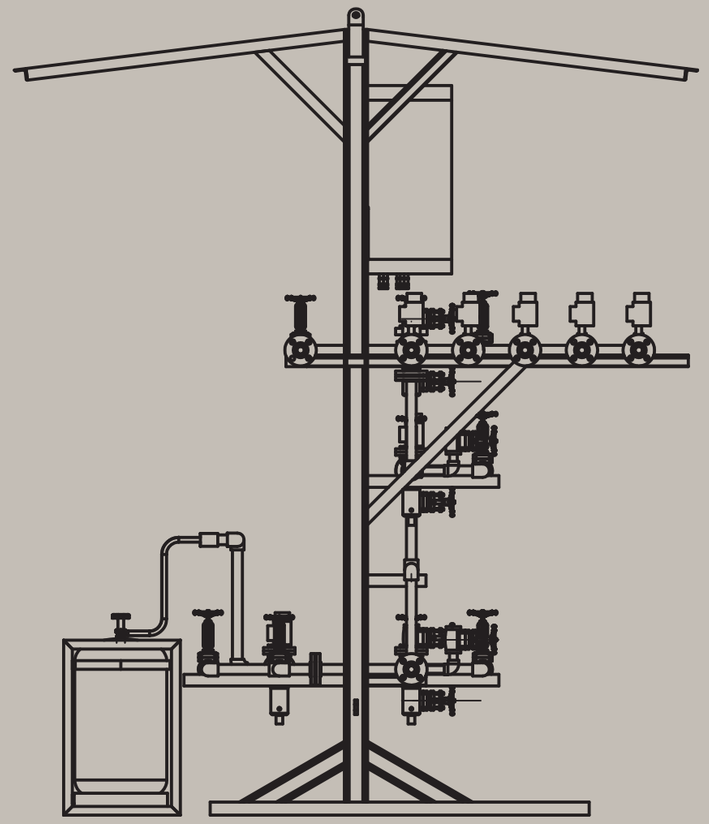


IMW MANURE BIOGAS POWER PLANT

IGNITION AND CONTROL PANEL (I&CP)

For most flare operations a release of waste gases can happen at any time and with little warning. As a result of these sudden release events, an integrated ignition system that can immediately and reliably ignite the flare is required. Many flares must be operated with a flame present at all times.

A reliable ignition system is one of the single most important aspects of a flare tip's safe operation. A flame front generator (FFG) ignition system is the most common method of lighting flare pilots. An FFG combines ignition fuel and compressed air in a mixing tee, and the air/fuel mixture flows through an ignition line to the pilot tip.



IGNITION & CONTROL PANEL

1.

ELEVATED FLARE SUPPORTS

Elevated flares are generally oriented to fire vertically upward. The discharge point is at an elevated position relative to the surrounding grade and/or nearby equipment.

There are several types of support methods for elevated flares, as below:

- **SELF-SUPPORTED**
- **GUYED**
- **DERRICK SUPPORTED**

2.

PILOTS

PURPOSE

The flare pilot is expected to reliably ignite the flare burner and maintain stable combustion throughout the full range of process conditions, including under severe weather conditions, without the requirement for maintenance for at least 5 years of operation, unless the pilot is accessible for on-stream maintenance. It is recognized that in some extreme services, such as burn pit flares, this 5-year lifetime might be unachievable. If the pilot fails, unburned hydrocarbons and/or toxic gases can be released into the atmosphere, potentially resulting in a vapor cloud explosion, odor problems, or adverse health effects.

In most elevated-flare applications, the pilot cannot be accessed for service or replacement while the flare is in operation. In order to improve pilot operability and reliability, as well as provide a means to test individual pilots while the flare is in operation, individual fuel supply lines should be installed to each pilot. The pilot system should be reliable enough to operate for years without maintenance. MFS has it in-house designed Pilots which care about Flare longevity and proper maintenance.

3.

FLARE TIP

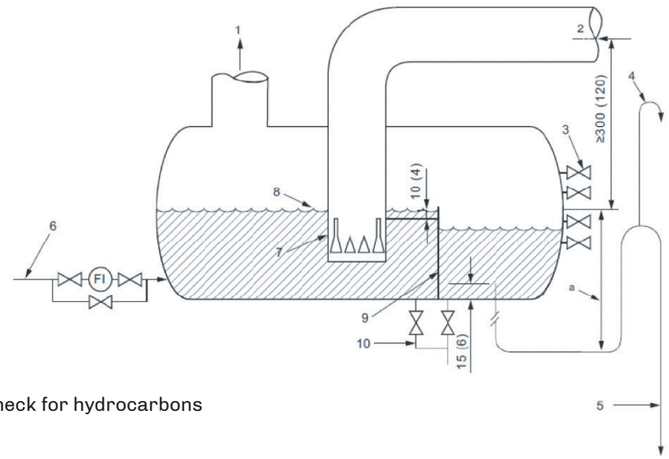
Part of the flare where fuel and air are mixed at velocities, turbulence, and concentration required to establish and maintain proper ignition and stable combustion. MFS can design different types of Flare Tips according to the project specifications, locations, client and environmental restrictions and expectations.

4.

SEAL

4.1. LIQUID SEAL

Device that directs the flow of relief gases through a liquid (normally water) on their path to the flare burner, used to protect the flare header from air infiltration or flashback, to divert flow or to create backpressure for the flare header. An example of a horizontal liquid seal drum is provided in following Figure.



Key

1 To flare
2 Flare header
3 Try cocks used to check for hydrocarbons
4 Vent
5 To sewer
6 Water supply
7 Submerged weir welded on end of flare line
8 Water level
9 baffle
10 drain

5.

PURGING

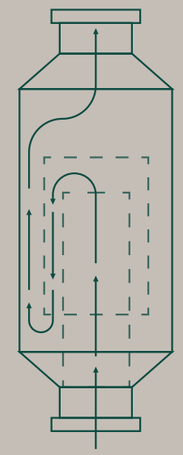
5.1. GENERAL

For safety purposes, a pre-commissioning purge and subsequent continuous purge with a non-condensable oxygen free gas is required through the flare system. The pre-purge displaces any existing air from the stack and the continuous purge ensures that atmospheric air does not enter the stack through the flare tip during low-flow conditions. There should, then, be a continuous purge of auxiliary gas, which may be gas from normal process vents (provided that the required flow rate can be maintained).

Air present in the stack can create a potentially explosive mixture with incoming flare gas during low-flare gas flow rate conditions. There are two common types of mechanical seals, usually located at/or below the flare tip, that are used to reduce the amount of continuous purge gas required to prevent air infiltration into the flare stack: the buoyancy seal and the velocity seal.

5.2. THE BUOYANCY (MOLECULAR) SEAL

The buoyancy seal uses the difference in the relative molecular masses of the purge gas and air to form a gravity seal that, at the proper purge gas flow, prevents the air from entering into the stack.



5.3. THE VELOCITY SEAL

The velocity seal works under the premise that infiltrating air enters through the flare tip and hugs the inner wall of the flare tip. The velocity seal is a cone-shaped obstruction, with single or multiple baffles, which forces the air away from the wall. It subsequently encounters the focused purge gas flow and is swept out of the tip.

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