TEHRAN JAVAN
Consulting Engineers & Managers

Combustion and Flare Systems

Production
Refining
Treatment Facilities
for Oil & Gas Industries

Tehran Javan designs and manufactures every flare with high safety and performance for both onshore and offshore operations. We offer different types of flare, Sonic, Assisted (steam, air and gas) and Non-Assisted as per client specifications and site conditions. We have unique and individual flare designs for our clients to provide more applicable and efficiency flares.

Sonic Flares:

Single-Point:

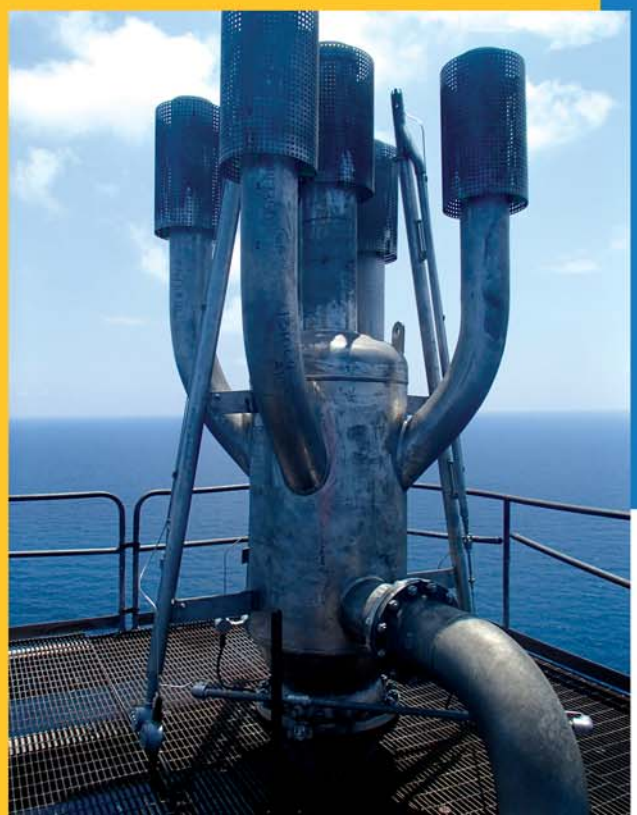
TJ's Single-point flares are used in the oil and gas industry for both onshore and offshore operations.They employ high-pressure waste gases to achieve an extremely high combustion rate with high smokeless performance and low radiation levels.

- Single-Point sonic flare systems typically have non-assisted or steam assisted flare tips that have special stabilizers built into the flare tip exit point.
- These special stabilizers ensure the flare flame will not "lift-off." Promoting a stable flame at the flare tip exit point also ensures very high destruction efficiency.
- Single-Point sonic flare systems also ensure the flare tip diameter is kept as minimal as possible, thereby resulting in lower equipment and utility costs, a longer flare tip life, less flame pull down, and a smaller wind profile for structural forces on the stack or boom support system.

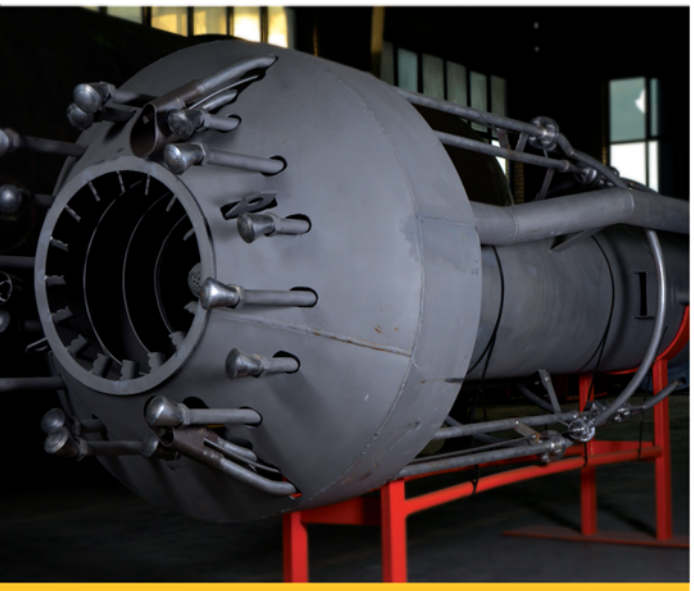
Multi-Jet Sonic:

TJ's Multi-Jet Sonic flare systems are used primarily for applications in the oil and gas production industry for both onshore and offshore operations. They are used where high flare gas pressures are available from 15 psig and up.

- Designed specifically to ensure high stability and high destruction efficiency, even with sonic velocity at the tip exit point.
- The flare tip has many smaller diameter exit nozzles, resulting in a much larger flare gas to ambient air contact surface and much higher air inspiration volumes and increased turbulence in the combustion zone.



Assisted Flares:



Steam-Assisted

TJ's Steam-Assisted flares are designed to dispose of heavier waste gases which have a tendency to smoke. In order to prevent smoke formation, steam is injected into the flare flame through injection nozzles. Steam-assisted flares are used in applications where high pressure steam is available on site.

- Sizes from 2 inch (50 mm) to 120 inch (3050 mm)
- Most economical steam-assisted flare for general use
- Multi-port investment cast steam nozzles for lowest possible noise
- Steam nozzles engineered for optimum air inspiration and mixing

Air-Assisted

TJ's Air-Assisted flares are designed to efficient combustion of heavier waste gases at sites where steam or even water are not available. Air-assisted flares are comprised of waste gas and air by using blowers to inject combustion air directly into the waste gas stream. The result cause smokeless burning and long flare tip life. These flares generally dispose of heavier waste gases which have a greater tendency to smoke.

- Sizes ranging from 2 inch (50 mm) to 120 inch (3050 mm)
- Longer flare tip life due to continual cooling by forced air flow
- Lower radiation level at grade due to a highly aerated flame
- Lower noise than similar size steam-assisted flares
- High stability pilots (tested to 170 mph [274 km/h] wind speed)

Gas-Assisted

TJ's Gas-Assisted flares are designed for smokeless burning of low-pressure and heavy hydrocarbons. Our design delivers stable burning, high combustion efficiency and low radiation levels wherever steam or air are not available. Certain gases that need to be burned in a flare system have very low heating values, so natural gas is injected into flare tips to prevent of smoking. These flares are typically used for ammonia, hydrogen sulfide/acid gas streams, venting from CO_2 floods, and any other situation where a high amount of inert gases are combined with combustible hydrocarbons.

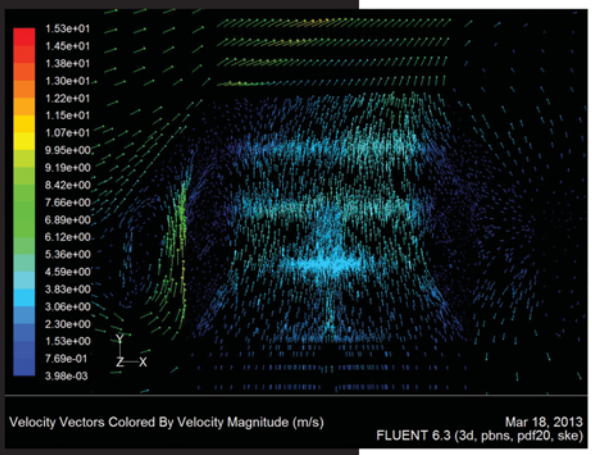
- TJ's gas flare system is equipped with extra pilot assemblies for ignition, a specially designed full perimeter flame retention ring assembly, an extended windshield, and (for certain cases) an ignition ring assembly.

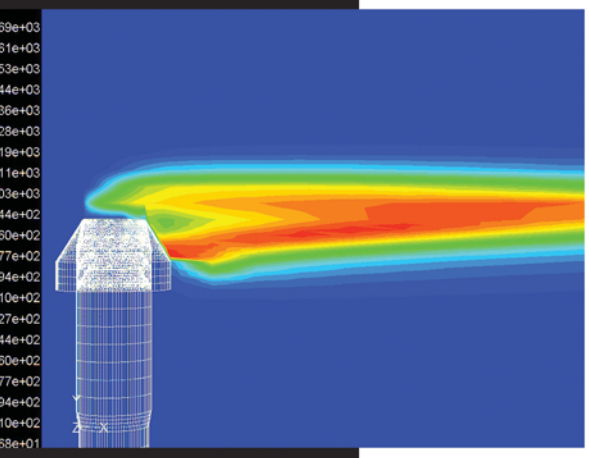
Non-Assisted Flares:

TJ's non-assisted flares and utility flares are used in applications that don't require smokeless operation, or where smokeless operation can be done without the assistance of external steam, air or gas. Utility flare tips are used for combustion of gases that do not produce smoke and gases with a low heating value, or for installations where smokeless combustion of heavy hydrocarbons is not required. These flare tips are one of the lower capital cost options for safe disposal of waste gases.

- Sizes from 2 inch (50 mm) to 120 inch (3050 mm)
- Most economical, reliable flare for general use
- Simplest, safest flare available
- Low noise
- High stability pilots tested to 170 MPH [274 km/h] windspeed
- Critical parts supplied as investment castings
- 310 stainless steel in high-heat areas

CFD Technology:





Industrial flares are equipment, which designed to safely dispose of waste hydrocarbon gases from chemical and petrochemical plants by burning gases and then releasing to the atmosphere. There is still great uncertainty about flare efficiency and the resultant gas emissions under different operating conditions.

CFD (Computational Fluid Dynamics) is a numerical tool to solve complicated fluid flow, heat transfer and chemical reaction models such as for the flare process. CFD is based on the numerical solution of the governing transport equations for mass, momentum, energy and species, and it represents one possible approach (in addition to experimental and theoretical methods) available to solve fluid dynamic problems.

The chemical and hydrocarbon industry employs CFD as a proven modeling tool to aid in equipment design.TEHRAN JAVAN combines advanced CFD technology with our extensive experience in the design, fabrication and operation of combustion equipment in order to ensure optimal flare system performance.

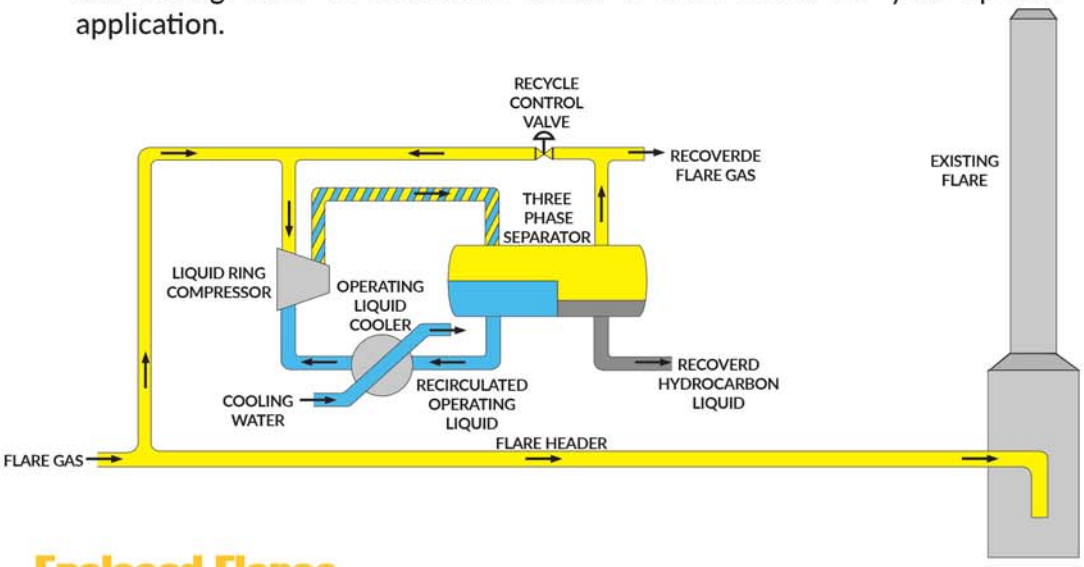
TEHRAN JAVAN use CFD to model your specific process condition against the actual equipment design, allowing us to accurately simulate flame behavior and interaction under varying wind and weather condition, fuel types, pressure, and flows.

Flare Gas Recovery Systems:

Tehran Javan designs advanced flare gas recovery systems that enable facilities requiring flare systems to achieve the benefits of near-zero flaring. Flare gas recovery can result in near 100 percent reduction of normal flaring, limiting flare operation to emergency releases and scheduled maintenance. Captured flare gas can then be reused as valuable fuel or feedstock. Near-zero flaring reduces costly emissions, giving you environmental control with an immediate return on investment.

Comprehensive Flare Gas Recovery Solutions

- System design, manufacturing and in-field start-up assistance
  Our engineering team will work with you to design the right system for your operation. From project beginning to final execution, we'll ensure your flare gas recovery system is optimized to reduce NOx, SOx, CO and CO2 emissions.
- Engineering studies and Engineering packages
  We offer engineering studies and packages that analyze your specific flare system and evaluate the economic feasibility of installing a flare gas recovery system at your facility.
- Compressor selection
  We evaluate all compressor technologies—reciprocating, screw, liquid ring and sliding vane—to determine which is best suited for your specific application.



Enclosed Flares

Tehran Javan Combustion is renowned for its clean, efficient enclosed ground flare technology that virtually eliminates noise, smoke, radiation and glare while delivering outstanding tip life. Many of our enclosed flare systems use a high-efficiency Burner to control emissions and our innovative fluidic wind fence for even air distribution. Our Enclosed Ground Flare Tehran Javan Combustion Thermal Oxidizer offer superior low-NOx performance and invisible flames, making them the two most in-demand enclosed flaring systems in the industry.

Principal Applications

- Petroleum refining
- Chemical processing
- Petroleum marketing
- Municipal waste treatment
- Biogas applications

Flare Control Systems:

Flare systems require many different types of controls. Controls are required for the ignition and monitoring of flare system pilots, control of fluid levels in knockout and liquid seal drums, for the control of steam or air or water or gas injection for control of smoke, measurement of oxygen, measurement of lower heating value, adjustment of assist gas injection, adjustment of blower speed for control of smoke, snuffing system controls, purging systems, staging controls, pump packages, solar power systems, etc. Tehran Javan have personnel that have expertise and extensive experience in the design, application, and implementation of all types of control systems as they are applicable for flare systems.

Auxiliary Equipment:

Velocity Seals

Integral Piece of Equipment Within the Flare Tip
Does not Require a Dedicated Drain Line
Ensures O2 Level Does not Reach Over 6-8% Below the Velocity Seal Device

Liquid Seal Drum

Liquid seal drum is a safety device usually located in the stack base to prevent a flashback from entering the piping upstream of the flare.

Knockout Drum

Knockout drums are used to collect any liquid entrained in a waste gas stream.
KnockOut drum types include:
- Separate / Stand-Alone (Horizontal or Vertical)
- Integral in Stack Base (Vertical)

Blowers

Tehran Javan can supply many different types of blowers including Engine Driven, Vaneaxial and Centrifugal.

Incinerators & Thermal Oxidizers

Thermal treatment of wastes has become the premier method of disposing of hazardous and non-hazardous wastes worldwide. Tehran Javan offers a complete line of liquid and fume incinerators or thermal oxidizers as they are also called, to safely and effectively dispose of waste streams such as tail gas, acid gas, BTEX vapors, chlorinated hydrocarbons, waste gases and waste liquids.
Because of the high temperatures associated with incineration, many Tehran Javan systems incorporate Waste Heat Recovery equipment to reduce operating costs or provide steam for other plant operations. Proven air pollution control devices such as scrubbers are also used to remove particulate matter and inorganic acids from the flue gas. Depending on the components of the flue gas, one or more devices can be incorporated into a waste treatment system. Bag houses, venturi scrubbers and ionizing wet scrubbers are designed to control particulate. Absorbers and scrubbers clean the acid gases present in the flue gas. Quench systems, conditioning towers and heat exchangers lower the temperature of the flue gas.

- ## Auxiliary Fuel Burner

  This burner is provided to maintain the system operating temperature at the level necessary to achieve the desired performance. The burner can be fired with either gaseous or liquid fuel. The burner design is an integral portion of the incineration system design to provide the proper heat release profile and flame envelope to assure proper destruction of the waste gases or liquids.

- ## Refractory Lined Chamber

  Waste gas or waste liquid incineration requires that the incoming waste be treated (1) at a high temperature (typically 650 to 1100°C), (2) for a minimum residence time (typically 0.5 to 2.0 seconds) and (3) in an environment to ensure proper turbulent mixing of fuel, air, and waste. To meet these requirements, a steel vessel lined with high temperature refractory is provided. The vessel size and refractory materials are selected to be compatible with the waste stream and to meet the basic time, temperature, and turbulence requirement.

- ## Discharge Vent Stack

  A vent stack transports the flue gas exiting the incinerator to the atmosphere. The vent stack height is fixed by flue gas dispersion requirements to avoid interference with other plant structures or operations. Vent stacks available separately.

- ## Control System

  An automatic control system is an integral portion of each incinerator. The control system assures that the unit will be operated in a safe manner to protect both personnel and equipment. To meet performance objectives, the waste combustion is performed under controlled and repeatable conditions. Typically, the control system monitors and actively controls flue gas temperatures, combustion/quench air flows, fuel pressures/flow, and flame stability to ensure safe and consistent equipment operation.

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