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Flares for the  
Petrochemical and  
Petroleum Industries

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**A World Leader  
in Flare and Flare  
System Applications**





# Advanced Flare and Flare System Designs

## Advanced Flare System Design and Execution

Honeywell UOP Callidus is committed to providing economical, environmentally friendly, advanced flare systems for a broad range of applications. As a global leader in flaring technology, we leverage our engineering expertise, manufacturing capabilities, flare test facilities and global service group to provide world-class solutions. We have provided support and service for the fabrication, installation and startup of thousands of flare systems worldwide.

Callidus test facility USA

## Broad Selection of Flare Products

### Our products include:

- Pipe flares
- Steam assisted flares
- Gas assisted flares
- Variable exit area flares
- Pressure assisted flares
- Offshore flares
- Low BTU flares
- Portable flares
- Ground flares
- Vapor combustors
- Rental flares

### Elevated flare support systems include:

- Tripod Supported
- Self Supported
- Guy Wire Supported
- Derrick Supported
- Demountable Derrick Supported
- Portable Trailer Mounted

### Flare accessories include:

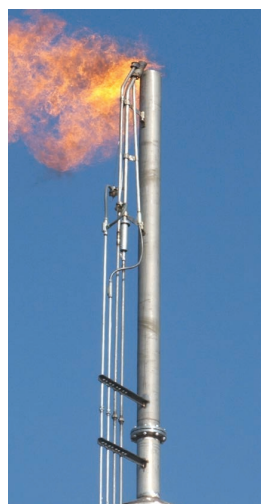
- Flare gas recovery systems
- High-stability pilots
- Velocity/fluidic seals
- Density/molecular seals
- Knockout drums
- Liquid seal drums
- Aircraft warning lights
- Flare tip removal davits
- Flame/smoke monitors
- CCTV systems

## Upper Steam Elevated Flare Systems – Smokeless Combustion

The Upper Steam (US) flare system utilizes a low noise steam injection ring to produce smokeless combustion. The upper steam distribution manifold is mounted at the top of the flare tip. Steam is routed through this manifold to a series of stainless steel nozzles and injected into the waste gas. This high velocity steam jet creates turbulence and forces combustion air into waste gas at the tip exit. By forcing air into the waste gas, additional oxygen is available for combustion, which allows the waste gas to burn without smoke, optimizing smokeless capacity.

### Upper Steam Flare benefits:

- Smokeless combustion
- Steam injection nozzles are an investment cast, low noise design, resulting in a long lifespan with limited maintenance and a reduced noise profile
- Simple to install and operate



Pipe Flare

## Pipe Flare Elevated Flare Systems – An Economical Solution

The Pipe Flare (PF) system is our most economical elevated flare solution. The long-life, simple-to-operate design is perfect for waste gasses that don't smoke or where smokeless operation is not required.

### Pipe Flare benefits:

- Lowest initial capital cost and operating cost of any elevated flare system
- Excellent choice for low BTU waste gas that does not smoke, such as ammonia
- Simple to install and operate



Flare Testing Upper Steam Flares

### Internal Steam Elevated Flare Systems – Low Steam, Optimal Performance

The Inner Steam (IS) flare tips are more technically advanced than a standard Upper Steam (US) flare tip. The IS series of flare tips uses a lower steam distribution manifold located near the base of the flare tip. Steam is routed through this distribution manifold and injected into a steam/air mixing venturi. This steam/air mixture is routed via advanced flare tip internals and mixed with the waste gas at the flare tip exit. The proprietary flare internals maximize the amount of air entrained and allow the steam/air mixture to be injected directly into the center of the waste gas stream for optimal combustion and smokeless performance.

We offer two variants of our Inner Steam technology. Our most advanced IS3 design utilizes stainless steel injection nozzles with a converging/diverging cross section. This cross section accelerates the steam to supersonic velocity, maximizing the amount of air entrained in the steam and improving steam efficiency and smokeless performance.

#### Internal Steam Flare benefits:

- High steam efficiency for lower utilities cost at high smokeless flow rates
- Muffled steam injection system reduces noise impact on the environment
- Advanced design features result in long flare tip lifespan
- Reliable smokeless capacity with high waste gas flow rates

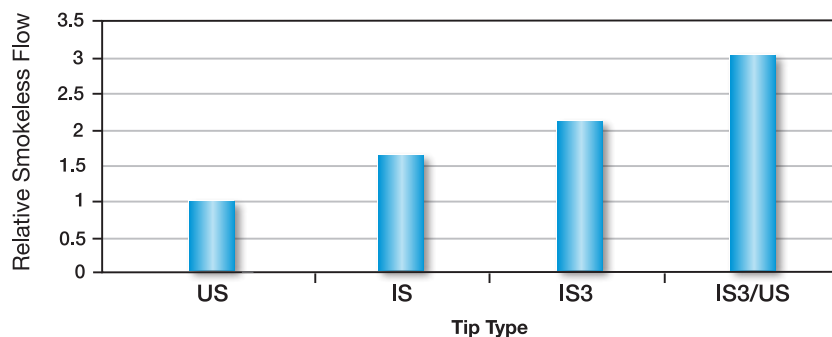
### Air Assisted Elevated Flare Systems – No Steam, Smokeless Combustion

Our Air Assisted (AA) flare tips are available in a variety of sizes and mixing geometries. Air assisted flare systems use blowers and a sophisticated flare tip mixing section to thoroughly mix air and waste gas within the combustion zone, resulting in smokeless combustion. Air assist flares are primarily used where steam is unavailable due to site environmental conditions, available site utilities, or the high local cost of water.

#### Air Assisted Flare benefits:

- Low-cost smokeless flaring option for sites that do not have steam available or where steam is expensive
- No high-frequency continuous steam injection noise. Blowers are located at or near grade and have a reduced noise profile

#### Steam Assisted Flare Smokeless Performance



Internal Steam Flare Tip High Steam Flow Testing



Air Assisted Flares



# The Best in Design, Quality, Performance and Delivery

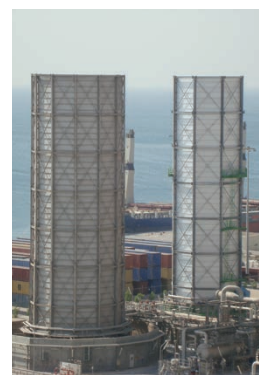
## Totally Enclosed Ground Flare/ Vapor Combustion Systems

The Totally Enclosed Ground Flare (TEGF) is designed to safely combust a wide range of gasses safely with minimal impact on the surrounding environment. Because combustion takes place entirely within a large, refractory-lined combustion chamber, the unit has no smoke, reduced noise, high destruction efficiency and no direct heat radiation from the flame.

Rather than using a single burner, the TEGF has multiple burners located in the base of the unit. The burners utilize natural draft to pull sufficient combustion air into the combustion chamber for controlled flaring temperatures and fully smokeless operation.

### Totally Enclosed Ground Flare Benefits:

- Reduced noise, and visible light and heat radiation impact on the environment, resulting in fewer complaints from neighbors
- Staged system for excellent turndown performance
- Modular designs are available to reduce installation time and site costs
- Most maintenance items can be repaired without shutting down the flare, increasing facility uptime and maximizing production
- 100% smokeless with reduced utilities consumption minimizes operating costs
- No radiation outside the combustor
- Reduced emissions



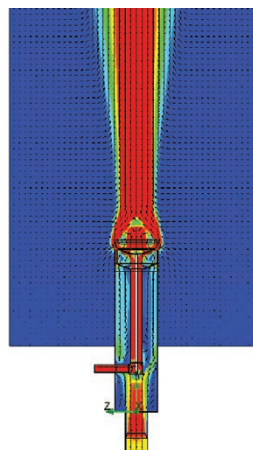
Totally Enclosed Ground Flare

## Hemisflare Elevated Flare Systems – Onshore and Offshore Applications

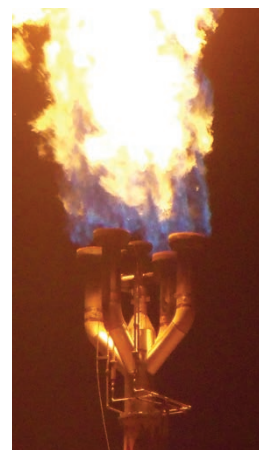
The Hemisflare (HF) smokeless flare system uses a combination of a variable exit area and thin-film mixing to produce high smokeless flow rates and excellent turndown performance. No steam injection or air assistance equipment is required for medium molecular weight gasses. The variable orifice design maximizes the waste gas velocity throughout the operating range, reducing radiation and maintaining the flare tip cool. The Hemisflare can be used for both onshore and offshore applications.

### Hemisflare Benefits:

- No steam injection or air assist required for reduced utilities cost
- Smokeless combustion
- High velocity operation reduces radiation at grade for a shorter, less expensive flare stack



Hemisflare CFD Modeling



Hemisflare

## Extended Perimeter Sonic Flare Systems – High Velocity, Stable Combustion

The Extended Perimeter Tip (Expert) is a unique multi-armed sonic flare tip designed for offshore and onshore use. The Expert uses an investment cast flare nozzle designed to maximize the surface area for mixing between the waste gas and the surrounding air, ensuring smokeless, stable combustion at high velocity. This results in a well-aerated, low radiation flame with reduced susceptibility to wind-induced flame lean. Additionally, the casting shape is designed to break up the sonic shockwave at the casting exist, reducing sonic jet noise.

### Expert Flare benefits:

- No steam injection or air assist required for offshore applications for reduced utilities cost
- Low weight
- High velocity, low radiation flame for improved offshore personnel safety



Offshore application for production flare

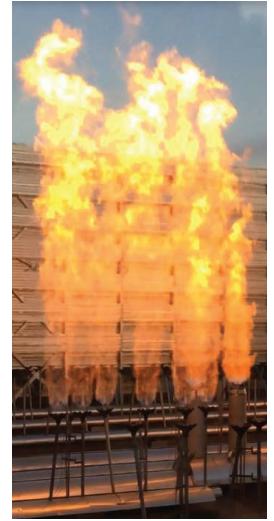
### Multipoint Ground Flare Systems – Highest Smokeless Capacity Available

The Multipoint Ground Flare System (MPGF) has the highest smokeless capacity of any flare system available. Multipoint ground flares are staged systems that automatically match the number of burners on service with the waste gas flow rate. By splitting the waste gas flow rate to hundreds of individual high-pressure burners, each burner has enough air access to burn without producing smoke.

In addition to our 20+ years of experience designing multipoint ground flares, we have the most advanced multipoint ground flare test facility in the world – a fully automated facility with the only permanent ground flare wind fence for testing purposes.

### Multipoint Ground Flare benefits:

- Highest smokeless capacity of any available flare. Most applications are 100% smokeless
- Staged design results in excellent turndown performance
- Very low steam or air requirement for smokeless operation
- Low profile design is less visible than an elevated flare, resulting in fewer complaints from neighbors
- No large cranes required for installation or maintenance
- Many maintenance items can be repaired without shutting down the flare, increasing facility uptime and maximizing production
- Callidus burners are long-life, single piece investment cast burners and most are expected to last through the design life of the facility without replacement



Multipoint Flare



Demountable Flare System

### Demountable Derrick Elevated Flare Support System

The Demountable Flare Support System (DFS) is a custom derrick configuration designed specifically for flare systems. The system has a built-in flare riser lifting system that allows an individual flare riser to be raised into position or lowered to grade without requiring a large crane.

Demountable flare systems are typically designed with multiple flare risers on a single derrick. Because a flare riser can be lowered to grade without sending maintenance personnel to the top of the derrick, an individual flare riser can typically be lowered and maintained while the other risers remain on service.

### Demountable Derrick Support System benefits:

- Risers can be raised into position without using a large crane, reducing maintenance costs and simplifying turnarounds
- Any riser can be lowered to grade while adjacent risers remain on service, maximizing plant uptime
- Consolidating flare risers to a single derrick may reduce total plot area required

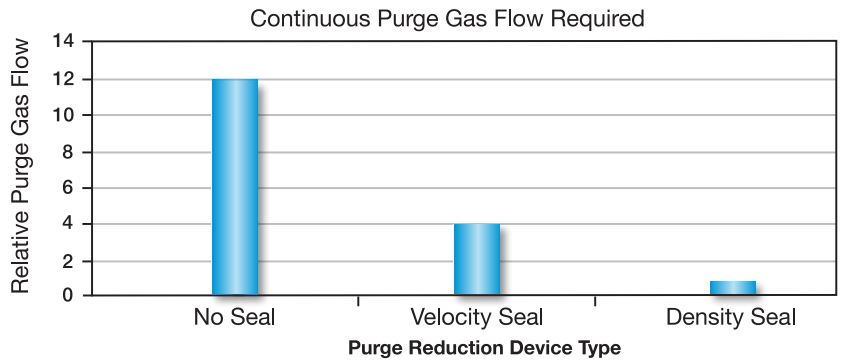
# Flares Designed to Meet the Application

## Density Seal Purge Reduction System – Reduces Utility Costs

Elevated flare systems are continuously purged in order to maintain the oxygen level in the flare stack below the temperature at which waste gas will burn. The Density Seal (DS) Purge Reduction System takes advantage of the density difference between the oxygen and the waste gas to reduce the amount of purge gas required to maintain the flare in a safe condition, which reduces utility costs.

### Density Seal Benefits:

- Reduced purge gas consumption for lower continuous utilities cost
- Lower oxygen diffusion rate results in reduced possibility of flashback during loss of purge, resulting in safer operation



Note: More purge gas may be required directly following high temperature waste gas releases due to volume shrinkage.

## Velocity Seal Purge Reduction System – Most Economical System

Elevated flare systems are continuously purged in order to maintain the oxygen level in the flare stack below that at which the waste gas will burn. The Callidus Velocity Seal (VS) Purge Reduction System limits oxygen diffusion down the inside wall of the flare stack, reducing the amount of purge gas required to maintain the flare in a safe condition. This reduces utility costs for the customer.

### Velocity Seal Benefits:

- Most economical purge reduction device
- Reduced purge gas consumption for lower continuous utilities cost
- Simple to operate with no parts that require routine maintenance or draining

## High Stability Flare Pilots and Pilot Ignition Systems

The most important part of any flare system is a reliable flare pilot. The pilot should be in continuous operation to ensure that waste gas routed to the flare is quickly and reliably ignited in a safe manner. If the pilot fails to ignite a heavier-than-air waste gas, unsafe conditions may occur at grade.

Honeywell UOP Callidus offers a full range of pilot ignition systems, including automatic high energy electric spark ignition systems and flame front generator systems. We also offer multiple pilot monitoring systems, including retractable thermocouples, flame ionization detection systems, and grade-mounted flame detection cameras.

### Pilot Benefits:

- Capable of operating on a wide range of fuel gasses, allowing plant utility flexibility
- Meets all international guidelines for pilot stability and safety
- Multiple available pilot monitoring and automatic relight systems are available
- Retractable pilots are available, which allows for pilot maintenance while the flare is in service, maximizing plant uptime
- Our pilots are ignited in our U.S. test facility before they ship, reducing site problems and helping maintain site schedules



High Stability Pilots

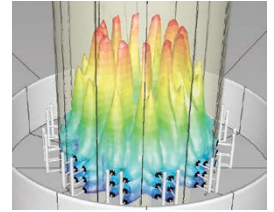


## Cutting Edge Computational Fluid Dynamics (CFD) Flare Modeling

The size and complexity of hydrocarbon processing facilities, such as refineries and petrochemical plants, continues to increase across the globe. Additionally, governments worldwide are implementing more stringent emissions requirements. These factors continuously drive the need for larger flares with reduced emissions profiles. Honeywell UOP Callidus CFD modeling provides our clients with access to the most advanced dispersion modeling, temperature profiles and emissions information.

### Benefits of CFD Modeling:

- CFD is performed in-house. Unlike CFD contractors, our CFD team has years of experience comparing model results to actual flare data from the test facility and from operating installations
- We leverage Honeywell's high-performance computing cluster, allowing our team to create larger, more accurate flare models and produce results faster than other suppliers – reducing project delays
- Our ability to optimize plot area and emissions permitting reduces capital cost and potential emissions penalties



CFD Modeling



## Flare Installation

Honeywell UOP Callidus offers complete installation packages for all our flares and flare systems around the world.

### Benefits of our Flare Installation:

- A single company manages the flare design, fabrication, and installation. Field issues during installation are managed by our team, reducing change orders, speeding up the schedule, simplifying the process, and reducing the total installed cost
- Our installation supervisors are experts on our equipment. They understand how the equipment is installed and the complete startup process, reducing rework and keeping the project on schedule
- Installation pricing often includes modular equipment design that maximizes shop fabrication in excess of the minimum specification. This minimizes field work and maximizes the quality of the final installation, resulting in a faster, less expensive installation schedule

## Aftermarket Services and Spare Parts

Honeywell UOP Callidus offers replacement flare tips, spare parts, equipment inspections, surveys and field service for flare equipment around the world. We can provide replacement and upgraded equipment for our flare systems and for systems provided by other vendors.

### Available Aftermarket Support Includes:

- Equipment inspections and site surveys
- Field service, repair, and tuning
- Guy wire tensioning
- Onsite training
- Miscellaneous spare parts

## Rental Flare Systems

Some plant relief headers are designed so that the flare cannot be fully isolated for maintenance during a plant shutdown. When this occurs, it is often cost-effective to install a temporary flare system. We offer a fleet of small, easily-transported flare systems that can be rented for flare maintenance or other flare system outages.

### Rental Flare Equipment Benefits:

- Full site installation and demobilization services are available, simplifying the rental process and reducing your costs
- Fast delivery minimizes unplanned outages
- Comprehensive customer technical support during the rental period
- Both short- and long-term rentals are available
- Custom, fast-track rental flare designs are available if our existing rental flares do not meet customer needs



Rental Flare

### Our Services Include:

- Installation
- Guy wire tensioning
- Supervision and inspections
- Commissioning and start-up
- Servicing tuning and training
- Rental fleet
- Spare parts



Honeywell UOP Callidus headquarters - Tulsa, Oklahoma. USA



Honeywell UOP Callidus' R&D and Test Center in China



Honeywell UOP Callidus 82,000 sq. ft. manufacturing and fabrication facility in USA

## Global Coverage

Honeywell UOP Callidus reaches the global market through our headquarters located in Tulsa, Oklahoma, USA, with regional direct sales offices and independent sales representation around the world. Meeting our customers' expectations and setting the standards for the combustion industry have always been our goals. Each burner, flare, thermal oxidizer and catalyst system we design and manufacture is built with those goals in mind.

## Test Facility

Honeywell UOP Callidus' test facilities in the U.S. and China are used for combustion technology research and development, as well as for customer demonstrations. Our array of test systems allow us to closely match actual field operating conditions, providing results that will more accurately predict actual measured performance.

## In Addition to Flares, Honeywell UOP Callidus Offers:

- Ultra-low NO<sub>x</sub> burners
- Thermal oxidizer systems
- Field services and parts
- CFD Modeling
- Training and schools

## ISO 9001:2008 Certification



USA Certification



China Certification

High-Performance Combustion Solutions  
Service – Parts – Installation

Contact us—we're here to help.

[CallidusHelp@Honeywell.com](mailto:CallidusHelp@Honeywell.com)

### For more information

For more information, please visit [www.callidus.com](http://www.callidus.com) to find a local sales representative

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