



**FLARES FOR THE PETROCHEMICAL  
AND PETROLEUM INDUSTRY**

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

# Advanced flare and flare system designs

Callidus Technologies by Honeywell prides itself in providing economical high destruction efficiency, high smokeless, low noise, low radiation flares for a broad range of flare applications. Through our engineering expertise, manufacturing capabilities and worldwide service, Callidus has become a leading provider of flare technology. The Callidus team has hundreds of years of combined flare design experience and has been involved in the fabrication, installation, and startup of thousands of flare systems worldwide.

## Quality Manufacturing

Our manufacturing facility complies with the highest quality standards in the industry. Many of our internal quality assurance programs require even higher performance standards than industry certifications. All proprietary items are fabricated at our 82,000 sq. ft. U.S. facility which uses the latest manufacturing techniques and equipment. We can proudly say that our



Flare Testing

U.S. facility has the ASME “U” stamp and NBIC “R” stamp. Our manufacturing techniques use state-of-the-art equipment and our employees are highly trained for their specialized tasks. For example, our welders are all qualified in accordance with ASME Section IX. Ongoing training is regularly scheduled through our research and development group to ensure that the highest level of quality and performance is maintained for each project. Callidus quality assurance personnel thoroughly inspect each flare system prior to shipment reducing installation time. In addition, Callidus project execution and manufacturing is certified ISO 9001:2008.

## Callidus has a flare to match your application

Callidus Technologies offers a comprehensive array of flares and flare systems.

### Our products include:

- Pipe Flares
- Steam Assisted Flares
- Air Assisted Flares
- Gas Assisted Flares
- HemisFlares
- Offshore Flares
- Low BTU Flares
- Portable Flares
- Pit Flares
- Totally Enclosed Ground Flares
- Multipoint Ground Flares
- Marine Vapor Combustors
- Truck Vapor Combustors
- Rail Car Loading/Cleaning Combustors

Our elevated flares can be supported by a number of different methods.

### Support methods include:

- Tripod Supported
- Self Supported
- Guy Wire Supported

- Derrick Supported
- Demountable Derrick Supported
- Portable Trailer Mounted

Callidus flares are available with a number of accessories.

### Available accessories include:

- High Stability Pilots
- Velocity Seal
- Density Seal
- Knock-out Drum
- Liquid Seal Drum
- Aircraft Warning Lights
- Davit
- Flame / Smoke Monitor
- Flame Arrestor
- CCTV

## Upper Steam Flares

The Callidus CAL-US flare incorporates a highly stable pilot and flame retention system in conjunction with a high efficiency, low noise steam injection ring to produce stable smokeless combustion. The Callidus upper steam nozzle is a unique investment casting to accomplish the function of inspiring air into the flame bundle with steam. The casting is aerodynamically designed to maximize efficiency as well as multi-ported to minimize noise production. This allows the user to



Upper Steam Flares

minimize steam consumption while optimizing smokeless capacity.

#### Upper Steam Flares:

- Low noise steam ring
- Advanced nozzle casting design
- Superior manifold connection
- Smokeless burning
- Extremely stable pilots

#### Internal Steam Flares

The Callidus CAL-IS flare is a dramatic improvement over the traditional internal steam design. This flare offers internal steam tubes manufactured with cast 310 SS segments at the top to prevent tube cracking and warping. To prevent vibration failure, Callidus utilizes a proprietary tube support system. This system allows free thermal expansion of the inner tubes and minimal waste gas flow blockage while still constraining flare inner tube vibration. To improve air inspiration, each steam tube inlet is constructed of a true inlet venturi, maximizing air inspiration. CFD modeling was used to optimize tube placement and muffler design, resulting in maximum air flow into the combustion zone with minimum noise.

The Callidus CAL-IS<sup>3</sup> flare is the newest generation of efficient internal steam design. The steam nozzles used in this flare tip utilize a converging/diverging nozzle to maximize steam velocity, and therefore air inspiration. This is a significant improvement



Internal Steam Flares

in flare technology and increases our steam efficiency and thus allows increased smokeless capacity. This flare tip design generates some of the lowest noise levels and highest smokeless capacities of any tip on the market.

The Callidus CAL-IS<sup>3</sup>/US flare utilizes both the upper steam injection technique and the internal steam tube inspiration methods to produce the most smokeless capacity possible. Injecting steam from two different sources also allows for more control of the steam consumption during intermediate flaring events.

#### Internal Steam Flares:

- Super sonic steam nozzles
- Muffler to reduce noise
- Cast 310SS internal tube segments
- Improved air inspiration
- Optimum tube density

- Venturi inlet at steam ejectors
- Higher smokeless capacity
- Extremely stable pilots

#### Air Assisted Flares

The Callidus CAL-AA flare is an effective alternative to steam assisted smokeless flares, especially when steam is not available. The main advantages of our air assisted flare design over steam are:

- Operation in freezing climates
- Lower operating costs in desert areas where steam is expensive
- Smokeless operation where steam is not available

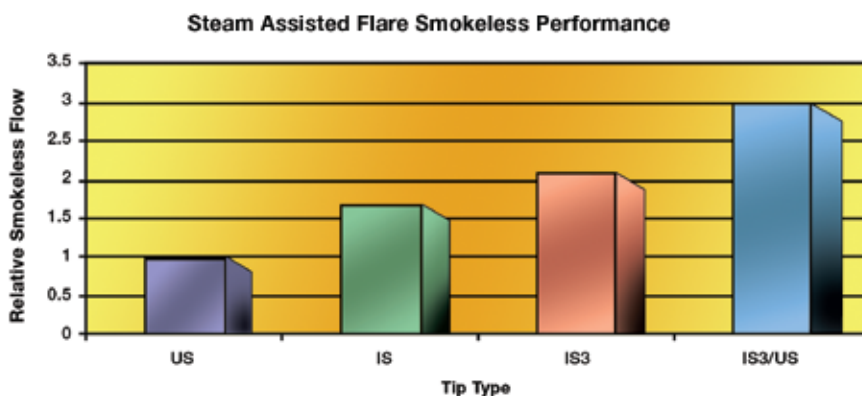
The Callidus design locates the air blower near grade to allow “on-line” maintenance of the smoke suppression system. In addition, the continual flow of forced draft air cools the tip and prevents flame pull down in high wind conditions. This greatly extends the life of the tip.

#### Air Assisted Flares:

- Low maintenance
- Long service life
- Low operating costs
- No steam lines
- High smokeless capacity
- Low noise design available
- Online maintenance of smoke suppression equipment
- Extremely stable pilots



Air Assisted Flares





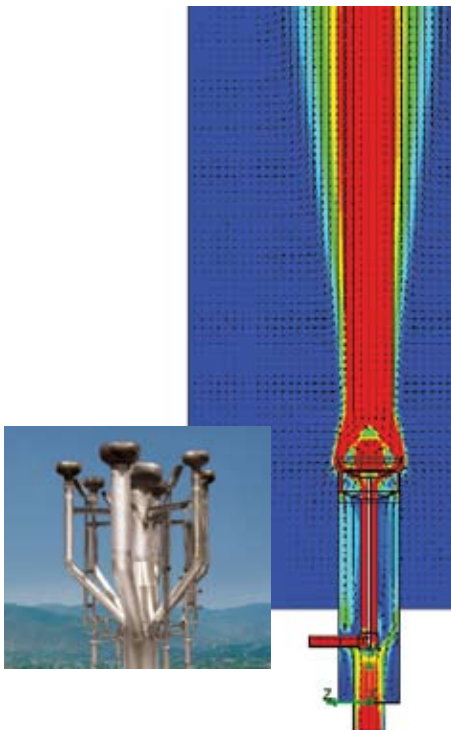
# The best in design, quality, performance and

## HemisFlares

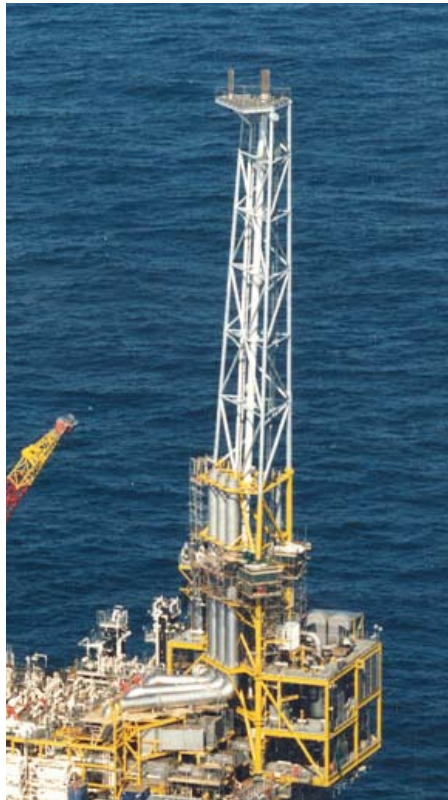
The Callidus CAL-HF utilizes the Coanda effect in conjunction with a variable exit area principle to produce better air/fuel mixing, resulting in increased smokeless capacity and lower radiation. These flares have the ability to dispose of high molecular weight gases smokelessly at low pressures without the use of steam or expensive air induction equipment. These flares use stainless construction and CK-20 investment cast nozzles that operate well at low flow and low purge conditions with dramatically extended flare tip life.

### HemisFlares:

- Low radiation over wide range
- Light weight
- Short rigid flame
- Long service life
- Smokeless flaring
- High stability pilots



HemisFlare CFD Modeling



Offshore application for production flare

## Offshore Flares

The Callidus CAL-EXPERT is the next generation of sonic flare technology. Due to the proximity of flares to equipment and operators on offshore platforms, it is imperative that offshore flare designs maximize reliability and minimize radiation, noise, and smoke. Callidus has met this challenge with a unique casting design. This proprietary tip design is coupled with extended periphery exit nozzles to produce a high flow, low thermal radiation, low noise flame.

### Offshore Flares:

- Low radiation
- Long service life
- Low weight
- Investment cast burners and components
- High smokeless capacity
- Shorter boom length/less boom weight
- Extremely stable pilot

## Totally Enclosed Ground Flares

The Callidus CAL-TEGF was developed by Callidus to burn flare gases with minimal environmental impact. The flame burns completely concealed from view with no smoke, low noise, reduced emissions, and no radiation at grade outside the combustor. This design is ideal for FPSO/FSO applications where constant flaring can occur. The CAL-TEGF flare utilizes a refractory lined combustor with highly efficient burners. Most equipment is located near grade for easy and online maintenance. Both forced draft and natural-draft systems are available. Our experience provides a one stop source for enclosed flares from vapor inlet to combustor stack. Callidus enclosed flares are available completely skid mounted, pre-wired, pre-piped, and tested. Applications include truck, marine and rail car terminals, production onshore and offshore (FPSO), refining, and petrochemical plants.



Totally Enclosed Ground Flare

## Totally Enclosed Ground Flares:

- Easy, on-line maintenance
- Turnkey systems including installation
- Skids 100% pre-wired, pre-piped, assembled and tested
- Flame finder technology
- Smokeless combustion
- Very low noise levels
- No radiation outside the combustor
- Reduced emissions

## Multipoint Ground Flares

The Callidus CAL-MP flare system is the result of over 20 years of work in the development of multipoint flare designs. Callidus' superior burner system develops significantly higher surface to area relationships for the waste gas exit. This feature provides more air inspiration and greater turndown capability. Multipoint flares offer unlimited smokeless capacity and the lowest possible radiation. Callidus MP burners are high quality stainless steel castings with thicker metal cross sections, longer life, better waste gas flow patterns, and lower internal pressure drops. These high quality castings also dramatically reduce the potential of cracking.



Multipoint

## Multipoint Flares:

- Unique burner design provides high surface to area relationship
- Unlimited smokeless capacity
- Extremely stable pilots
- Easy maintenance-all equipment at grade
- Low radiation and no radiation designs available
- High quality investment cast stainless steel burner
- Infinite turndown staging system
- Extremely long life burners

## Demountable Flare Systems

The CAL-DFS (Demountable Flare System) features a derrick with the risers mounted in such a way as to permit the lowering of the flare burner to grade for service without the use of a crane. Since the stack is lowered to grade, no personnel are required to climb the stack beyond the first riser length to perform needed maintenance. Flare systems with multiple risers allow service to be performed on all risers and flare burners except the one flare in service. This means flare maintenance can be performed safer without a plant wide shutdown saving time and money.



Demountable Flare System

## Demountable Flare Systems:

- Pivoting working platforms are designed for 360° access to the flare stack.
- Multiple risers allow flare tip to be maintained at grade while the flare system and plant remain in operation.
- Multiple risers allow for smaller plot space.
- Extra space on derrick may allow for the addition of risers for future expansion.

# Flares designed to meet the application

## Pipe Flares

The Callidus CAL-PF incorporates several key design features which ensure a stable burning flare designed for long life and dependable service. The flare comes with a high stability flame retention system to ensure stable burning during all types of weather conditions. This feature also allows the use of smaller flares, greatly increasing flare life while also decreasing operating costs.

### Pipe Flares:

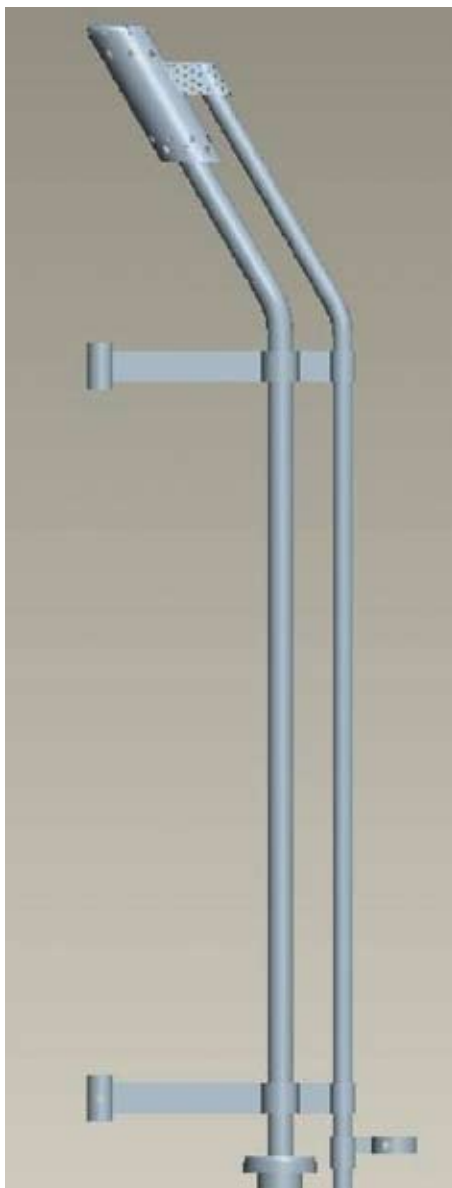
- High stability flame retention system
- Extremely stable pilots
- Long service life
- Reliable pilot ignition systems
- Plug welded brackets



Pipe Flare

## High Stability Pilots

Callidus has developed an extremely stable pilot system that can survive hurricane wind conditions of over 125 mph with rainfalls over 12 inches per hour. The pilot system incorporates a windshield, strainer, and a true premix burner capable of firing in 0% oxygen environments at the pilot tip ensuring stable operation. The pilot gas tip, flame shield and thermocouple mounting well are all investment castings of CK-20 material, which is a casting version of



High Stability Pilots

310SS. The castings metallurgy, the lack of forming stresses, and the metal thickness combine to make a long-lived pilot. In addition, Callidus designers have selected a thermocouple placement to maximize response in all weather conditions, as well as minimize the exposure to direct flame. The stability, metallurgy, and thermocouple placement make the Callidus pilot one of the most reliable pilots on the market.

## Density Seal

Callidus offers an advanced CAL-DS purge reduction labyrinth-type density seal. The Callidus density seal design uses two 180° bends in the waste gas flow stream. Because the purge gas has a different density than air, lighter purge gas tends to collect in the upper end of the seal while heavier purge gas tends to collect at the bottom of the seal. The accumulated purge gas forms an effective barrier to air infiltration. At proper purge rates, oxygen levels below the density seal will be less than 0.1%.

The Callidus density seal has several improved features not found in the industry standard labyrinth seal:

- 1) The unique internals of the Callidus density seal are designed to support maximum flow with minimum pressure drop while still maintaining an adequate purge gas accumulation.
- 2) The Callidus density seal is available with an industry-exclusive lower head rather than the standard flat plate or rolled cone. This results in a stronger, better draining density seal chamber.

## Velocity Seal

Callidus also offers a CAL-VS purge reduction velocity seal which is a less expensive option to the density seal design



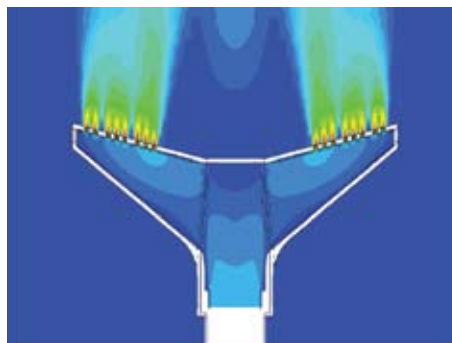
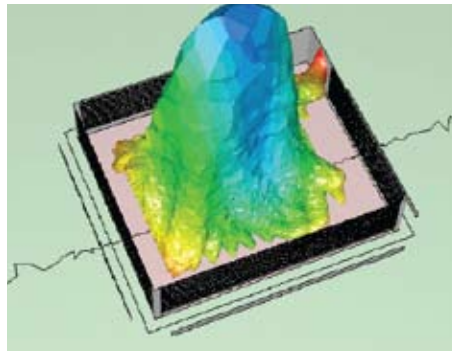
that uses more purge gas. At low gas flow rates, air will enter the flare tip through the top and tends to travel down the inside wall of the tip. The cone-shaped design of the velocity seal breaks the flow of air into the system by disrupting the flow attachment of air to the wall of the flare tip and creating a velocity differential barrier in the purge gas. Proper purge rates will ensure 6 to 8% oxygen below the seal.

### Purge Reduction Devices

During normal operation, a flare stack is open to atmosphere in an unpurged flare system. It is possible for air to infiltrate the flare stack and mix with the hydrocarbons in the stack, resulting in a combustible mixture. In order to prevent this from happening, flare stacks are operated with continuous purge gas flow. The flow of the purge gas will sweep the oxygen from the stack, preventing combustion inside the flare stack. The purge gas can be any non-condensable oxygen free gas. Nitrogen and natural gas are the two most common purge gas gases.

### Rental Flares

Callidus understands that taking a flare out of service may require a plant shutdown, resulting in lost revenue. Additionally it can be very costly to expedite flare delivery for



CFD Modeling

emergency flare replacement. To minimize these costs, Callidus has a fleet of rental flares that are ready to ship. If a suitable flare is not in our inventory, our rental group can fast-track a custom unit for short or long-term rental usage. As with all Callidus equipment, our rental units are rigorously inspected by our quality assurance personnel before leaving our facility. Each rental unit includes a full warranty and comprehensive customer support.

Callidus also offers complete installation, start up and other after-market services to fit all your combustion needs.

### CFD Modeling

Requirements for ever-increasing efficiency and reduced emissions require innovative design. Callidus has used CFD modeling for more than 20 years to provide products that better meet our client's needs. Callidus design engineers utilize the latest CFD software in conjunction with Honeywell's HPC (high performance cluster) to produce CFD simulations to answer difficult questions with precision and speed, reducing the amount of physical testing required. Used alone or in conjunction with physical testing at our industrial scale test facility, simulation results allow for the evaluation of virtually all combustion questions, including: efficiency, temperature profiles, flame shape, dispersion, and pollutant formation.

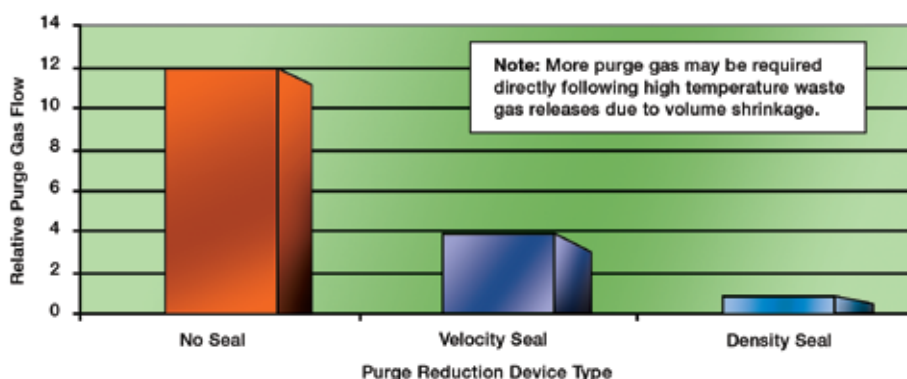
### Flare Installation

Callidus offers turnkey installation and aftermarket support for all our flares and flare systems around the world. Because we are the manufacturer we know the product better than any contractor. Our goal is to provide first class service from professionals who have years of experience with our equipment and understand how it should be installed and operated to obtain the highest quality and efficiency.

### Our services include:

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

Continuous Purge Gas Flow Required



## Flare Test Facility

With an excess of 600,000 lb/hr (300 mmscfd) capacity our industrial scale research center can simulate an unlimited number of flaring scenarios. Our wide array of test flares and state-of-the-art computerized data acquisition system allows us to not only research and develop new products but also simulate and solve problems in the field. Our research center also serves as a test center for regulatory agencies as well as for private clients. Callidus' continued investment in its test facility underscores its commitment to being the leader in the combustion industry.



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



Callidus headquarters - Tulsa, Oklahoma. USA

## Global Coverage

Callidus reaches the global market through our headquarters located in Tulsa, Oklahoma, USA, regional direct sales offices in Shanghai, China; Brussels, Belgium; Mumbai, India and Sao Paulo, Brazil and with independent sales representation around the world.

Meeting our customers' expectations and setting the standards for the combustion industry have always been our company goals. Each burner, flare, thermal oxidizer, flare gas recovery and catalyst system we design and manufacture is built with those goals in mind.

## ISO 9001:2008 Certification



USA Certification



China Certification

Callidus Corporate Headquarters, USA  
7130 South Lewis, Suite 335  
Tulsa, OK 74136  
Phone: +1 918 496 7599  
Fax: +1 918 488 9450  
**[www.callidus.com](http://www.callidus.com)**

Brussels, Belgium:  
Phone: +32 2255 0909  
Fax: +32 2251 8241

Sao Paulo, Brazil:  
Phone: +55 11 3475 1885  
Fax: +55 11 3475 1901

Shanghai, China:  
Phone: +86 21 2894 3088  
Fax: +86 21 5895 7546

Mumbai, India  
Phone: +91 22 2582 2639  
Fax: +91 22 2582 3345

