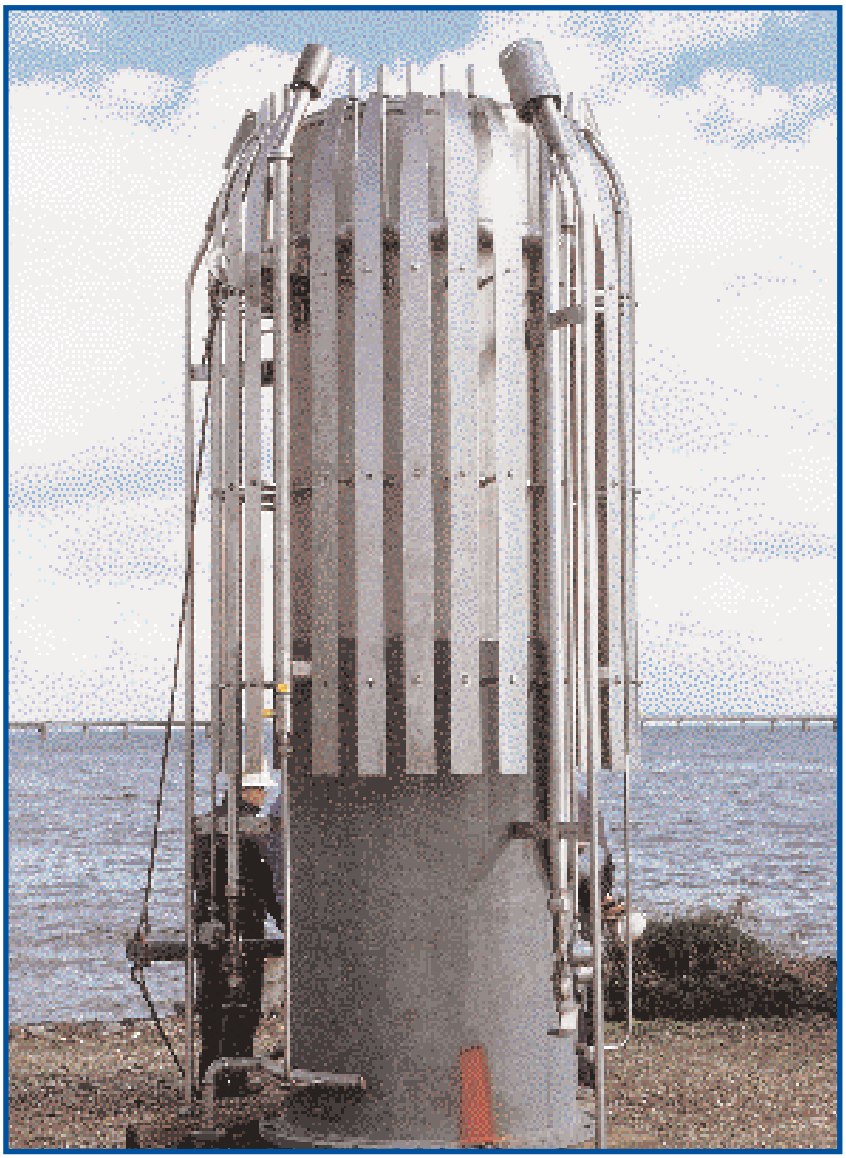
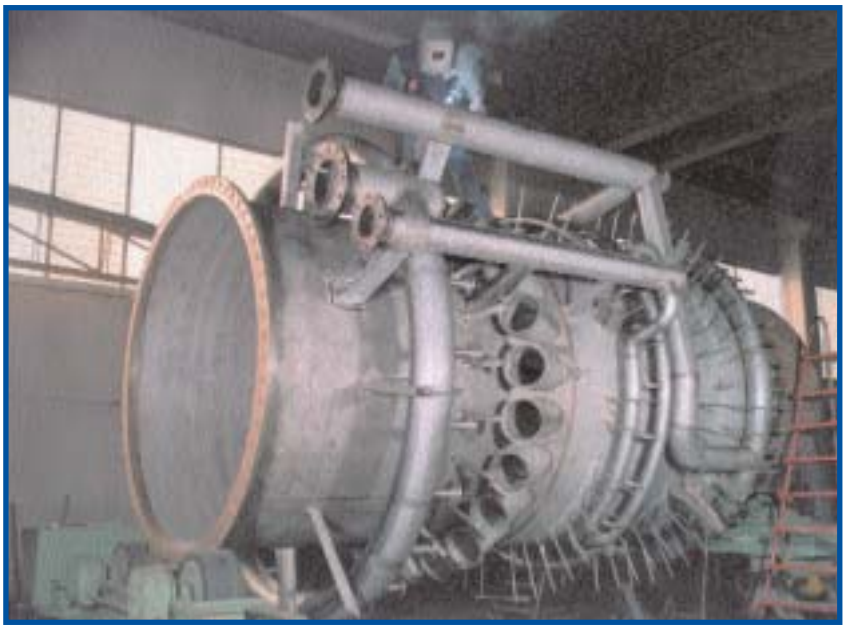
04/2003

FLARE TIPS





INTRODUCTION

A flare tip is used for the disposal of waste combustible gases and consists basically of a high grade alloy tube. Usually it is mounted on the top of a steel stack so that the heat of combustion and its products will not cause danger to life and property on the ground.

The flare tip is provided with an ignition source called a pilot burner. The pilot burners supply a constant source of ignition to the root of the flame so that even if there is a tendency for the flame to lift off, the flaring gas is being constantly re-ignited. The number of pilot burners installed around the flare tip is function of the flare tip diameter.

The wind shield is made up of a series of deflectors and is one of the most important components of the flare tip. In addition the flare tip is provided with flame retention rings or flame stabilisers. On the deflector side wich is exposed to the wind, an air compression, immediately upstream of the plates, will take place due to the energy of the wind stream. After the air stream has passed the free vertical spaces between the plates, a through vortex is formed by the sudden increase of the cross section, so that the wind energy is completely absorbed. Thus, no air pressure and accumulation will build up on the flare tip side exposed to the wind, and no vacuum can form on the lee-side. In view of the above, a down-deflection of the flame is safety prevented and long life of the tip is ensured.

TYPICAL TYPES OF FLARE TIPS:

- **NON-SMOKELESS**
- **SMOKELESS STEAM**
- **AIR BLOWN**
- **STEAM / AIR SMOKELESS**
- **LOW BTU**
- **COKE OVEN GAS**
- **H_2 (HYDROGEN)**
- **ACID GAS (H_2S)**
- **NH_3 (AMMONIA)**
- **SONIC**

FLARE TIP DESIGN CONSIDERATIONS

A flare tip should be selected with the aim of:

- improving combustion to reduce radiations and the quantity of unburned gases released to the atmosphere;
- reducing or eliminating smoke formation;
- ensuring that the flared gases burn with a stable flame over the whole operating range;
- reducing to a minimum the maintenance required over its operating life;
- meeting permissible noise levels.

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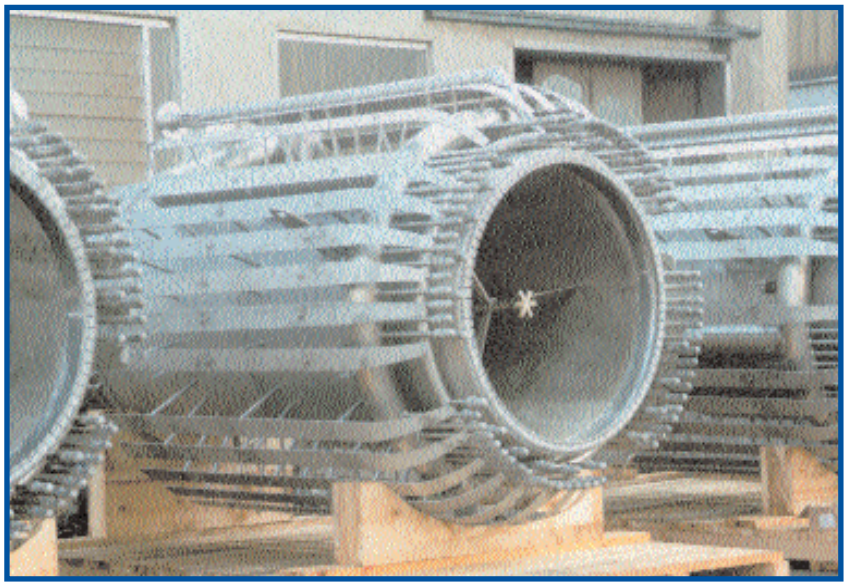
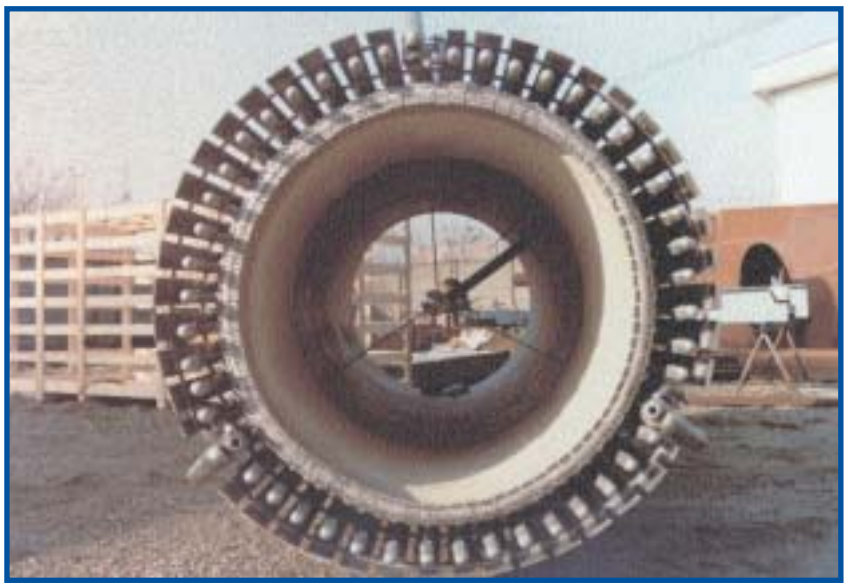
FLARE TIPS

NON-SMOKELESS

The ITAS RK Tip is a general purpose flare tip for use when smoke suppression is not required either because the gas to be flared is not an inherent smoke producer, or enviromental conditions permit it. This type of flare tip is equipped with wind deflector and retention ring to ensure complete flame stability under the most severe weather conditions.

FLARE TIPS





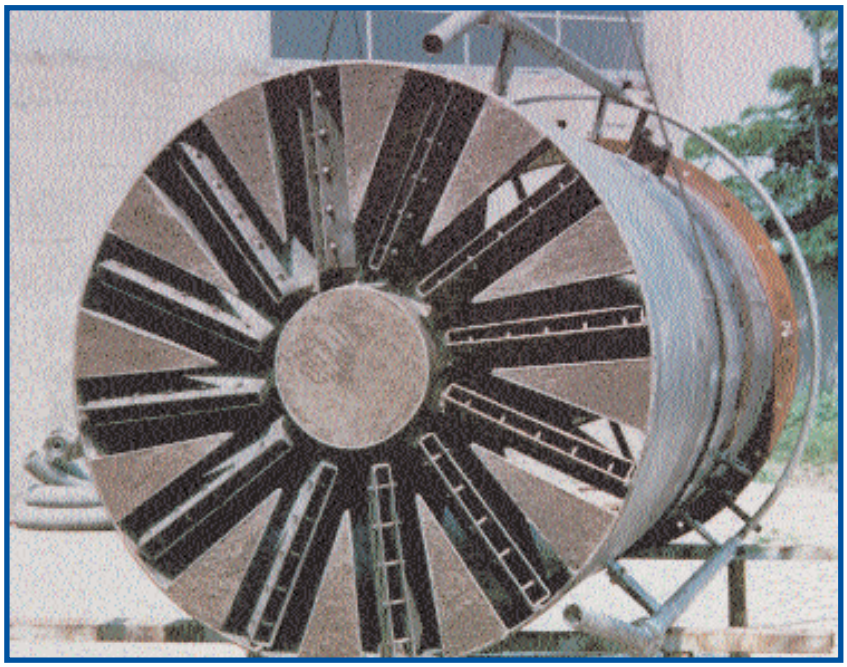
SMOKELESS STEAM

The ITAS DIK Tip is a smokeless flare tip designed for use with a wide range of hydrocarbon gases. The steam is externally injected directly into the root of the flame, by means of several nozzles located around the top of the tip. Thus, the steam jet momentum draws-in the air in order to produce faster and clean combustion.

This type of flare tip is normally supplied complete with wind deflectors, retention ring, central steam nozzle.

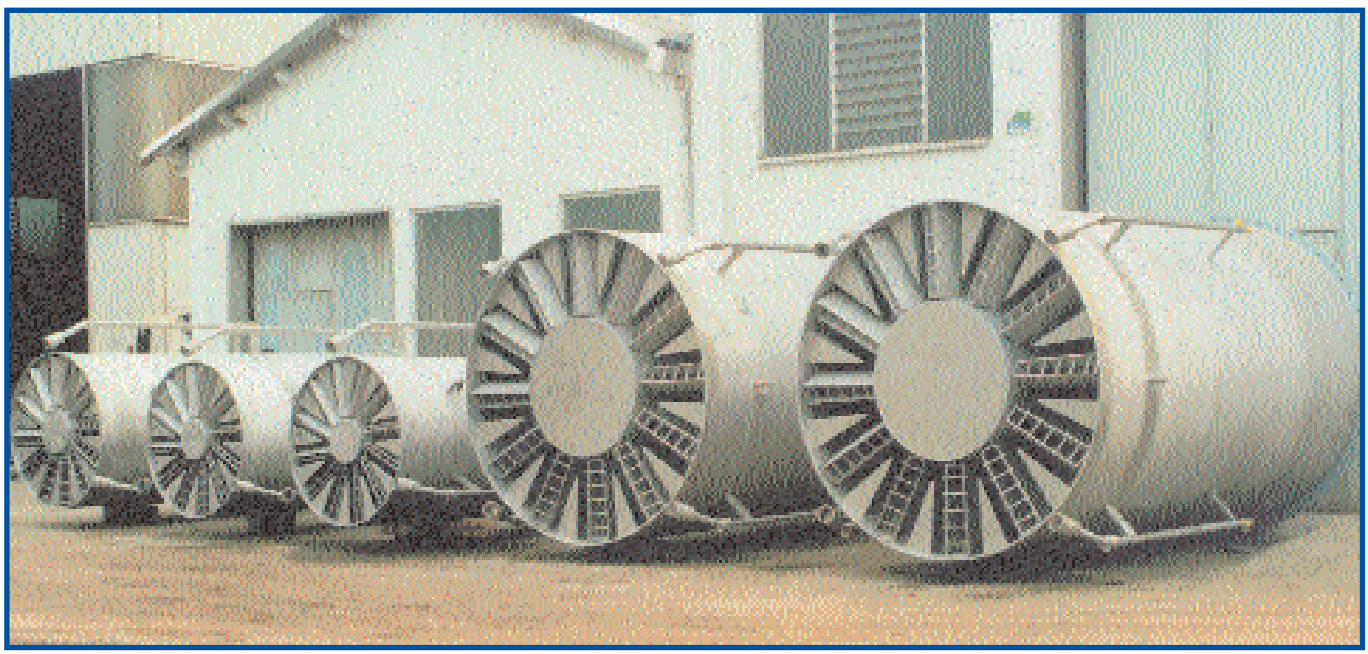
FLARE TIPS

AIR BLOWN



The AIR BLOWN flare is designed with the following features:
1. Top exit swirling.
2. Low operational costs.
3. Lower maintenance requirements.
4. Elimination of steam lines and controls.
5. Non-luminous combustion.
6. Longer flare burner life.
7. Low noise levels.
8. Low emissions.
9. Low pressure air for smoke suppression.
10. Up to 100% smokeless combustion.

The ITAS DKC flare tip is suitable for smokeless burning of hydrocarbon gas, using air from a blower.
One benefit of the air blown flare is a longer tip life. The forced air continuously flows past the flare tip eliminating burn-back problems and cools the flare tip itself. This results in lower maintenance.



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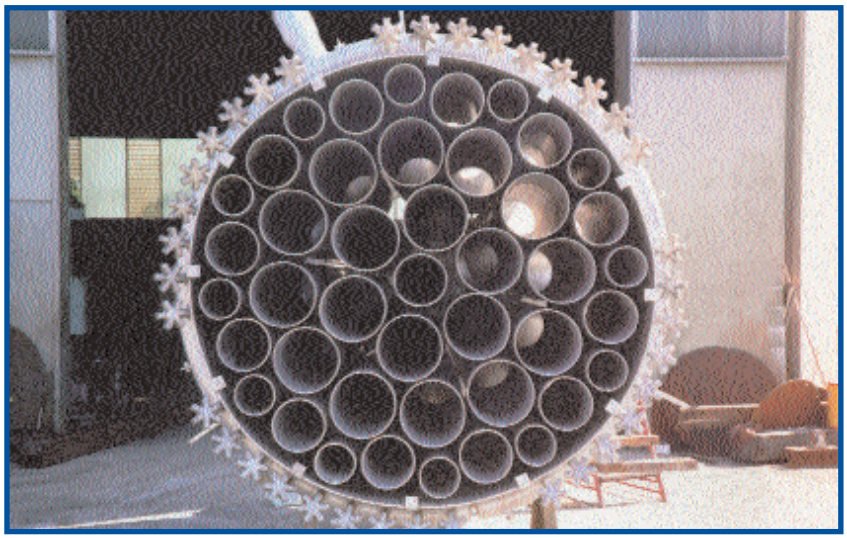

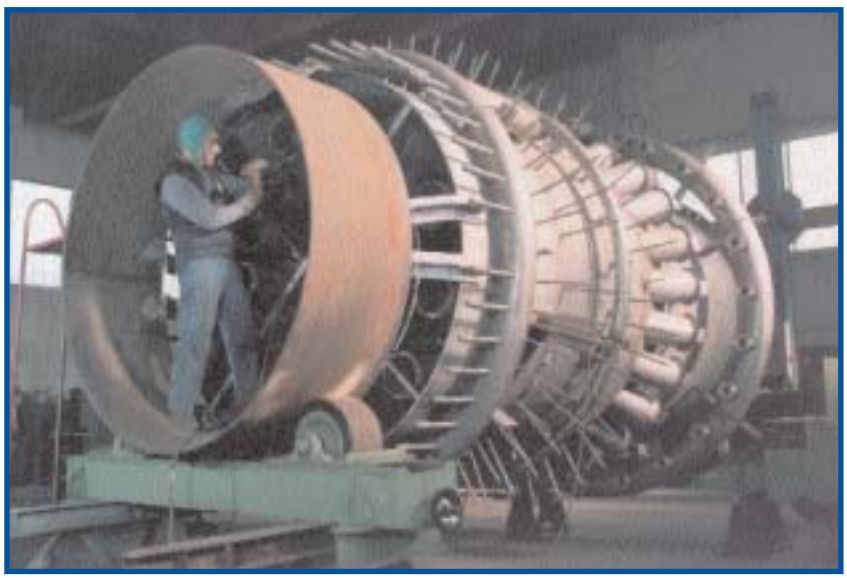

STEAM / AIR SMOKELESS

The ITAS DKCS flare tip is designed to provide wide range smokeless burning at lower noise levels and with optimum steam usage.

This type of burner is provided with an external steam injecting system located at the top of the tip.
This flare tip also has an internally installed steam and air injecting system which feeds the steam air mixture into the centre of the gas stream.
The lower steam injectors are equipped with the silencer.
Centre steam is provided to handle low waste gas flows and to offer operating flexibility.

ITAS DKCS flare tip design advantages:
- low noise emissions;
- low luminousity;
- wide smokeless range;
- low steam consumption.

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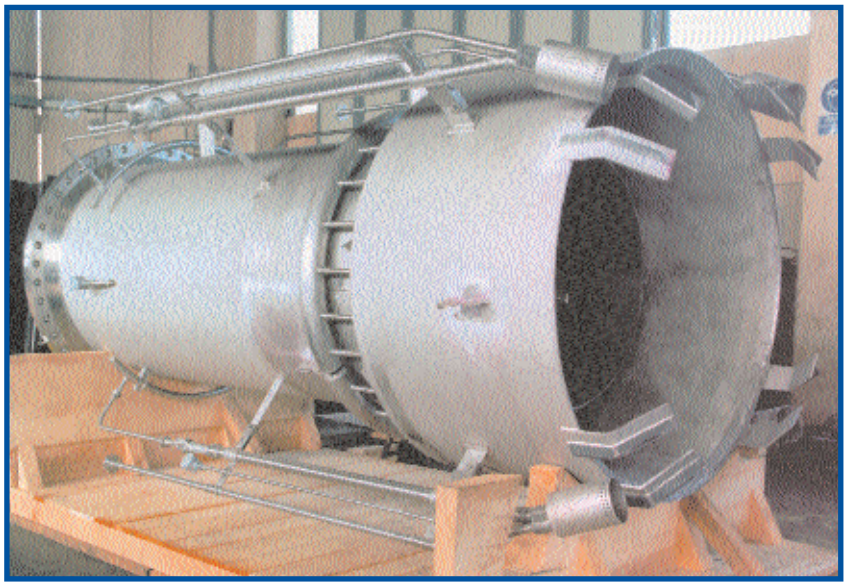
FLARE TIPS



LOW BTU WASTE GAS

COKE OVEN GAS TIP

The ITAS flare tip is designed for low pressure drop, which gives a correspondingly low exit velocity.

When the LHV of the flaring gas is below 1600 KCAL/Nm^3 support fuel gas should be added to ensure good destruction efficiency.
This support fuel gas is injected in the flaring gas through special nozzles located in the top of the flare tip.

The flare tip is equipped with special heat shield installed at the top of the tip, in order to protect the root of the flame from the wind.

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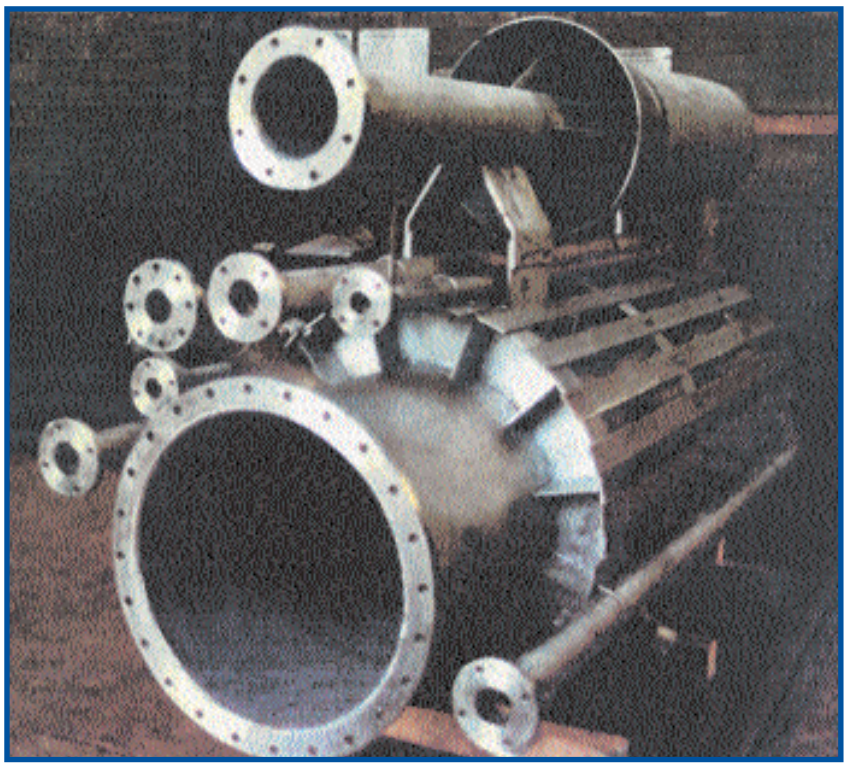
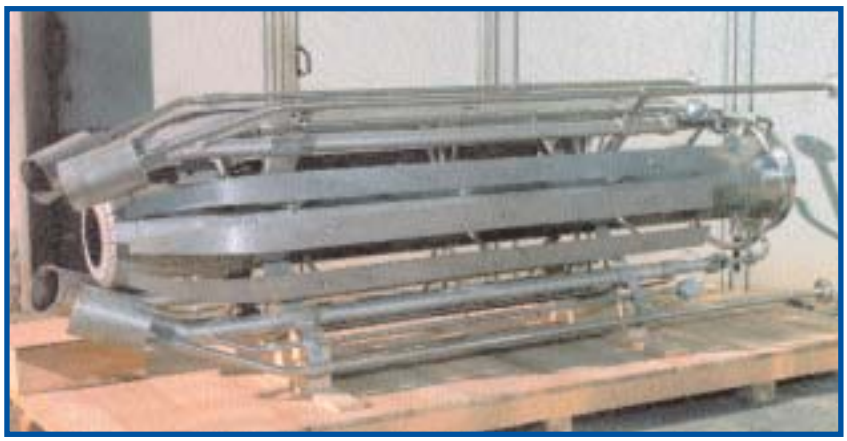
FLARE TIPS





ACID GAS (H_2S) TIP

Usually a separate Acid Gas flare is required to burn the acid gas stream. The flare stack is externally insulated in order to keep the acid gas stream well above the condensation point.

Acid streams may require support fuel gas in order to complete the combustion. This is a function of all the components of the flaring stream.

Depending on the composition of the acid stream a special heat shield and a support fuel gas burner may be required.

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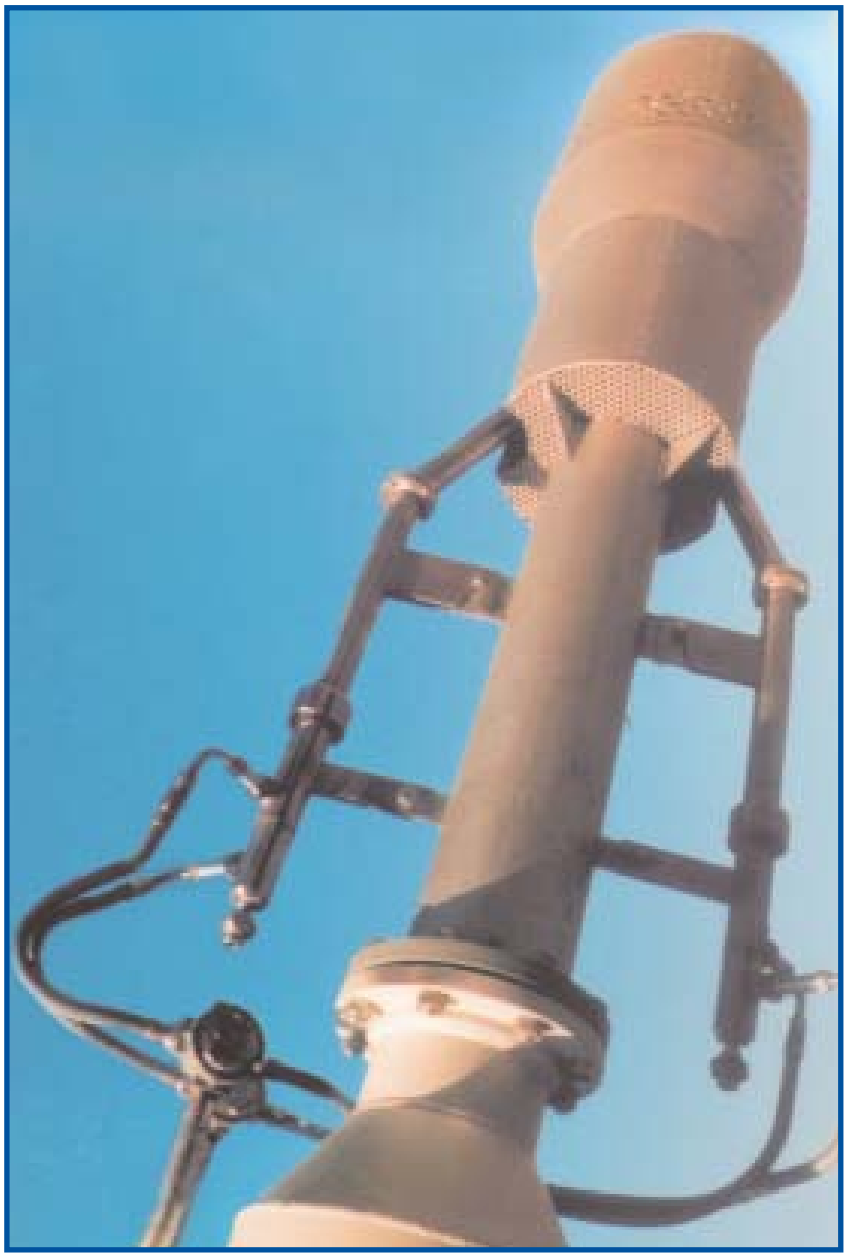
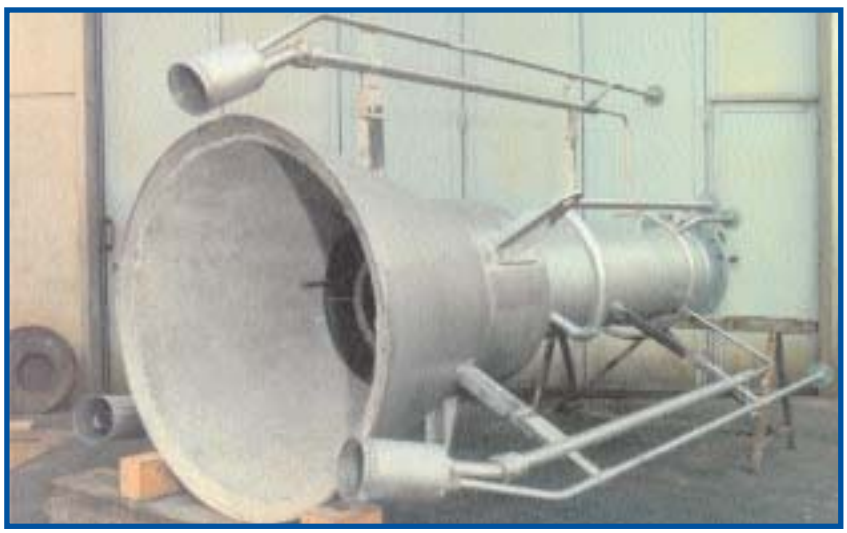
FLARE TIPS





AMMONIA (NH_3) TIP

ITAS has designed an Ammonia flare tip in which the root of the ammonia flame is well stabilised at the exit.

This design, associated with a low ammonia exit velocity, creates a combustion efficiency of over 95%. The burning of ammonia in this way produces a relatively cool flame with a relatively low level of NO_X emissions.

To increase the combustion efficiency, support gas must be added to the ammonia stream.

HYDROGEN (H_2) TIP

In flaring Hydrogen, precautions must be taken to insure that system is completely sealed so as to prevent air entry. Increased purge rate will avoid air entry. A Molecular Seal is strongly reccomended. When pressure is available the flare tip should be designed for high exit velocity.

FLARE TIPS

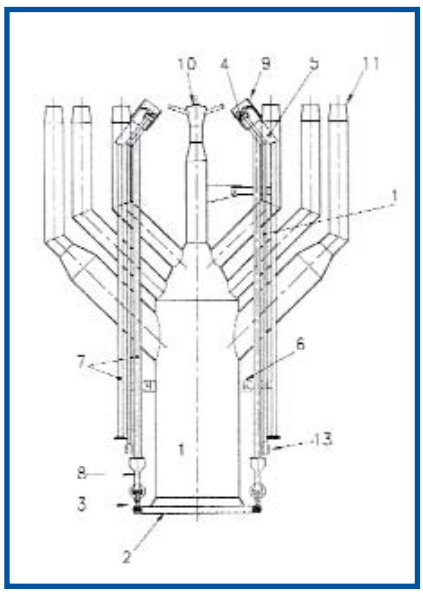
SONIC TIP

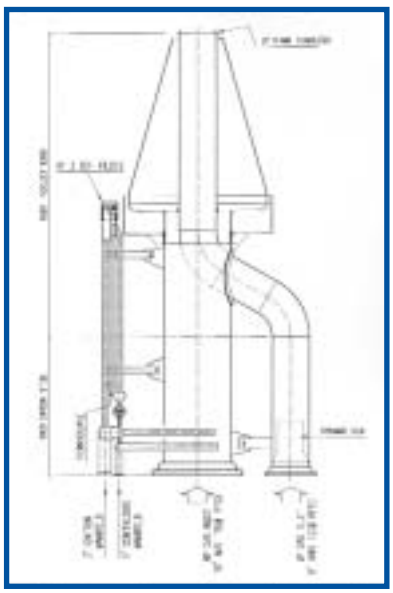
If the gas to be flared is available at the tip at high pressure it is possible to produce smokeless and low radiation combustion.

ITAS is able to supply three types of sonic tip which utilise the gas pressure to inspirate combustion air thereby improving combustion and lowering radiation.

The preferred design is a multi-arm, multi nozzle burner. Each nozzle is designed for a sonic exit velocity thereby maximising the amount of air that can be inspirated.

A possible alternative is to operate an open pipe at sonic velocity. This type of tip does not provide optimum conditions for combustion, has high noise levels, but is relatively low cost.
Consequently it is suited to emergency relieving which will occur infrequently and under highly exceptional circumstances.





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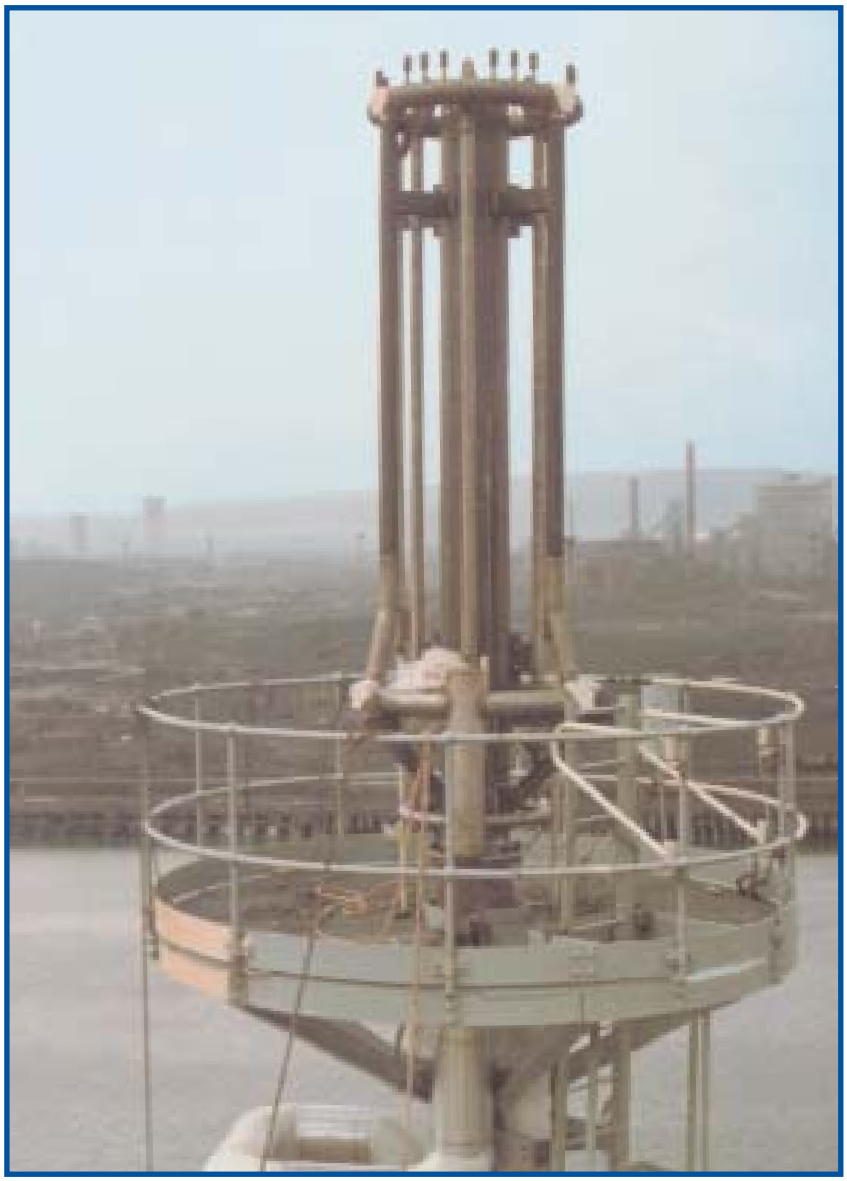
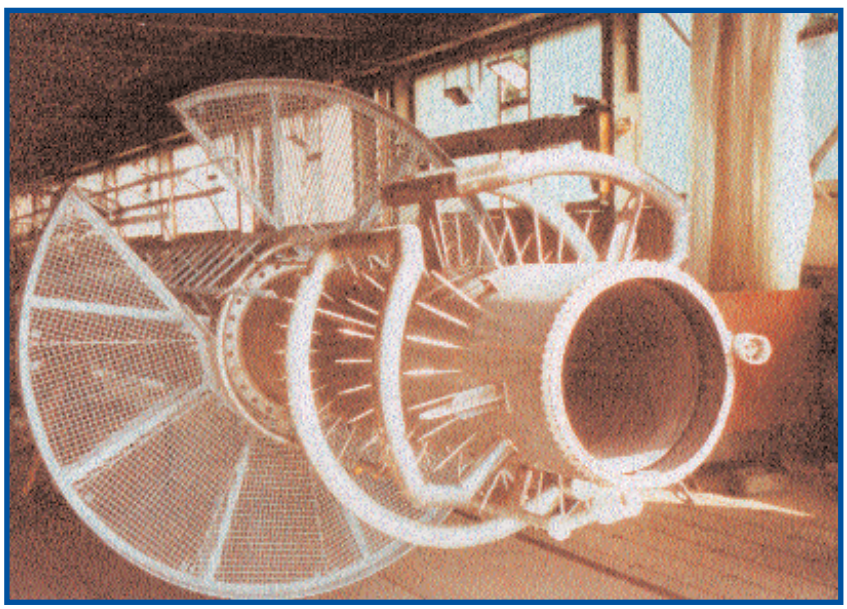
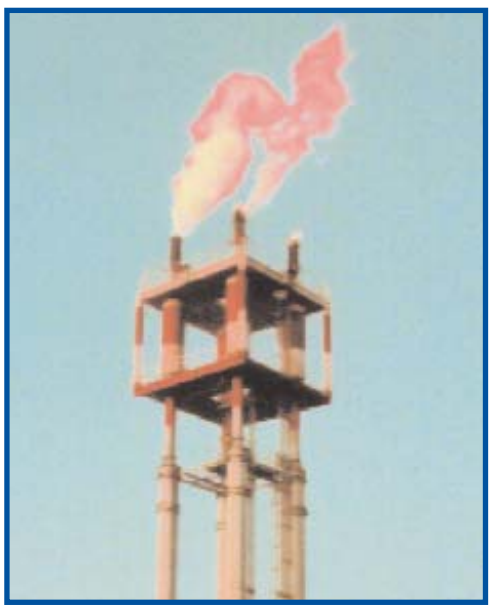


SPECIAL DESIGN

On particular client demands, ITAS designs and supplies special flare tips utilising:
- Water ignition nozzles;
- Coanda injection nozzles;
- High Pressure gaz nozzles;
- Radial arms nozzles.





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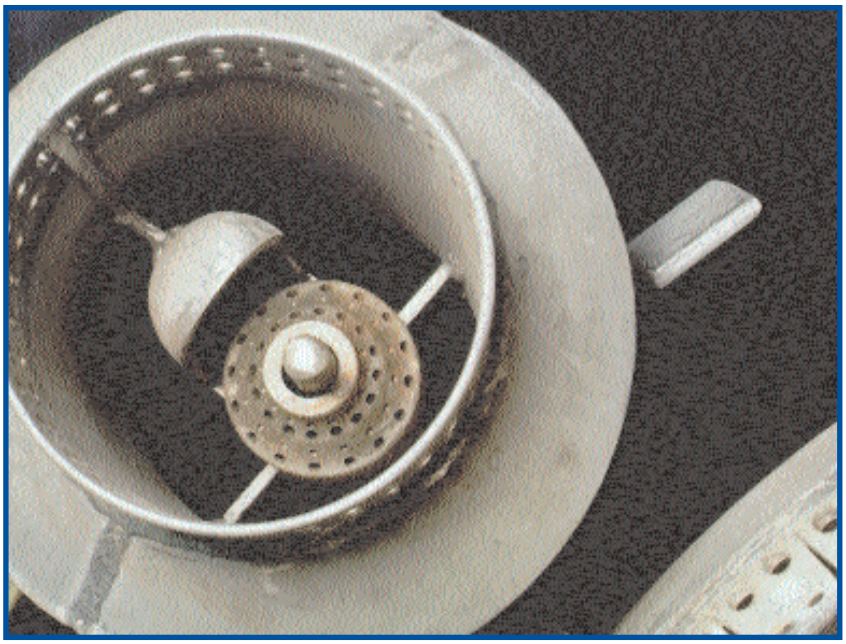
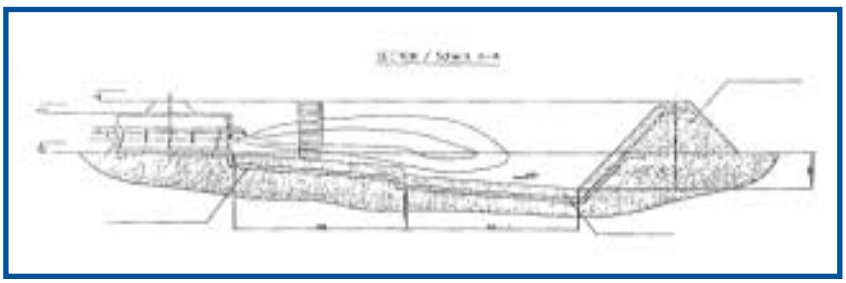
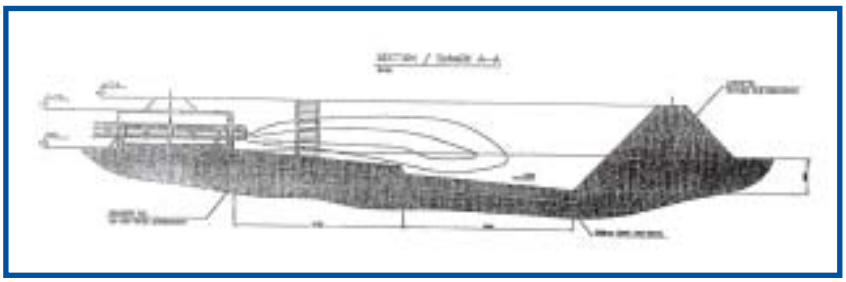
BURN PITS







The main use of a burn pit is to dispose of liquid or mixed liquid/vapour reliefs generally as emergency flows or an intermittent basis when blowing down pipelines or vessels.

The nature of the pit is simply a shallow depression or hole in the ground which acts as a reservoir for the burning liquid. The pit is normally lined with refractory material (castable or bricks). The philosophy of burn pit flaring is essentially unsophisticated, and this technology is frequently employed where it may be necessary to blow down a section of pipeline in some emergency situations.

The design of the pit should take into consideration the maximum input rate of liquid and the rate at which this can burn. The most conservative and consequently the usual method of sizing is to assume that it is required to burn the flammable liquid at the same rate at which it is relieved to the pit.

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 vaporises and heats up further before burning in the flare. The rate at which this vaporisation occurs is dependant on the thermal heat output of the flame and the sensible heat of vaporisation of the liquid at the top of the pool.

As the air for combustion of the liquid supported flame is drawn only from around the outside of the pool the mixing of air is poor and the resulting flame will almost certainly smoke heavily and could relieve uncombusted hydrocarbon together with the smoke plume.

Ignition of the flammable vapours is accomplished by setting a number of continuously burning pilots around the outlet of the feed headers. At least two pilots should be used for each header.

ITAS designs and supplies:

BURN PITS
PIT TIPS AND PILOTS
IGNITION SYSTEMS
REFRACTORIES