

TORNADO Technologies Inc.



Design and Manufacturing since 1984

Celebrating over 20 years of innovation

TORNADO Technologies Inc. has been working with customers for over 20 years, innovating new products that provide simple and effective solutions.



Design & Engineering Team

At the core of Tornado is our expert design team. Tornado's guiding philosophy? "Make things simple." Rather than add bells, whistles and features that can eventually break down, our engineers innovate simple, practical solutions to real customer problems. Reliable equipment designed for everyday ease of use — *this is Tornado's competitive advantage.*

Our products work the first time, and the thousandth time.



Stringent quality control ensures superior welding.

Pressure Vessel Facilities

- A-stamp, U-stamp, NB-stamp
- ASME Sec. 8, Div. 1

Welded Steel Piping

- ASME B31.1 & B31.3

ABSA-Approved QC Program

- Cert # AQP-1345 for vessels and piping

Dual Wall Steel Tanks

- To EUB G55

Experience Worldwide

***Born in Alberta, Canada.
Respected around the World!***



Alberta, Canada

16 inch sweet Separator



Baltic Sea, Poland

Incinerator for LPG storage facility

For more information, please visit us at

www.tornadotech.com

Combustion Systems



Production Equipment



Truck-Mounted Equipment



Flame and Detonation Arrestors

It all starts with SAFETY!

Any ignition source, such as a flare or incinerator, creates an explosive opportunity for flame fronts to propagate back through lines, destroying facilities and causing injuries. An arrestor is a passive safety device designed to disperse any flame front, release its energy, and cool it to below the ignition point of that vapor.



The ultimate last line of defense against flashbacks!

Flame Arrestors

Tornado **flame (Deflagration) arrestors** utilize a crimped ribbon aluminum or stainless steel flame cell to protect against rapid burn backs in low-pressure situations. Custom sizes and configurations can match any application.



Crimped Ribbon Flame Cell

Arrestor placement

Ignition source



Tornado detonation arrestor housings are built to withstand sonic velocity shock waves exceeding pressures of 1,800 psi and speeds of 7,000 feet/sec.



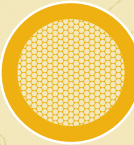
Detonation Arrestors

Tornado detonation arrestors allow gas and vapors to pass through, but stop dead any sonic velocity explosion or accompanying shock wave. Unlike any in the industry, Tornado's **revolutionary design** guarantees the highest reliability in accordance with the strictest regulatory ratings.

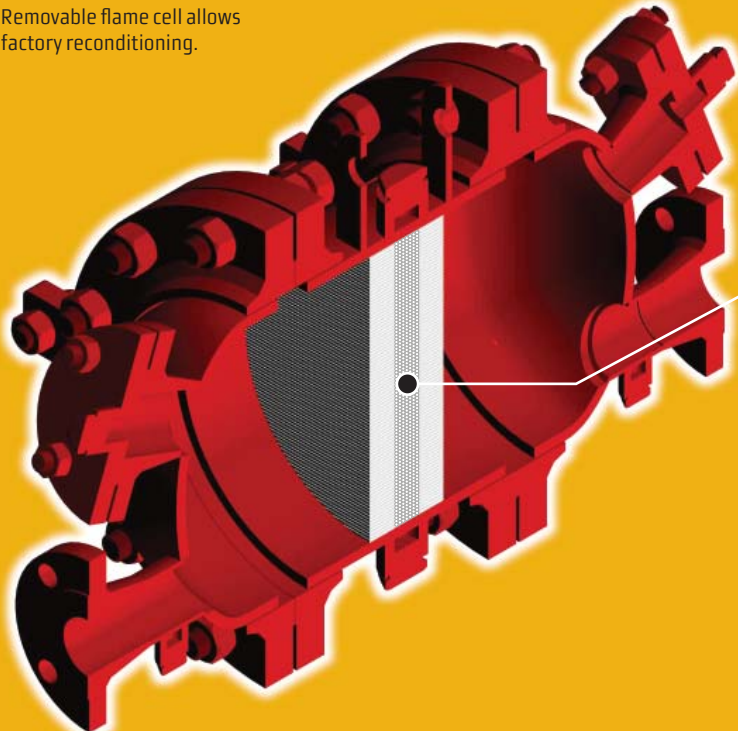


Removable flame cell allows factory reconditioning.

The secret is in our unique patented flame-quenching cell.

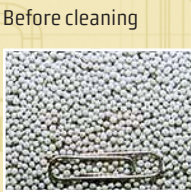


Ceramic bead media



An Industry First... Cleanability!

Tornado's entire **detonation arrestor** flame cell is removable, allowing it to be cleaned and factory reconditioned multiple times. A routine maintenance program means no expensive replacement elements are required, translating into thousands of dollars in cost-savings.



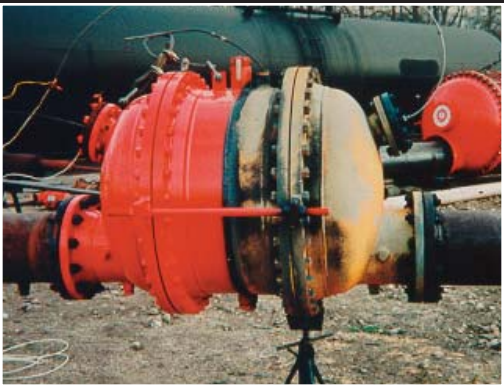
After cleaning

Original pressure drops are instantly restored.

Best in the World?

Without question!

Tornado detonation arrestors (DA) carry the highest stamps of **regulatory approval** in the industry. Designed to withstand up to two hour continuous burns, the US Coast Guard (USCG) and Canadian Standards Association (CSA) have approved Tornado DA's to meet and exceed every classification rating. Tornado manufacturers up to 24-inch DA's – the largest approved in the world – and are the only DA accepted for branch-line applications. No other product in the world meets the same level of performance standard.



Two hour continuous burn test. Extended flame exposure cannot penetrate the patented system's barrier.

More to learn...

- What pressure drop does a DA put on a 14-inch line?
- What vapor types are FA's good for?
- Should arrestors be installed horizontally, or on an angle?

For the answers to these and other important questions, please visit us at

Incinerators

Incinerators are the ultimate combustion system for disposing of hydrocarbons (including BTEX's) and sulfur compounds. Designed with precise calculations, Tornado's innovative systems achieve in excess of

99.99% combustion efficiency

based on site-specific gas flows, compositions, pressures and temperature. Tornado guarantees full parameter control to meet air quality regulations while delivering ease of use and peace of mind.

Measuring the effectiveness of equipment for reducing Greenhouse Gas Emissions

LEAST	VENT TO ATMOSPHERE	FLARE	ASSISTED FLARE	THERMAL OXIDIZER	INCINERATOR	MOST
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Still-Off Gas

Tornado designers pioneered the industry's first dehydrator still-off gas incinerator (SOGI) over 20 years ago. The same unit still operates in the field today.



Acid Gas



Tail Gas

- Additional applications:**
- Casing Vent
 - Solution Gas
 - Bio-Gas
 - Industrial Fumes
 - Ammonia Vapors
 - BTEX Vapors

Thermal Oxidizers

IMPACT ON REDUCING GREENHOUSE GAS EMISSIONS						
LEAST	VENT TO ATMOSPHERE	FLARE	ASSISTED FLARE	THERMAL OXIDIZER	INCINERATOR	MOST

Thermal oxidizers (TOx's) are a cost-effective alternative to full-blown incinerators. Choosing one over the other depends on both economic factors (capital and long term operating costs) and safety concerns.



TEC-4CS Denver, Colorado

Tornado's TEC series TOx's are primarily designed for applications with less than 5% H₂S. They achieve a high destruction efficiency without full temperature or process controls, thus saving clients money.



TEC burners can handle a wide range of process conditions and turndowns.

Burner Management Systems

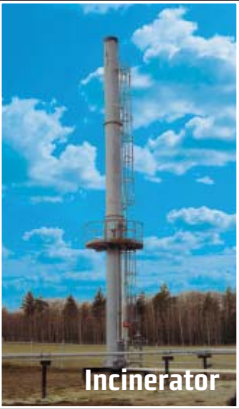
- Superior temperature and process controls
- Recording features
- CGA/CSA Compliant Gas Trains (if required)
- CSA Compliant Control Panels, Area Classification (per requirements)
- Standard Panel is relay logic based; Digital PLC logic as required by process demands

Benefits of Incinerators over flaring

- 99.99% combustion efficiency
- Destruction of BTEX's
- Can handle heavier gases
- Eliminate odor concerns
- No flame visibility
- Reduced fuel costs vs. flaring
- No radiation at ground level
- Low space requirements
- Low operator attention
- Peace of mind



Well-test Flare



Incinerator

Dramatic reduction in environmental impact

More to learn...

- At what degree should I slope my dehy still-off gas line?
- Can the TEC burners be used for a 17% sour application?
- What is the maximum turndown range for a thermal oxidizer?

For the answers to these and other important questions, please visit us at



Flare Systems

We design the World's best flare systems.

Each project is custom designed to make environmental and economical sense for our customers. Specific applications include utility, smokeless (assisted), and sonic variable-slot flares. With over 5,000 Tornado systems operating around the world, our research and development is based heavily on field performance data. Customer feedback has paved the way for patented design innovations including Tornado gas strippers, pilot shrouds, and retractable pilot & ignition systems.

Assisted Flares

Tornado has developed a broad range of air, steam and gas assisted flares specifically designed to meet a large spectrum of gas compositions and varied operating conditions. Waste gases burn cleanly and without visible black smoke to meet the most stringent regulations. All designs are driven by flare performance and operating costs. Assisted tips can even be retrofitted onto existing flares cost effectively.

IMPACT ON REDUCING GREENHOUSE GAS EMISSIONS					
LEAST	VENT TO ATMOSPHERE	FLARE	ASSISTED FLARE	THERMAL OXIDIZER	INCINERATOR
					MOST



Pilot and Ignition Systems



Alumina ceramic pilot nozzle

Pilots

Tornado pilots are wind-proof, fuel-efficient, and resistant to the most corrosive conditions. A unique venturi system introduces regulated air into a high-pressure stoichiometric air-fuel mixture – ensuring an extremely stable, dependable pilot flame.

- Lowest fuel consumption
- Short intense blue flame
- Wind tunnel tested to 200mph
- Suitable for H₂S

Ignitors

The ultimate in fail-safe reliability! Even with variable flow rates and H₂S environments, our custom designed systems ensure positive ignition.

Different models include:

Tornado Pilot Monitor and Auto-Relight (TPMR)

- Continuous pilot
- Enclosed thermocouple sits within ceramic nozzle
- No direct flame exposure
- Active auto-relight system
- Auto-shutdown with alarm activation



Tornado Pilot Monitor and Auto-Relight (TPMR)

Tornado Electronic Ignitor System (TEIS)

- Intermittent spark ignition
- Onsite or solar power options
- U.V. or Infrared Monitoring optional
- Patented Arch and V-Design
- Self-aligning, self-cleaning gap



Tornado Electronic Ignitor System (TEIS)

Fluid Knockouts

All combustion systems require a fluid knockout. Tornado can provide any variety of **code or non-code vessels** to suit our customer's unique field requirements.



Above ground KO with containment



Double-walled below ground KO



Integral flare knockout



Above ground KO with shelter



Underground KO with shelter

More to learn...

- Which pilot best suits my gas plant burning 40% sour waste gas?
- How do local regulations affect my choice of flare system?
- How far do knockouts need to be positioned from the flare base?

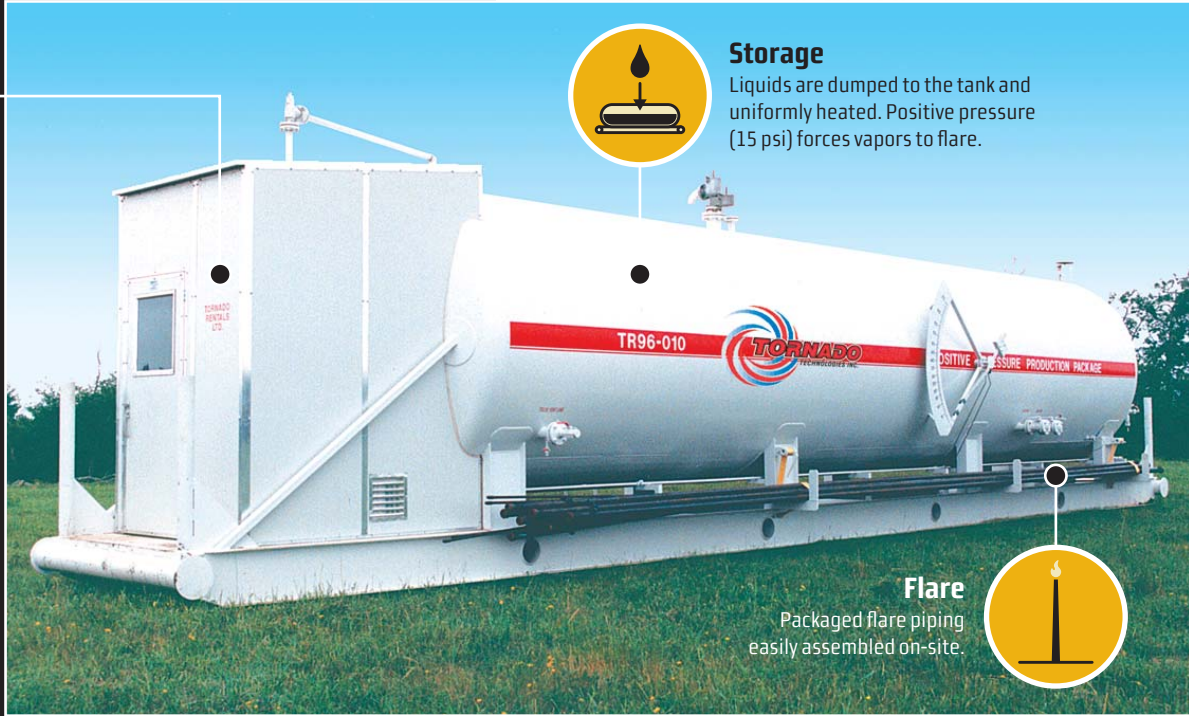
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Process/Production

Need to maximize return for oil and gas production? Tornado manufactures a wide range of products designed for both sweet and sour field sites. Drawing on our operational background we build cost-effective, high quality equipment that is easy to use/install, and demonstrates long-term reliability. 20 years of design and manufacturing experience goes into every package we build.



Separation
Preheated fluid allows better gas and oil separation without dumping, waxing and freezing concerns.



Storage
Liquids are dumped to the tank and uniformly heated. Positive pressure (15 psi) forces vapors to flare.



Flare
Packaged flare piping easily assembled on-site.

Oil

The Original PPPP

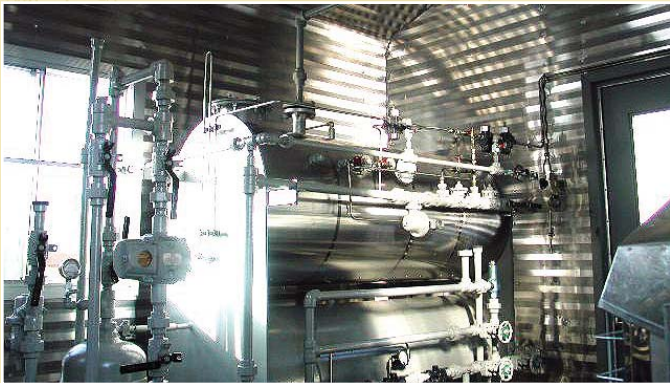
Positive Pressure Production Package

Perfect for sour crude, single well sites! The simple design of Tornado's PPPPs makes them ideal for producing single-well or non-unitized sites during drilling programs. Each unit is quick to install, simple to operate, and equipped with emergency safety shutdowns for high level and high pressure. Operating on propane, they require no on-site power. Companies realize immediate production of their sour fluids at an economical price.

Gas



Separator Packages



Dehydrators

Package can include Still-off Gas Incinerator



Treaters and Free Water Knockouts



Line Heaters - up to 10 MMBTU/hr



Metering Units

And other process equipment...

- Oil Separator Packages
- Sand Catchers
- Storage Tanks & Pressure Vessels
- Water Injection Packages
- Pump Skids
- Used Pump Jacks & Propane Bullets
- Satellite Units
- Blowcase Units

Truck-Mounted Equipment

Tornado is proud to introduce its line of truck-mounted equipment, including hydrovacs and industrial vacuum trucks. Traditional technology has been completely re-engineered from the ground up to deliver superior productivity, reliability and operator ease-of-use.



Tornado Hydrovacs - The best dedicated hydro excavation unit available.



Tornado Vacuum Truck

New in production, Tornado has engineered a smarter vacuum truck - built for ultimate ease-of-use.

For more information on our truck division, please visit



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www.tornadotech.com