



Steamexfire: unlimited production of inert gas

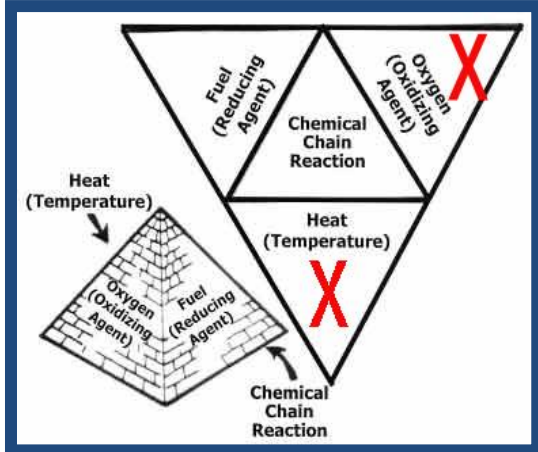


What is a Steamexfire system?

The Steamexfire is an inert gas generator that produces a mixture of combustion products with water vapour and steam, with a minimum content of oxygen at a temperature of approx. 80° to 90° Celsius. In simple words, a Steamexfire system is a generator that produces very large quantities of inert gas (less than 1% oxygen if required), steam and water vapour.

Steamexfire inert gas consists of nitrogen and carbon dioxide and some combustion gasses.

The most important application of the Steamexfire is to reduce oxygen content in an enclosed environment, such that it will not support combustion.



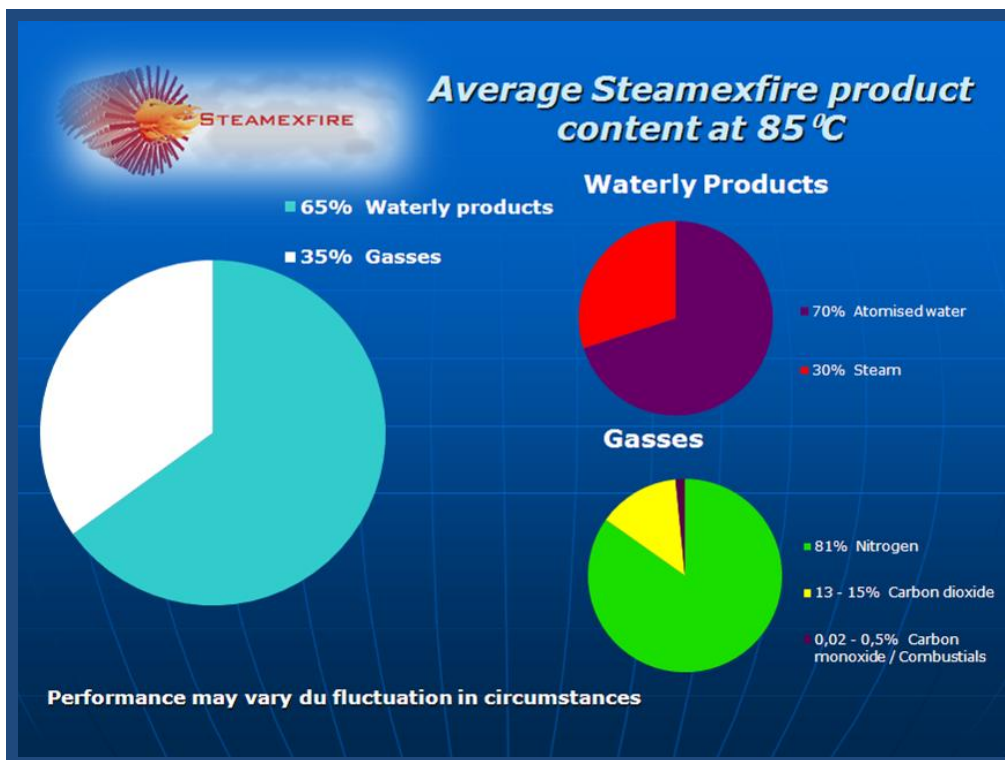
In fire suppression language, the Steamexfire reduces two of the three elements of the fire: oxygen and heat. Consequently, the fire will starve from a lack of oxygen and heat.

The main difference between a Steamexfire system and any other inert gas generator is the fact that its product takes out two of the elements of the so called fire triangle.

The Steamexfire produces as long as fuel and water is supplied, up to hundreds of hours, nonstop.

The Steamexfire system is the best system in the world when it comes to O₂, CO and CO₂ output in unmatched and unlimited quantities.

The system runs on water and petroleum, paraffin, heating-oil or kerosene (Jet A-1) and in some cases diesel.





Steamexfire BV from the Netherlands produces 3 different models:

Steamexfire 300	⇒	average capacity 3 m ³ / second
Steamexfire 1000	⇒	average capacity 10 m ³ / second
Steamexfire 2500	⇒	average capacity 25 m ³ / second

The main difference between a Steamexfire system and any other inert gas generator, is the fact that all Steamexfire systems are driven by a jet engine. For this reason its capacity is average 10 times greater compare to any conventional inert gas generator.

Who is Steamexfire BV?

Steamexfire BV, a subsidiary company of Liberty Gasturbine International BV, is the manufacturer of all Steamexfire systems, the Steamexfire 300, 1000 and 2500.

T.E.E.T.-group

Steamexfire BV is part of the T.E.E.T.-group, an international joint venture specialized in **T**urbine **E**ngine **E**xtinguishing **T**echnology. T.E.E.T. is specialised in aerosol and inertisation technology. T.E.E.T. consists of Zikun Fire Trucks, Germany, Liberty Gasturbine Holland, Liberty Control Systems and Steamexfire BV from the Netherlands.

Some partners of the combined T.E.E.T. group are major Mine and Rescue Organisations, major Mining Organisations, refineries, petro-chemical plants like BASF, Wacker Chemie, Currenta, OMV, Borealis, Shell, etc.

T.E.E.T. customers can be find in Holland, Belgium, Germany, Austria, Poland, Norway, Ukraine, USA, South Africa, China, India, Australia, Brazil, Chile, Mexico, Russia and Canada.

Steamexfire BV, global leader in jet engine driven inert gas generators and inventor and owner of brand names, has killed major mine fires all over the world. We supplied various Mine and Rescue Organisations with our systems,



experience and technology. World's leading Mine and Rescue Organisations belong to our business partners nowadays.

Steamexfire BV not only sells their systems, we also act as contractors, using our equipment and operators, for inertisation jobs on site at customers request.

We supply Steamexfire system training schools on location by using our systems.

With this service, Salvage Groups, Mine and Rescue Organisations and professional company fire fighters, could use our systems.

Obviously, Steamexfire BV has global service and maintenance points, we are stock holder of all spares, even a complete line of turn-key jet engines.

Why a Steamexfire 300 system?

The largest available Steamexfire system, the 2500, produces 25 cubic meters of inert gas products per second. This was the first system we developed. Over the years the global mining market and maritime salvage market, but also professional company related fire fighters, asked for smaller systems, for easier transport and to be able to take underground. This resulted in the production of the smaller Steamexfire 1000, and our newest and smallest system, the Steamexfire 300.

In short, the global mining/maritime industry asked for a system that should meet the following criteria:

- Easy transport (helicopter)
- Light and compact
- Easy operation
- Inertisation from the surface via a network of boreholes or ventilation shafts
- Ability to take underground
- Unmatched price/performance ratio
- Meeting international safety standards

**Steamexfire: inertisation /
fire suppression from
outside; SAFE !**

The Steamexfire 300 meets all above criteria and therefore it will greatly reduce risks of ragging underground fires, fires in machine rooms/bulk, etc.

The system enables Salvage Companies, Mining Organizations and Mine and Rescue Organizations to have their own inert gas generator on site as part of their standard equipment, for fast deployment.





The Steamexfire 300 system in detail

The Steamexfire systems contains the following major components:

1. Chassis/frame
2. Jet engine
3. Afterburner
4. Combustion/cooling tube
5. Water diffuser
6. Adaption
7. Control system





1. Chassis / frame

The casing of the system is a rugged aluminum or steel frame that contains all components. The frame rides on four small wheels for easy transport use. The frame can be mounted on a rugged sub frame with air suspension for easy touchdown on a ocean going vessel.



One man could move the entire system. At the four outer corners, hooks are mounted for lifting purposes. For elevator use, the system can stand up.

The system front locates the connectors for water, fuel and control panel and electric supply.





On top, two large lids are mounted for easy access to all the systems components and some adjustments valves.

The sides of the system has quick lock aluminum or steel doors. At the back a flange provision is made for connection of pipes or tubes, in order to guide the inert product to the affected area. Also some adapter/connector pieces are made in order to measure backpressure and to take samples for gas chromatograph functions.

The entire system is designed for easy service/maintenance access to all components, and interchangeability of parts.

2. *Jet engine*

The main drive, or propulsion of the system is Micro turbo jet engine, also called the stage 1 combustion.

The function of the engine is to supply a large volume of gasses, normally containing approx. 17 % oxygen.

While the engine runs, the electric starter motor turns into a electric generator in order to charge the batteries. The exhaust gasses of the engine are hotter than standard jet engines, a feature needed for Steamexfire applications.

The engine has its own oil reservoir and cooling provisions.

The entire engine is made of high grade aluminum and stainless steel and inconel materials.

The engine and or its modifications, are purposely designed for Steamexfire systems.



3. *Afterburner*

The after burner section is called the stage 2 combustion. The function of the afterburner is to use up the oxygen from the engine's exhaust gasses, in order to end up with an oxygen low (inert) gas.

Therefore a special afterburner is designed, basically a secondary fuel injection, an ignition source and a system to stabilize the afterburner flame in order to achieve a stoichiometric (complete) combustion. The afterburner is located straight behind the engine, and is driven by a separate fuel pump, controlled by the system's control system.

The afterburner flame creates dynamic energy and heat.

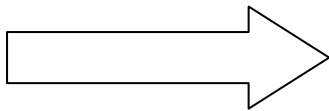


4. *Combustion/cooling tube*

The cooling tube is a double sleeved tube where in the afterburner process takes place. The produced heat of the afterburner flame is absorbed by the water in de cooling sleeve. Cold water is pumped in the front of the tube and heats up while being pumped to the rear of the tube. At the back of the tube, the heated water is taken out and is guided to the water injection manifold system.

The cooling tube has various sensors and valves to control the entire afterburner and cooling process.

Obviously, the combustion/cooling tube is made from a special material to accept the produced heat.



Steamexfire 300; for suppressing fires, inertisation of long walls, and storages

5. *Water diffuser*

The water diffuser consist of a manifold and water valves and a special designed injection system. The hot water from the cooling tubes is guided into a manifold. From the manifold the water is injected at the end of the afterburner flame, by using a number of injectors and valves. The hot injected water will turn into steam and water vapor immediately, and is mixed with the produced inert gas straight away. The whole process is carefully watched by sensors of the control system.

6. *Adaptors*

The last part of the Steamexfire system is the adaptor pipe, the adaptor part in between the system and the provisions to guide the inert product to the affected area. The adaptor pipe is flange bolted to the cooling tube. Also this adapter piece has miscellaneous provisions for backpressure measuring and for taking gas samples. The adaptor pipe is equipped with a connection for a water drain hose to release a possible surplus of water. Various adapter pieces are available to install a gate valve, a tree way valve for start-up purposes, for connecting tubes or a flexible harmonica tube. We have quite a bit of experience to advise you.





7. Control system

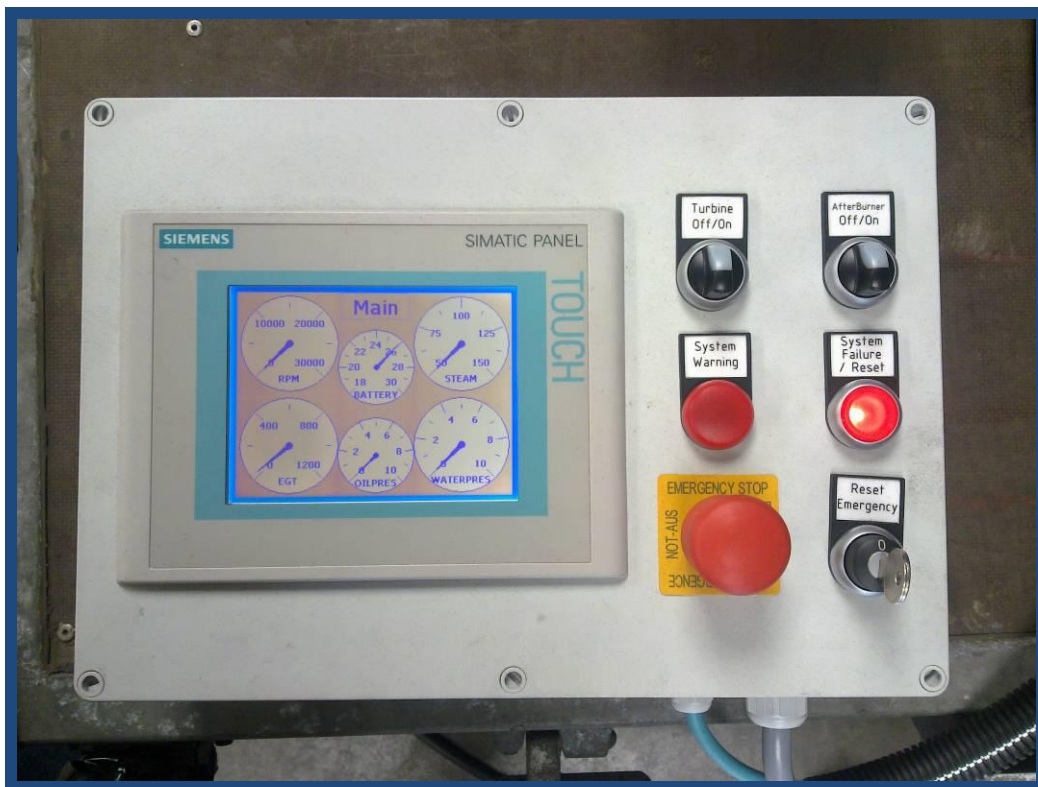
Each Steamexfire system for an end customer is equipped with a full automatic control system. All our controls are build, software and hardware, in house The control system basically has two switches for engine and afterburner start, and a touch screen visualization, for watching all the system values. The controls take care for automatic start sequence of the engine and afterburner. The control system also guards and monitors all safety related values like engine oil pressure, water temperature, water pressure, steam temperature, afterburner pressure, etc. The entire control panel and operation is very users friendly; when a certain value is out of limits it will warn the operator and indicates where to locate the problem. With this function the operator hardly need an operator manual.

When a specific value goes outer limits, the system will automatically shut off, and the display will exactly explain what the reason was for stopping.

It takes three days to train your operators to run and operate a Steamexfire system.

Optional we offer remote throttle and afterburner pressure adjustment from the control panel and data logging, remote communication and connection to your laptop and your mobile phone.

A purposely designed Steamexfire control system allows you to perform and operate in a 100 % safe manner.





Technical specifications in summary:

Frame material	: steel/aluminum
Dimensions, lxwxh	: 2.7x0.8x0.9 meters
Weight	: 220 Kg
Wheels	: 4 caster wheels
Lifting hooks	: 4 hook points for (helicopter) lift purposes
Engine mounts	: 2 flexible stainless steel mounts
Engine	: Micro turbo LGH 300
Afterburner	: SEF 300 inconel
Afterburner ignition	: 8 Mega joule multi spark
Cooling tube	: Heat threaded steel 3 mm.
Water diffuser	: 3 channel ring lines 316 stainless steel
Meter pipe, diameter	: 316 stainless steel 250 mm diameter
Batteries	: Optima dry cell, 77 Amp/h, maintenance free
Electric power needed	: 440 Volt, 50 Hz, 10 KvA, 5 faze
Water consumption	: 6 m3/hour
Fuel	: Jet A , heating fuel or diesel
Fuel consumption	: approx. 300 liter/hour
Output performance	: approx. 3 m3/second
Control system	: Liberty Control System, stage 10
Sensors	: Industrial 4-20 Ma, 0-10 Mv
Programmable Logic Controller	: Siemens 7
Touch screen	: Siemens / Vipa

Conclusion

The new Steamexfire 300 system brings a whole new perspective in inert gas generators, a new perspective in fire fighting in general.

Advantages Steamexfire 300:

- ***Smallest and lightest inertisation system available***
- ***Unmatched performance/size capacity***
- ***Unmatched performance/price ratio***
- ***Fully automatic control***
- ***Inertisation through boreholes or ventilation shafts***
- ***Available and affordable to any Rescue & Emergency Organization in the world***
- ***Firefighters don't need to go inside; safe!!***



***Steamexfire:
unlimited production of inert gas***

***Each Steamexfire system is custom build to customers
specification***



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