pulsFOG®

THERMAL FOGGING

ADVANTAGES OF THE PULSE-JET TECHNOLOGY

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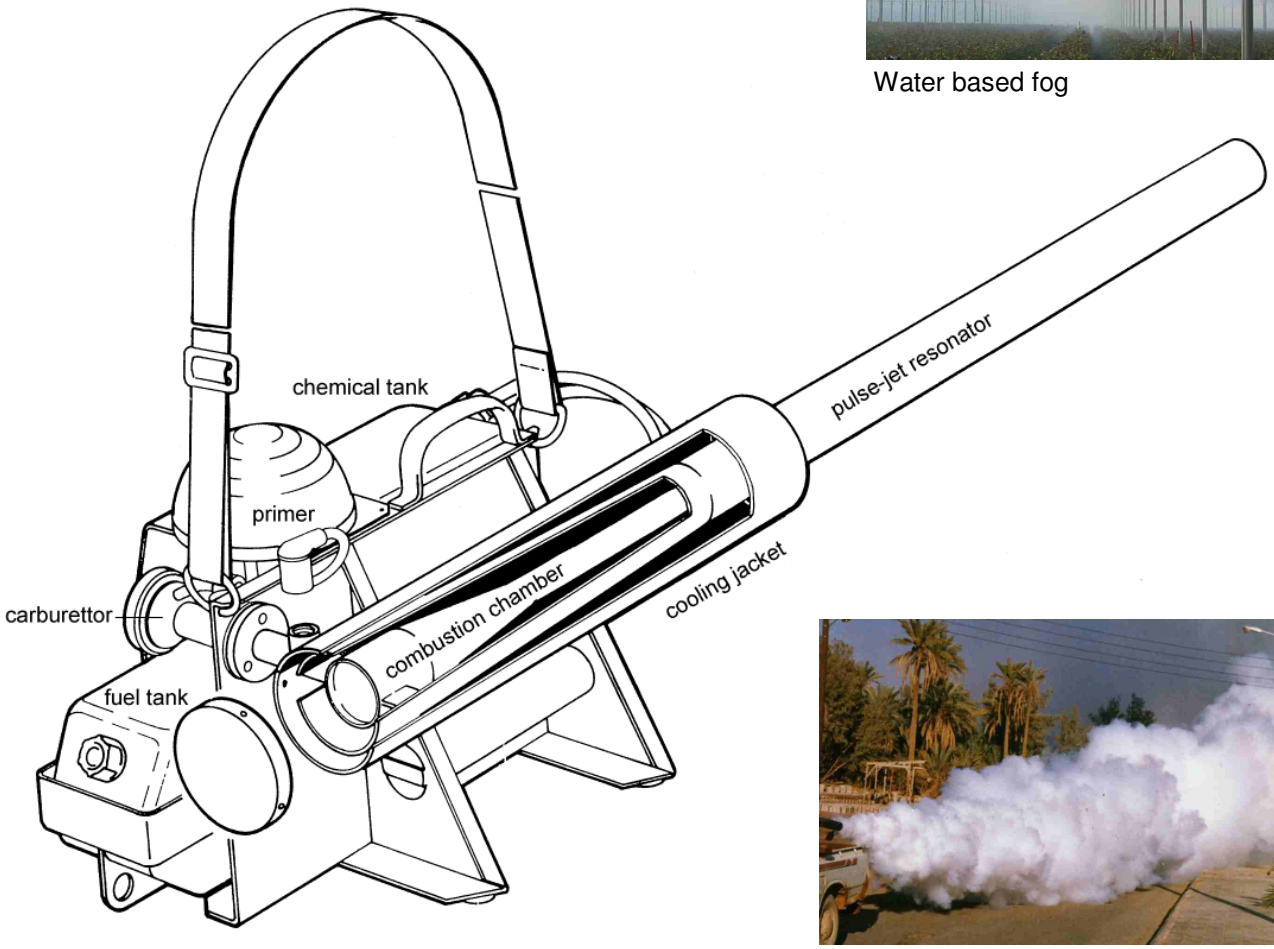
THERMAL FOGGING

Water based fog



Oil-based fog

What is Thermal Fogging?

Thermal fogging is the generation of ultra-fine droplets in a range of 1-50 µm using thermo-pneumatic energy. Liquid substances are vaporised at the end of fogging barrel (resonator) and form ultra-fine aerosols by condensing on contact with cool ambient air, on being ejected, to create dense visible fog-clouds. Pure oil solutions or aqueous liquids with a glycol component are especially suitable for this purpose.

Uses of Thermal Fog.

Thermal fogging is used for any pest control task where active substances should be uniformly distributed, even in inaccessible places, without leaving undesirable residues. This fogging method is the solution for treating large areas and spaces with a minimum quantity of pesticide solution, less operational work and with little harm to the environment (less residues, no penetration into the ground).

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Application Fields

1. Plant Protection (Indoors) in Greenhouses and Plant Cold Storages.

2. Plant Protection (Outdoors) in Crop Plantations and Forest, Ant- and Vole Control, Protection against Frost.

3. Animal Health (Disinfections and Insect Control of Livestock Buildings, and Aerosol Vaccination).

4. Stock Protection (Post-Harvest Application in Silos, Warehouses, Tobacco Stores..)

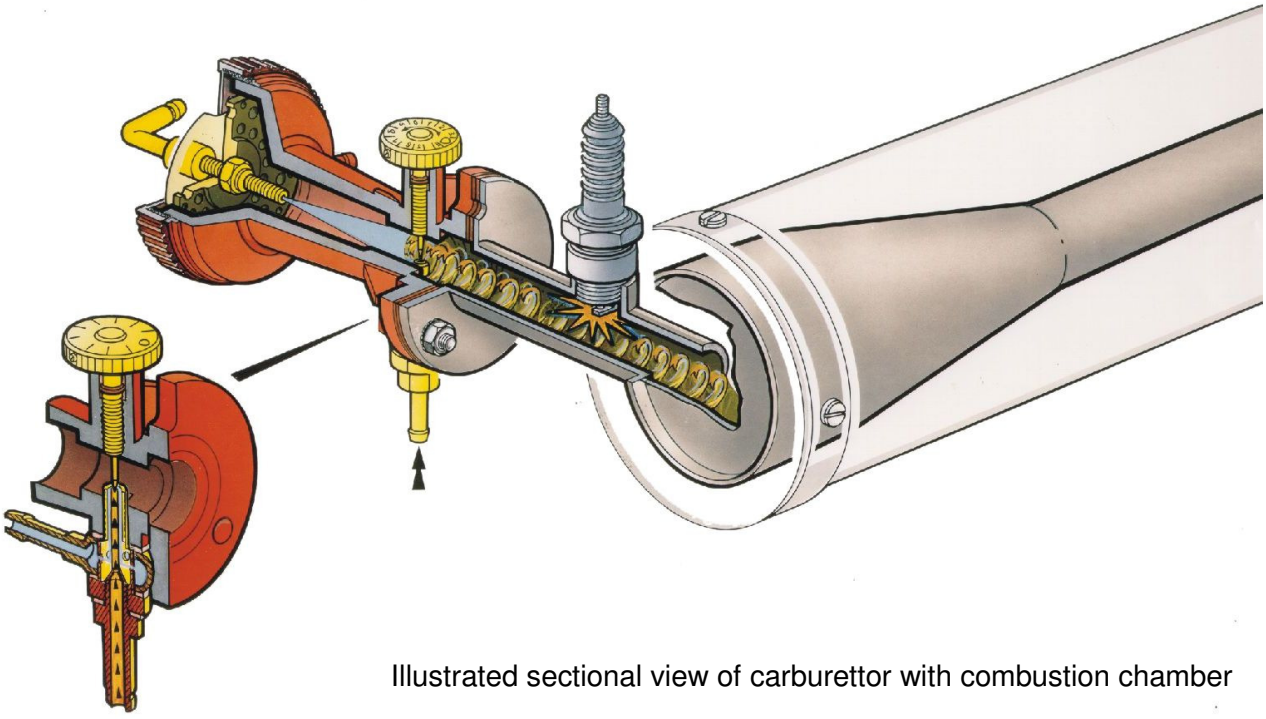
5. Disinfection in case of disasters and Human Sanitation in Public Bathrooms, Hospitals, Dry Cleaners, Railway wagons, Trucks, Air Condition Installations, including Odour Control and Fire Restoration.

6. Cinema-, Theatre- and Camouflage Effects, Fire Fighting Exercises, Leak Detection.

7. Public Health (Mosquito, Nuisance and Vector Control) e.g. Insect Control in Public Installations (e.g. Parks, Lake Borders, Sporting Areas, Underground Sewage Channels), in Hotels, Canteens, Restaurants and in Private House & Gardens

Functional Principle of a Thermal Fogger

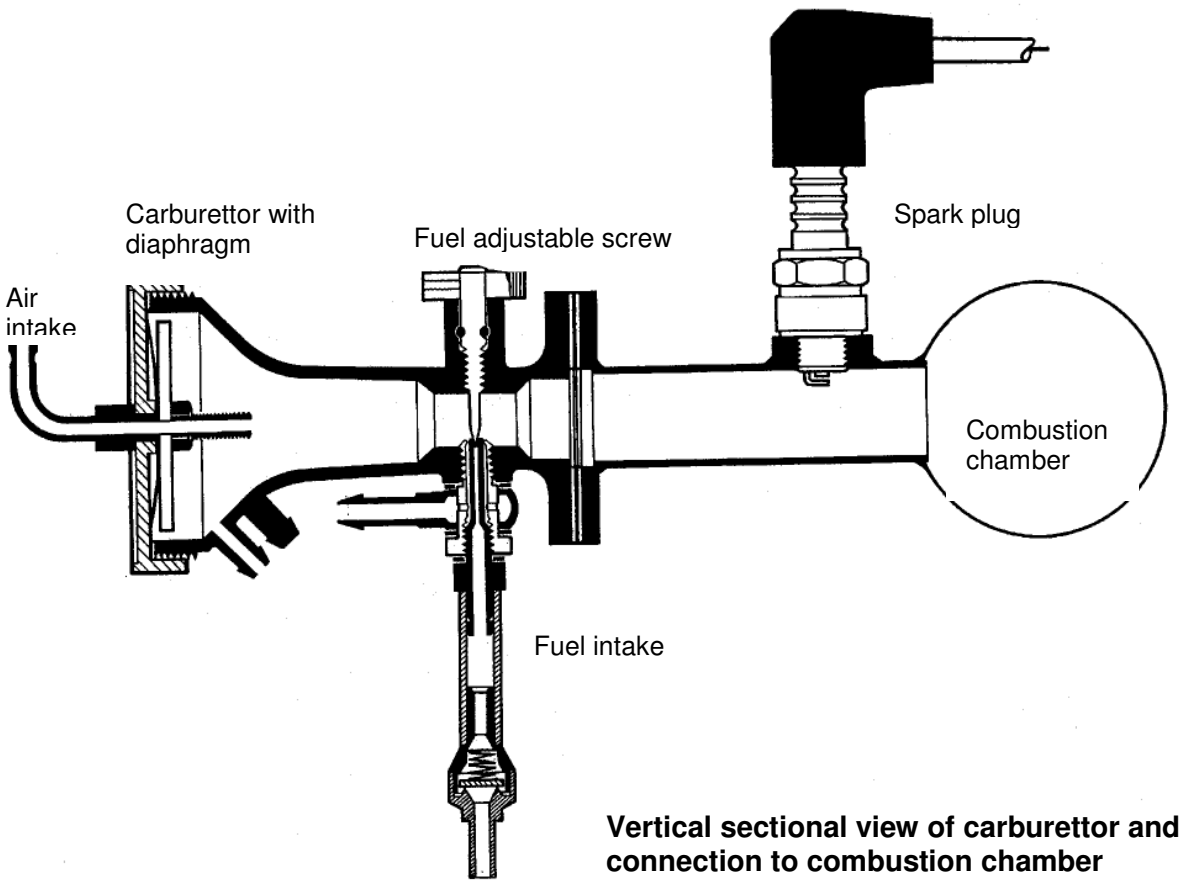
Thermal foggers are equipped with a pulse jet engine, which, while extremely light-weight, has a substantially higher Output capacity than a conventional fuel engine.



Illustrated sectional view of carburettor with combustion chamber

The pulse jet engine does not have any mechanically moving drive components.

- It consists of a bottle-shaped combustion chamber similar to a rocket engine which opens into a long exhaust pipe (resonator).
- An initial mixture of fuel and air is supplied through non-return valves into a combustion chamber, and is ignited by a high-tension spark obtained from a battery-powered electronic ignition device connected to the plug for a few seconds.
- The fuel is regular-grade petrol and about 2 l/h is used on the smaller machines.
- Once the machine has started, the high-tension spark is no longer required and is automatically stopped.
- The exhaust gases from the combustion chamber escape as a pressure wave at high velocity through a long pipe of smaller diameter than the combustion chamber, and draw in a fresh change of fuel and air from the carburettor (s. figure 3).
- If operating with the correct mixture, there are about 80 - 100 pulsations per second, slightly irregular with maximum noise similar to a chain-saw.
- By means of a non-return valve the pesticide tank is also pressurized (with 0,2 - 0,4 bar), and when the machine has warmed up, after about 2 min. running, a valve tap is opened to permit the controlled and regulated flow of solution through interchangeable dosage nozzles, fitted into the end of the resonator.
- Near the outlet of the resonator, the chemical to be atomised is injected into the hot exhaust gas stream. A part of it gassings, and it condenses to form billions of ultra-fine fog droplets.



Vertical sectional view of carburettor and connection to combustion chamber

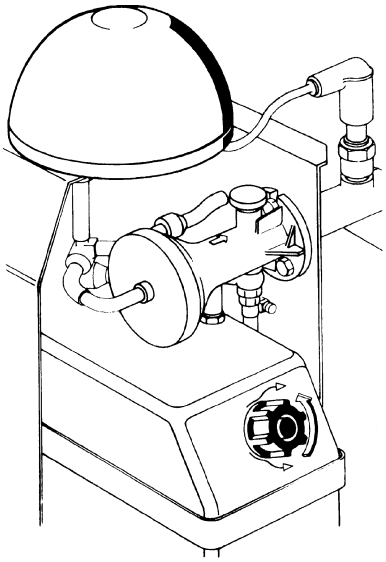
The Difference between pulsFOG and other Thermal Foggers.

A special feature of the pulsFOG engine is the start-carburettor with direct fuel injection (pulsFOG patents world-wide) and a vibrating diaphragm (air-intake valve) which allows a controlled pulsating combustion of the fuel fed into the engine. The name "pulsFOG" is derived from this kind of pulsating combustion. The quick-start feature developed by pulsFOG does not require any electrical compressor or charger. The standard version is independent from mains power supply, charger or heavy accumulators.

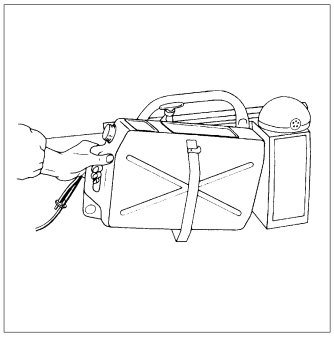
The patented direct fuel injection system and automatic ignition allow the user to start the unit by a simple finger press onto the air ball (primer). Fuel delivery does not require continuous pressure in the fuel tank, which eliminates the disadvantages of a non-transparent and heavy metal fuel tank, non functional when fuel tank lid is leaking.

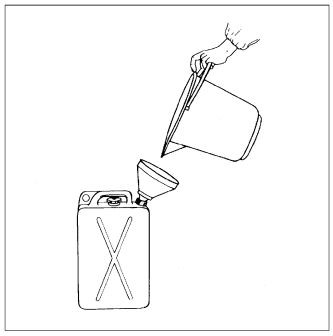
The chemical tank is made of especially thick-walled, chemical and UV resistant polyethylene, designed with a x10 safety pressure of 2-3 Bar, transparent for improved visibility of the contents and provided with a litre scale. The chemical tank is simple to remove - for easy cleaning and filling, or replacement, without the use of any tools.

Simple and straightforward Design

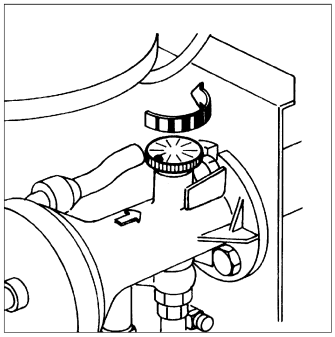


non-pressurized transparent fuel tank

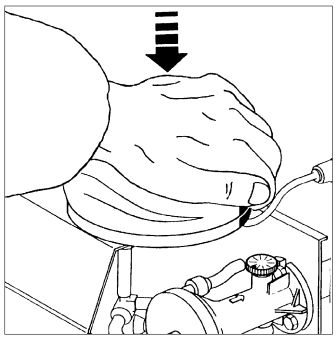




easy handling of transparent chemical tank

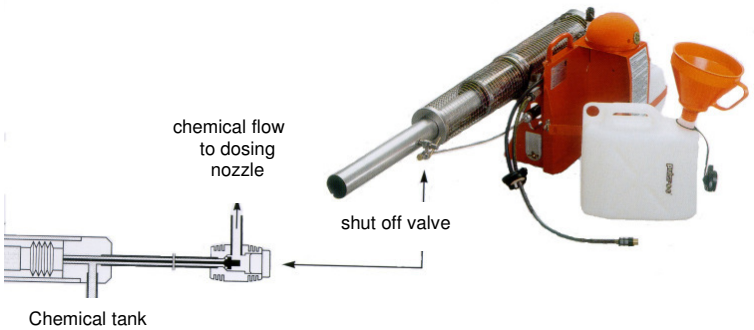


1. open adjustable screw

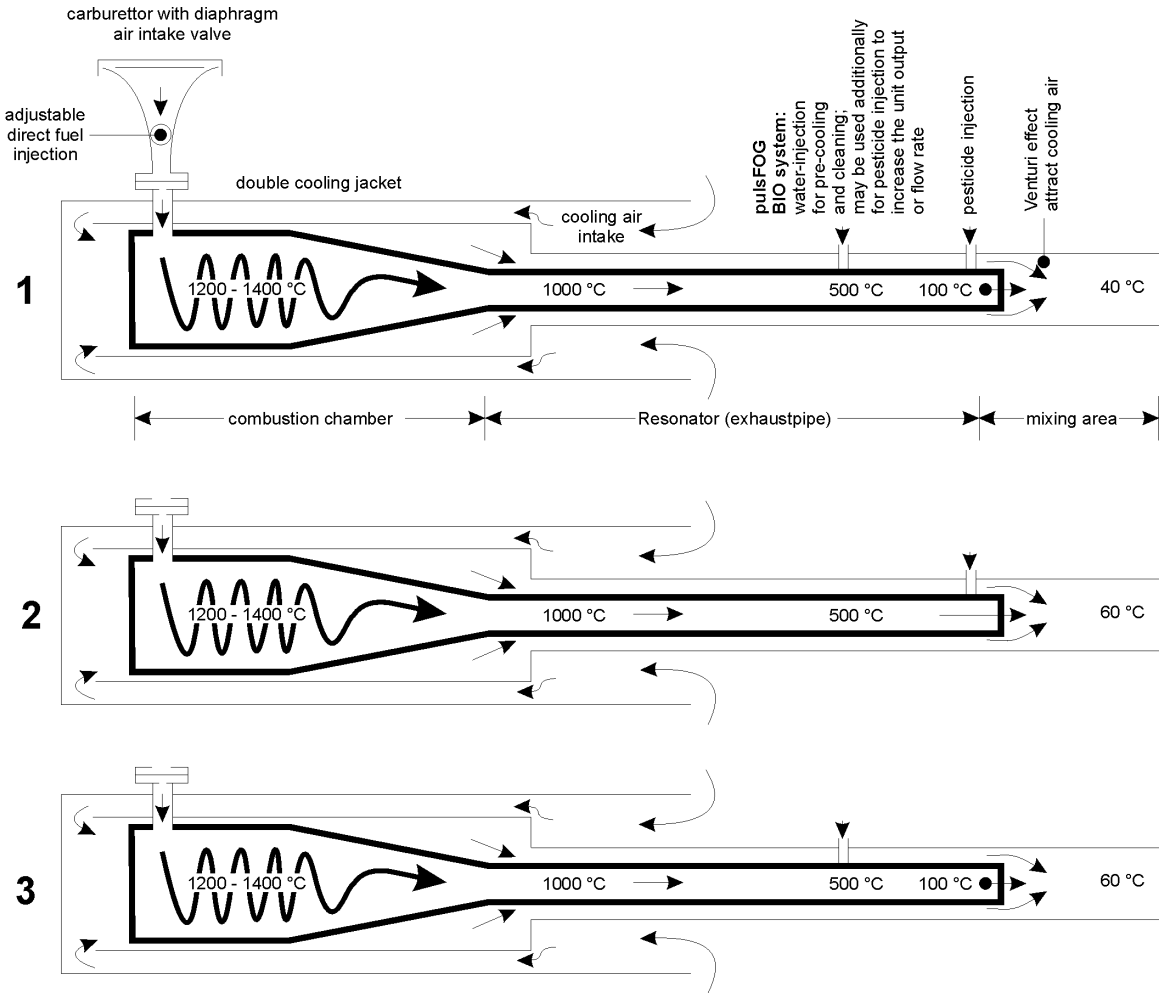


2. finger tip start

Automatic cut off device
with pneumatic working principle shuts off the chemical flow immediately in case of danger or an operating error.
The device is truly independent of batteries or cells (no solenoid valve) and allows so unlimited function.



There are 3 basic models with different technical features:



1. The pulsFOG BIO system models with 2 different fogging injection points at the resonator providing the following advantages:

- The successful application of heat sensitive biological or chemical substances.
- The fogging of wettable powder formulations without choking and clogging the outlet of resonator.
- The avoidance of the flame danger with highly combustible fogging liquids.
- Adjustment of desired increase of droplet size.
- Application of 2 different biocides with different properties: fungicide and insecticide or the combination of small and large droplet sizes (larvicide and aduldicide).

2. The pulsFOG standard models with the fogging injection point at the end of exhaust pipe retard choking and clogging when wettable powder formulations are used. The standard models (e.g. K-10 Standard) are designed for the use in greenhouses (plant protection). Only non inflammable water-based fogging liquids are allowed to use.

3. The pulsFOG O-models (O=oil, e.g. K-10/O) with an injection point towards the middle of the resonator provide a little more heat energy for the fogging process with the aim to produce an extremely dry fog (droplets < 15 µm). These units are designed to avoid ignition of combustible liquids with a flash-point > 70°C and are preferred for the use of any oil

formulations as well as for Formalin and other disinfectants. Fogging formulations with a flash point lower than 70°C are not allowed to use (except diesel fuel).

The pulsFOG BIO technology

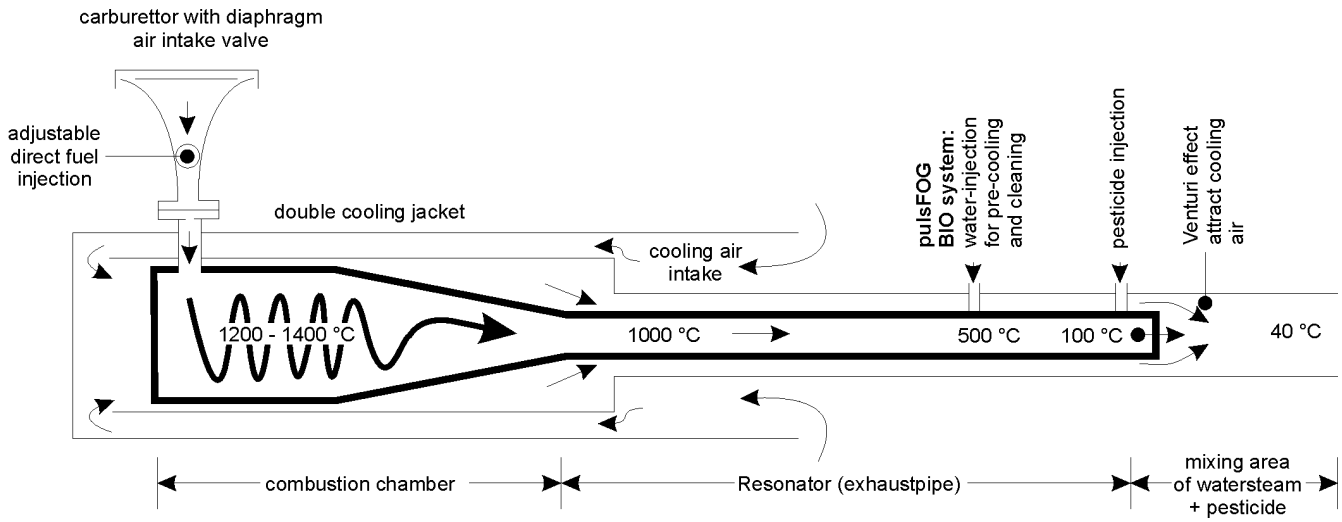
How did the idea of BIO technique develop? The basic idea was, not to pre-mix in the chemical tank the pesticide and the water as carrier, but inject them into the resonator of the machine separately, and only mix it at the point where it is atomised. This has several advantages for a pulse-jet thermal fogger:

1. The water which needs more calories to be evaporated, is injected into the resonator at a point of higher temperature and cools down the hot explosion gases to the so-called water steam temperature of an open system = 100°C. The pesticide with a sensitive active ingredient is injected at a cooler point and absorbs instead of the original exhaust temperature, a pre-cooled temperature of 100°C for 0,05 - 0,1 second which leads to an even lower temperature between 30 - 40°C into the mixing area of “Venturi effect”. The desired droplet size is controlled by the adjustable flow rate of the injected water. If required, larger and heavier droplet sizes can be produced. Consequently, the pulsFOG BIO technique offers a kind of cold fog application system compared to LV and ULV systems.

2. The produced water vapour cleans the resonator exhaust pipe and avoids residues of the fogging solution at the end of the pipe. This is especially advantageous if wettable powder and flowable formulations have to be used.

3. The injection of water avoids in any case the inflammation of the oil-based pesticide fog and also reduces the danger of fire next to nothing when the machine is used improperly. Even if the user forgets to close the fog tap when he stops the machine the water injection will avoid an inflammation of the pesticide formulation.

The pulsFOG BIO technology offers the fogging of highly sensitive active ingredients, the self-cleaning when suspensions are fogged and the increased flow-rate for thermal fogging solutions if the water nozzles are also used for injecting the pesticide formulation.



Why pulsFOG thermal foggers do not damage active ingredients by heat

- According to the research report published by the Technical University of Berlin in 1972*, it was discovered that the period during which the active ingredient remains in the hot gas stream is only 0,05 - 0,1 second.

- The degree of temperature is less important than the total amount of heat energy (calories) generated e.g. a red-hot pin-point will have a temperature of 1000°C, while this is an extremely high temperature it can be quenched completely by a single drop of water and presents no serious hazard.

  The total amount of heat generated by pulse-jet foggers can be calculated from the calorific-value of the fuel it consumes. This includes heat loss due to radiation to the environment and heat loss in the exhaust gas.

  According to a dissertation (Prof. Mathes and Bau) published by the University of Berlin in 1972 the exhaust gas of small pulse-jet foggers with a fuel consumption of 1 l/h contains approx. 6.000 kcal/h. Based on this a medium-sized pulsFOG K-22 (fuel consumption 4 l/h) produces 24.000 kcal/h and this amount of heat energy is made available for the fogging process.

  The average chemical solution flow-rate of the K-22 machine is approximately 40 litres/hour (24000 kcal/h divided by 40 litres/hour of chemical solution, equals 600 kcal/h per litre).

  It can be easily understood therefore that water based fogging solutions absorb less than 100°C. In fact, it has been shown that water based fogging solutions absorb for a fraction of a second (0,05 - 0,1 sec.) - a temperature of approx. 60°C (600 kcal/l).

- Pulse-jet foggers work with an open exhaust system. This means that the active ingredients are not heated in a closed pressurised system and do not absorb more temperature than their own evaporation heat permits. In fact, the temperature absorbed by pulsFOG standard units is approx. 60°C (140°F) for a fraction of a second, and by pulsFOG BIO types approx. 30 - 40°C (86 - 104°F). This can be controlled any time using a seconds thermometer.

- The so-called refrigeration effect avoids a sudden absorption of heat: When gasifying or atomising a solution at first a cooling (refrigeration) effect is produced. This cooling effect reacts against the absorption of heat. During the short heat influence of 0,05 - 0,1 second this refrigeration effect reacts against a possible thermal destruction through high temperature.

*Prof. Mathes, Dr. Bau

We all know the effect when a drop of water falls on a Hot Plate: It dances on the plate for a long time before it evaporates completely though the Hot Plate produces a temperature of approx. 800°C (1472°F) i.e. large amount of calories.
Theoretically, the water should evaporate with an explosion, because it reaches 100°C immediately changing to the vapour-phase. However, this does not happen, since a vapour film develops around the water-droplets - acting as an insulator. The heat energy then has to overcome this insulation to achieve total evaporation.
Puls-jet foggers do not permit sufficient time for the heat energy to have this effect upon the fogging solution.
If the application of heat sensitive formulations is safe with pulsFOG standard units it is even more with the pulsFOG BIO units.

Ten Advantages of the pulsFOG Thermal Foggers

Some of these claims are specific to certain models/types and certain machine parts.

1. Extremely favourable power-weight ratio:
   K-10 SP 3.5 hp/kg unit weight
   K-10 2.8 hp/kg "
   K-22/G 5.6 hp/kg "
   K-22/O 5.3 hp/kg "
   K-30 8.5 hp/kg "

2. Transparent fuel and chemical tanks for better visibility of the contents.

3. Chemical tank removable without any tools to simplify replacement, filling and cleaning.

4. Double stainless steel cooling pipe for the pulse-jet engine with additional sound absorption.

5. Double air cooling system closed-off on the rear prevents auto-ignition of inflammable fogging solutions in case of accident.

6. Double chemical injection feature for improved fogging capacity and a more uniform droplet spectrum.

7. Stainless special steel frame with chemical-resistant powder coating and stainless steel chemical piping.

8. Automatic electronic ignition with finger-tip starting feature (only four mono-cells with a life of two years).

9. Simple and straightforward design enables the user to carry out repair work himself.

10. Manufacturer warranty of five years for the pulse jet engine (in case no acidic fogging liquid is used).

pulsFOG patents are issued, applied for or pending worldwide under the following numbers:

Europe:	**EU**	0060938,	94112785.4,	0092057,	92 115 438.1,
	GER	P2835338	P3214932.8	P3100414.8	P3521941.6
		P2938958.0	P3230184.7	P3306546.2	
	GB	2028170	2066 367	2125317	
	F	7920407	8020747		
	I	982677	967324		
	CH	660668			
	NL	8004432	149990		
USA+		4.298.167	4.504.214	08/274.267	992 039
Canada:		4.556.383	1.144.227	1.195.229	5.224.651
Japan:		1 223491	133094/80	195755/81	5-245 415
Brazil:		PI7508223	PI7904982	PI8006095	PI8200067

 issue: April 2011

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Japan:	1 223491 // 133094/80 // 195755/81 // 5-245 415
Brazil:	PI7508223 // PI7904982 // PI8006095 // PI8200067

Under the registered pulsFOG trade mark the following trade names of pulsFOG products are used:

pulsFOG BIO
(water cooled thermal fogger with 2 tanks for water and pesticide)

DECOFOG
(Portable thermal fogger with special design for decontamination)

COLFOGGER
(Heavy duty coldfogger mounted on wheels with a flow rate more than 30 l/h)

Turbo ULV
(portable electric coldfogger with 5 l tank)

TracFOG
(Coldfogger with PTO drive)

TURBOMATIC
(Autostationnary electric coldfogger on turntable, computer controlled)

MINIMATIC
(Autostationnary electric coldfogger, computer controlled)

nutriFOG
(Fogging additive with foliar fertilizing properties, bio-active, for the conversion of plant protective chemicals into a fogging formulation in glasshouses)

VK-2 special
(Fog enhancer for water based fogging formulations)

TÜVRheinland® CERT ISO 9001

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