

Heavy Oil + Water

- Low Cost Energy
- Low Fuel Consumption
- No Pollution
- High Efficiency Combustion
- High Technology Burners

**15% ENERGY
SAVING**



Tecflam
burners and thermal machines







Introduction

When it comes to producing calories (kW) at low cost, one always thinks of using dense BTZ fuel oil (low sulfur), a residue derived from the distillation or refining of petroleum.

The economic benefits are undeniable and indisputable. Partly because it is a poor fuel product, difficult to burn and its cost, much lower than noble fuels such as Natural Gas or Diesel.

Using this fuel, however, comes with a whole range of technical and environmental drawbacks which often dissuade users from burning this convenient fuel; the most common reasons being:

- challenges with regards to availability and fuel storage
- lack of technical knowledge in the construction and operation of plants and fuel supply systems to the burners.
- high level of dirt on heat transfer surfaces and areas close to the burner;
- product needs to be treated due to contamination from direct fire flame;
- critical levels of pollutant emissions into atmosphere.

There is a unique solution to the above mentioned problems and it is defined as EMULSION.

The emulsion which we refer to is a mixture between the BTZ fuel oil, with a viscosity up to 50°E at 50°C (on request even up to 80° E at 50°C) and a variable percentage of water between 15 and 18%, with a hardness degree of not more than 40°F. The emulsion, as we intend, is prepared on board the burner, taken to 2400 g/min between the quantity of fuel required and the water proportional. All the produced emulsion is injected into the chamber, with fully modulating system and used (burned).

You will never have the emulsified product circulating in the system with the risk of the two components splitting (oil and water).

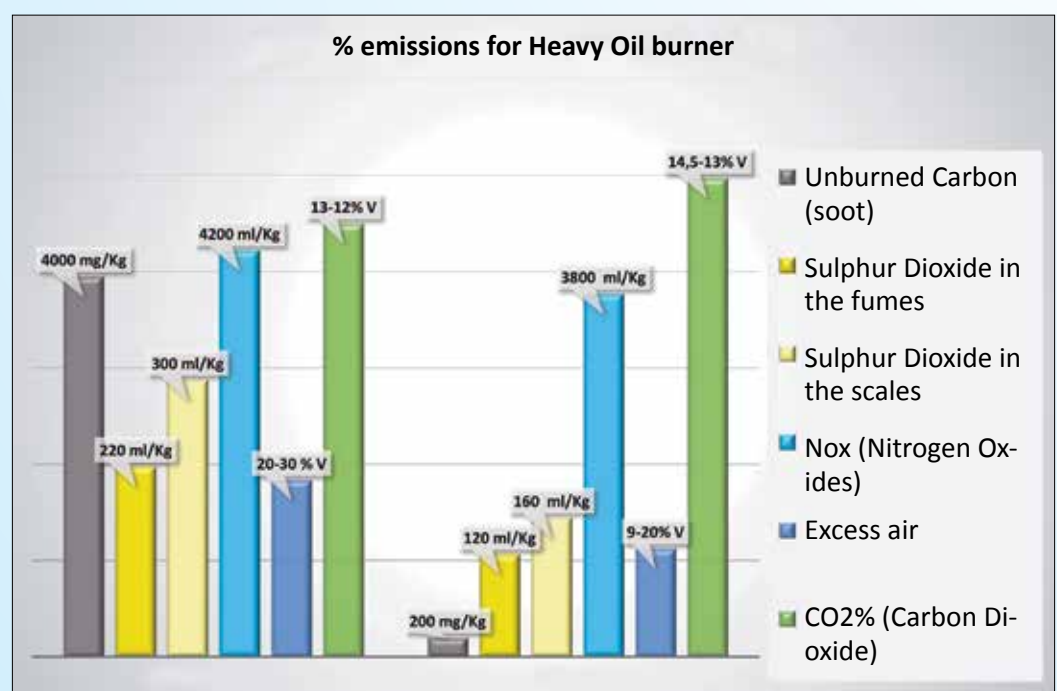
The emulsions as fuel

(Magazine WATER-AIR - 7-1983 from a study of the Department of Energy of Politecnico di Milano):

«The emulsion is a heterogeneous system consisting of the dispersion, in the form of tiny droplets of a liquid (dispersed phase) in another liquid (continuous phase). In this specific case the dispersed phase is constituted by water and the continuous phase, fuel oil.

In the early 60s a fundamental research conducted by Ivanov and Nefedov (1965) showed that the combustion of a drop of emulsion is better (faster and more complete) than the combustion of a drop of oil alone. The explanation for this is very simple: a drop of emulsion with a diameter of ~ 50 μm , which is produced at the spraying nozzle of the burner, can hold up to 10,000 and more water droplets diameter of 0.5 to 1 micron. In the combustion chamber the water evaporates, the vapor is overheated and then explodes shattering the fuel oil so that it undergoes a second pulverization: hence a faster and more complete combustion with less formation of unburned particles(Elias 1977) [...]»

Graph showing average emissions for Heavy Oil fuel and Emulsion with 18% water





Conclusions

(Magazine WATER-AIR - 7-1983 from a study of the Department of Energy of Politecnico di Milano)

«It can be concluded that the addition of water to fuel appears to be a viable and attractive method for the reduction of gaseous and solid effluents from combustion plants. Between the two possible ways for use in this sense water: direct injection into the combustion chamber or the emulsification of the fuel, the latter is undoubtedly the most effective. In the specific case of combustion of heavy fuel oils, emulsion also improves combustion efficiency due to the reduction of solid particulate products, resulting in less dirt on the heat exchange surfaces and thus lower expenses for the maintenance and preservation of the plants».

Generality

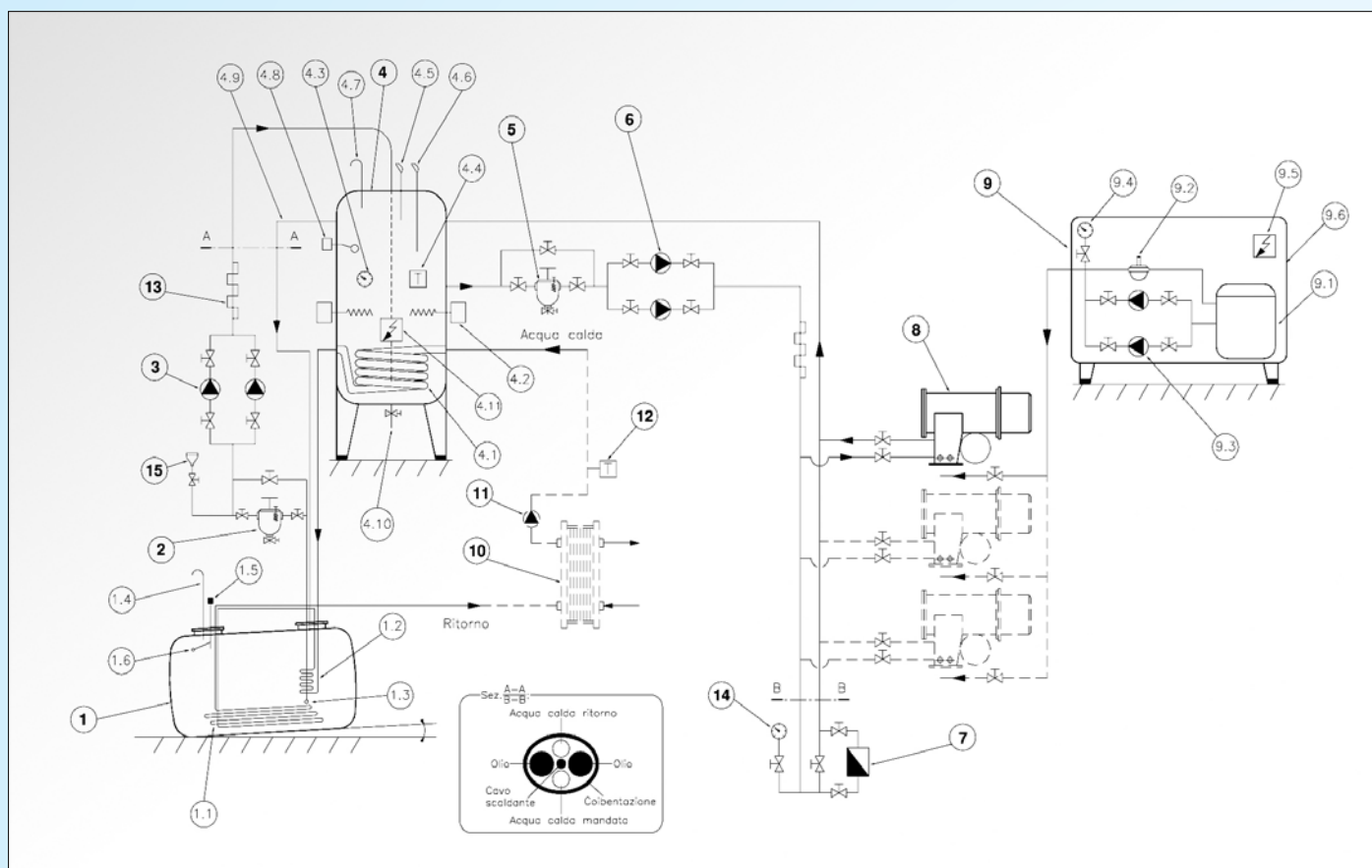
In thermal plants which service the ceramics, bricks and aggregates industries and heat treatment for the production of steam, the use of this technology has produced many economic and environmental benefits.

In view of the criticality of this basic fuel (fuel oil BTZ) it is not sufficient to mention only the burner but it is necessary to refer to a combustion system that is studied and designed starting from the storage at the premises up to the atmospheric emissions.

The many experiences accumulated between Tecflam Srl and its partners allows you to easily propose this type of combustion ensuring reliability through the many references, local and abroad.



**Plant supply for fuel oil burners
to emulsify with water** (according to the UNI 9248)



Legend:

- 1 Oil stocking tank (cistern) with double scuttle
- 2 **Autocleaning comb filter** (600µ)
- 3 **Loading gear pumps**
(one as a spare for the other one)
- 4 **Service tank** (2° preheating)
4.2 Nr.3 Resistors (3kW each)
4.3 Thermometer
4.5 Maximum level probe
4.6 Minimum level probe
4.11 Connector box
- 5 **Autocleaning comb filter** (300µ)
- 6 **Gear pumps for ring**
(one as a spare for the other one)
- 7 **Pressure regulator**
- 8 **Burner/s**
- 9 **Water push unit** (only for Emulsion Burners)
9.3 *Pumps (one as a spare for the other one)*
9.5 *Connector box*
- 13 Heating cable with auto-thermostat

* These components can be supplied assembled together on a metallic frame

In the Tecflam Srl catalogue there are a number of accessories, which when supplied together with the burner, allows for easy fuel supply to the burner and a perfect NO POLLUTION combustion.

This presentation is intended as a foundation to which one has to add the needs and plant characteristics that are required for the use of this technology.

It is good to note for companies that future users of this technology where the continuity of operation is particularly important, Tecflam Srl is able to offer multi-fuel burners (at least up to 4 different fuels) and for power up to 20 MW.



Burners and Accessories



CE

Emulsion (Heavy oil + Water)

Burners Series T...NDE.M

Generalities

It is the answer to the problem in burning Heavy Oil optimizing consumption and emissions at the same time. The emulsion, composed of heated Oil and water, is obtained inside the gear pump installed on machine board, in times and quantities required by the system which utilizes the heat; the two liquids meet only a short time before being pushed to the nebulization nozzle. This method allows the heat production at low cost, without fouling the boiler exhaust pipe, with pollutant emissions much below the limit fixed by current regulations; for these their peculiarities, the Emulsified oil burners are commonly defined "high technology products purposed to contain both energetic consumption and pollutant emissions".

Burner features

Fuel	: Heavy oil (max. 50°C at 50°C) (n.c.v. 9600 kcal/kg) + Water (15% average)
Operation	: Modulating (1/5)
Use	: for pressure or vacuum furnaces
Electric fan	: separate, to be selected as a function of the back pressure value in the combustion chamber
Power supply	: 3 x 380 V, 50 Hz - auxiliaries 220 V



extra standard realizations on request

The burner must be fed by an Oil flow equal to 3 times its maximum consumption per hour, at 70°C temperature, at a constant pressure of 3 bar and filtered at at least 250 micron; we suggest to adopt the system diagram indicated by the Standard UNI 9848. The Water, whose hardness degree must not be higher than 40°F, have to reach the burner with a 5 bar pressure.

Burner Model	Code	Thermal capacity	Heavy-oil flow		Resistors	Pump Motor
			kW	Mcal/h		
T 10	NDE.M 035010	1120	1	100	10	0.75
TR 25	NDE.M 035015	1670	1.4	150	10	0.75
T 25	NDE.M 035025	2510	2.1	225	18	1.1
TR 40	NDE.M 035030	3350	2.8	300	18	1.1
T 40	NDE.M 035040	4460	3.8	400	24	1.5
TR 60	NDE.M 035050	5580	4.8	500	24	2.2
T 60	NDE.M 035060	6690	5.7	600	30	2.2
TR 80	NDE.M 035070	7800	6.7	700	30	3
T 80	NDE.M 035080	9480	8.1	850	44	3
TR 120	NDE.M 035100	11720	10	1050	44	4
T 120	NDE.M 035120	13400	11.5	1200	60	5.5
TR 150	NDE.M 035140	15600	13.4	1400	-	-
T 150	NDE.M 035150	17900	15.3	1600	-	-

* separate desk switchboard or panelboard, complete as regards power and auxiliaries

Burner setup

• Burner body • flame funnel • flange and fixing gasket • Heavy oil supply line with heating cartridge • head with deflector disk with fins • combustion air pressure switch • photoresistance • pulverization pump unit with heating cartridge • emulsifier • modulating servomotor • preheating tank with electric resistors and steam coil • Heavy oil pressure regulator on the return circuit • air regulating locks • nozzle opening control solenoid • modulating reflux nozzle • supply line and solenoid valve for gas pilot ignition • connector box and flame control device kit LAL supplied: loose

Special versions:

- short head
- upward flame
- prearrangement for hot combustion air (max 180°C)
- combustion air inlet from upwards
- air/fuel electronic adjustment
- power/auxiliaries control panel on machine board



Gas / Emulsion (Heavy Oil + Water)

Burners Series T...GNDE.M

Generalities

This burner contains in itself everything an industry requires to satisfy its need for:

- energetic costs reduction
- pollutant emissions reduction
- service continuity guarantee

Burner features

Fuel	: Gas (n.c.v. 8500 kcal/Nm ³) 300mbar Heavy oil (max. 50°C a 50°C) (n.c.v. 9600 kcal/kg) + Water (15% average)
Operation	: Modulating (1/5)
Use	: for pressure or vacuum furnaces
Electric fan	: separate, to be selected as a function of the back pressure value in the combustion chamber
Gas train valves	: to be defined if for Natural gas or L.P.G.
Power supply	: 3 x 380 V, 50 Hz - auxiliaries 220 V



extra standard realizations on request

The burner must be fed by an Oil flow equal to 3 times its maximum consumption per hour, at 70°C temperature, at a constant pressure of 3 bar and filtered at least 250 micron; we suggest to adopt the system diagram indicated by the Standard UNI 9848. The Water, whose hardness degree must not be higher than 40°F, have to reach the burner with a 5 bar pressure.

Burner Model	Code	Thermal capacity	Flow		Resistors	Pump Motor
			Nat. gas	Emulsion		
		kW	Nm ³ /h	kg/h	kW	kW
T 10	GNDE.M 050010	1000	0.9	102	10	0.75
TR 25	GNDE.M 050015	1450	1.3	147	10	0.75
T 25	GNDE.M 050025	2230	1.9	226	18	1.1
TR 40	GNDE.M 050030	3350	2.9	339	18	1.1
T 40	GNDE.M 050040	4180	3.6	424	24	1.5
TR 60	GNDE.M 050050	5300	4.5	536	24	2.2
T 60	GNDE.M 050060	6400	5.5	649	30	2.2
TR 80	GNDE.M 050070	7250	6.2	734	30	3
T 80	GNDE.M 050080	8930	7.6	904	44	3
TR 120	GNDE.M 050100	11150	9.6	1129	44	4
T 120	GNDE.M 050120	12830	10.9	1299	60	5.5
TR 150	GNDE.M 050140	13390	11.5	1355	-	-
T 150	GNDE.M 050150	15500	12.5	1468	-	-

* separate desk switchboard or panelboard, complete as regards power and auxiliaries

Burner setup

• Burner body • flame funnel • flange and fixing gasket • heavy oil/gas supply line with heating cartridge • head with deflector disk with fins • combustion air pressure switch • UV photocell • pulverization pump unit with heating cartridge • emulsifier • modulating servomotor • preheating tank with electric resistors and steam coil • heavy oil pressure regulator on the return circuit • air regulating locks • nozzle opening control solenoid • modulating reflux nozzle • supply line and solenoid valve for gas pilot ignition • connector box • flame control device kit LFL and gas valve seal control device LDU supplied loose

Special versions :

- short head
- upward flame
- prearrangement for hot combustion air (max 180°C)
- combustion air inlet from upwards
- air/fuel electronic adjustment
- power/auxiliaries control panel on machine board



CE

Accessories for Burners Series T...

TANKS SER...

Generalities

They are utilized for the second pre-heating of the fuel Oil; they are used in the fuel supply circuits applied to the burners for fuel Oil or Oil emulsified with water; they receive the Oil from the stocking tank (50°C) and preheat it up to about 70°C, ready to be pushed into the ring circuit of the burner(s) fuel supply.

We recommend to install them according to what is indicated by the Standards UNI 9248.

The Tank capacity must be equal to about 3 times the maximum consumption per hour of the burner(s) placed in the Station.

For their positioning and hydraulic pipings, we recommend to comply with what is indicated by the Standard UNI 9848.

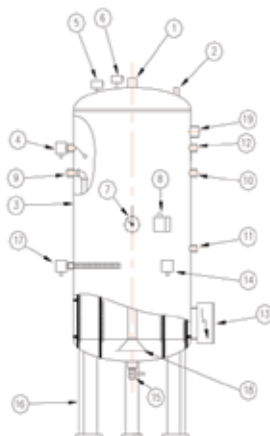
Burner features

Type	: vertical
Electric Resistors	: 3 x 3 kW, complete with a thermostat
Coil	: stainless steel, for water heated at 85°C
Power supply	: 3 x 380 V 50 Hz



* different capacities on request

Model	Height mm	Diameter mm	Capacity * lit
SER 500	2100	750	500
SER 1000	2300	950	1000
SER 2000	2600	1300	2000



Legend

- 1 Gate for oil loading from the tank
- 2 Gate for the breather pipe to atmosphere
- 3 Insulated tank
- 4 Safety level control device
- 5 Maximum level probe
- 6 Minimum level probe
- 7 Drawing zone oil temperature thermometer
- 8 Resistors double thermostat (work/safety)
- 9 Coil gate
- 10 Coil gate
- 11 Oil ring drawing gate for burner(s) supply
- 12 Oil ring return gate
- 13 Connector box
- 14 Nr. 03 Electric resistors
- 15 Manual dump valve
- 16 Support feet
- 17 Idem as item 14
- 18 Loading pipe distributor

Burner setup

• Vertical cylindrical body in stainless steel plate • Nr.3 support feet on the floor • stainless steel water coil • Nr. 3 Electric resistors • work/resistors thermostat • safety/resistors thermostat • thermometer • Maximum level probe • Minimum level probe • safety level switch • double connection gates • mud dump valve • connector box and wiring harnesses • insulation protected by a PVC coating



Accessories for Burners Series T... PUMPS FRAME / Oil Filters

Generalities

In order to make the carrying out of the fuel Oil supply system to the burner faster and less subject to errors in assembling of the various components, we equip a hydraulically and electrically preassembled Unit, on which, each time, the components resulting in the design will be placed.

Burner features

Type : Painted steel frame with an anti-dripping basin in stainless steel.
Power supply : 3 x 380 V 50 Hz.



Model	Code	Height mm	Width mm	Depth mm	Capacity * lt
UPF 2004	030002	200	1,300	50	120

Accessories for Burners Series T... water PUSH UNIT

Generalities

For the service to the burners for fuel Oil to be emulsified with water on machine board, we have equipped this hydraulically and electrically preassembled unit, ready to be connected to both water pipe network and burner. The unit can be supplied either in cased version UGS2001 or in open version UGS 2000.

Burner features

Type : cased in a metallic box
Pumps : Nr. 2 with peripheral fan wheel – 60lt/h – 2x0,37 kW – 2900 rev./min - conn. 1/2" Mod.NTp78
Water tank : capacity 30 l
Power supply : 3 x 380 V, 50 Hz



Cased version UGS2001

Model	Code	Height mm	Width mm	Depth mm	Capacity * lt
UGS 2000	035001	1000	1000	400	30
UGS 2001	035002	1300	1200	400	30

Burner setup (Mod. UGS2001)

• painted metallic box for support on the floor • water tank • Nr. 02 pumps (one as a spare for the other one) • pressure regulator • level switch • wiring harness • connector box • gauge with push button valve • thermostat • relief solenoid valve • thermometer .



Morocco



Puglia (IT)



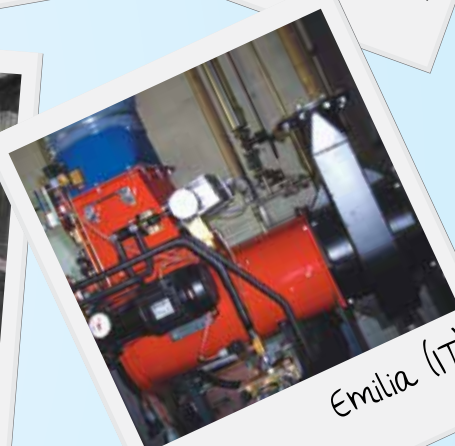
Veneto (IT)



Morocco



Friuli (IT)



Emilia (IT)



Umbria (IT)



United Arab
Emirates



Puglia (IT)



Tecflam s.r.l.
via Curiel, 3 (Corte Tegge) - 42025 Cavriago Reggio Emilia, Italy
tel. +39 0522 944207 - fax +39 0522 494091
tecflam@tecflam.it - www.tecflam.it



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