

Okay Energy HHO Gas for Combustion-Supporting

1.Introduction of Oxy-hydrogen Generator

Oxy-hydrogen generator is equipment which just need water and electricity to produce oxygen and hydrogen on demand.Oxygen is a kind of gas for combustion-support,and hydrogen is a carbon-free gas.Compared with other fuels,oxy-hydrogen have the following features:

1)safe and environment

Hydrogen molecular weigh is 2,lighter than air by 1/14.Hydrogen will escape from the ground and wont mix with the air.However,Other fuel oil and gas will gather on the ground and have a risk of explosion.

2)high-temperature and high-energy.

The heat value of 1kg hydrogen is 34000Kcal which is two times of diesel.The temperature of oxy-hydrogen flame is as high as 2800℃ which is higher than normal gas.

3)concentrated heat value.

Oxyhydrogen flame is straight,less-heat loss and high efficient.

4)automatically regeneration

Hydrogen come from water and become water vapor after combustion.

5)catalysis characteristic

Hydrogen is an active catalyst which can be mixed with air for catalyzing combustion of all solid,liquid,gas fuels.It also can speed up the reaction process,help complete combustion to improve the flame temperature.

6)energy saving

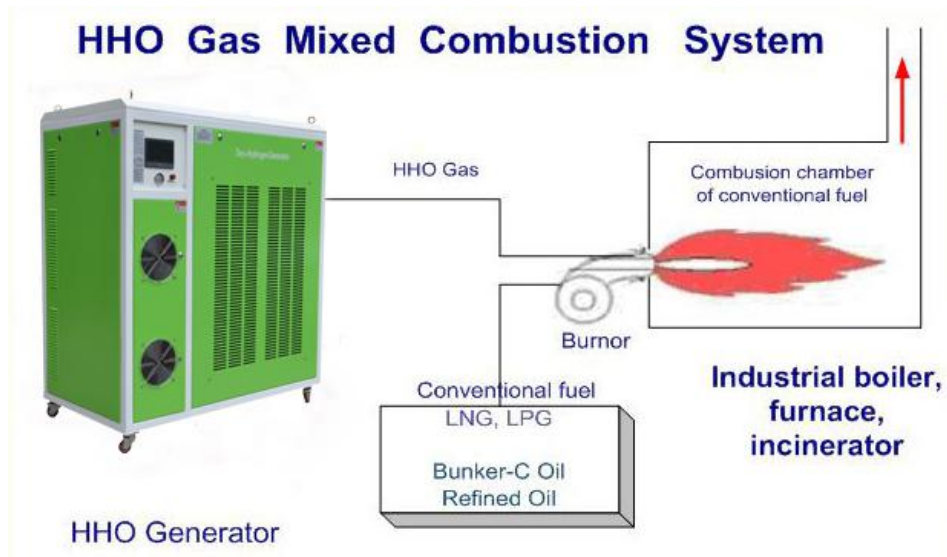
See the below test report(refer to 1.5Ton Steam Boiler Test Report 1)

2.Oxy-hydrogen gas for combustion-supporting on boilers,furnaces and waste incinerator etc.

Using the catalytic properties of hydrogen,and combustion characteristics of oxygen,it makes diesel oil,coal,LPG etc fuels burning with oxy-hydrogen gas(HHO gas) to reduce smoke emission more than 70% and saving fuel 10%-30%.

Application 1:

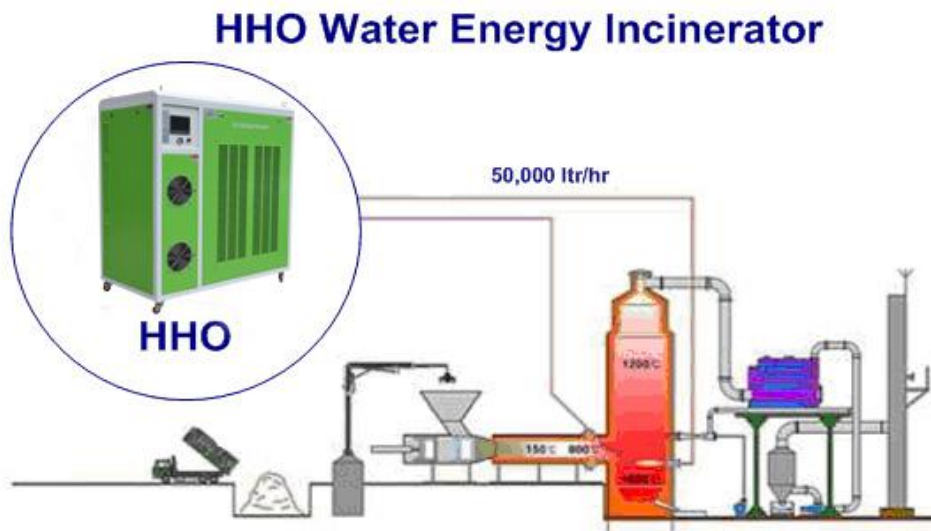
Oxy-hydrogen mixed combustion system is a new combustion technology.If HHO generators are installed with existing equipment(industrial large scale boilers,heating furnaces,melting furnaces etc)that use fossil fuels(diesel,LNG,LPG etc).The oxyhydrogen gas from Okay Energy hho generator is mixed and burned with fossil fuels.It makes the combustion acceleration to save the fuel.



Oxy-hydrogen mixed combustion system has an advantage that it can use the existing equipment as it is without modifying too much or making newly. The fuel saving rate are from 10% to 30% according to the quantity of hydroxy gas and CO₂ is reduces as much as the saved fuel. Therefore, we can say it is a green revolution of low carbon.

Application 2:

Oxy-hydrogen water energy incinerator system is working in high temperature pyrolysis melting incinerator by water energy system. It is composed and linked of hho generator and oxyhydrogen gas melting incinerator by the unique heat generation technology of oxyhydrogen gas.



This melting incineration technology is a new technology. A combustion chamber is prepared in the incinerator and it has the most complete combustion condition of oxy-hydrogen gas. Combustion heat of syngas and combustion heat of hydroxy gas make synergy each other to create high 1400-1800°C. It can Melt everything and it doesn't produce any ash, the problem of existing incinerators.

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3.Okay Energy Oxy-hydrogen Generator Specifications

Model	Photo	Specification	
OH3000		AC Voltage (V)	380V 50/60Hz
		Phase	3N
		Power Consumption	9KW/h
		Max Gas Output	3000L/hr
		Max. Working Pressure	2kg/cm2
		Water Consumption	1.8L/hr
		Water Feed	auto
		Dimensions - L*W*H	1070*670*1500mm
		Gross Weight	300kgs
		Ventilation Space	400mm in each
Model	Photo	Specification	
OH5500		AC Voltage (V)	380V 50/60Hz
		Phase	3N
		Power Consumption	17.5KW/h
		Max Gas Output	5500L/hr
		Max. Working Pressure	2kg/cm2
		Water Consumption	2.8L/hr
		Water Feed	auto
		Dimensions - L*W*H	1200*670*1700
		Gross Weight	396kgs
Model	Photo	Specification	
OH7500		AC Voltage (V)	380V 50/60Hz
		Phase	3N
		Power Consumption	23KW/h
		Max Gas Output	7500L/hr
		Max. Working Pressure	2kg/cm2
		Water Consumption	4L/hr
		Water Feed	auto
		Dimensions - L*W*H	1650*800*1500mm
		Gross Weight	552kgs
		Ventilation Space	400mm in each

Model	Photo	Specification	
OH10000		AC Voltage (V)	380V 50/60Hz
		Phase	3N
		Power Consumption	31KW/h
		Max Gas Output	10000L/hr
		Max. Working Pressure	2kg/cm2
		Water Consumption	5.6L/hr
		Water Feed	auto
		Dimensions - L*W*H	1520*900*1490mm
		Gross Weight	610kgs
		Ventilation Space	400mm in each
Model	Photo	Specification	
OH20000		AC Voltage (V)	380V 50/60Hz
		Phase	3N
		Power Consumption	70KW/h
		Max Gas Output	20000L/hr
		Max. Working Pressure	2kg/cm2
		Water Consumption	11.6L/hr
		Water Feed	auto
		Dimensions - L*W*H	2300*1100*1800mm
		Gross Weight	140kgs
		Ventilation Space	500mm in each

4.Test Report

1.5Ton Steam Boiler Test Report 1 Fuel saving testing(heavy oil +HHO gas) 1.1

In the case of different gas output of HHO gas equipment combined with the same steam boiler,the fuel saving testing is based on testing items including heavy oil combustion,HHO generators' power consumption and water consumption,steam temperature,and steam volume to estimate the percentage of fuel saving and reduction percentage of combustion waste gases.

1)heavy oil testing

Time (min)	Heavy oil Consumption (L)	Power consumption (KW)	Water consumption (L)	Steam temperature (℃)	Steam temperature increased (%)	Steam pressure (kg/cm ²)	Steam volume (L)	Total energy cost (RMB)	Production cost of steam/cbm (RMB)	Fuel saving cost (%)
0~20min	29	0	0	132	0%	5.5	369	536.5	1454	0.0%

21~40min	28	0	0	130	0%	5.4	363	518.0	1427	0.0%
41~60min	28	0	0	131	0%	5.5	367	518.0	1411	0.0%
Average	28.3	0.0	0.0	131.0	0%	5.5	366.3	524.2	1431	0.0%

2) Heavy oil and HHO gas (OH3000), and HHO gas output: 1800L/hr

Time (min)	Heavy oil Consumption (L)	Power consumption (KW)	Water consumption (L)	Steam temperature (°C)	Steam temperature increase (%)	Steam pressure (kg/cm ²)	Steam volume (L)	Total energy cost (RMB)	Production cost of steam/cbm (RMB)	Fuel saving cost (%)
0~20min	28	2.8	0.5	139	6.1%	5.5	386	526.4	1364	5.0%
21~40min	28	2.8	0.5	140	6.9%	5.4	384	526.1	1370	4.6%
41~60min	28	2.8	0.5	140	6.9%	5.5	389	526.4	1353	5.8%
Average	28.0	2.8	0.5	139.7	6.6%	5.5	386.3	526.3	1362	5.1%

Remark: 1.boiler's heavy oil:18.5RMB/KG,water charge:11.5RMB/Ton,electric charge:3RMB/°C
2.fuel saving cost(%):energy increases(%) to reduce the fuel costing including steam volume increased(%) and steam temperature increased(%) after adding HHO gas.

3). Heavy oil and HHO gas(OH5500), and HHO gas output: 3600L/hr

Time (min)	Heavy oil Consumption (L)	Power consumption (KW)	Water consumption (L)	Steam temperature (°C)	Steam temperature increase (%)	Steam pressure (kg/cm ²)	Steam volume (L)	Total energy cost (RMB)	Production cost of steam/cbm (RMB)	Fuel saving cost (%)
0~20min	28	5.3	1	142	8.4%	5.5	408	533.9	1309	9.3%
21~40min	28	5.3	1	143	9.2%	5.6	410	533.6	1301	9.9%

41~60min	27	5.2	1	142	8.4%	5.5	405	515.1	1272	12.1%
Average	27.7	5.2	1.0	142.3	8.7%	5.5	407.7	527.5	1294	10.4%

4).Heavy oil and HHO gas(OH7500),and HHO gas output: 5400L/hr

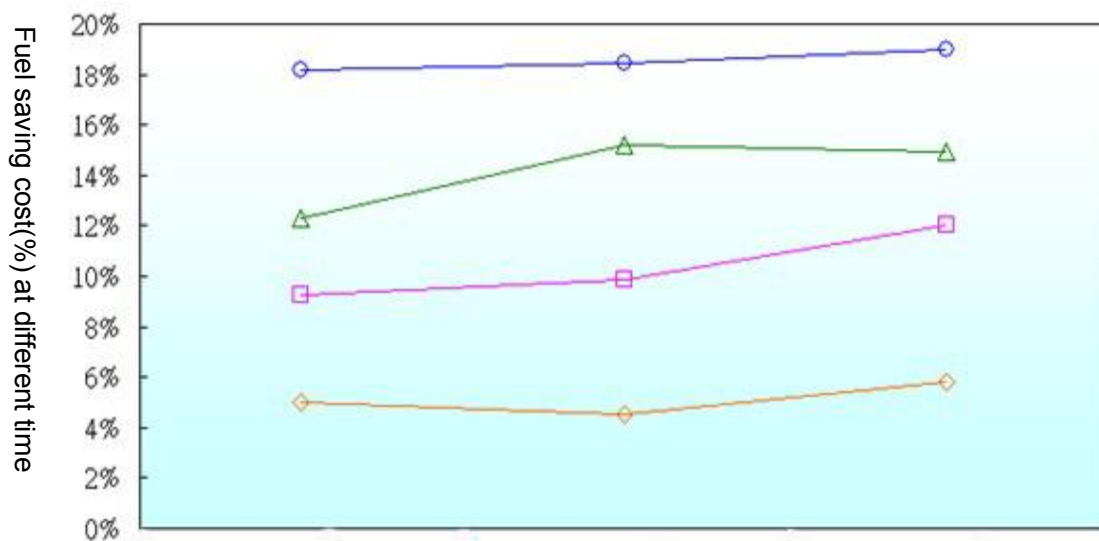
Time (min)	Heavy oil Consumption (L)	Power consumption (KW)	Water consumption (L)	Steam temperature (°C)	Steam temperature increase (%)	Steam pressure (kg/cm ²)	Steam volume (L)	Total energy cost (RMB)	Producti on cost of steam/cbm (RMB)	Fuel saving cost (%)
0~20min	28	7.4	1.5	144	9.9%	5.6	425	540.2	1271	12.3%
21~40min	27	7.2	1.5	143	9.2%	5.6	423	521.1	1232	15.2%
41~60min	27	7.3	1.5	143	9.2%	5.5	422	521.4	1236	14.9%
Average	27.3	7.3	1.5	143.3	9.4%	5.6	423.3	527.6	1246	14.1%

5).Heavy oil and HHO gas(OH1000), and HHO gas output:7200L/hr

Time (min)	Heavy oil Consumption (L)	Power consumption (KW)	Water consumption (L)	Steam temperature (°C)	Steam temperature increase (%)	Steam pressure (kg/cm ²)	Steam volume (L)	Total energy cost (RMB)	Producti on cost of steam/cbm (RMB)	Fuel saving cost (%)
0~20min	27	9.2	2	143	9.2%	5.6	442	527.1	1193	18.2%
21~40min	27	9.3	2	144	9.9%	5.6	443	527.4	1191	18.5%
41~60min	27	9.3	2	145	10.7%	5.7	445	527.4	1185	19.0%
Average	27.0	9.3	2.0	144.0	9.9%	5.6	443.3	527.3	1189	18.6%

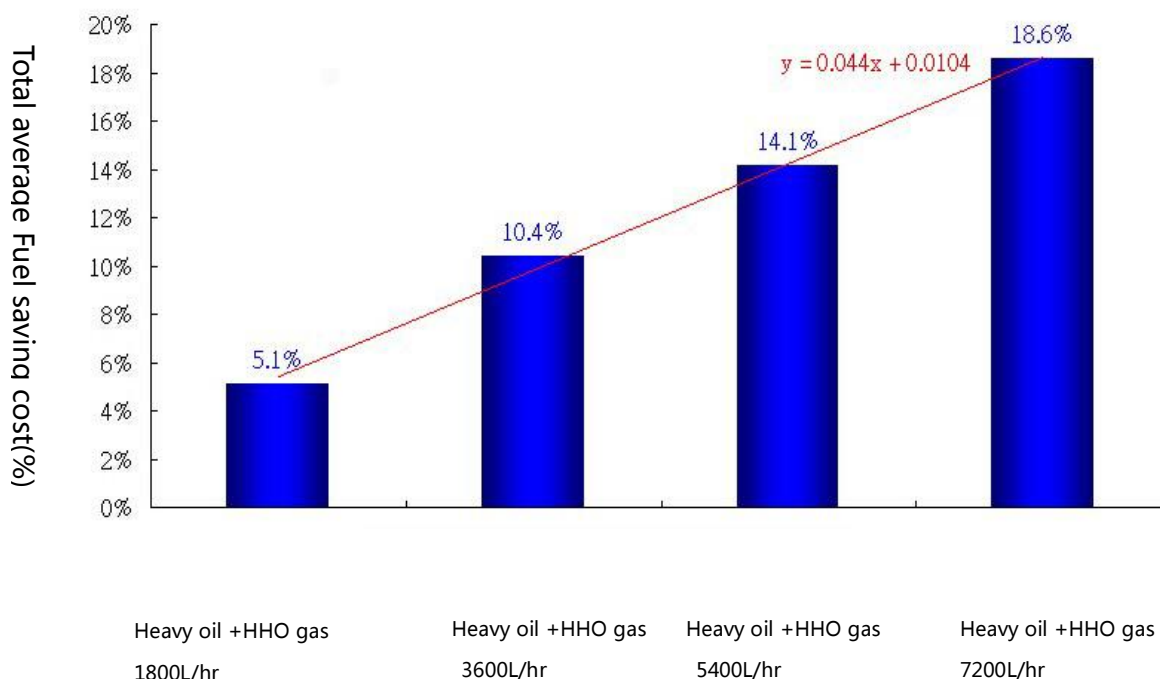
Fuel Saving Testing(heavy oil+HHO gas) 1.2

Boiler's Fuel saving cost(heavy oil + different volume of HHO gas)



	0-20min	21-40min	41-60min
Heavy oil+HHO gas 1800L/hr	5.0%	4.6%	5.8%
Heavy oil+HHO gas 3600L/hr	9.3%	9.9%	12.1%
Heavy oil+HHO gas 5400L/hr	12.3%	15.2%	14.9%
Heavy oil+HHO gas 7200L/hr	18.2	18.5	19.0

Boiler's Fuel Saving Cost Percentage (%)-(heavy oil + different volume of HHO gas)



***Conclusion:** After adding HHO gas 7200L/hr for mixed combustion with heavy oil, the fuel saving cost (%) is 18.6%.

Boiler's Waste Discharge Testing(heavy oil + HHO gas) 2.0

Heavy oil

time (Min)	O2(%)	CO (ppm)	CO ₂ (ppm)	NO (ppm)	NO ₂ (ppm)	NOx(ppm)	SO ₂ (ppm)	HC (ppm)	Temp(℃)	Particle Pollutant (mg/Nm ³)
20	3.74	128.8	14.11	152.4	8.3	160.7	183.0	15.3	346	372.8
40	3.61	91.0	14.2	153.6	8	161.6	189.0	7.6	350	354.4
60	3.64	76.6	14.19	155.1	8.2	163.3	188.8	8.6	352	379.0
Average	3.66	98.80	14.17	153.70	8.17	161.87	186.93	10.50	349.33	368.73

Heavy oil+HHO gas(OH3000),and HHO gas output: 1800L/hr

time (Min)	O2(%)	CO (ppm)	CO ₂ (ppm)	NO (ppm)	NO ₂ (ppm)	NOx(ppm)	SO ₂ (ppm)	HC (ppm)	Temp(℃)	Particle Pollutant (mg/Nm ³)
20	5.56	53.3	12.62	148.0	8.9	156.9	184.1	1.7	334	168.0

40	5.59	44.8	12.56	152.9	5.1	158	186.1	3.3	335	171.5
60	5.6	45.2	12.54	152.7	3.8	156.5	185.3	4.0	335	172.9
Average	5.58	47.77	12.57	151.20	5.93	157.13	185.17	2.98	334.67	170.80

Heavy oil + HHO gas(OH5500),and HHO gas output:3600L/hr

time (Min)	O2(%)	CO (ppm)	CO ₂ (ppm)	NO (ppm)	NO ₂ (ppm)	NOx(ppm))	SO ₂ (ppm)	HC (ppm)	Temp(°C)	Particle Pollutant (mg/Nm ³)
20	5.97	25.4	12.2	145.5	7.6	153.1	183.2	1.3	340	153.1
40	5.7	26.9	12.31	148.8	9	157.8	177.6	1.3	336	157.5
60	5.7	32.2	12.08	149.9	8	157.9	179.5	1.7	342	158.2
Average	5.82	28.17	12.20	148.07	8.20	156.27	180.10	1.44	339.33	156.27

Heavy oil +HHO gas(OH7500),and HHO gas output:5400L/hr

time (Min)	O2(%)	CO (ppm)	CO ₂ (ppm)	NO (ppm)	NO ₂ (ppm)	NOx(ppm)	SO ₂ (ppm)	HC (ppm)	Temp(°C)	Particle Pollutant (mg/Nm ³)
20	5.85	29.1	12.15	146.8	5.1	151.9	160.2	1.7	335	178.4
40	5.64	30.5	12.23	148.3	7.1	155.4	179.5	0.7	337	183.4
60	5.57	23.8	12.14	146.7	9.1	155.8	181	1.7	339	179.7
Average	5.69	27.80	12.17	147.27	7.10	154.37	173.57	1.34	337.00	180.50

Heavy oil +HHO gas(OH10000),and HHO gas output:7200L/hr

time (Min)	O2(%)	CO (ppm)	CO ₂ (ppm)	NO (ppm)	NO ₂ (ppm)	NOx(ppm))	SO ₂ (ppm)	HC (ppm)	Temp(°C)	Particle Pollutant (mg/Nm ³)
20	6.08	24.9	11.93	146.1	5.6	151.7	155.3	0.7	337	21.2
40	5.95	25.9	12.00	146.4	5.4	151.8	157.4	0.7	336	22.1
60	5.96	25.1	11.94	145.6	5.5	151.1	160	0.7	341	21.6
Average	6.00	25.30	11.96	146.03	5.50	151.53	157.57	0.67	338.00	21.63

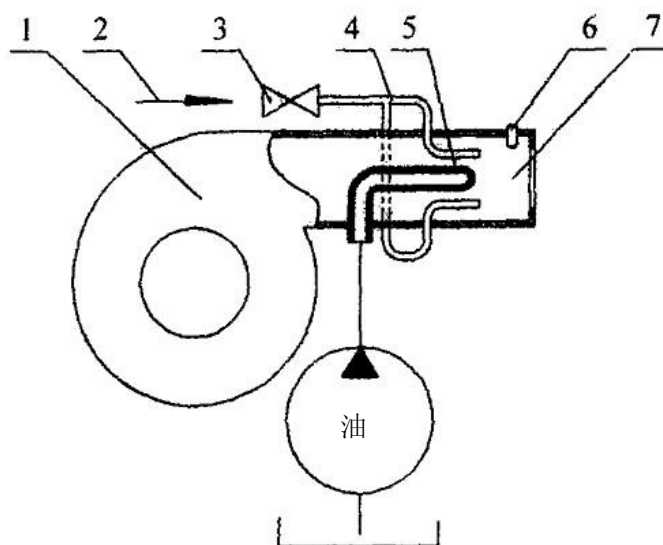
The average percentage(%) of Waste carbon emission reduction compared only heavy oil with adding different volume of HHO gas 2.1

Item	O2(%)	CO (ppm)	CO ₂ (ppm)	NO (ppm)	NO ₂ (ppm)	NOx(ppm)	SO ₂ (ppm)	HC (ppm)	Temp(℃)	Particle Pollutant (mg/Nm ³)
Heavy oil	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Heavy oil+HHO gas1800L/hr	52%	-52%	-11%	-2%	-27%	-3%	-1%	-72%	-4%	-54%
Heavy oil+HHO gas3600L/hr	59%	-71%	-14%	-4%	0%	-3%	-4%	-86%	-3%	-58%
Heavy oil+HHO gas5400L/hr	55%	-72%	-14%	-4%	-13%	-5%	-7%	-87%	-4%	-51%
Heavy oil+HHO gas7200L/hr	64%	-74%	-16%	-5%	-33%	-6%	-16%	-94%	-3%	-94%

***Conclusion:** The carbon emission testing about heavy oil and heavy oil mixed with HHO gas shows that the CO,Hydrocarbon,Particle pollutants are declined except for O2 up as for enough oxygen and hydrogen gas for complete combustion.Under the condition of HHO gas output 7200L/hr,the waste gas CO,Hydrocarbon,Particle pollutants are greatly reduced up to 74%,94%,94% each,and the black smoke emission is decreased obviously.

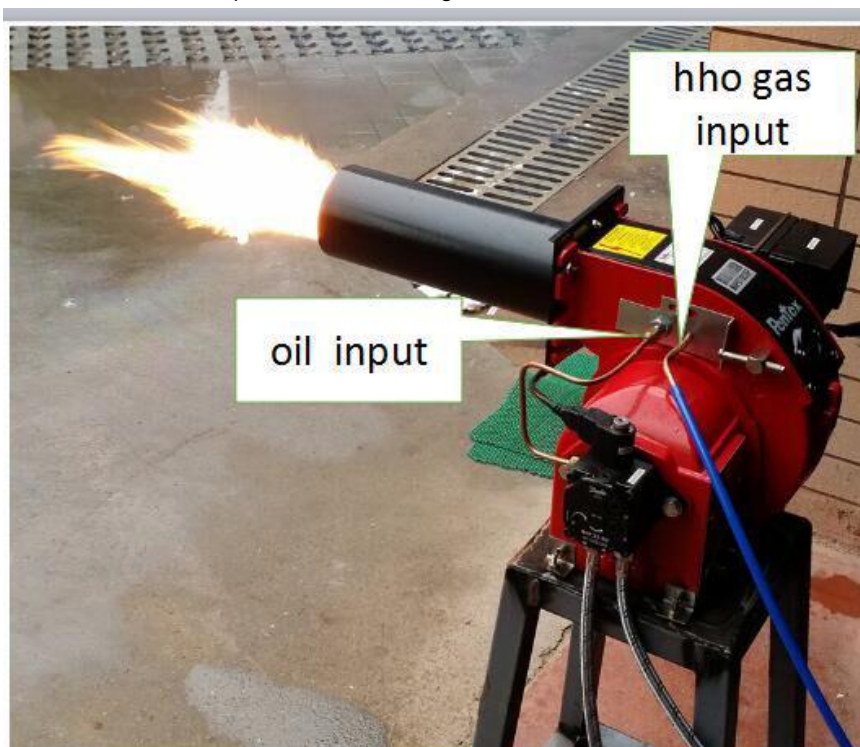
5. Machine installation

1). HHO gas burner



1. Fan
2. HHO Gas Inlet
3. solenoid valve
4. HHO gas branch
5. Fuel injector
6. Igniting system
7. Atomizing oil, HHO gas, air chamber entrance

HHO gas burner is the transformation to the traditional burner, which just adding a HHO gas 's input on the traditional burner and then split into two on the both sides of fuel injector, HHO gas 's output should be two small holes to prevent backfire. E.g as below:



2) Video demonstration on how to install/use hho generator on boiler:

<https://youtu.be/OGYtdhk1I3s>

