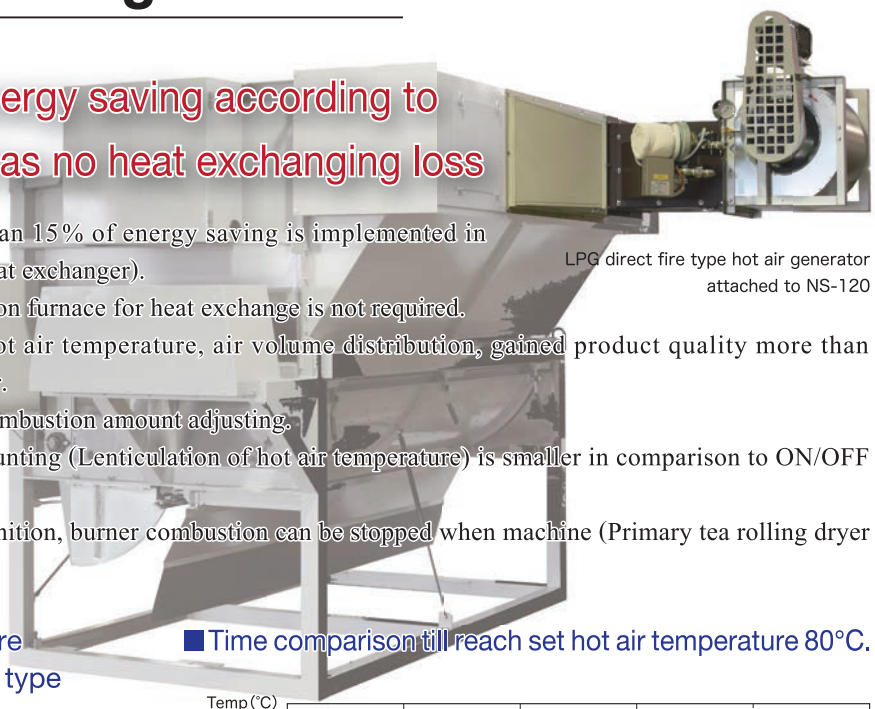
Direct fire type hot air generator

TERADA

Implemented large scale of energy saving according to LP gas direct fire type which has no heat exchanging loss

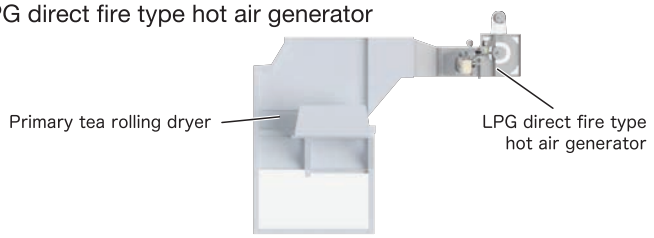


LPG direct fire type hot air generator attached to NS-120

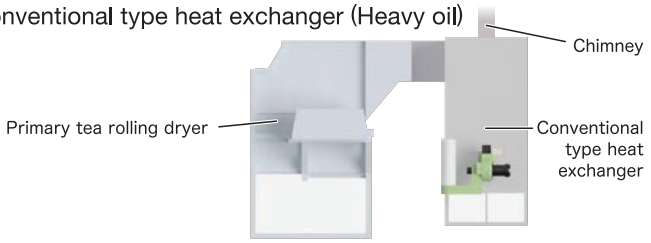
- According to LP gas direct fire type, more than 15% of energy saving is implemented in comparison with conventional type (Indirect heat exchanger).
- More than 20% of space saving since combustion furnace for heat exchange is not required.
- Short flame burner is used since averages hot air temperature, air volume distribution, gained product quality more than conventional type according to original rectifier.
- Used proportional control method for LP gas combustion amount adjusting.
- High precision temperature is possible since hunting (Lenticulation of hot air temperature) is smaller in comparison to ON/OFF control used to conventional type.
- Since the temperature increasing is fast after ignition, burner combustion can be stopped when machine (Primary tea rolling dryer etc.) is in waiting state which is energy saving.

■Installation side space comparison figure with conventional type

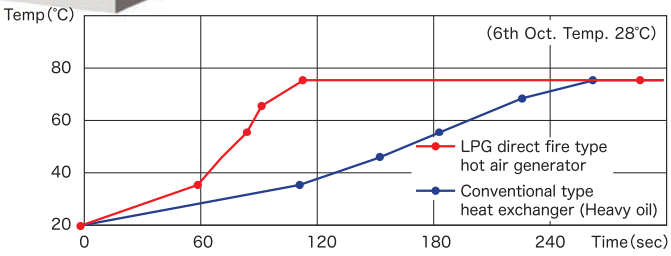
LPG direct fire type hot air generator



Conventional type heat exchanger (Heavy oil)

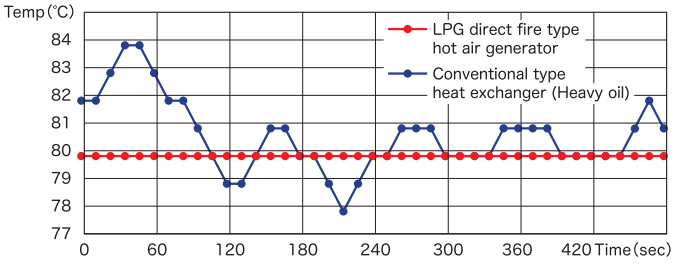


■Time comparison till reach set hot air temperature 80°C.



It takes 110sec for LP gas direct fire type hot air generator to reach set hot air temperature of 80°C, for conventional type heat exchanger 260sec. Direct fire type hot air generator is **150sec** faster & energy saving.

■Hot air controlling without hunting



Tea manufacturing test data comparison

① First flush

Heat exchanger type	Count	Process time (min)	Heavy oil consumption (L)	Generating heat amount (kcal)
2018.4/22	1	45	11.3	104,930
2018.4/22	2	33	10.0	92,860
2018.4/22	3	38	10.4	96,570
2018.4/26	4	41	12.1	112,360
2018.4/26	5	29	9.6	89,140
			Average	99,172

About 16% of generating heat amount cut

Direct fire type	Count	Process time (min)	LPG consumption (㎥)	Generating heat amount (kcal)
2018.4/22	1	38	3.66	86,280
2018.4/22	2	39	3.71	87,480
2018.4/22	3	41	3.86	91,080
2018.4/26	4	36	3.43	80,890
2018.4/26	5	32	3.05	71,900
			Average	83,526

② Autumn flush

Heat exchanger type	Count	Process time (min)	Heavy oil consumption (L)	Generating heat amount (kcal)
2018.9/28	1	24	5.3	49,220
2018.9/28	2	24	6.0	55,720
			Average	52,470

About 15% of generating heat amount cut

Direct fire type	Count	Process time (min)	LPG consumption (㎥)	Generating heat amount (kcal)
2018.9/28	1	24	2.12	49,970
2018.9/28	2	24	1.86	39,900
			Average	44,935

※ Processed with rotor vane after the tea scattering dryer & before the primary tea rolling dryer in autumn flush.

※ Terada factory 2018: Compared in final primary tea rolling dryer NS-250.

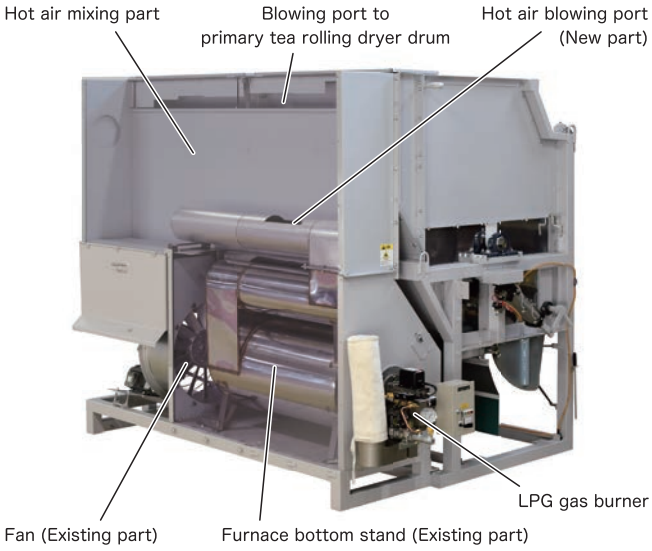
Comparison of conventional heat exchanger & direct fire type hot air generator

	Conventional type heat exchanger (Heavy oil)		LPG direct fire type hot air generator	
Heat efficiency	○	There is heat exchanging loss	◎	No heat exchange loss (Comparatively 15% energy saving)
Installing space	△	Required large installing space	◎	Comparatively 20% Space saving
Responsiveness	△	Takes time to heat up	◎	Fast heating up
Target value followability	△	Temperature amplitude is large	◎	Temperature is stable according to proportional control
Durability	△	Combustion furnace damages since metal fatigue by heat	◎	Excellent durability since not having combustion furnace
Maintainability	△	Require manpower for cleaning & inspection of combustion furnace, chimney	◎	Easy cleaning & maintenance with simple structure
Chimney construction	×	Required	◎	Not required
Tea quality	◎	Good	◎	Luster is up by keeping [Dampness] since combustion gas includes moisture
Oil/smoke smell	○	Might get oil/smoke smell according to furnace damage	◎	No oily smell since heavy oil is not used
Safety	○	High if the using conditions & handling are not mistaken	○	Be careful of flammability & clean air supply
Incidental construction	○	Not required when replacing existing machine (Heavy oil furnace usage)	△	Require gas pipe construction & bulk storage etc.

LPG direct fire type hot air generator which has no heat exchanging loss correspondent to karo-pack type primary tea rolling dryer

- Terada original karo-pack type primary tea rolling dryer has correspondent to LPG direct fire type hot air generator.
- Direct fire type is 15% energy saving & 27% greenhouse gas reduction in comparison with conventional heavy oil furnace
- Includes subtle amount of moisture in gas, keeps dampness when manufacturing & improves gloss.
- Efficient controlling is possible according to little hunting of hot air temperature with utilizing furnace lower part.
- It is possible to install without changing the current using karo-pack type primary tea rolling dryer.
- Chimney construction is not required.

■ Karo-pack type primary tea rolling dyer rear surface



※Rear cover is removed of this image for explanation.

KS-120

■ Specifications

LPG direct fire type hot air generator

Type	Height	Depth	Width	Weight	Power		Max air rate	Generating heat amount	Max LPG consumption
					Fan	Burner			
	mm	mm	mm	kg	kW	kW	㎥/m	kW	kg/h
HAG-80	815	1,000	1,280	120	1.5	0.02 x2	80	116	8.4
HAG-100	815	1,000	1,280	120	1.5	0.02 x2	100	116	8.4
HAG-150	1,085	1,190	1,370	150	2.2	0.06 x2	150	232	16.8

LPG direct fire type hot air generator (Karo-type primary tea rolling dryer)

Type	Width		Depth	Height		Weight	Power			Max LPG consumption	Max air rate	Main shaft rotation	Feeding amount (Fresh leaf)
	With motor cover	Frame		With exhaust pipe	Frame		Shaft	Fan	Burner				
	mm	mm	mm	mm	mm	kg	kW	kW	kW	kg/h	㎥/min	rpm	kg
KS-120	3,050	2,550	2,000	2,980	2,380	1,700	3.7	1.5	0.25	12.5	120	33~40	60~120
KS-200	4,570	4,000	2,320	3,010	2,410	3,100	5.5	3.7	0.25	16.7	160	33~40	100~200

※Part of the specifications might be changed for improvement.

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