鼎益科技

Top-In Technology Co.,Ltd.

Heat Recovery System

Sharing

Perfection

Quality

Service

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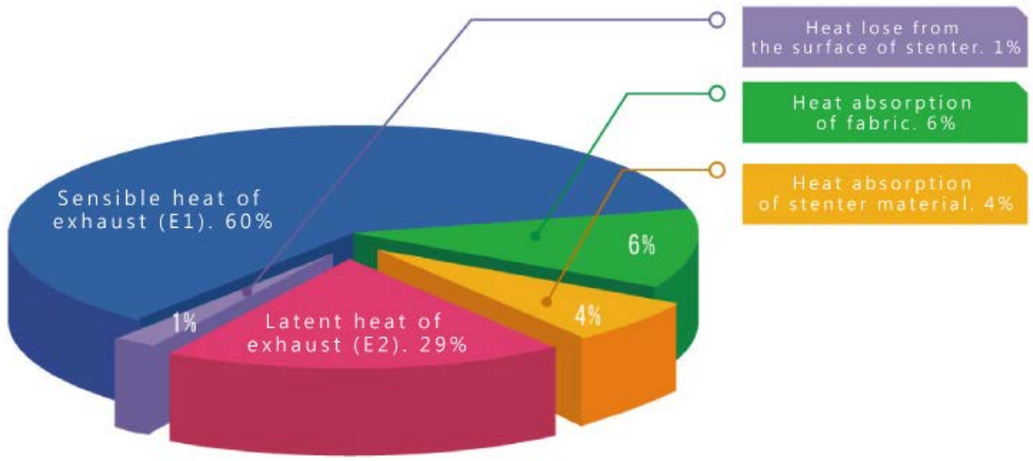
Exhaust heat recovery system overview

Heat recovery of exhaust

The concept of heat recovery of exhaust

Take advantage of the exhaust heat of the stenter or dryer to pre-heat the fresh air, then, refill this heated air to the drying oven to raise up the original heat and shorten the temperature difference between oven and the previous temperature setting. It will save the heat demands of drying oven, and reach the utmost production efficiency and energy saving.

The heat consumption distribution scale of stenter



Why take advantage of exhaust heat recovery system?

According to the heat consumption distribution scale shows, the exhaust exposed sensible heat (EI) and latent heat (E2) are occupied approx. 89% of the total fuel energy consumptions. The exhaust is the main heat-loss reason, so take advantage of the exhaust for heat recovery is the most accurate and best economical efficient method.

Latent heat (E2) is the vaporization heat of water. If the latent heat (E2) in exhaust occupied ratio is higher, the heat usage efficiency is higher. This portion can be controlled by the exhaust humidity control system to reach the utmost optimization of heat effect.

The advantages of heat recovery

- Save fuels and energy by heat recovery.
- Improve the temperature stability of drying oven, especially for the first and last chamber temperature setting, to minimize the difference from the actual running temperature.
- Extend the setting zone of drying oven to increase the fabric speed and production·
- Decrease the air pollution equipment load at the late stage and promote the air pollution treatment efficiency by condensational pretreatment of waste oil mists.
- Reduce the heat supply equipment capacity and cost.
- Lower the oil outlet temperature to extend the life time of thermo oil boiler.
- Save energy and reduce the exhaust to minimize the carbon-dioxide emission, and respond to the international trend of energy saving.

Heat recovery system of RHA and RHW

Function and consistent	RHA	RHW
Preheat air	●	●
Preheat water		●
PLC+HMI control system		●
Air to Air heat exchanger	●	
Air to water heat exchanger		●
Water to water heat exchanger		●
Dispersed type	●	●
Converged type		●
Recovery profit	18~25%	30~45%
Pay back,year	1~2	0.8~2

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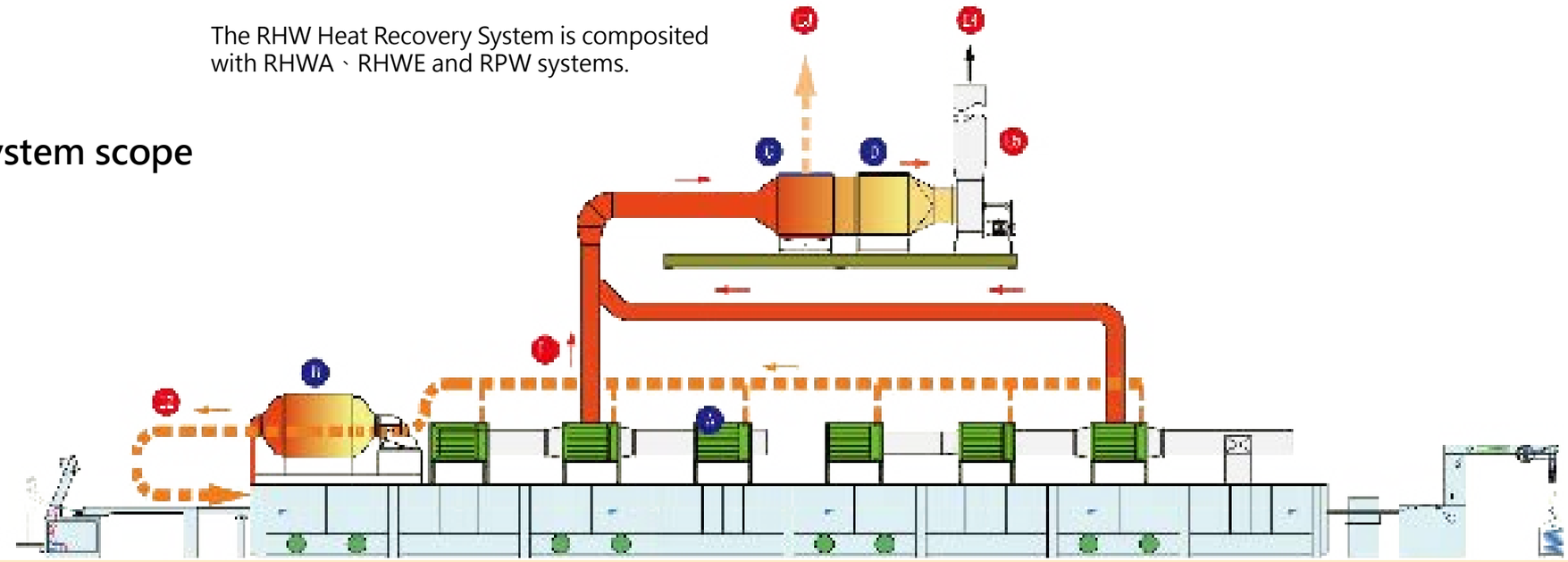
RHW combined air and water heat recovery system

The RHW Heat Recovery System is composited with RHWA、RHWE and RPW systems.

Dispersed system scope



MODEL

- A RHWA-30 heat absorption device
- A1 RHWA-150 heat absorption device
- B RHWE-150 heat exothermic device
- C RPW-23 water heat recovery device
- D RI-400 exhaust purifying device

E1

The heat of exhaust (Qt)		
Exhaust temperature	℃	180
Exhaust flow volume	CMM	250
Heat of exhaust	Kcal / day	17,237,033
Heat ratio(Qt/Qt)	%	100.0
Energy conversion		
Heavy oil	L / day	2,200
Natural gas	M^3 / day	2,300
Coal	kg / day	4,239
Steam	kg / day	35,177

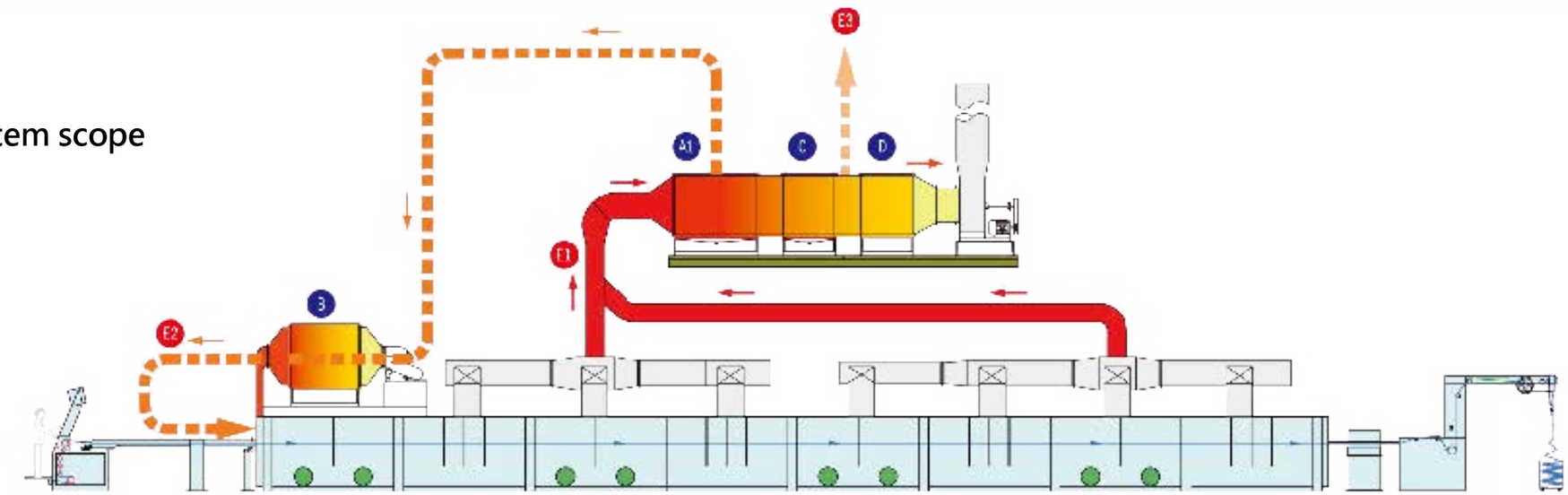
E2

Heat of pre-heat air (Qa)		
Fresh air temperature	℃	100
Fresh air flow volume	CMM	120
Heat of fresh air	Kcal / day	3,384,789
Heat ratio(Qa/Qt)	%	19.63
Energy conversion		
Heavy oil	L / day	432
Natural gas	M^3 / day	444
Coal	kg / day	700
Steam	kg / day	6,907

E3

Heat of pre-heat water (Qw)		
Hot water temperature	℃	80
Hot water flow volume	CMM	3500
Heat of exhaust	Kcal / day	4,620,000
Recovery ratio(Qw/Qt)	%	26.80
Energy conversion		
Heavy oil	L / day	503
Natural gas	M^3 / day	525
Coal	kg / day	796
Steam	kg / day	9,427

Converged system scope



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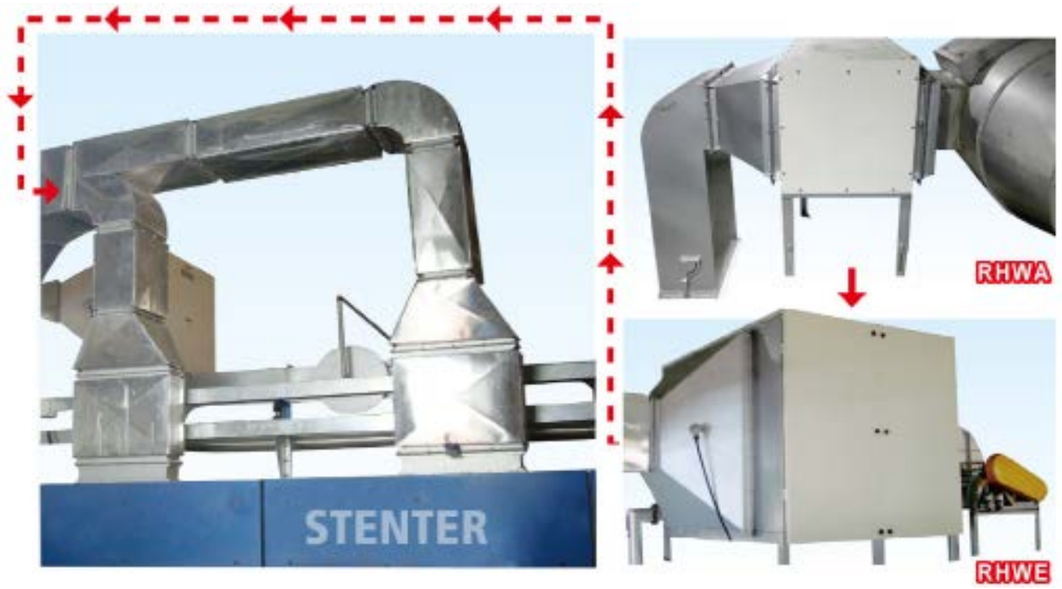
RHW combined air and water heat recovery system

RHW heat recovery system

The RHW heat recovery system is composited With RHWA, RHWE and RPW systems.

Dispersed heat recovery design: the exhaust heat will become hot air and hot water type after heat recovery process. At the first stage, the heat of exhaust will be recovered (exhaust temperature is 95 ~ 120℃ , recove rate is approx. 20%). At the second stage, the heat of hot water will be recovered (hot water temperature 80 ~ 90℃ , recovery rate is approx. 25%). Total heat recovery rate can be up to 45%.



Design features of RHWE heat exothermic system

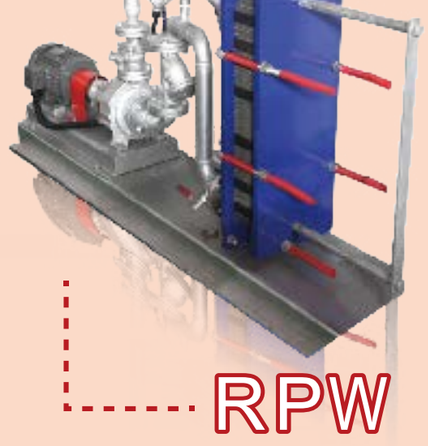
- Pre-heated fresh air supply to the first three chambers of drying oven, effectively replace the front section of high humidity air to enhance drying efficienCy.
- Using high-efficient air-liquid aluminum-alloy fin of heat exchanger, effectively release the recovered heat air·
- By virtue of counter flow heat exchange design, fin tubes are with wide exothermal area and optimum heat exchange efficienCy.
- Modular single unit design, easy for disassembly and maintenance. Each unit of heat exchanger can be dissembled and cleaned individually.

Design features of RHWA heat absorption system.

- According to the exhaust flow, the heat absorption system is designed into 3o, 100, 150, 300, 400 CMM types; in which the 30 CMM type is dispersed and the rest are converged system.
- Using high-efficient air-liquid aluminum-alloy fin of heat exchanger, effectively absorb the exhaust heat and convey to the exothermic system for heat recovery.
- By virtue of counter flow heat exchange design, the heat recovery efficiency is the best.
- Special fin tube and staggered design, the air pressure loss is low and maintenance frequency can be reduced (clean up once a year).
- Front and rear pressure-different design can automatically detect the pressure difference and easy for cleaning and maintenance management. (optional)
- Modular single unit design, easy for disassembly and maintenance. Each unit of heat-exchanger can be disassembled and cleaned individually.
- Oil-dirt collecting pipese effectively eliminate the exhausting oil-dirt.

Design features of RPW heat recovery system

- By virtue of high-efficient plate heat exchanger to recycle hot water, size is small and less space.
- Counter fiow heat exchange design, optimum recovery efficiency·
- Adopt SUS316 plate material, resistant for acid, alkali and corrosion.
- Gasket temperature tolerance is up to 180℃ , great temperature tightness.
- Detachable design is easy for plate pollutants cleaning and maintenance (such as scale, and etc.).



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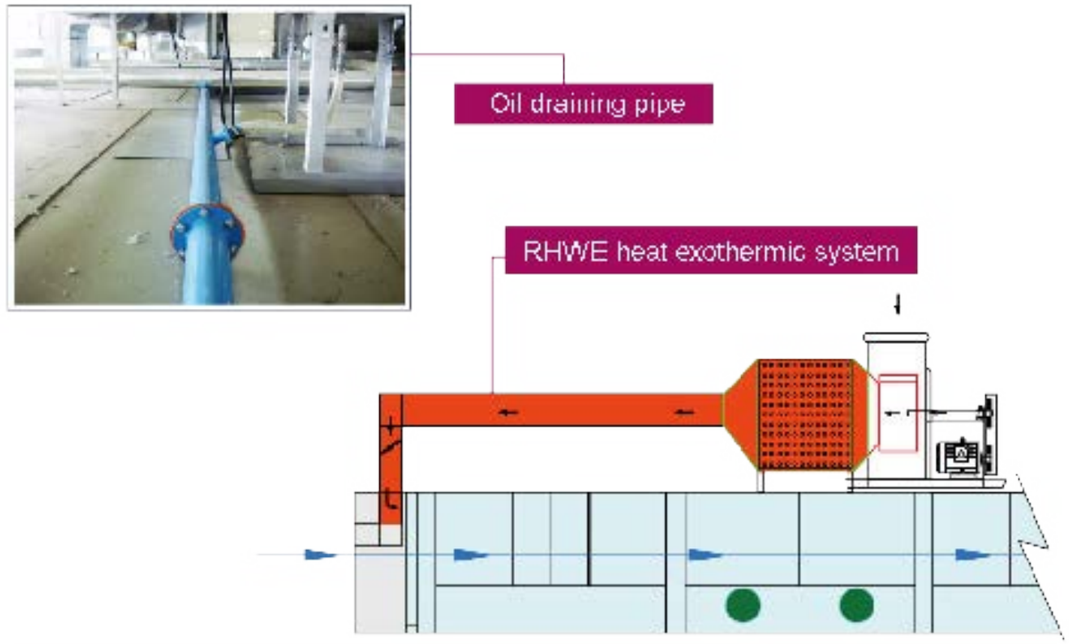
RHW combined air and water heat recovery system

PLC+HMI automatic control and recording system of RHW

- Adopt PLC + HMI automatic control and recording system, program-logical control, can effectively record and statistical analyze the production effectiveness of heat recovery, and automatically convert the equivalent fuel consumption of recovered heat.
- HMI operating mode and trouble-shooting management icon, easy to operate and convenient.
- Set a target temperature or flow by automatic control recovery system to optimize operational process, and reduce manpower control requirements.
- Duct pressure-different alarm system of heat recovery unit, easy for operator to clean and maintain, ensure the smooth nature of exhaust. (Optional)
- Fire alarm and auto moisture damping setup system.



Exhaust purifying device

Utilize two stage method of heat absorption and exothermal to recover exhaust heat, the separate design can ensure the exhaust and fresh air are in different channels. The heat can be recovered into hot air or hot water type. Meanwhile, the exhaust can be cooled and deoiled at the front section, then release to the atmosphere after purified at the late stage by water scrubber or electrostatic precipitator.

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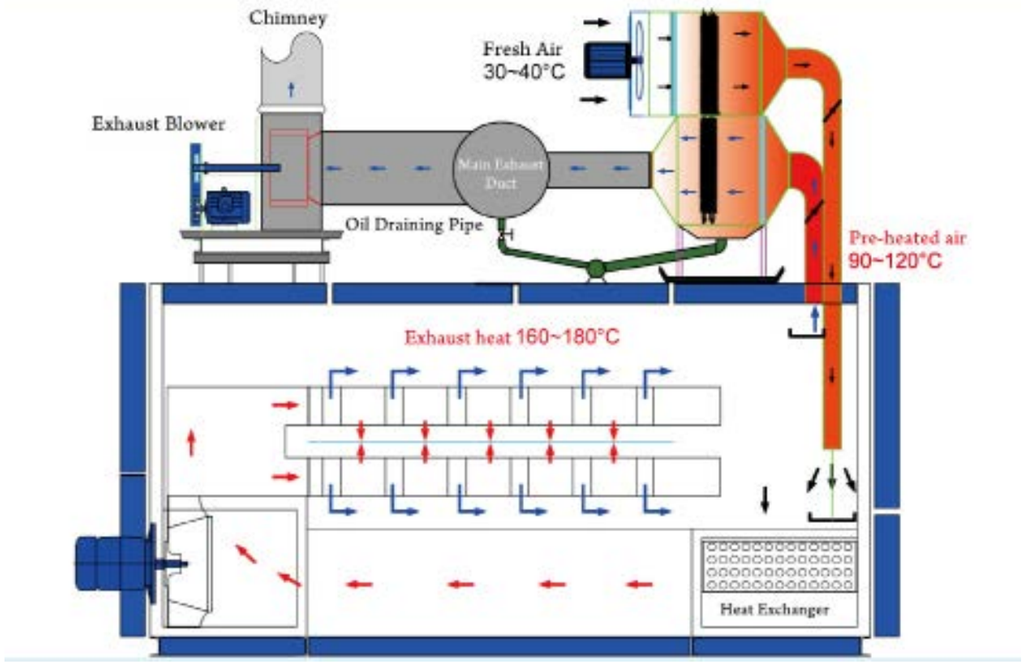
RHW combined air and water heat recovery system

RHA-30 air to air dispersed heat recovery system

- Installation location: at the exhaust branch ducts of stenter or dryer.
- Exhaust flow: suitable for 20~30 CMM.
- Suitable temperature: 100-230℃
- Suitable model: for various type of stenter or dryer.
- Heat type: hot air, recovery temperature is 90~120°C
- Recovery efficiency: 18~25%



Features of RHA-30

- ■Very close to the exhaust outlet of drying oven, can recover the maximum heat.
- ■The path of air refilling is short, minimum fan power requirement.
- ■The heat recovery unit is small and no space limit, installed on the top of the stenter at 1.5M height.
- ■Can be disassembled for each single unit, easy for disassembly and maintenance.
- ■Oil-dirt collecting pipes effectively eliminate the exhausting oil-dirt.

Calculation of heat recovery system

Parameters of pre-heated air	Condition 1	Condition 2	Condition 3
Fresh air flow volume (Q, CMM)	120.0	120.0	120.0
Temperature of inlet air (T1, ℃)	35.0	35.0	35.0
Temperature of pre-heated air (T2, ℃)	95.0	100.0	105.0
Heat specific capacity of air (KJ / (Kg*℃)) ,Cp	1.009	1.009	1.009
Air density (Kg / M^3) , ρ air	0.946	0.946	0.946
Unit conversion (Kcal / KJ)	0.239	0.239	0.239
Heat of heat recovery (Kcal / hr)	98,552	106,764	114,977
Profit of heavy oil	-	-	-
Enthalpy of heavy oil (Kcal / L)	9,200	9,200	9,200
Efficiency of heavy oil boiler (%)	85	85	85
CO_2 emission of heavy oil (Kg / L)	2.95	2.95	2.95
Heavy oil saving amount (L / day)	302	328	353
CO_2 reduction amount, (Ton / year)	300	325	350
Profit of coal	-	-	-
Enthalpy of coal (Kcal / Kg)	5,500	5,500	5,500
Efficiency of coal boiler (%)	70	70	70
CO_2 emission from coal (Kg / Kg)	2.51	2.51	2.51
Coal saving amount (Kg / day)	614	666	717
CO_2 reduction amount, (Ton / year)	518	561	604
Profit of natural gas	-	-	-
Enthalpy of NG (Kcal / M^3)	8,800	8,800	8,800
Efficiency of NG boiler (%)	85	85	85
CO_2 emission from NG (Kg / M^3)	2.09	2.09	2.09
NG saving amount (M^3 / day)	316	343	369
CO_2 reduction amount, (Ton / year)	222	241	259

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