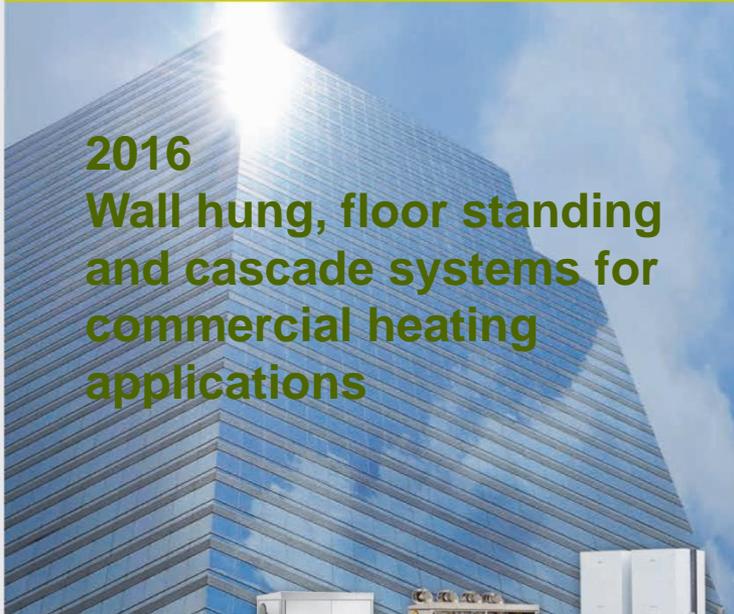


POWER PLUS POWER PLUS BOX

High power heating solutions Stand alone, cascade and in-box applications for commercial heating solutions

Power Plus Power Plus Box

Stand alone, cascade and in-box applications
for commercial heating solutions



**2016
Wall hung, floor standing
and cascade systems for
commercial heating
applications**



Power Plus: heat exchangers



• **Power Plus (50 kW) → 500 Series → 15 kW ÷ 3 MW**

• **Power Plus Box (128 kW) → 1000 Series → 23 kW ÷ 6,9 MW**

The embedded MASTER PCB allow the management up to 60 SLAVE's PCB and also 3 different ZONE TEMPERATURES at the secondary

-A) 1 x High Temperature Zone (Radiators)

-B) 1 x Low Temperature Zone (Underfloor heating → 3 way mixing valve)

-C) 1 x DHW preparation with remote tanks

□ 500 SERIES: POWER PLUS (P.P. BOX)

- a. WALL HUNG (Frame Linear or Back to Back)
- b. FLOOR STANDING (Zync coated steel BOX)

□ 1000 SERIES :POWER PLUS 1000 BOX

- a. FLOOR STANDING (STD, INOX)



WALL HUNG

POWER PLUS 50
POWER PLUS 100



SMART FRAME

POWER PLUS 50
POWER PLUS 100



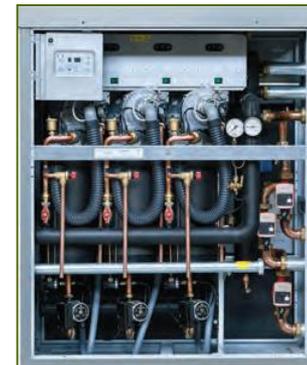
FLOOR STANDING INDOOR

POWER PLUS BOX 150-200
POWER PLUS BOX 100 SE



FLOOR STANDING+ HEADER+ SAFETY D.

POWER PLUS LE 85 SYS
POWER PLUS LE HI 115 SYS

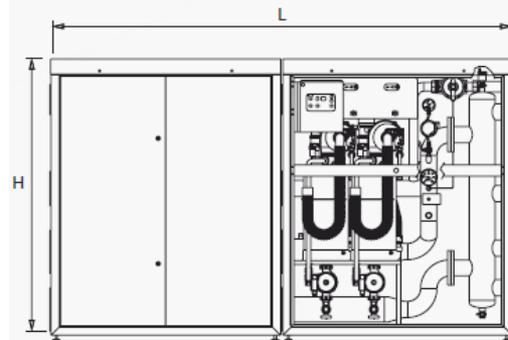


Beretta Power Plus BOX cascade example of cascade installation of 600 kW



Power Plus Box 250 M P EXT

Power Plus Box 300 M P EXT





FLOOR STANDING OUTDOOR

P. PLUS BOX 1002 – 230 kW
P. PLUS BOX 1003 – 345 kW
P. PLUS BOX 1004 – 460 kW



FLOOR STANDING INDOOR

P. PLUS BOX 1002 – 230 kW
P. PLUS BOX 1003 – 345 kW
P. PLUS BOX 1004 – 460 kW



FLOOR STANDING+ HEADER+ SAFETY Devices

P. PLUS BOX 1001 – 128 kW
P. PLUS BOX 1001 – 128 kW



**FOCUS: condensing technology according
to BERETTA POWER PLUS**

Why a condensing gas boiler?

Fuel saving

A natural gas floor standing boiler dating back to the '80s has got a thermal efficiency significantly lower than the current condensing technologies.

The difference is even more pronounced if the boiler body is made of cast iron and /or the fuel is diesel / kerosene.

We can surely estimate a saving in a range from 15 to 30%

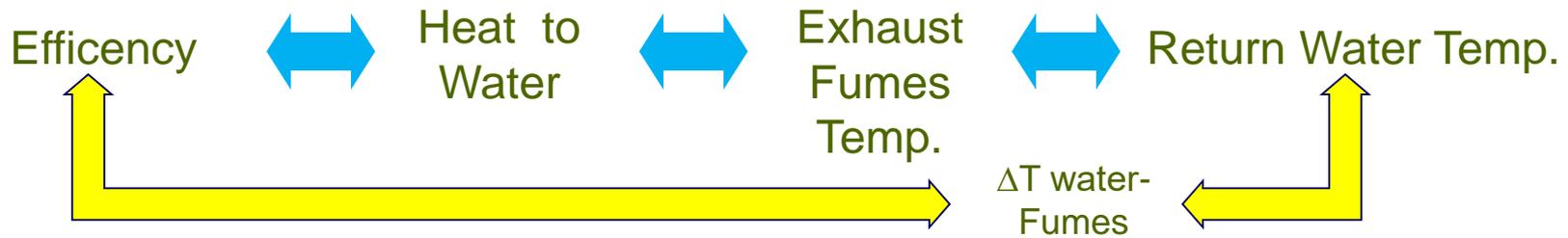
Through other devices like for instance the use of heat meters and/or thermostatic valves it is possible to achieve savings up to 50%.

NOT ALL CONDENSING GAS BOILERS ARE THE SAME AND SOME LIKE BERETTA POWER PLUS WORK BETTER IN CONDENSING CONDITIONS AND THEREFORE WITH HIGH EFFICIENCY ! UP TO → 60%

T° exhaust flue

The Exhaust fumes temperature depends on the thermal features of the heat exchange created by the return temperature of the water cools the exhaust fumes which rise their own temperature (“working effect” of the boiler).

The lower the difference between return water and fumes temperature, the greater will be the efficiency of the boiler.



This parameter depends on the water-fumes exchanger. Generally speaking the lower this value, the better will be the condensing performances, even with not-so-low return temperatures.

RE-DEFYNING THE CONDENSING BOILER !!!

Condensing—Boiler: BOILER BUILT TO WORK IN CONDENSING MODE (condensing the steam water that would be normally discard with the fumes) – The re-use of this heat fraction, allows better performance (> 100% because the performance is calculated on PCI).

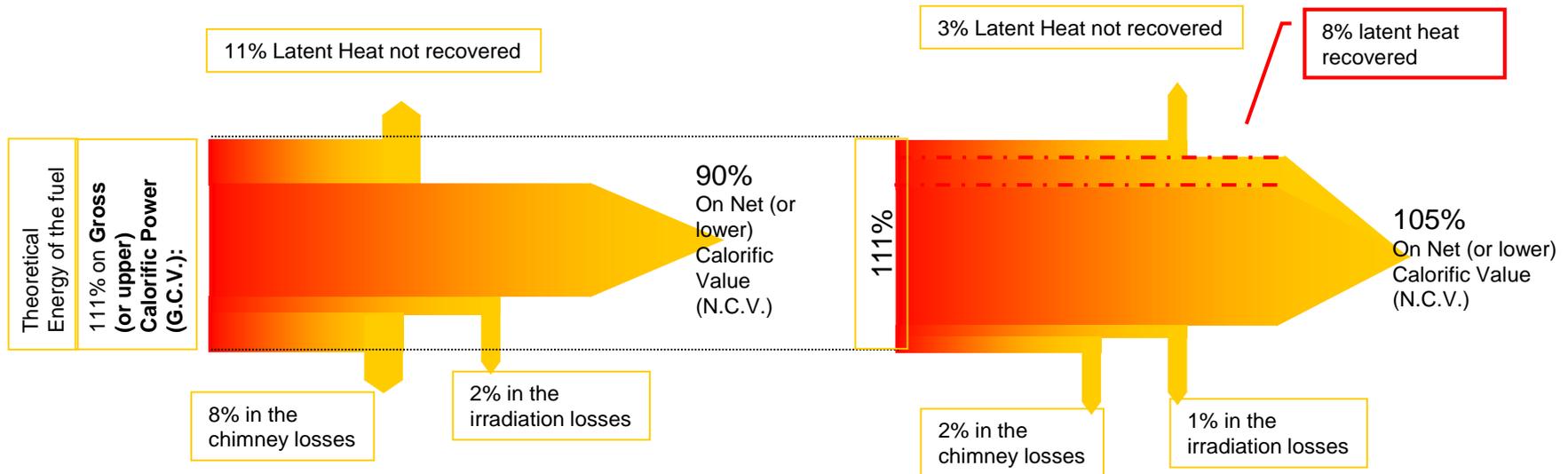
COMBUSTION GROUP

The standards on the calculation of the efficiency do not take into account the latent heat of evaporation.

The calculation is usually referred to the Lower Heating Value (LHV), this factor takes into account only the sensible heat.

STANDARD EFFICIENCY BOILER

CONDENSING GAS BOILER



By executing the calculation of the efficiency of a condensation (which draws energy from both the sensible heat that the latent heat) compared to the Gross Calorific Power, the efficiency is higher than 100%.

Theoretically the same calculation could be done according to the Gross Calorific Power which takes into account both the sensible heat of both the latent heat.

In this case also the performance of a condensation would result (as it is correct!) less than 100%.

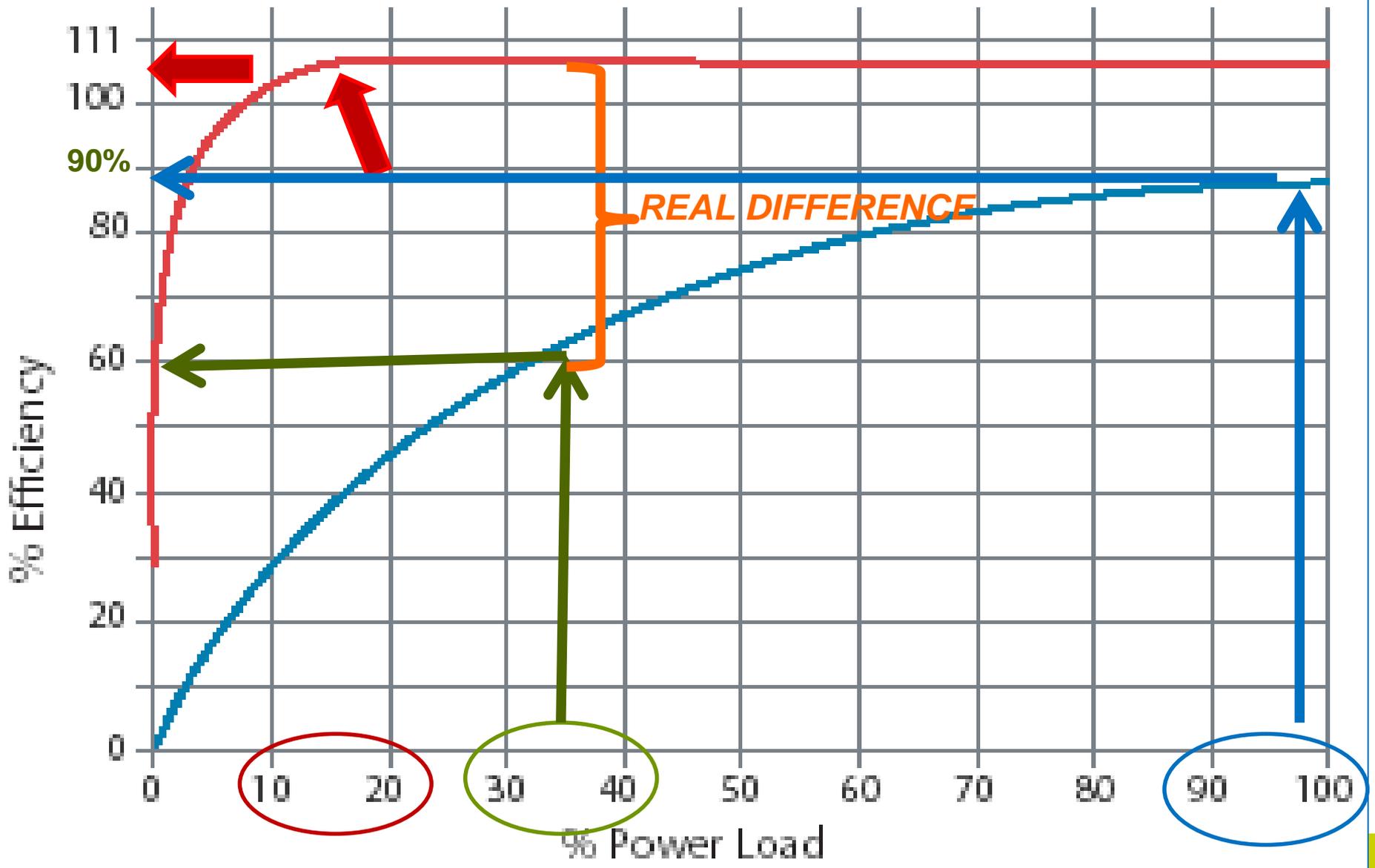
OPERATING CHARACTERISTICS: "MODULATING AND MODULAR SYSTEM."

In a centralized system, the power of the boiler is determined on the basis of the maximum thermal load, that is to say on the heat demand in the coldest days of the year. Therefore the boiler is often oversized for the majority of the operating days.

It is easily understandable how these operating conditions may adversely affect the average seasonal efficiency.

From this operative philosophy it has been developed the family of the Power Plus thermal groups, which combines the possibility of flame modulation of each individual thermal element with modular installations in cascade of multiple elements, that can split the power used depending on the actual demands of the plant.

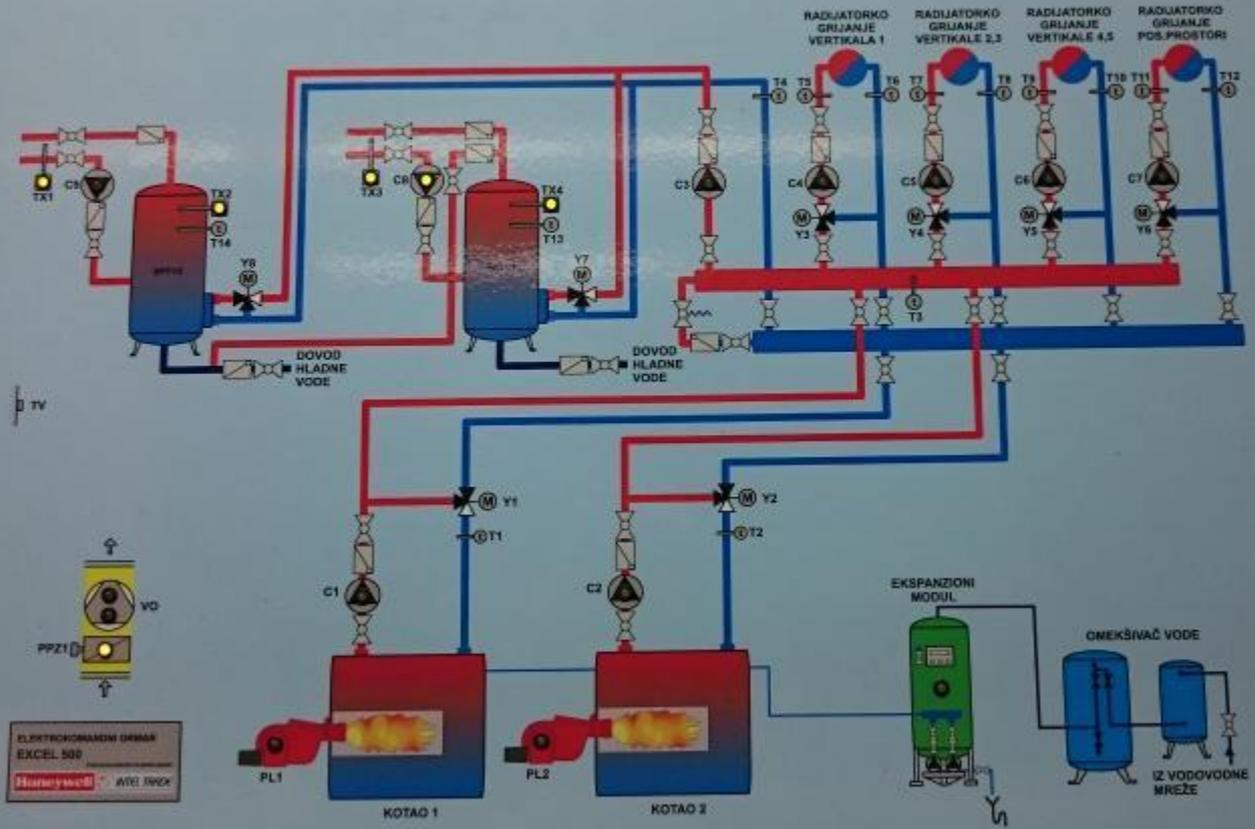
- Beretta condensing boiler
- Traditional boiler



TYPICAL PLANT ROOM WITH STANDARD EFFICIENCY HOT WATER HEAT GENERATORS



HEMA AUTOMATSKE REGULACIJE KOTLOVNICE



NEED OF TWO HEAT GENERATORS TO ASSURE THE REDUNDANCY

 **Beretta**
Il clima di casa.

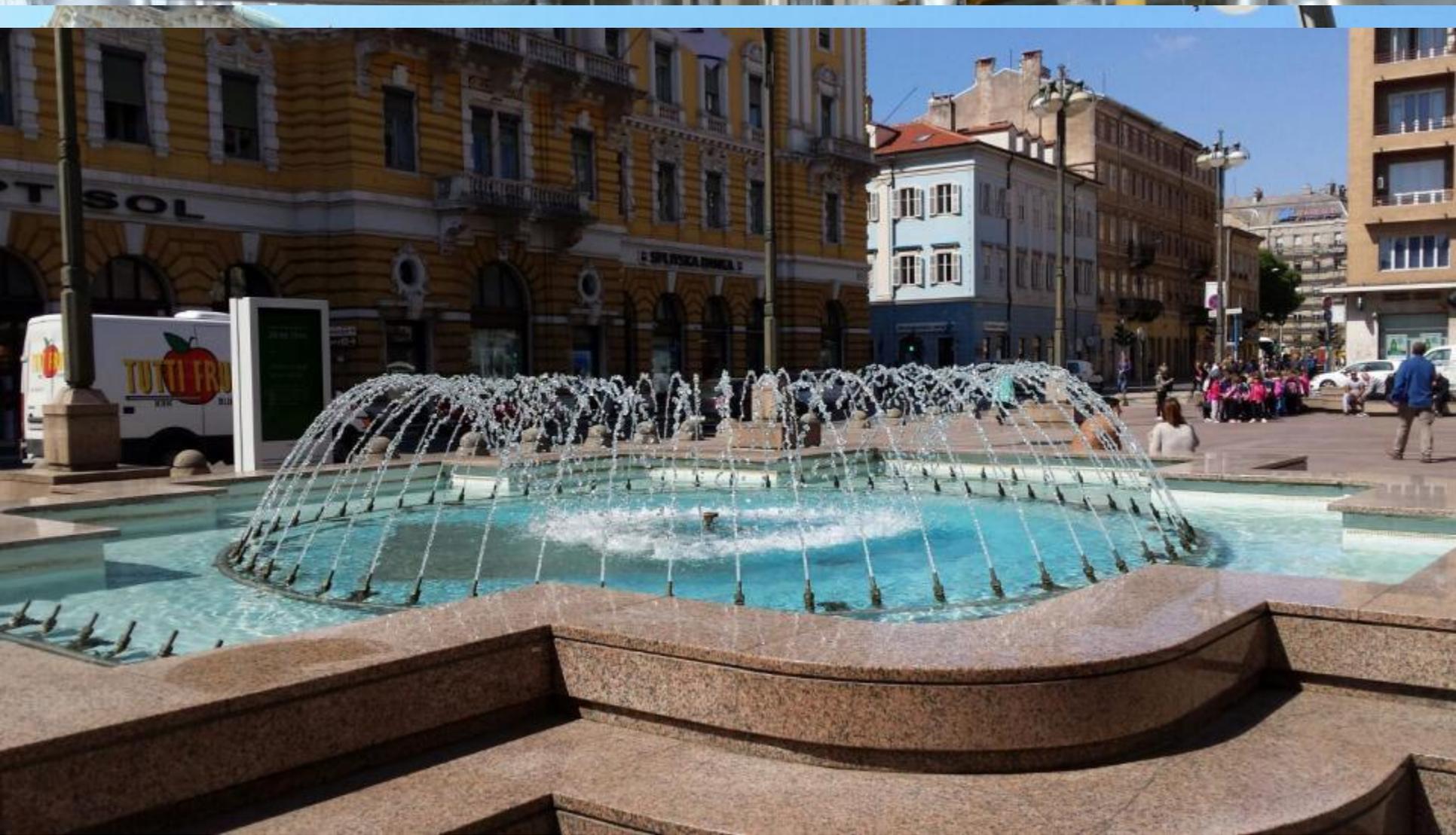


JADROLINIJA PALACE RIJEKA

 **Beretta**
Il clima di casa.



OLD PLANT ROOM BOILER ROOM IN THE BASEMENT



NEW BOILER – ROOF TOP CASCADE SYSTEM POWER PLUS BOX 1012 P EXT

 **Beretta**
Il clima di casa.



1,5 MW







**FOCUS: The Heart of Beretta Power Plus
The Heat Exchanger**

- The efficiency of a condensing heat exchanger is closely related to the temperature of its flue.
- The lower is the flue temperature the higher is the energy exchanged with the hot water.
- So even if the flue T° in a condensing boiler is lower than the Dew Point, it is important to define how much ...→ it depends primarily on 3 parameters:
 - Surface extension;
 - Materials;
 - Flow speed;



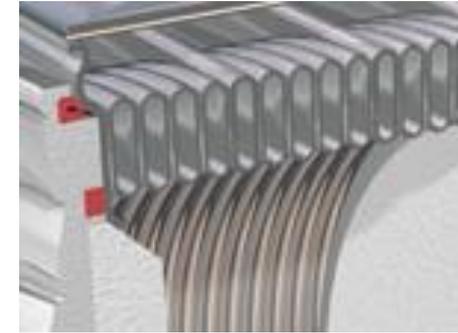
Heat Exchanger (flue gas-water)

- 1) the heat exchange surfaces;
- 2) the type of materials;
- 3) the flow speed;

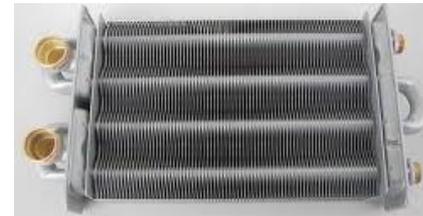
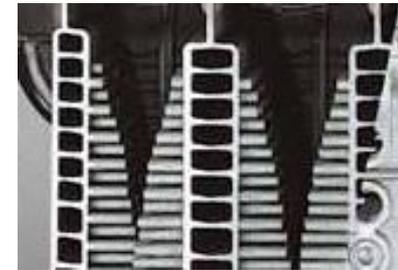
THE HEAT EXCHANGER SURFACE

TYPES OF HEAT EXCHANGERS

-Smooth pipe



-Shaped finned pipe



-Corrugated pipe



A Continuous,
Crimped
Cupro-Stainless-
Steel Heat
Exchanger Tube

The Heat Exchange surface / Heat output

-**Smooth pipe**— typical solution of the heat exchangers made 100% in stainless steel; typically low S/P (Surface / Power) ratios both for water and flue side;

-**Finned pipe**- generally made of aluminum, for instance diecast heat exchangers; the S/P ratio is generally different from the water side and the flue side, being different the surfaces;

-**Corrugated pipe**— in this way the heat exchange surface is high both on the water side and then the flue gas side; The S/P ratio is high both on the water side then the flue gas side; → we can achieve that thanks to the “cuprosteel” Fontecal/Riello Patent.

Surface ext. / kW



Type of Materials

the material of which is composed the heat exchanger has to ensure at the same time:

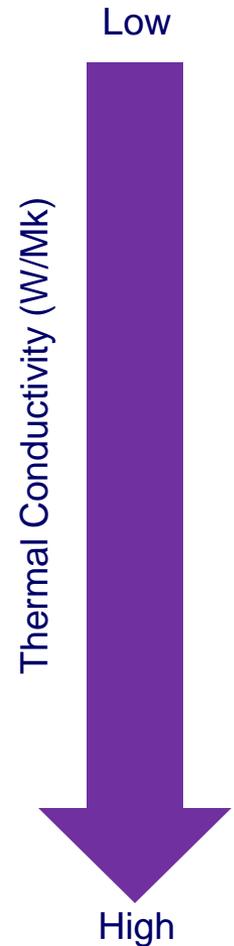
Strength, durability, conductivity

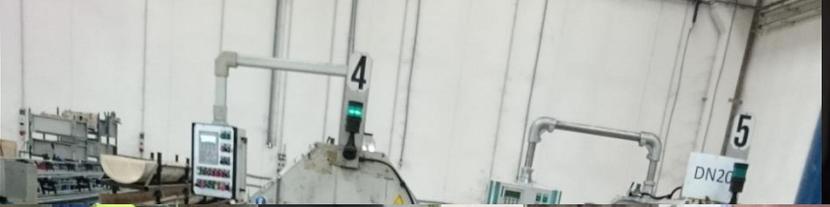
What are the materials most used on the market:

-**Stainless steel**– potentially an excellent material (depending on the type) but always with low thermal conductivity (15 W / mK);

-**Aluminium alloy**– good technical features from the thermal conductivity side (170-225 W / mK), generally used for diecast heat exchangers;

-**Cuprosteel – Copper-stainless steel** A Fontecal patent, combining the high copper thermal conductivity (386 W / mK) for the water side with the resistance of the stainless steel for the flue side.

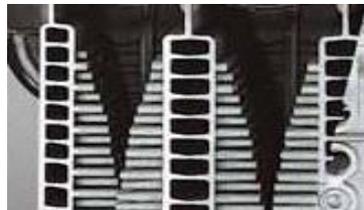




- Stainless Steel
- Aluminium Alloy
- Patented Cuprosteel

- High Temperature;
- Wet environment;
- Zones with different Temperature
- Zones in contact (next) to acid Condensates products

Interesting from this point of view is the patent Fontecal/Beretta Cuprosteel, the only one which uses copper material in the water side thanks also to its high thermal conductivity (386 W/mK) compared to that of the stainless steel (15 W/mK) and to the aluminium-silicium alloys (225 W/mK).



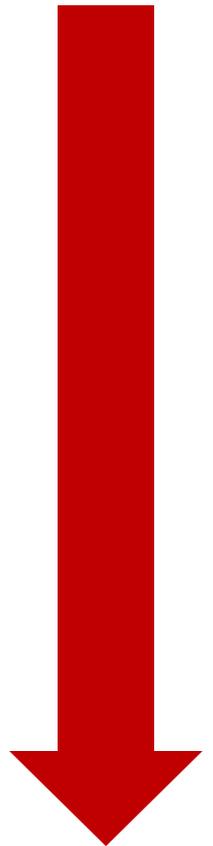
High Turbulence and circumferential velocity increase heat exchange.

-**Low sections** – they favor high-speeds with same flow rate value, but they suffer occlusions due to sludge and limescale;

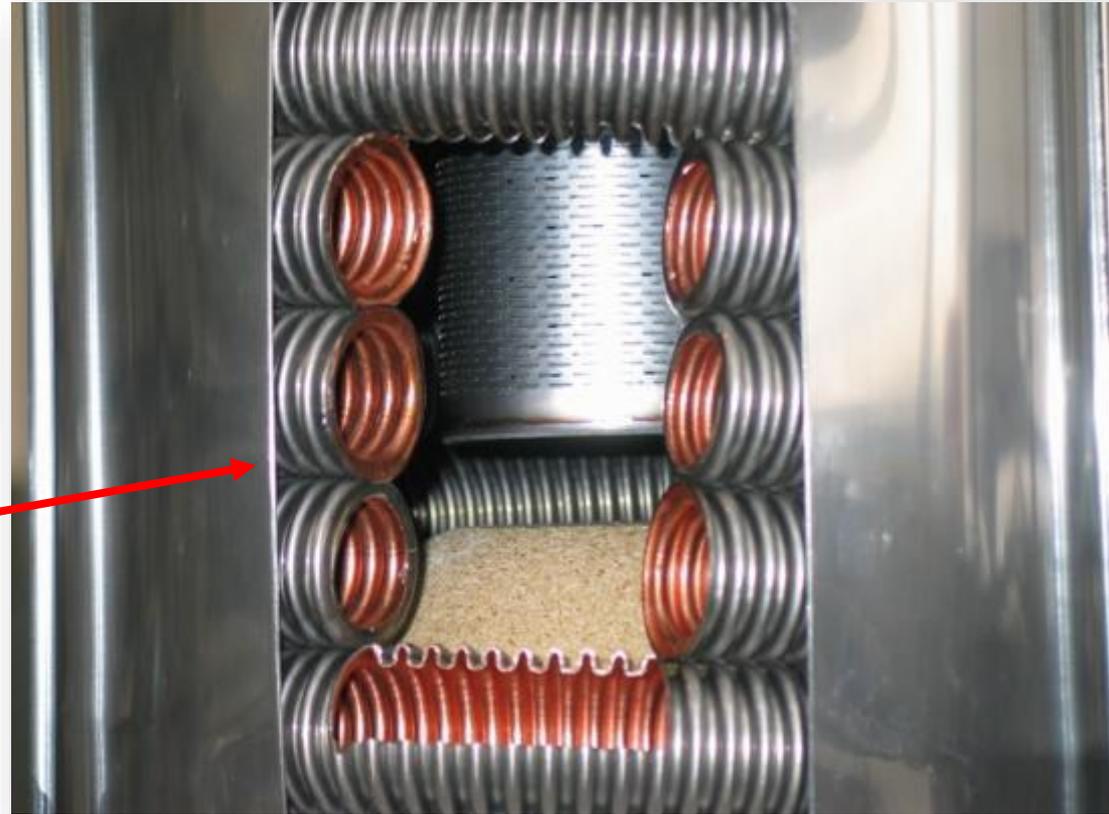
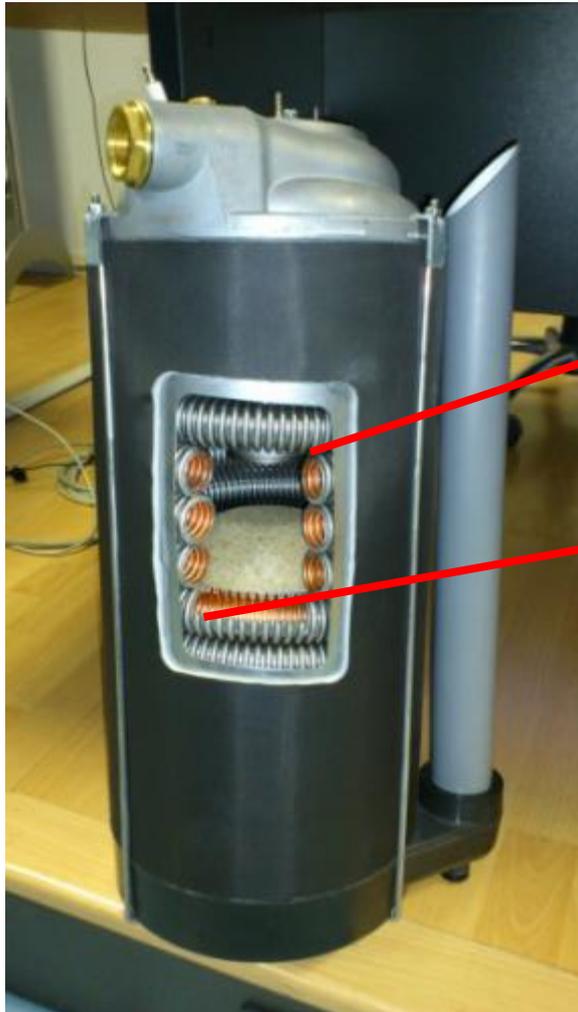
-**High section**– they tolerate sludge and limestone but worsen the heat exchange conditions for the lower speed;

-**High section-corrugated pipe** – RIELLO Patent that combines the tolerance to the sludge with the high speed in contact with the wall thanks to the turbulence in the grooves;

Low speed



High speed



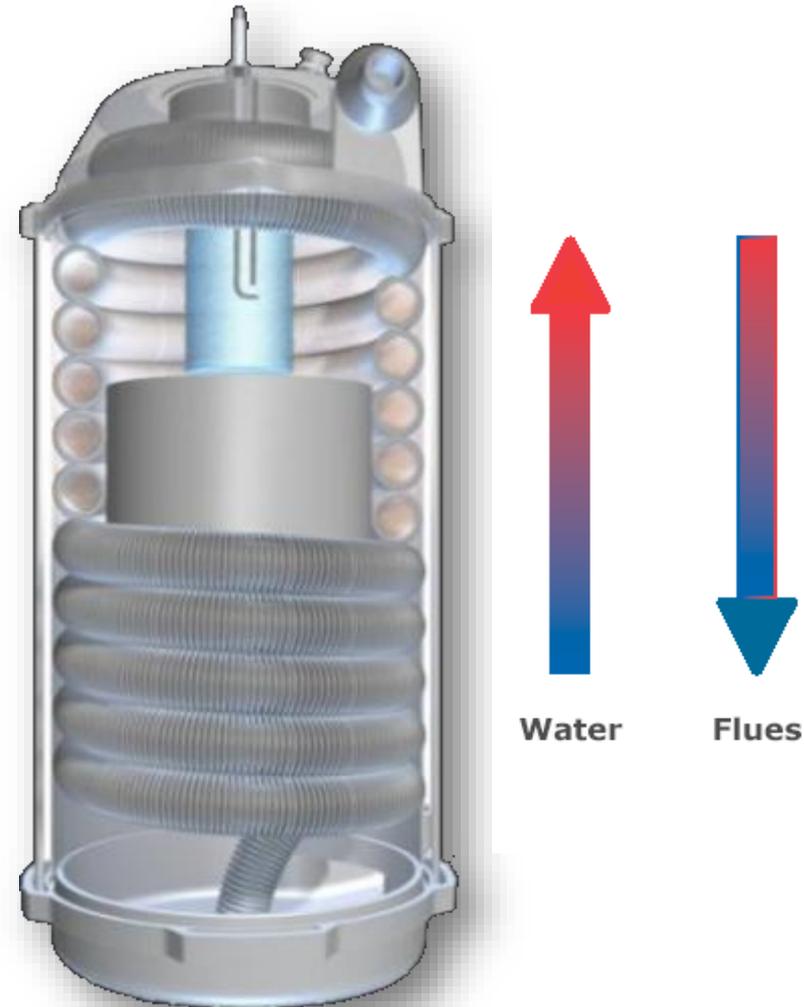
COIL EXCHANGER CORRUGATED

- It's the **HEART** of the **POWER PLUS** system
- Made of a **PATENTED** bi-metallic corrugated tube (cuprosteel), 25 mm internal diameter that surrounds the combustion chamber
- Exchange surface of 2 mq
- Only 3 °C= ΔT between flue temp and return water flow

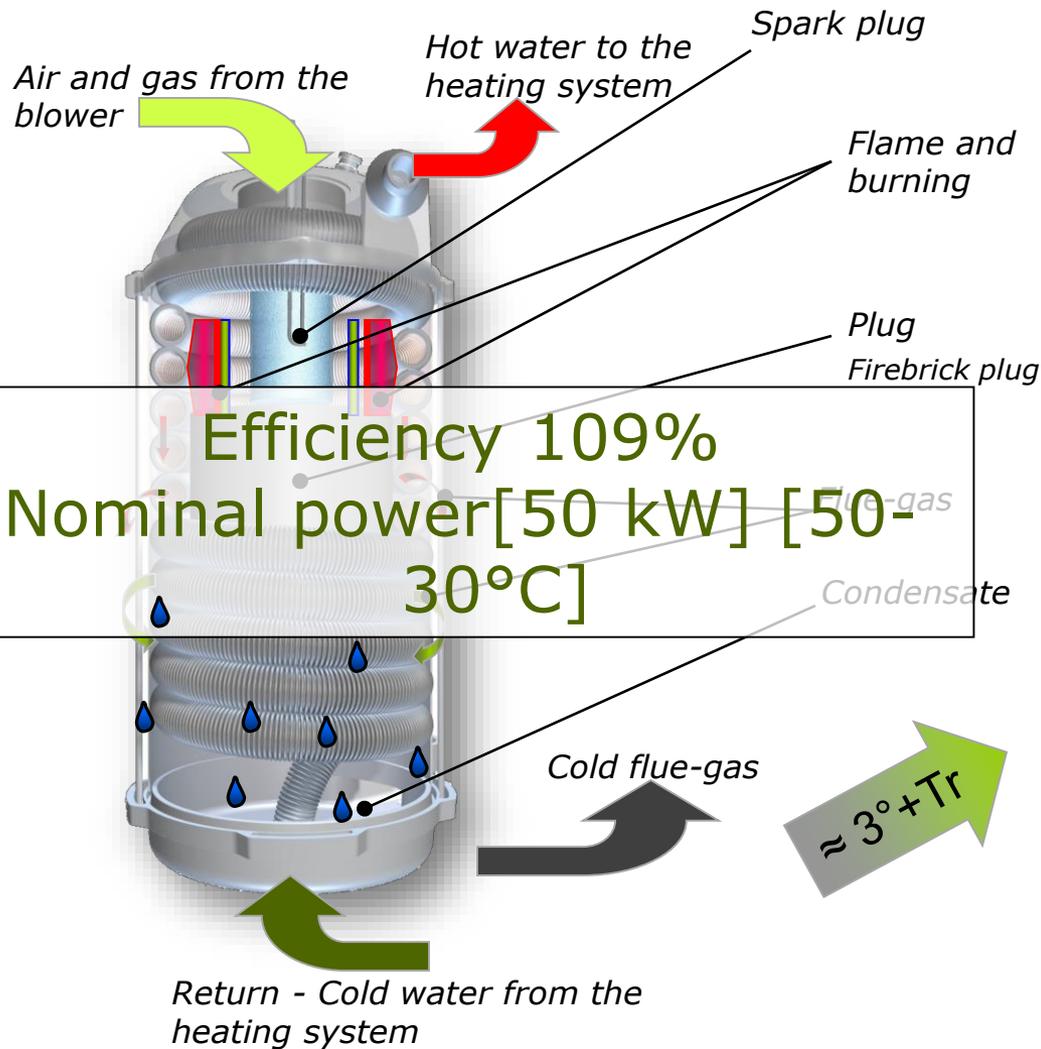
CONDENSING HEAT EXCHANGER

A heart of steel and copper

The heart of Beretta condensing boilers is constituted by the Power Plus heat exchanger. The functioning principle is easy: the water to be heated (the return water from the heating plant) flows inside the bimetallic corrugated pipe (copper inside, stainless steel outside) spiral wrapped from the bottom upwards inside a stainless steel plating; from the top, the micro-flame burner generates heat and flues to lick the corrugated pipe external surface, in the opposite direction to the water. The water comes out of the exchanger, heated by the flues, and the flues will come out cooled by the water; the condense is collected in the lower part. The whole process is controlled by sophisticated electronics which guarantee the control of the comburent air (modulating fan), fuel gas (modulating gas valve) and the water capacity (modulating pump).



Heat exchanger Working Principle



Efficiency 109%
Nominal power [50 kW] [50-30°C]

Pipe Exchanger



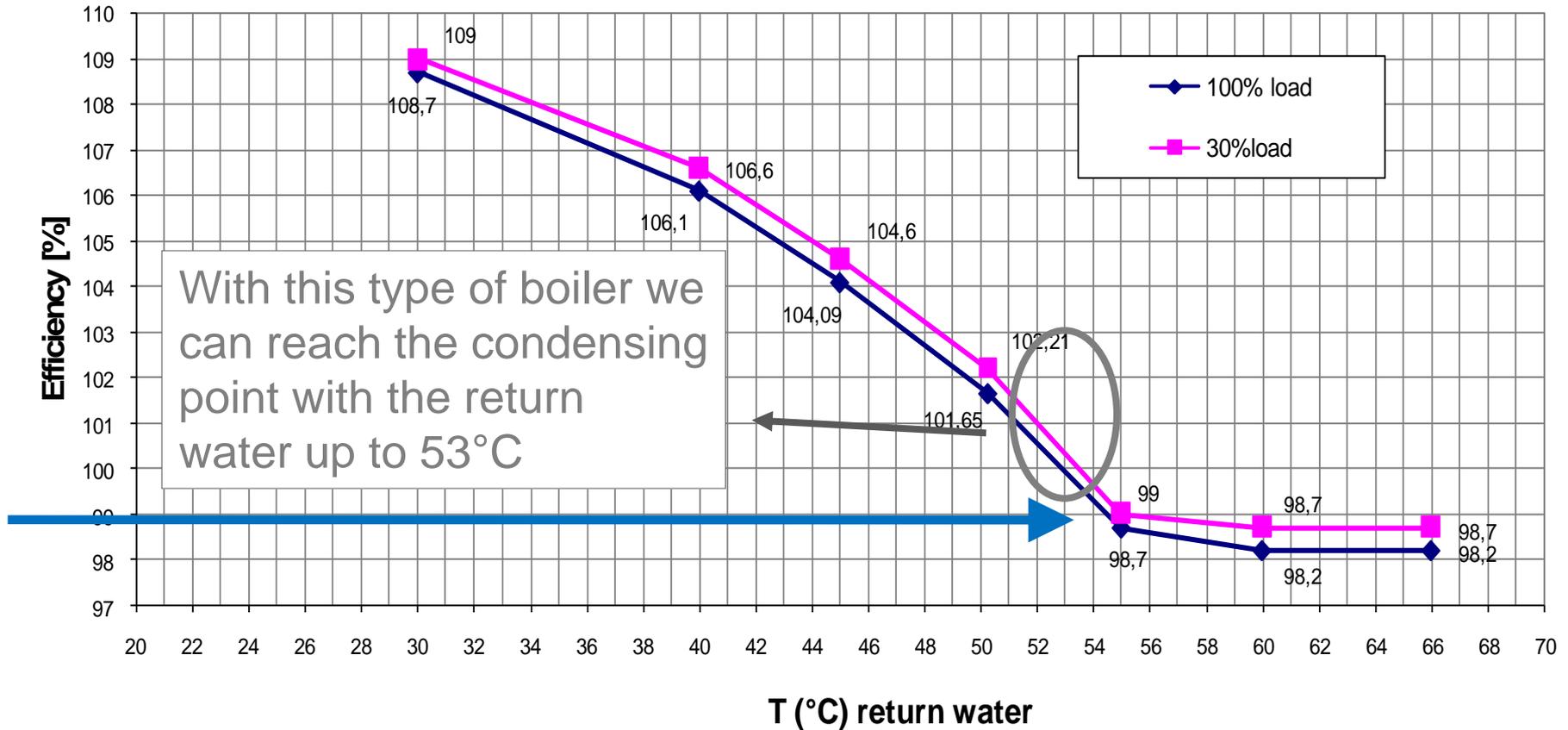
Sensible and Latent heat

Efficiency above 109%
at full load [50 kW] [50-30°C]

Power Plus Load & efficiency

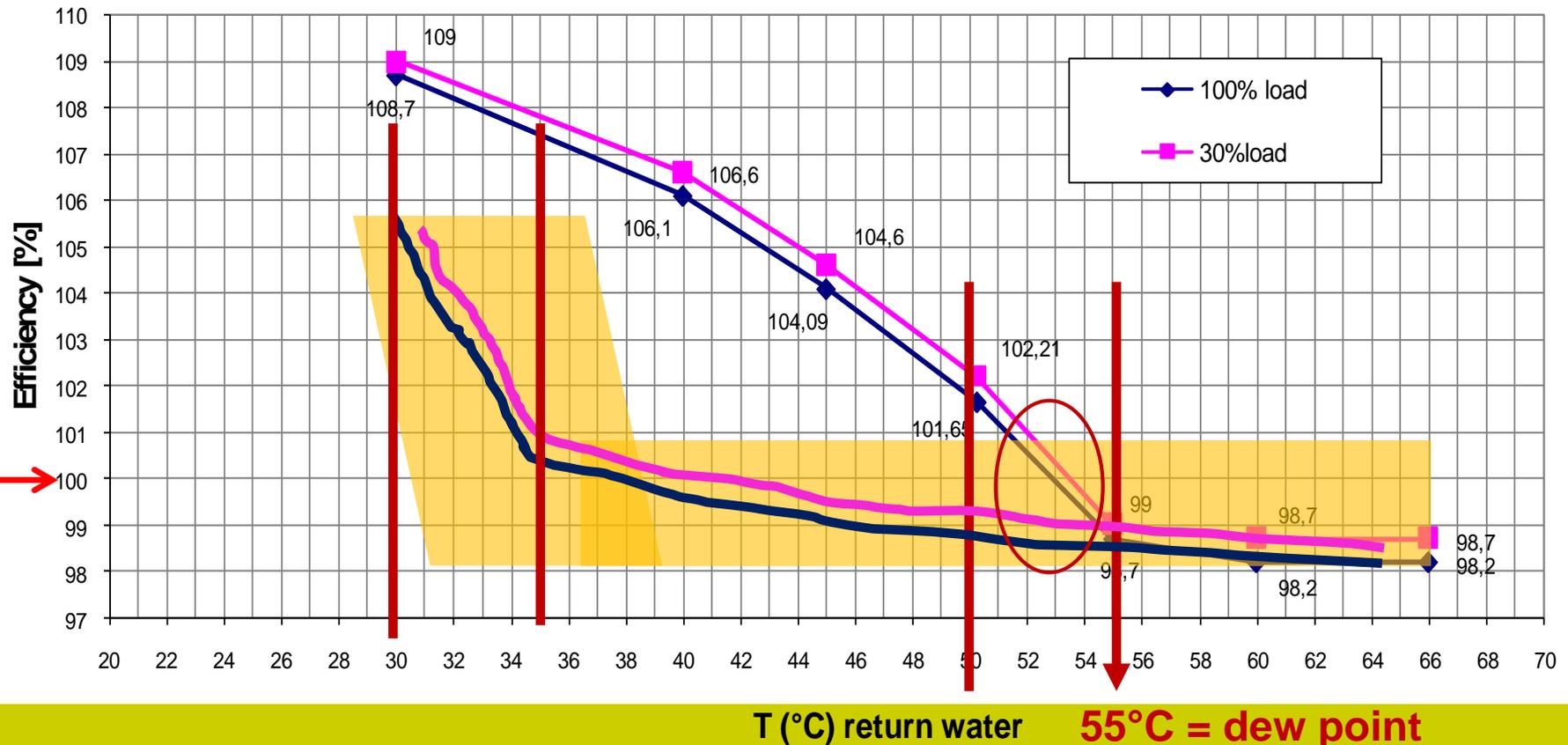
The efficiency of the heat exchanger

Efficiency vs. Water return temp [50kW]

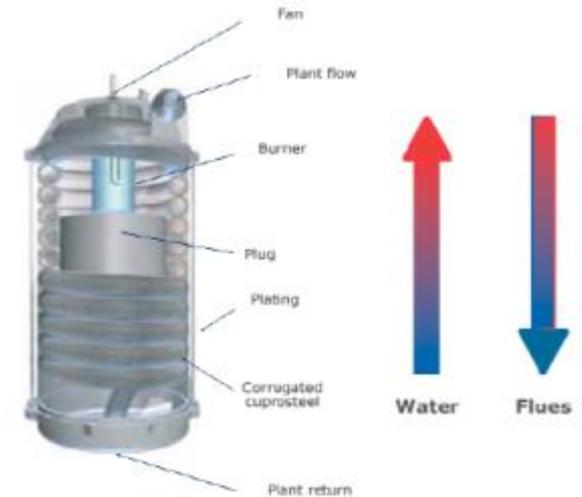
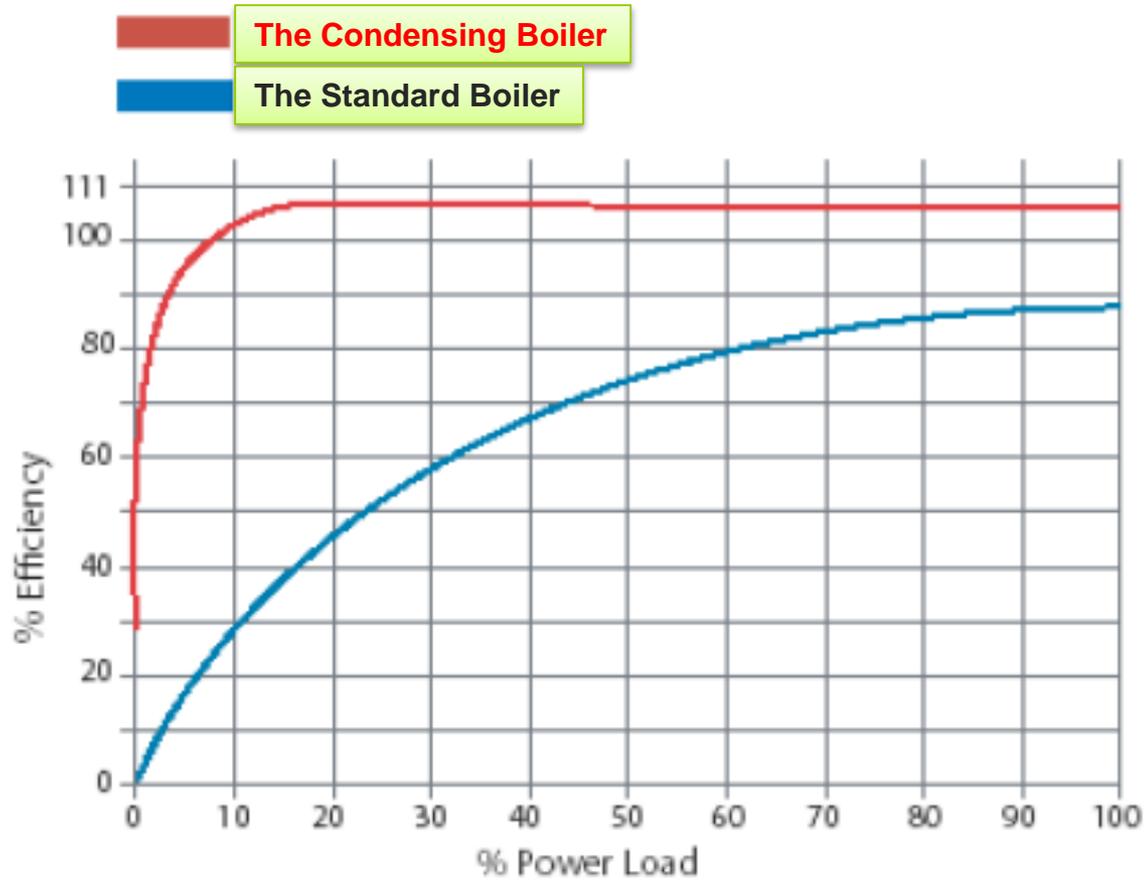


EFFICIENCY VS. WATER RETURN TEMP [50KW]

This curve shows the performance efficiency of the Power Plus heat exchanger (the unit of 50 kW) when the water return temperature of the system changes. You can see how already from 50°C to 55°C the performance curve changes its slope and begins to grow attesting the high efficiency with water return temperatures compatible with radiator systems (high temperature systems 70°C/50°C). The orange area shows the zone in which are located the same curves for condensing boilers with delta T° water-fumes of 20°C

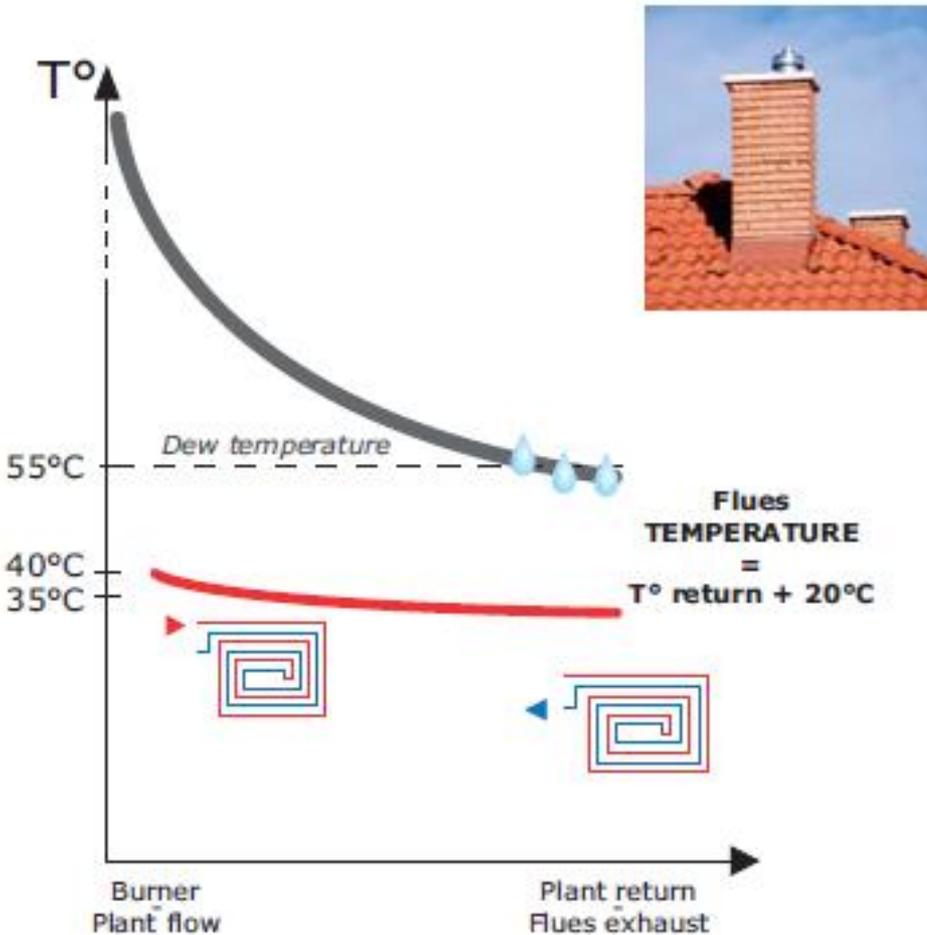
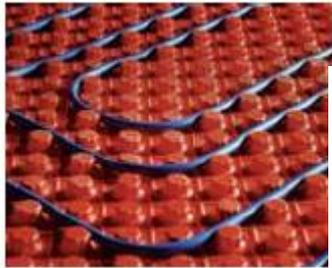


The Efficiency of the Heat Exchanger



CONDENSING HEAT EXCHANGER

UNDERFLOOR HEATING (NORMAL CONDENSING BOILER)



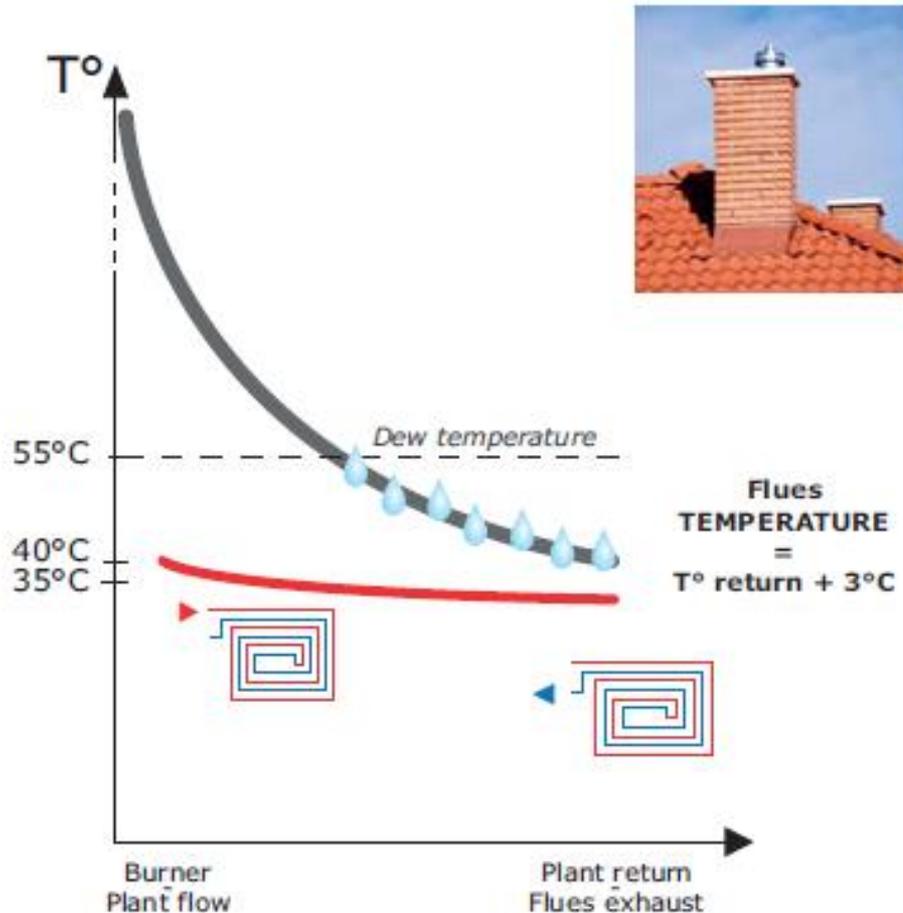
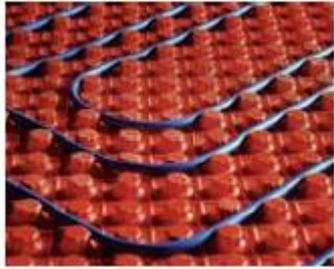
- $\Delta T = 20^\circ\text{C}$
- Dew point in case of Natural gas is 55°C
- Flow temp = 40°C
- Return temp = 35°C
- $35^\circ\text{C} + 20^\circ\text{C} = 55^\circ\text{C}$



**CONDENSING MODE
ONLY IN TRANSIENT**

CONDENSING HEAT EXCHANGER

UNDERFLOOR HEATING (POWER PLUS BOILER)



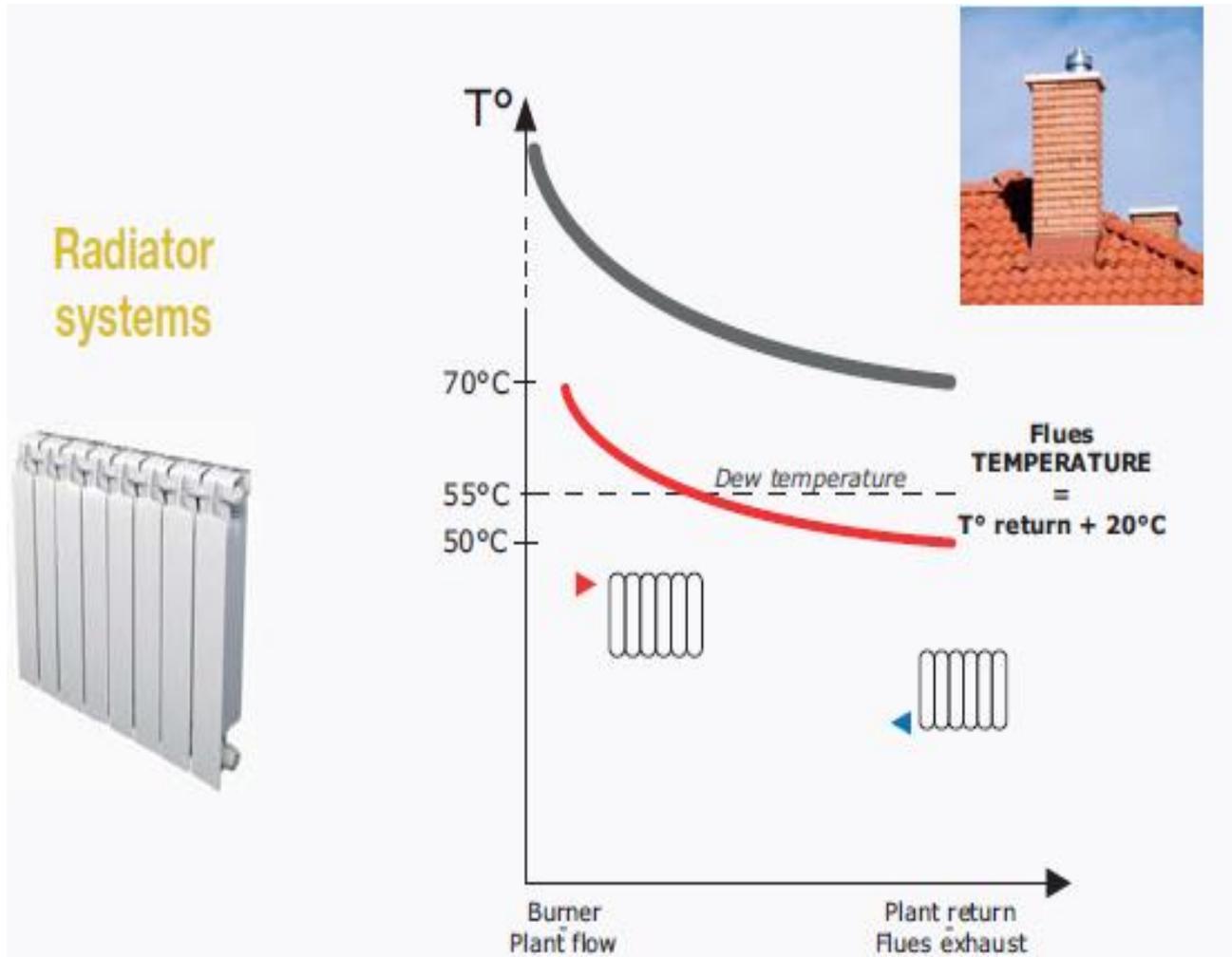
- $\Delta T = 3^{\circ}\text{C}$
- Dew point in case of Natural gas is 55°C
- Flow temp = 40°C
- Return temp = 35°C
- $35^{\circ}\text{C} + 3^{\circ}\text{C} = 38^{\circ}\text{C}$



**ALWAYS FULL
CONDENSING MODE**

CONDENSING HEAT EXCHANGER

RADIATORS HEATING (NORMAL CONDENSING BOILER)



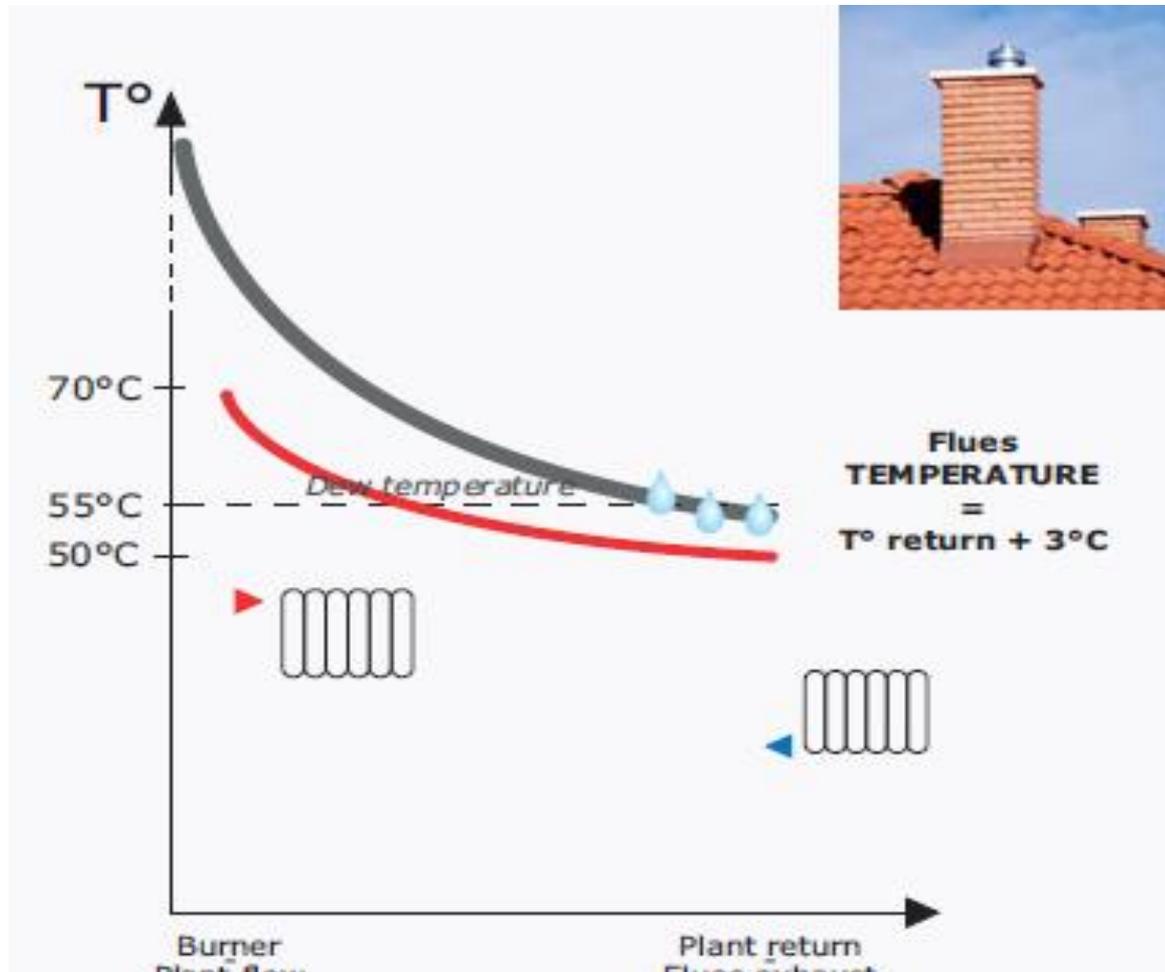
- $\Delta T = 20^\circ\text{C}$
- Dew point in case of Natural gas is 55°C
- Flow temp = 70°C
- Return temp = 50°C
- $50^\circ\text{C} + 20^\circ\text{C} = 70^\circ\text{C}$



**NEVER
CONDENSING MODE**

CONDENSING HEAT EXCHANGER

RADIATOR HEATING (POWER PLUS CONDENSING GAS BOILER)



- $\Delta T = 3^{\circ}\text{C}$
- Dew point in case of Natural gas is 55°C
- Flow temp = 70°C
- Return temp = 50°C
- $50^{\circ}\text{C} + 3^{\circ}\text{C} = 53^{\circ}\text{C}$



**PARTIAL
CONDENSING MODE!!
CAN CONDENSATE
EVEN WITH
RADIATORS!! HIGH
TEMPERATURE
CIRCUITS**

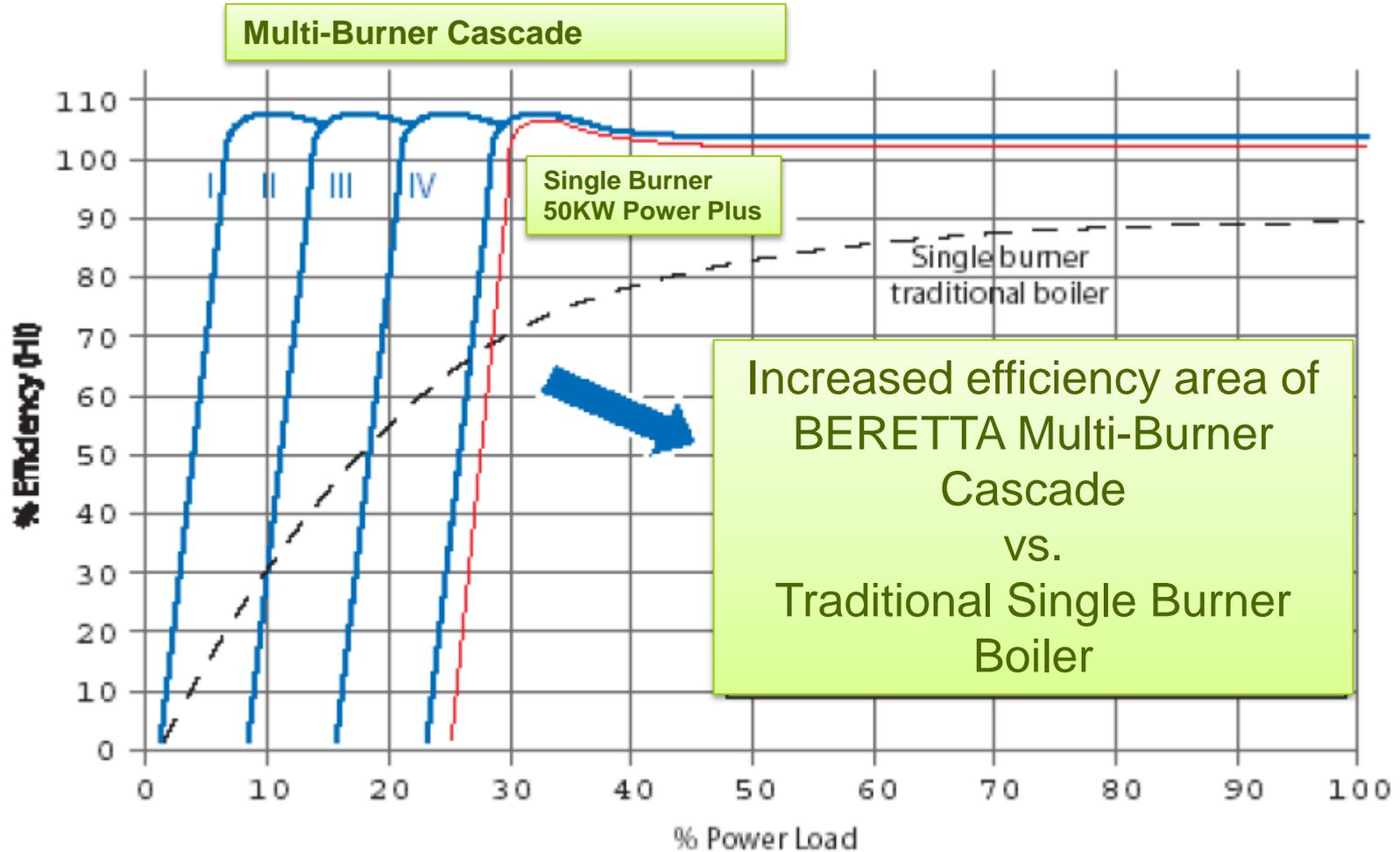
**Flues temperature of only 3°C higher than the
water of the return plant means cold flues to
guarantee efficiency and concrete savings;**

■ Modulation

- The modulation ratio is a boiler's ability to reduce its maximum output to its minimum output. As a general rule, for a boiler to be classed as having a 'good' modulation ratio its minimum output should be **one fifth or one sixth of its maximum output**.
- A boiler with a high maximum output and a good modulation ratio, however, will be able to modulate down to an extremely low output, reducing wear and tear on primary components (fewer on/off cycles **increase component longevity**) and **optimising fuel efficiency**.
- Modulation across a cascade of burners can, depending on the control process, result in significant full range efficiencies.

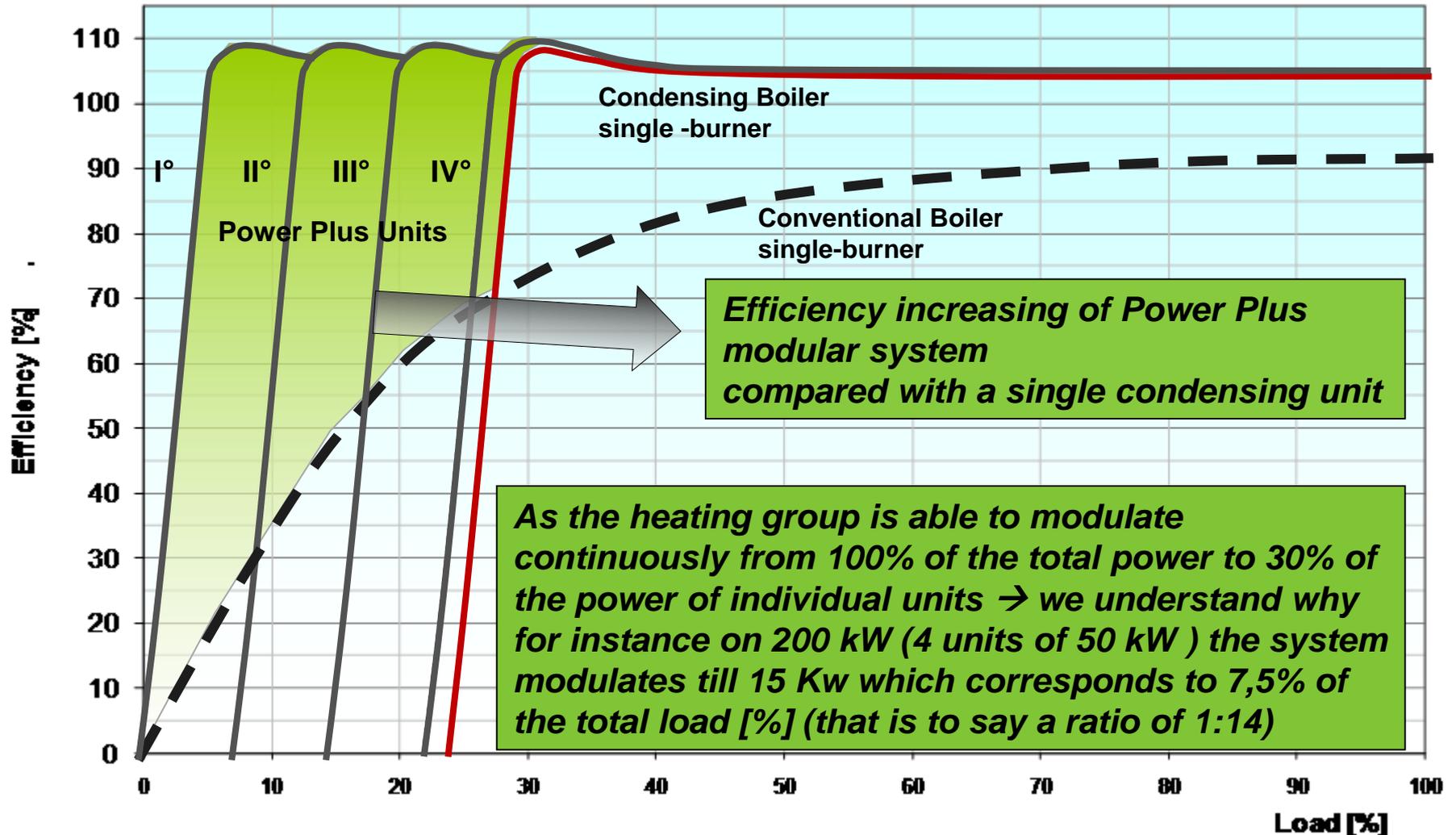
Only provide the power required – saving fuel and component wear

The efficiency of the heat exchanger



Respect to traditional boilers, the high efficiency of a single burner is maintained, also with a partial load (red curve vs. broken curve).

The Power Plus heating groups allow to extend the maximum efficiency zone.



example of 200 kW obtained with 4 units of 50 kW

- **What constitutes an efficient cascade system?**

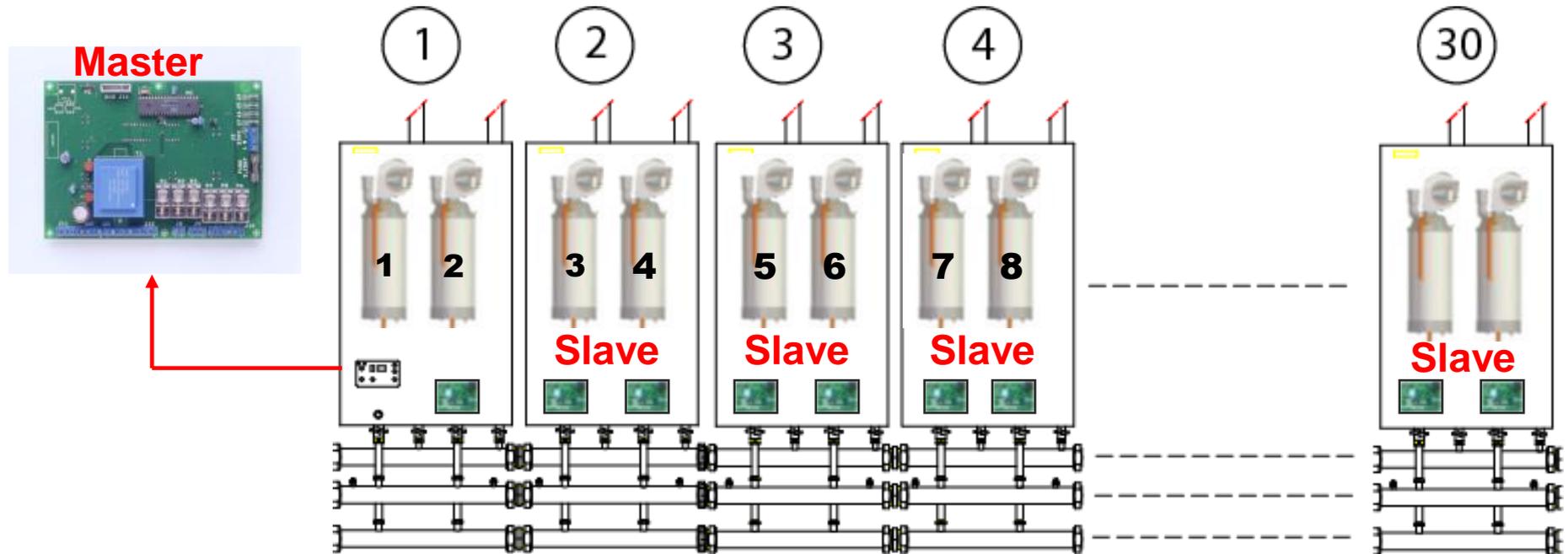
The efficiency of the heat exchangers

How the heat exchangers are controlled

FEATURES AND BENEFITS OF A MULTI-BURNER CASCADE

HOW THE HEAT EXCHANGERS ARE CONTROLLED – An economy of scale

The control system manages both the simple insertion in cascade and the power modulation on the heating elements in order to divide the power output on as many exchangers as possible, then on a larger exchange surface, improving the condensing capacity of the generator.



Controls + Heat Exchanger can lead to high efficiency across all outputs, including the mid-values.

MODULATION OF ALL THE HEAT EXCHANGERS IN ORDER TO USE ALL THE AVAILABLE HEAT EXCHANGE SURFACE → INCREASE OF THE EFFICIENCY → $DT\ 3^{\circ}C$

FEATURES AND BENEFITS OF A MULTI-BURNER CASCADE

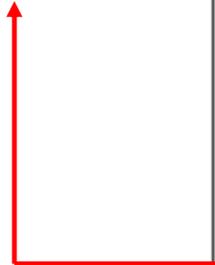
INTELLIGENT CONTROL OFFERS HUGE EFFICIENCIES – Through smart modulation

The regulation system controls the units in the following way:

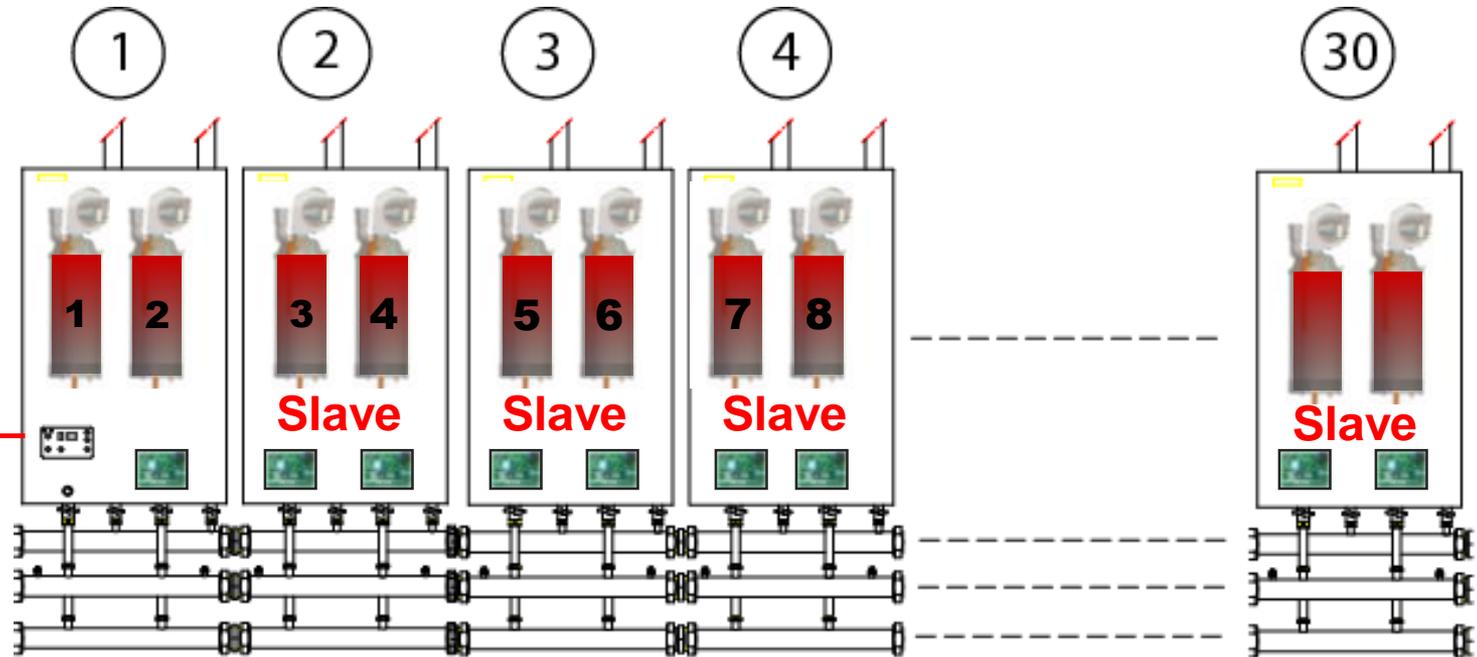
The first unit starts working at the 70% of its power output; 30 seconds later, the second unit starts working and in succession all the other burners. All heating elements modulate at their maximum power in order to bring the temperature to the set point.



Master



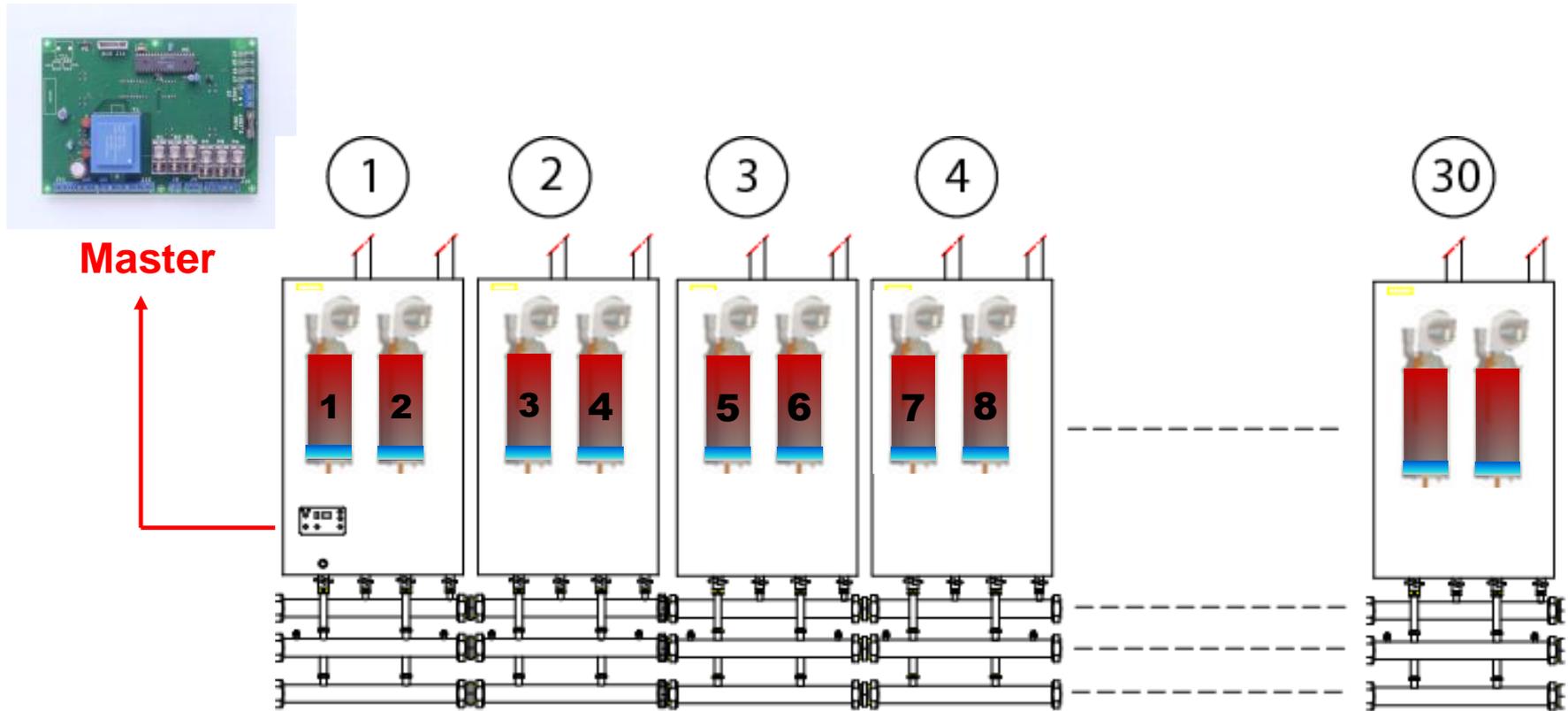
An Economy of Scale



The Master can manage up to 60 slave or burners

FEATURES AND BENEFITS OF A MULTI-BURNER CASCADE

Once the set point is reached the control system modulates the burners to the minimum till the last unit turns off. Every 24 hours of the burner working time, there will be a cyclic inversion so as to equally distribute the workload among the heating elements



Conclusions and key elements

- High heat exchange surface (corrugated tube)
- heat transfer (patented copper-stainless steel tube)
- Low fumes T° (only 1.5 ° C ÷ 5 ° C above the water return T°)
- ability to condensate also with water return temperature till 50 °C !
- ability to work with high delta T ° between water flow and water return
- High water passage section (no obstructions)
- Modulation, modularity and also embedded electronic with rich possibility of secondary hydraulic circuits control

*Power Plus Floor standing
configuration (BOX)*
UNIT of 128 kW

New patented heat exchanger 1000 Series



Technical features:

- Total stainless steel body;
- Double hydraulic circuit : smooth/corugated pipe;
- Improvement due to new pipe section;
- Low hydraulic losses;
- Low pressure drop flue side;
- Residual fan head: 600 Pa (Homologation H1);

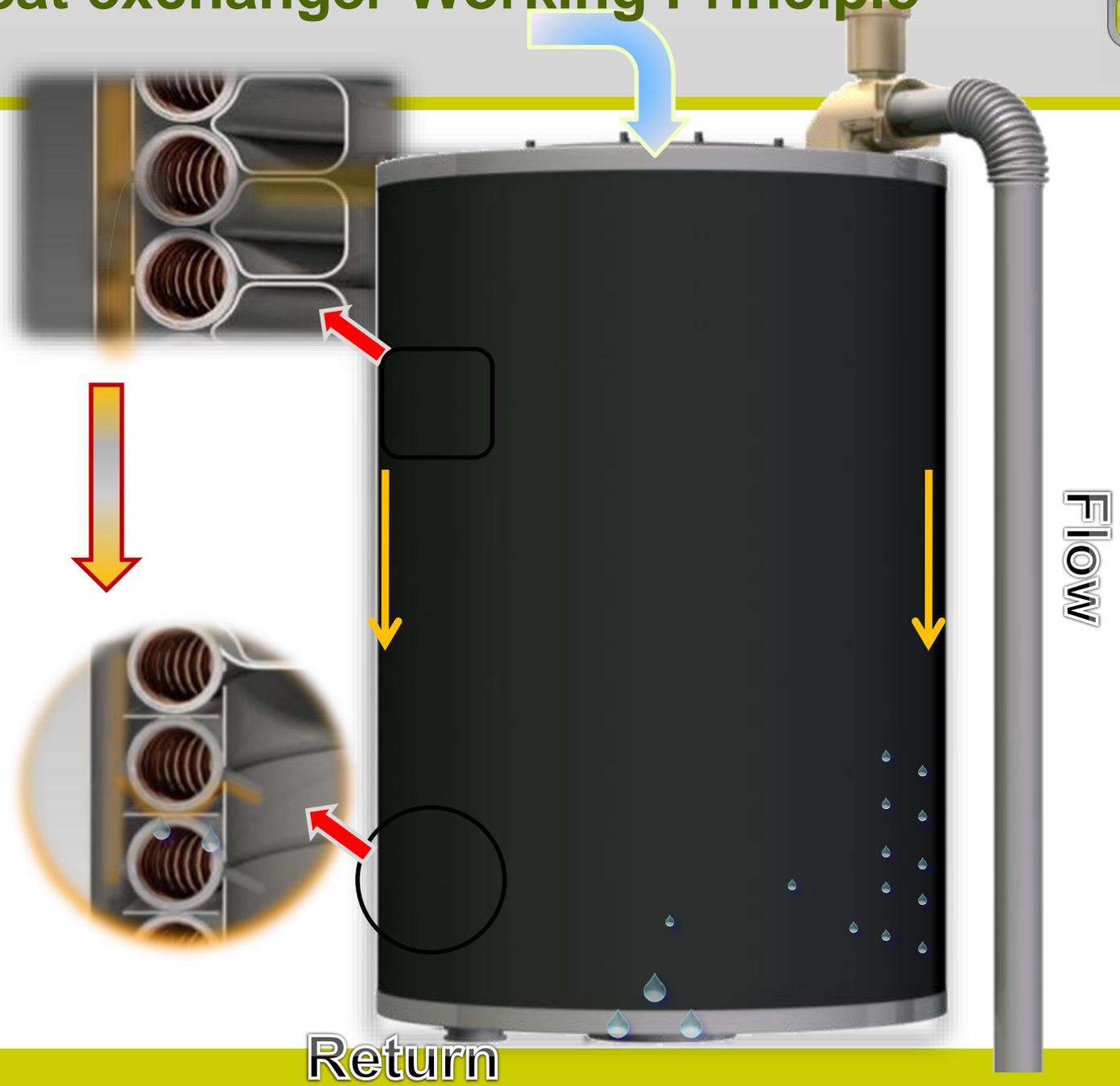
Heat exchanger Working Principle



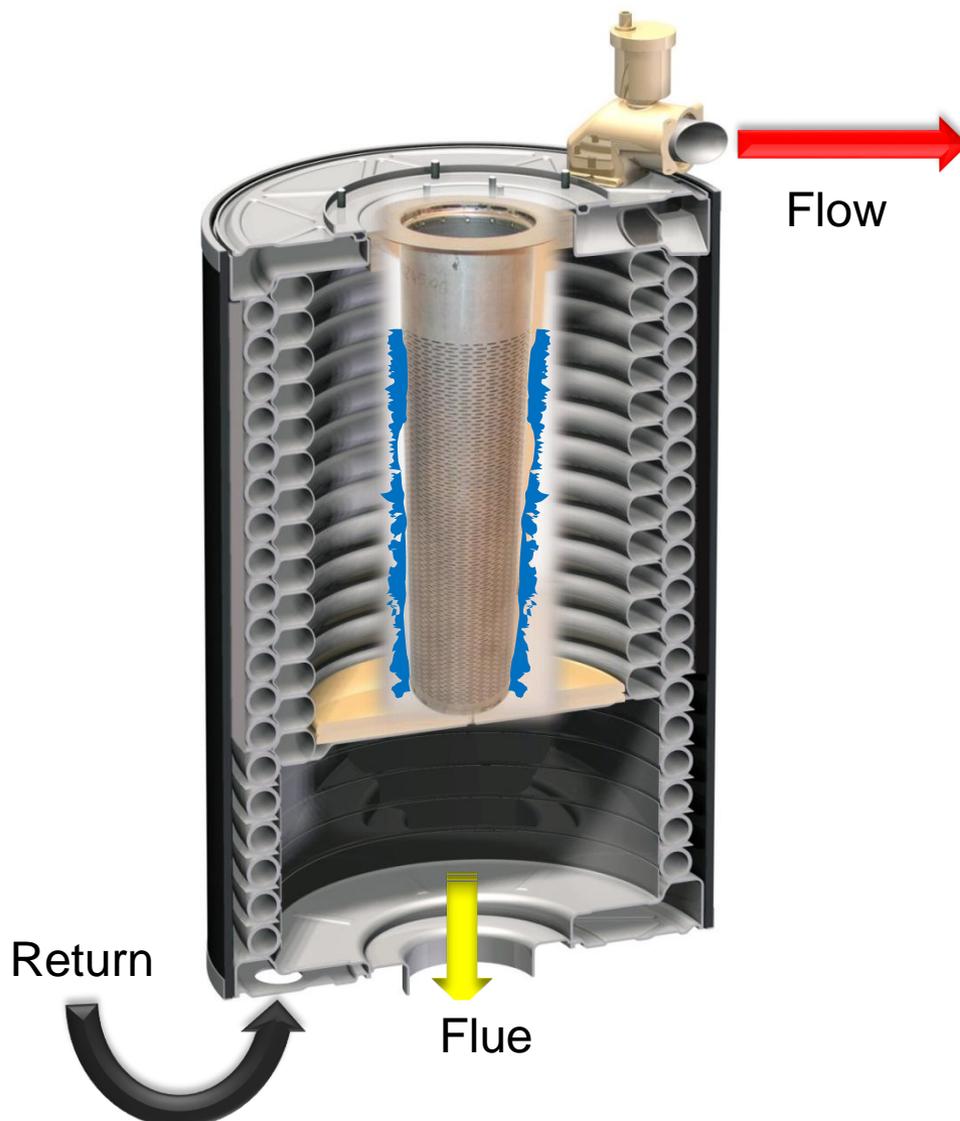
Heat exchanger Working Principle



Heat exchanger Working Principle



*Principio di funzionamento scambiatore Pack 1000 /
HELIX*

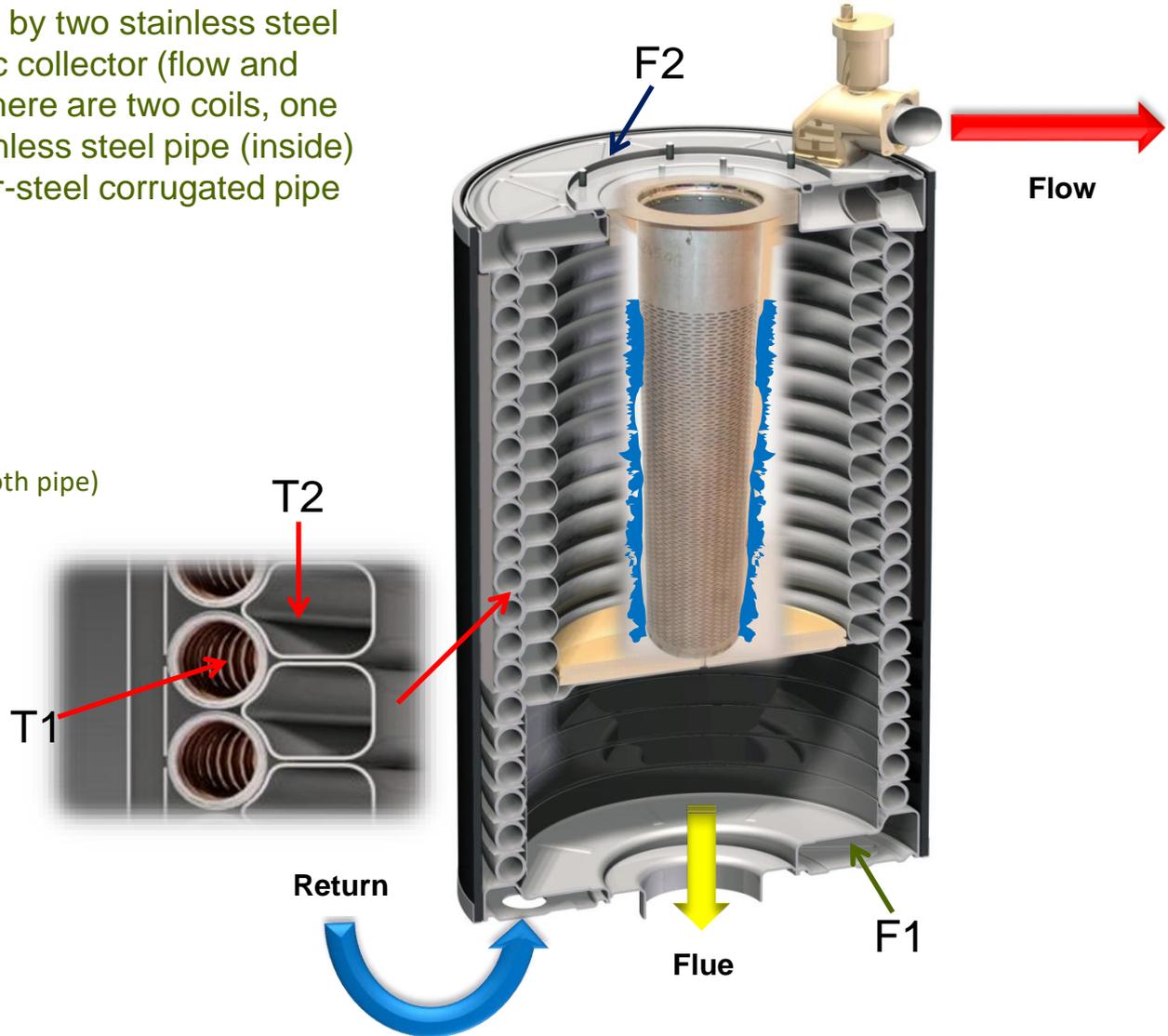


Heat Exchanger layout

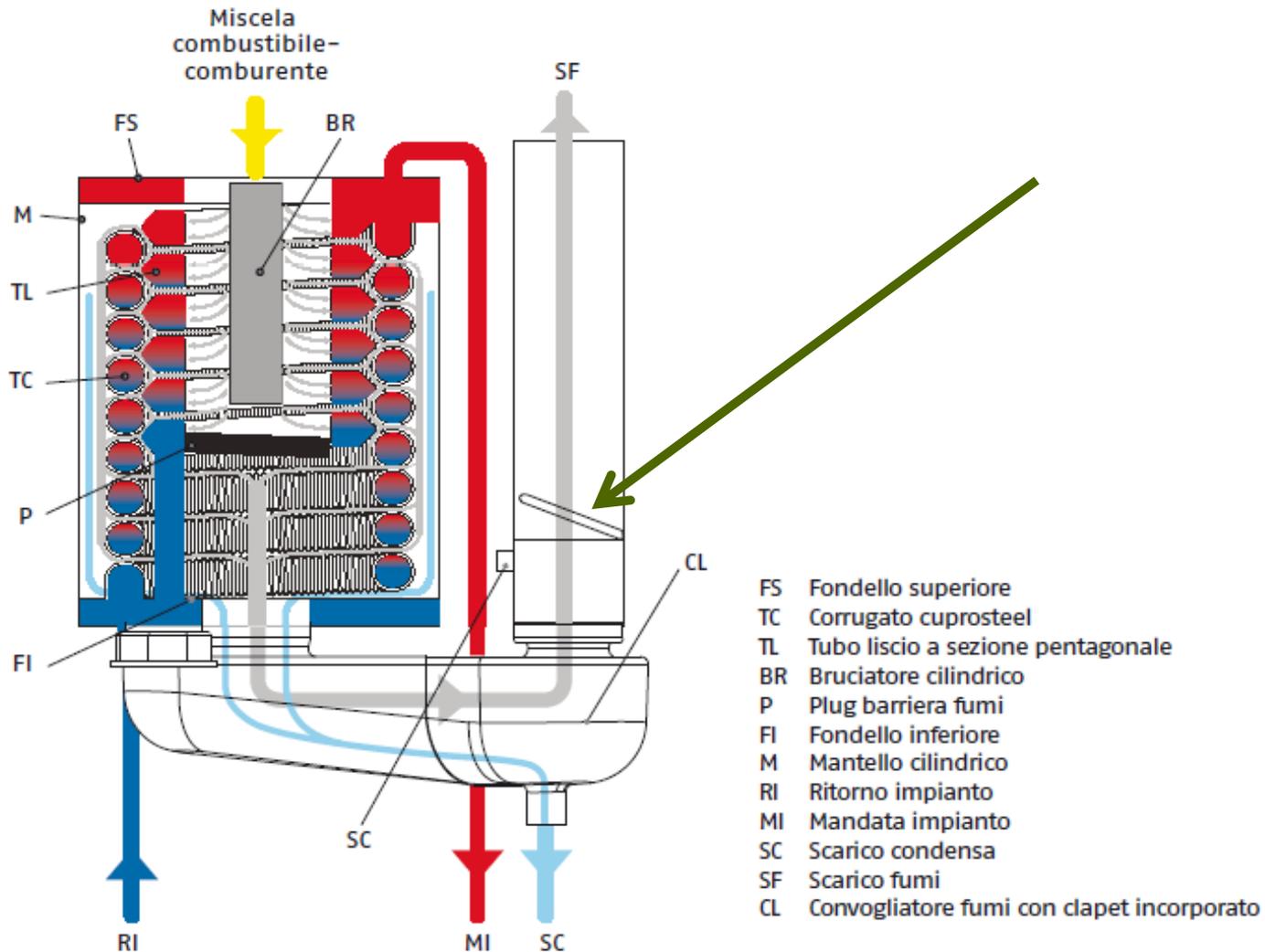


The heat exchanger is made up by two stainless steel cups which also act as hydraulic collector (flow and return); between the two cups there are two coils, one pentagonal section smooth stainless steel pipe (inside) and one circular section copper-steel corrugated pipe (outside).

- LEGENDA
T1 – Corrugated pipe Cuprosteel / (smooth pipe)
T2 – Pentagonal smooth pipe
F1 – Formed tank (2,6l)
F2 – Formed tank (2,3l)

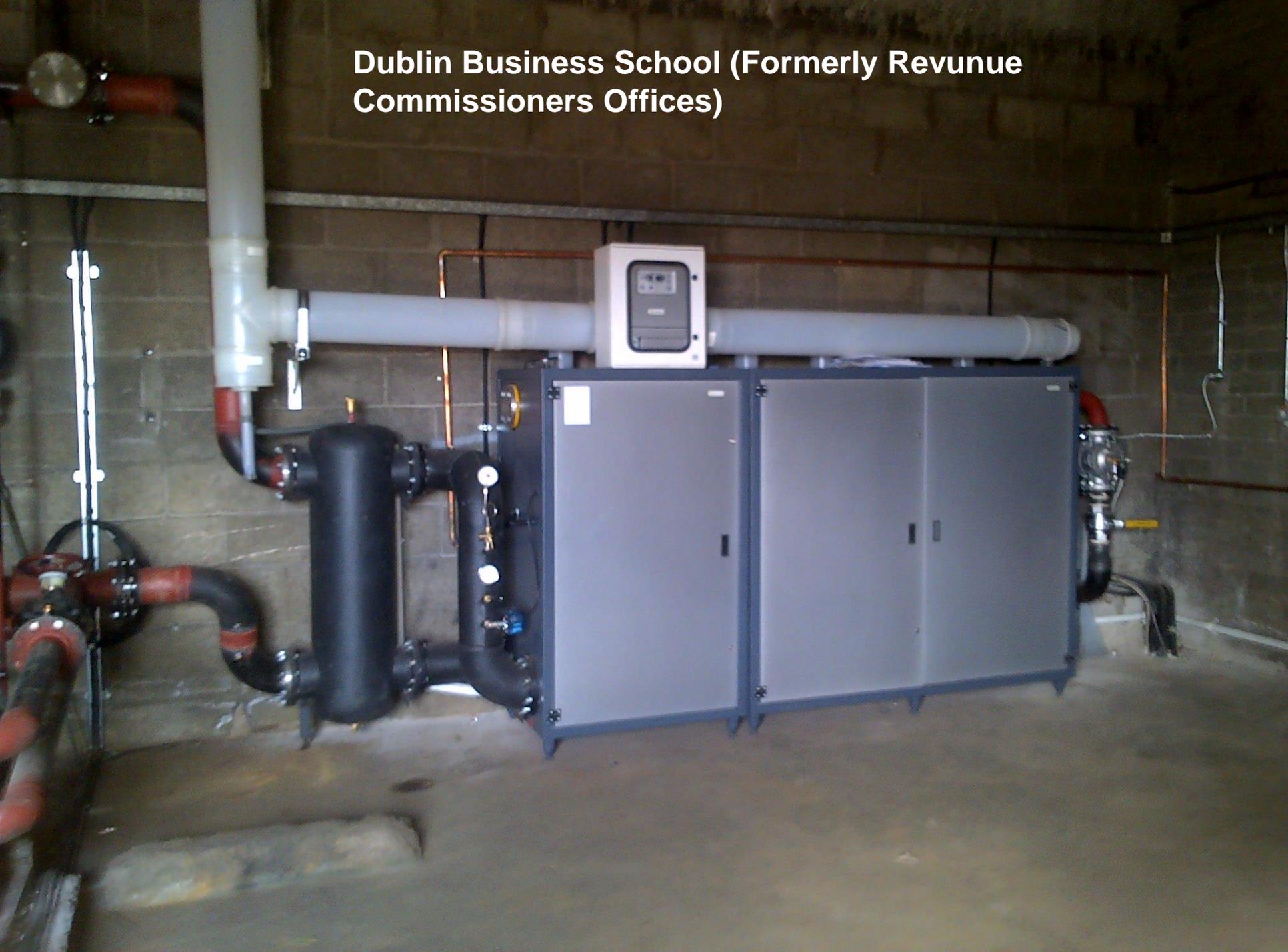


NEWS ON 1000 SERIES: EMBEDDED "CLAPET" (NON-RETURN VALVE FOR FLUES GAS)





Dublin Business School (Formerly Revenue Commissioners Offices)





Dublin Business School (Formerly Revenue Commissioners Offices)

Dublin Business School (Formerly Revenue Commissioners Offices)



Street C/ MAYOR, 9
CP 28840 MEJORADA DEL CAMPO (MADRID)
Residential Multiple Dwelling – 5 blocks connected to the same plant room –
2 MW Power Output

 **Beretta**
Il clima di casa.





2 MW INSTALLATION

Mejorada del Campo (Madrid)

2014 - Power Output 1 MW

Plant room retrofitting realized using
2 x Condexa PRO3 460 IN C A + LLH + Accessories
Useful heat output at 80°/60°C: 907,2 kW







 Beretta

 Beretta

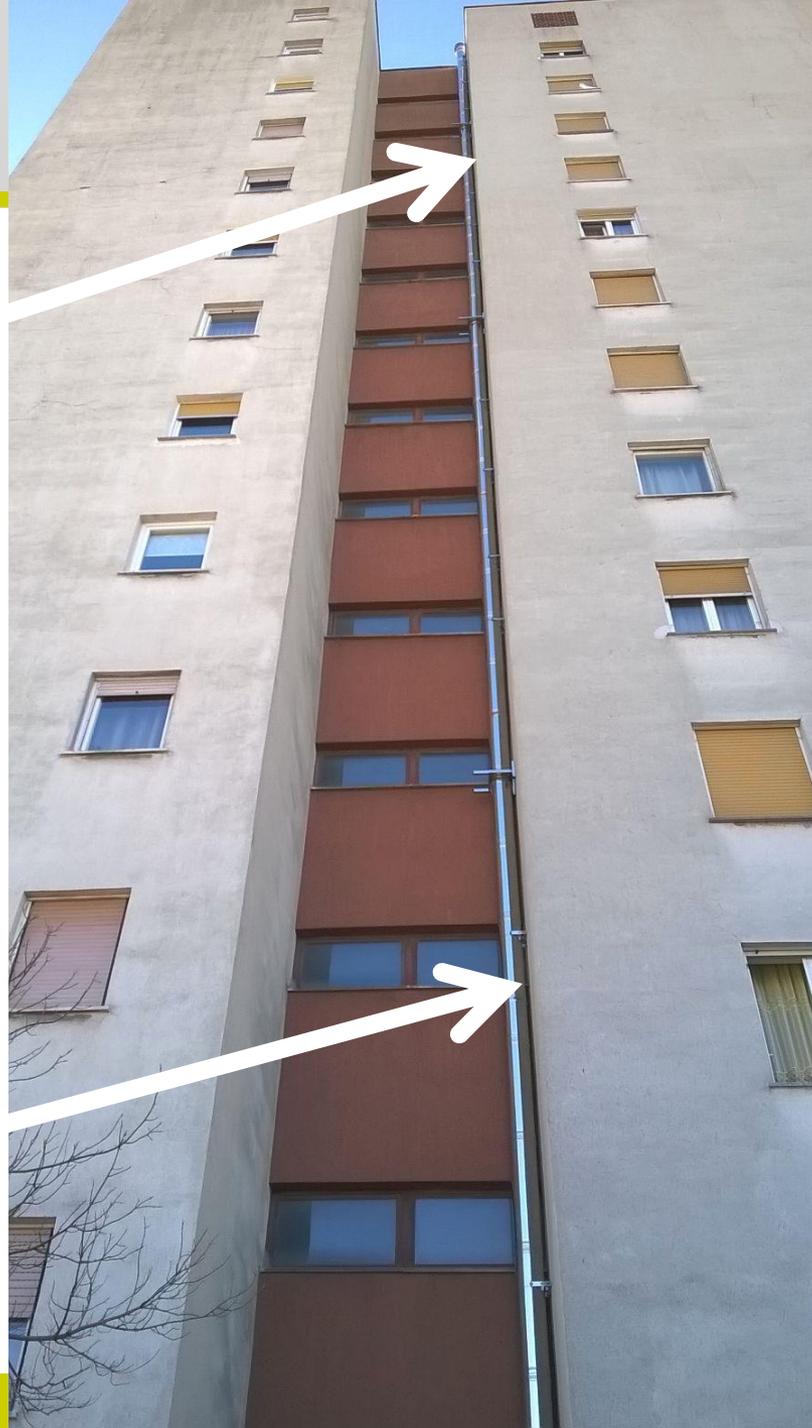
Rijeka Tihovac 6 Stambena zgrada
Power Plus 1003 BOX P EXT +
PLATE HEAT EXCHANGER CIPRIANI CIAT – 345 kW





Rijeka Tihovac 6 Stambena zgrada
Power Plus 1003 BOX P EXT +
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HOTEL HISTRION - SLOVENIA

1,9 MW POWER PLUS BOX 1017 Cascade System The 1000 Series, Roof Top

Power Plus BOX 1017 BOX P EXT
(1004+1004+1004+1003+1002+LLH)



HOTEL HISTRION - SLOVENIA

1,9 MW POWER PLUS BOX 1017 Cascade System The 1000 Series, Roof Top













Thanks for your attention!



Selling points Beretta Power Plus

***10 good reasons for choosing Beretta Power Plus
Commercial High Efficiency Condensing Gas Boilers***

10 good reasons...

- 1 *Flexible, corrugated heat-exchanger*
- 2 *Double layer patented cuprosteel pipe*
- 3 *Best heat exchanger*
- 4 *Integrated full electronic control*
- 5 *Large pipe diameter of heat exchanger*
- 6 *High residual fan head*
- 7 *Modular and modulating solutions*
- 8 *Wide range of products and complements*
- 9 *Completely made in Italy product*
- 10 *Support from Beretta – Riello Group*

10 good reasons...

① *Flexible, corrugated heat-exchanger*

✓ *High exchange surface*

✓ *Self cleaning function*

✓ *Thermal differential dilatation absorption (OK Thermal dilatation)*

✓ *No limits on difference between flow and return water temperature*

(OK working with high DT)

10 good reasons...

② *Double layer patented cuprosteel pipe*

- ✓ *Corrosion resistance of stainless steel*
- ✓ *Conductivity of copper (High thermal conductivity !)*
- ✓ *Patented pipe*

10 good reasons...

③ *Best heat exchanger*

- ✓ *Flue temperature just $1,5 \div 5$ °C more than water return T° (3°C !)*
- ✓ *Condensing effect also with radiators plants (High Temperature!)*

10 good reasons...

- 4 *Integrated full electronic control*
- ✓ *Cascade management standard equipped*
 - ✓ *Control of secondary zones (3 standard, up to 8 low temperature zones in additional with Zone Master kits)*

10 good reasons...

- ⑤ *Large heat exchange pipe diameter (25 mm on 500 Series – 20 mm on 1000 Series)*
- ✓ *Any problems of plugging due to sludge and dirt*
- ✓ *Series heat exchanger for constant efficiency*

6 High residual fan head

- ✓ 50 mm diameter flue discharge for unit of 50 kW Hs
- ✓ Flues manifolds for indoor or outdoor installation of 50, 60, 125, 160, 200, 250 and 315 mm of diameter
- ✓ Possibility to design long chimneys

7 *Modular and modulating solutions*

- ✓ *Modular solution with advantages vs. single burner*
- ✓ *Full modulating boilers (from 20% to 100%)*
- ✓ *Cascade solution with repowering possibility*

10 good reasons...

⑧ *Wide range of products and complements*

✓ *Continuos development of complements and accessorizes*

10 good reasons...

⑨ *Completely made in Italy product*

✓ *Power Plus heat exchanger is a total made in Italy product from a company with more than 20 years of experience in the thermo hydraulic field*

10 *Support from Riello*

✓ *Complete and free support from Beretta with an English speaking team at your disposal and a growing up documentation (Catalogue, Development Manual, Booklets, Designs, Systems solutions, CAD drawings, Advices)*

Thanks for your attention