



HEAT
EXCHANGE
MASTERY

MADE IN ITALY SINCE 1951 ● ○ ●

FLUE GAS CONDENSER



By FIC S.p.A.



Heat-recovery technologies to increase efficiency of the plants

A BETTER USE OF ENERGY

for a sustainable development

Energy transition from fossil to other sources is a common goal of all the countries worldwide, in order to lower the carbon footprint for the safeguard of the environment and for a use of the available fossil resources more rational, in order to preserve and make them available also for the future generations.

In this perspective both heat-recovery and renewable sources are two main pillars for a sustainable development.



FGC- installation at a WtE plant

FLUE GAS CONDENSER

Technology of heat-transfer and energy recovery

FIC/Sical has developed a technology capable to be used in both cases or – even better – **to bring the advantage of the energy recovery when a specific renewable source is used as the energy vector**, that is in biomass-fired CHP (combined heat&power) and/or WtE (waste to energy) plants.

In these installations, biomass (typically wood, but can be from other sources, like e.g. bagasse from sugar cane) in CHP and domestic waste in WtE is burned to get the internal energy of these fuels and transfer it to produce steam and further electricity and heat that is used in e.g. district heating networks.

The gas that results from the combustion, called **flue gas**, is highly rich in humidity because the raw material has a relevant % in weight of water. This moisture during the burning process is simply vaporized, absorbing part of the energy of the fuel that is released during combustion and thus being heated up but without giving any benefit to the power generation process, it is a lost energy whose recover would be highly beneficial for the whole energy balance of the process.

This can be achieved by condensing it, and this is exactly what the FIC Flue Gas Condenser (FGC) technology does.



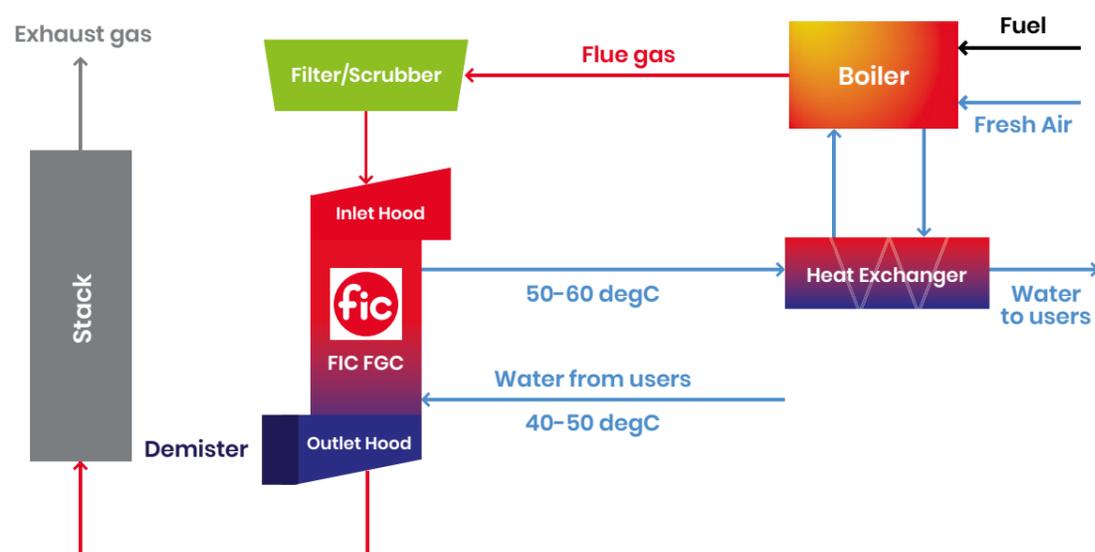
Flue Gas Condenser ready for shipment

A SCIENTIFIC AND MATHEMATICAL APPROACH FOR TECHNOLOGIES WITH HIGH ENERGY EFFICIENCY

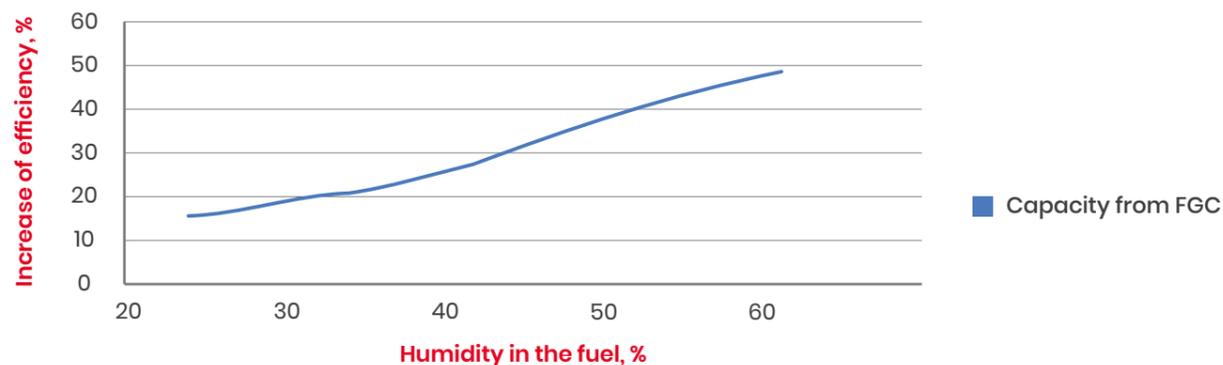
FIC technology has been then developed **based on a scientific approach**, studying the process on lab scale, that allowed to define the right mathematical model to simulate it, further proving its reliability running pilot test and finally going to the industrial scale with the first experiences, early in the 90's.

The result has been fully in compliance with the expectations showing a **high efficiency and wide applicability of the Flue Gas Condensation** based on the FIC/Sical approach.

HEAT RECOVERY WITH FGC - FLOW DIAGRAM



HOW HUMIDITY CONTENT IN THE FUEL CAN INCREASE PLANT EFFICIENCY WHEN FLUE GAS CONDENSATION IS USED

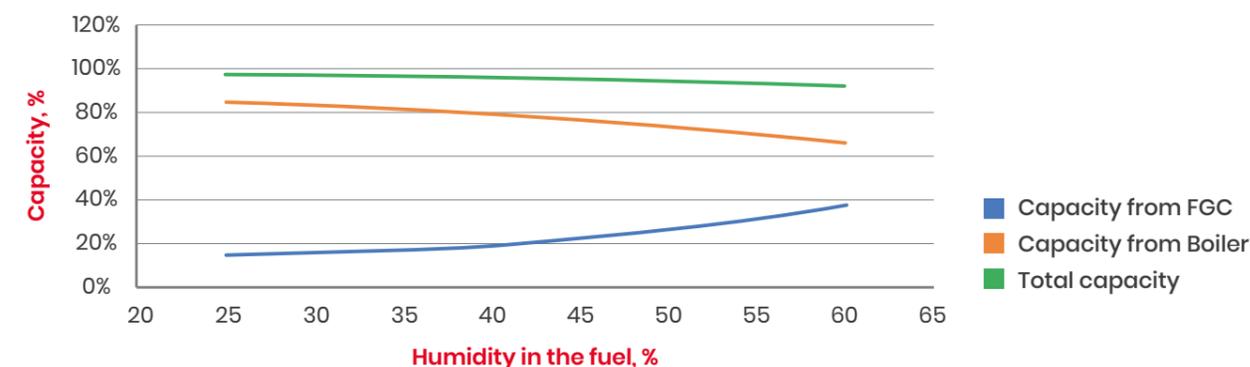


ADVANTAGES OF FIC/SICAL FLUE GAS CONDENSERS

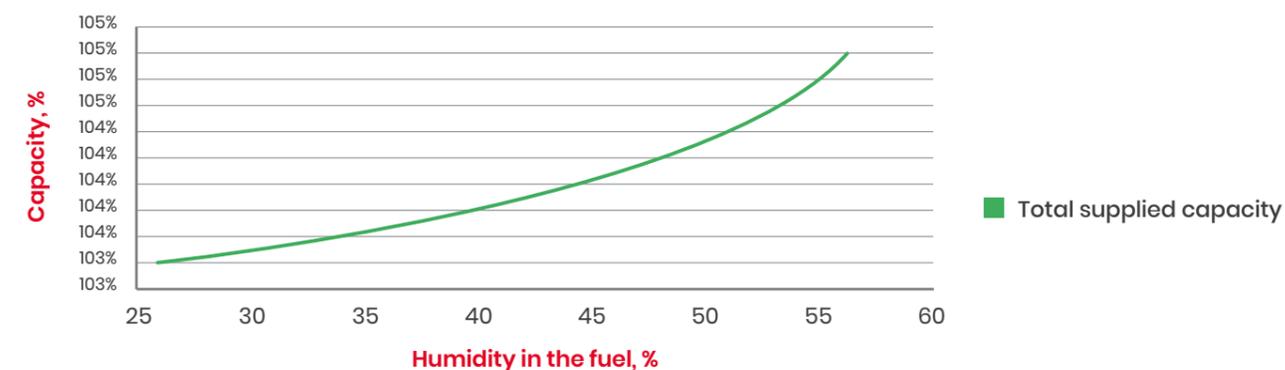
The FIC/Sical Flue Gas Condenser technology uses thermal plates as heat-transfer surface, and this compared to pipes has advantages in terms of:

- higher turbulence;
- surface working 100% without hidden or blinded zones;
- perfect condensate film formation, thus enhancing the heat-transfer and getting high efficiency;
- flexibility in design: possibility to adapt to wide range of process conditions;
- cleanability, the plates are always kept clean, thus fouling or sticking of material is avoided in principle;
- wet area 100%, thus corrosion risk is avoided.

CAPACITY FROM BOILER FGC VS. HUMIDITY IN THE FUEL



TOTAL PLANT CAPACITY VS. HUMIDITY WITH FLUE GAS CONDENSATION GIVEN IN PERCENTAGE OVER THE NOMINAL



FIELDS OF APPLICATIONS

FIC/Sical Flue Gas Condenser are used in **biomass-fired plants** with boiler capacity from 1MW up to 200 MW **and in waste-to-energy plants** that are normally of very large capacity (50-200 MW or more). The single Flue Gas Condenser can have a capacity up to 15 MW, and modular solutions can be studied to match the energy recovery demand.

The scope of supply can include all or some of the following:

- design;
- manufacturing;
- on site activities;
- ancillary equipments like mechanical framework;
- condensate treatment.



FIC - HEAT EXCHANGE MASTERY

FIC is a master producer of thermal plates with 4 automatized welding lines which cover all the available technologies: laser based on optic fiber and multispot resistance.

The design and construction of the heat-exchangers follows the strictest international design codes for pressure vessels like CE/PED and U-Stamp and all welding processes are qualified according to ISO 3834.

FIC/Sical FGC are manufactured in **duplex** (2205, 2507), **stainless** (A316L, A904L), **special alloys** (SMO 254), and the selection is based on the composition of gas to be processed.



Engineering
and manufacturing



80 countries
export



40.000 sqm
of production area



130
people





AZIENDA CON SISTEMA
DI GESTIONE QUALITÀ
CERTIFICATO DA DNV-GL
ISO 9001



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