



Compabloc helps get the most out of biomass

Biomass power plant at Miajadas, Spain

Case story



The Miajadas plant is the first power plant in Europe fuelled by a biomass mixture.

The ACCIONA Group is one of the largest corporations in Spain, operating in construction, energy, water and sustainable services in more than 30 countries. As part of the company's focus on using well-proven, reliable technologies, Acciona Energía decided to include Alfa Laval components in two new biomass-fuelled power plants that Acciona Energía was to build at Miajadas (in the province of Cáceres) and in Briviesca (in Burgos province). The Miajadas plant uses mixed wood waste as input, while the Briviesca plant uses agricultural straw.

These two projects, which also involved conversion from traditional shell-and-tube technology to the use of modern plate heat exchangers, were developed by GHESA, a Spanish engineering and technology company that specializes in turnkey power generation projects. Alfa Laval Compabloc technology – the most compact high-efficiency plate heat exchangers currently available – was selected for both power plants.

Wood waste instead of fossil fuels

The plant that Acciona Energía commissioned at Miajadas uses biomass based on mixed wood waste, instead of burning fossil fuels. For this purpose, it uses a wide range of biomass that includes waste from agriculture, forestry and other sources.

This plant, under the management of Rafael Godoy, considers itself a Spanish pioneer in this field as well as one of the first in Europe to use this type of process. "The plant produces 16 megawatts of power and is able to generate up to 128 million Kwh of electricity annually. That's sufficient to provide electricity for a town with 40,000 inhabitants for a whole year," explains Rafael Godoy.

Betting on renewable energy

Biomass is a renewable source of energy, as Rafael Godoy explains. "The Miajadas power plant is fuelled by biomass whose growth is fuelled by photosynthesis, through the absorption of carbon dioxide present in the atmosphere. Once this biomass – such as waste from pruning trees or from agricultural products such as corn and cereals – has been harvested, it is used as fuel in our plant and the following year it renews itself – and the process continues again and again."

Biomass into electricity

Converting this valuable resource into electricity is a thermodynamic chemical procedure that starts with combustible biomass material, whose main components are carbon and hydrogen. When mixed under appropriate conditions, these two elements combust and generate heat.

This heat is then used to produce high-pressure steam, which is led to a turbine that drives a generator producing electricity at 11,000 volts. The electricity is then converted to 45,000 volts before being fed into the Spanish national grid.

Elements in the process

The boiler is a key element in the power generation process. This complex item of equipment is required to carry out the combustion of a variety of biomass types, including woody raw materials. It was specially designed and manufactured for the Miajadas plant.

In the Miajadas plant the pre-heating of the low-pressure feed water was set up using an all-welded Alfa Laval Compabloc heat exchanger instead of a traditional shell-and-tube unit. The Alfa Laval Compabloc used here was specially configured to deal with the particular requirements of this plant.

This provides added value to the whole process, because, as Godoy emphasizes, "With the Compabloc, our process yields improve noticeably, and water reaches the boiler at higher temperatures. This provides better performance while using less biomass input."

Compabloc heat exchangers

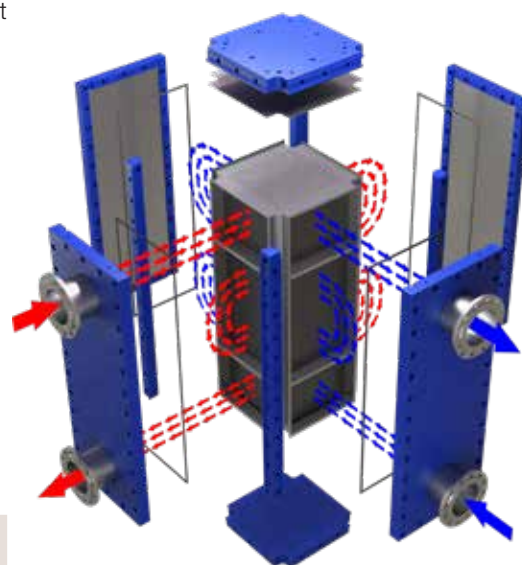
GHESA was the engineering company in charge of installing the water and steam equipment that connects the boiler to the turbine, and Alfa Laval supplied Compabloc all-welded plate heat exchangers to serve as low-pressure pre-heaters for the Miajadas and Briviesca plants.

The all-welded plate pack that is the distinctive feature in all Compabloc designs consists of special corrugated heat transfer plates, welded alternately to form channels, ensuring an exceptional degree of turbulence in the flow. This results in heat transfer coefficients that are three to five times greater than with traditional shell-and-tube heat exchangers, and an equipment footprint three to five times smaller. Moreover, the unique construction of the Compabloc permits full access to the entire heat transfer area. This makes it easy to clean, which ensures operation at highest possible efficiency at all times, with no degradation over time.

In the Miajadas plant, the main duty of these Compabloc units is to use extraction steam from the turbine to heat the boiler water from 50°C to



80–90°C. According to Rafael Godoy, "This equipment, which has been designed specifically to suit our needs, provides outstanding performance as well as being very compact." This space-saving design then made it possible to mount this pre-heater unit in the most convenient place.



Key Facts:



Design temperature
400°C (752°F), down to
-100 °C (-148°F)

Design pressure
From full vacuum to
42 barg (600 psig)

Maximum heat transfer area
840 m² (8,985 ft²)

Material of construction
316L, SMO254, 904L (UB6),
Titanium, C-276/C-22/C-2000

Duties
Heat recovery, cooling, heating,
condensation, partial condensation,
reboiling, evaporation and gas cooling.

Learn more at www.alfalaval.com/compabloc

Unique features

Compabloc is the champion of heat exchange thanks to unique Alfa Laval innovations that enable reliable, efficient performance, letting you save energy and improve sustainability.



SmartClean
Fast and efficient flushing of
fouling material



C-Weld
Superior cleaning and
extended performance



XCore
Advanced design for higher
pressures



ALOnsite
Qualified support at your
facility

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Up-to-date Alfa Laval contact details for all countries are always available on our website at www.alfalaval.com