

**CASE STUDY:**  
**Abengoa Bioenergy**

**Industry:**  
**Energy & Petrochemical**



## **Cleaver-Brooks Increases Efficiency and Reduces Fuel Costs for Abengoa Bioenergy**

Cleaver-Brooks provides important Heat Recovery Steam Generation (HRSG) technology for Abengoa Bioenergy's high-octane automotive-grade ethanol plant in York, Nebraska. The Energy Recovery International (ERI) HRSG product complements a fuel-fired Cleaver-Brooks Nebraska watertube boiler by adding processing capacity while saving fuel.

Abengoa — which ranks in the top 5 in ethanol production in the USA — produces 54 million gallons of ethanol from 20 million bushels of Nebraska corn each year. Not only does Abengoa's York, Nebraska plant produce highly-refined ethanol — but the by-product of the ethanol production process is used as dry cattle feed across the State of Nebraska and around the world.

Making automotive fuel and its by-product cattle feed is a 3-step process involving fermenting, refining and drying.

The raw material — corn — is ground into a meal-like substance and then made into what is called “beer” because the process is very similar to the fermenting process for consumable alcohol.

Steam from two gas-fired Delta-style watertube boilers is applied to the material, fostering its chemical breakdown. Next the “beer” is sent to a separate steam-intensive refining process. This refining process brings the alcohol up to the 100-percent level that is used to provide ethanol and gasoline blends.

While the lion's share of the energy in the ground corn raw material is converted to high-octane ethanol as part of the fermenting and refining processes — the remaining by-product retains sufficient food value to be useful as cattle feed for Nebraska's beef and dairy industries. This closed loop system not only ensures that nothing in the process is wasted — but the cattle feed by-product provides an added business for Abengoa's York plant.

Though Abengoa's primary objective is the production of ethanol and feed, it also has a strong desire to conserve finite fuel resources and preserve the environment while contributing to the local economy.

It is for these reasons Abengoa turned to Cleaver-Brooks Nebraska Boiler and ERI to supply an energy-efficient solution to the problem of capturing wasted heat from its odor-eradicating thermal oxidizer; operating between 1,200 to 1,500o F with a mass flow exceeding 300,000 pounds per hour.

### **ABENGOA BIOENERGY**

#### **LOCATION**

York, Nebraska

#### **PROFILE**

Abengoa Bioenergy is a world leader in production of bio fuels and the development of innovative bio-based chemical solutions.

#### **CHALLENGE**

Provide enough steam capacity for Abengoa's ethanol processing while saving fuel.

#### **SOLUTION**

Slant style Heat Recovery Steam Generators (HRSG) has a finned watertube design and isolated diagonal downcomers for increased heat transfer and excellent heat absorption, saving valuable energy.

#### **RESULTS**

- The increased efficiency in the HRSG allows Abengoa to reduce energy costs
- Since the by-product of ethanol production is used for local cattle feed, there is no waste



The steam generated from this recovery is applied to the fermentation, refining and drying processes that convert the liquid-laden corn byproduct into dry cattle feed that can be easily stored and shipped.

In the final analysis, the answer was ERI's highly engineered waste heat recovery boiler, the "Slant" two-drum HRSG, incorporating finned riser tubes and isolated (diagonal) downcomers for enhanced circulation, increased heat transfer and excellent heat absorption.

Since ethanol production is a very energy-intensive process — using every BTU generated is critical to Abengoa's effective operation and certainly the York, Nebraska area because of the company's sensitivity to the local economy and its finite resources.

It is fitting that in their home state, Cleaver-Brooks Nebraska Boiler and ERI help Abengoa Bioenergy lead the way in the exciting and emerging bio-ethanol industry.



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