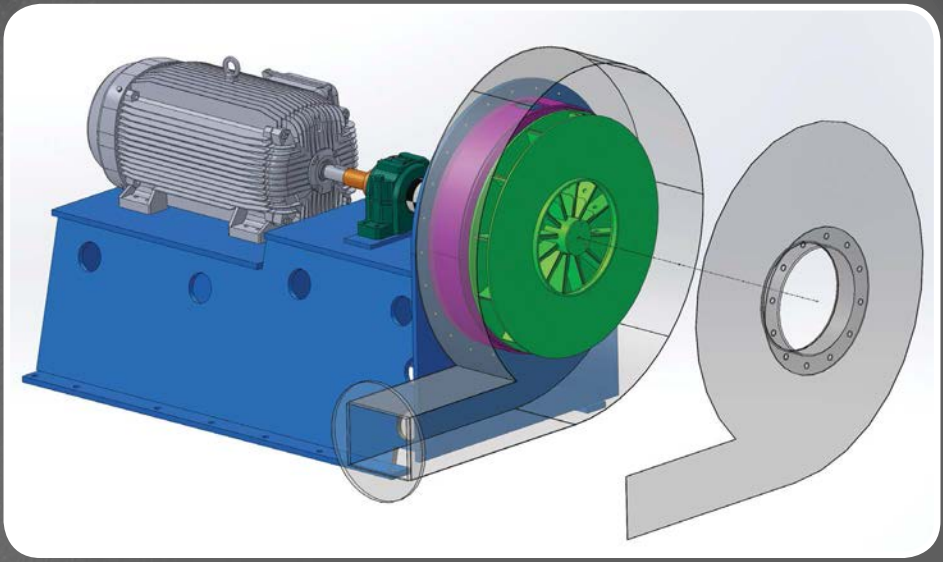
CASE STUDY

REDESIGN OF INDUCED DRAFT RADIAL FAN



ALTERNATIVE FUEL CONVERSION PROCESS

Clarage

QuickFacts

Customer: A tire fractionation company

Location: U.S. Midwest

Industry: Power Generation

Application: Induced draft fan for alternative fuel facility

Challenge: Customize large induced draft fan housing, redesign impeller and shaft, reposition bearings, and fabricate new designs.

Solution: Radial fan and housing rebuild

Project Overview:

The technology that recovers the energy value from whole tires is known as fractionation. This process converts tires into gaseous fuel and carbon particles, and recovers steel belts for reuse. The fractionation company implemented this technology at a coal-fired power plant in the Midwest.

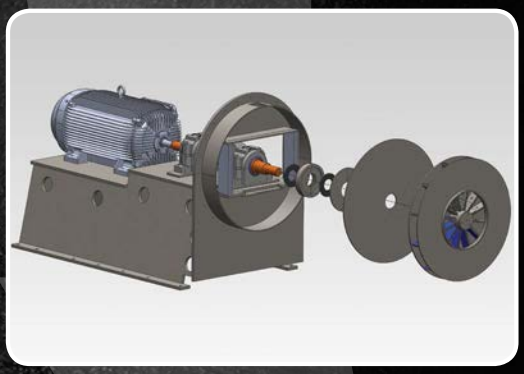
Tires are suspended in a high-temperature, low-oxygen slipstream from the boiler. The heat converts the organic portion of the tires to a gas and fine carbon particles. A mixture of air, carbon particles, and the gas extracted from the tires is conveyed to the boiler via an induced draft (ID) fan.

When the fractionation facility's original ID fan began experiencing extreme vibration in the impeller and housing, and the rotor welds started to crack, the company turned to Clarage for a reliable solution. Clarage diagnosed the vibration issues, and redesigned, repaired, and fabricated the impeller and fan housing in less than two weeks.

CASE STUDY

The energy value recovered from used tires is converted to fuel

Poor welds and construction of the existing fan caused excess vibration



3D Model Exploded View of Redesigned Components

Challenge:

The fractionation company wanted to reuse the existing housing of the ID fan because of the existing ductwork connections and the fan's anchor bolts. The shaft centerline height had to remain the same, and the outboard bearing needed to be positioned closer to the centerline of the rotor.

As originally designed, the shaft and bearings were drastically undersized. The motor and bearing pedestals were neither square nor level. There was a 3-inch gap between the gas inlet and the rotor. There were poor welds to repair and fabrication errors to correct.

The Clarage Solution:

The Clarage engineering team designed a new shaft and repositioned the bearings. However, the team had to modify the fan housing to accommodate the outboard bearing, which had to be positioned closer to the rotor. Clarage also designed the new rotor with thrust holes in the back plate to help reduce the amount of axial thrust. The drafter used a 3D modeling software to determine the position of the new bearing, cooling wheel, and double-carbon ring-seal.

In addition to redesigning and fabricating the impeller and modifying the fan housing, the Clarage team also addressed the gap between the gas inlet and the rotor eye. Clarage designed a shroud bar that helped the gas stream flow into the fan more efficiently, which also improved fan performance.

Results:

By customizing a new fan that fit within the existing housing, Clarage was able to engineer a solution with increased performance and reliability. As a result, the fractionation company can continue to provide clean alternative fuel for the power plant's boiler, reducing the amount of coal required. This process will convert 4 million scrap tires each year into environmentally friendly fuel. Also, 6,000 tons of scrap steel will be sold to local steel mills and foundries every year.

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