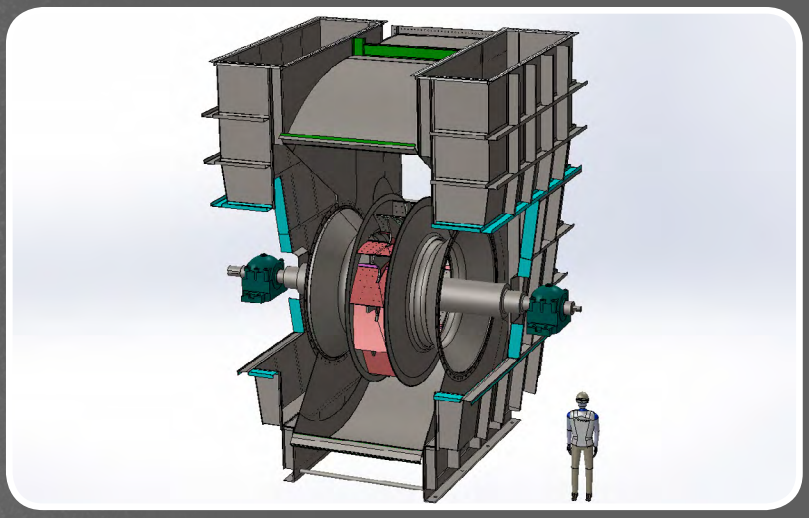
CASE STUDY

REPLACEMENT WASTE GAS FANS



IRON ORE MINING

Clarage

QuickFacts

Customer: Iron ore mining company

Location: U.S. Midwest

Industry: Mining

Application: Process fan associated with iron ore pelletizing

Challenge: Provide energy saving solution by retrofitting process fan impellers and rebuilding fan housings

Solution: Designed and fabricated four new backward curved impellers, saving $376,024 per year operating costs and over 4,500 Megawatt hours per year.

Project Overview:

Many companies are looking for ways to operate more efficiently. A major global corporation specializing in mining coal and iron ore operating several mines in the Midwest is no different.

At one of its mines, the company determined that the existing fans used in its pelletizing process were consuming an unnecessary amount of energy for the work performed. The company was using an oversized, inefficient radial tip fan for the application, and consequently had to operate it at an extreme damper setting. In addition, fan wheels and housings needed repair every 9 months because of erosion from taconite particulate in the exhaust stream. Based on the success of previous projects, the mining company turned to Clarage for a solution that included fan performance testing, scale-model development, impeller redesign, and improved energy efficiency.

Challenge:

Before new impellers and associated components could be designed, the existing fans had to be performance tested. Clarage tested the performance, horsepower consumption, and operating conditions of the original fan to establish how the new fan impellers should perform. The original radial tip rotor was oversized. When tested, it achieved only 39.5% system efficiency.

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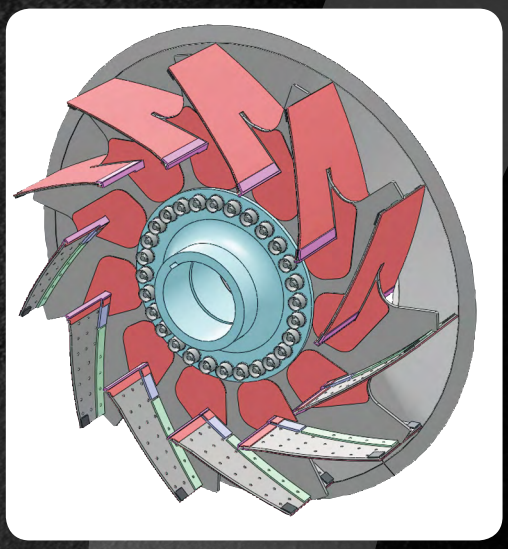
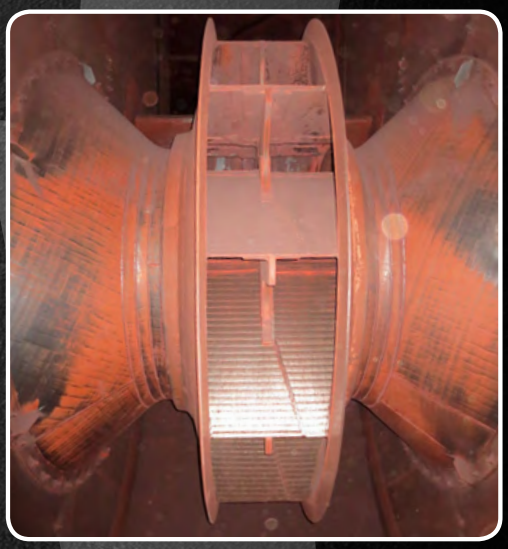


Backward Curved Impeller with Chromium Carbide Overlayment



Clarage's New Impeller After 18 Months of Operation with no wear

In retrofit situations, the existing fan enclosure limits the space available for a new impeller. Clarage had to design a rotor that would operate efficiently in a competitor's housing, while keeping the bearing centers the same. However, the existing housings were in such disrepair, the mining company also needed new housings to be constructed to match the dimensional specifications of the original units.

The Clarage Solution:

Eliminating problem areas, while considering current and future operational requirements, can ensure the long term reliability of a retrofit fan impeller. Fans should be designed to optimize both operational and maintenance issues. The Clarage engineering team designed a smaller rotor, and built housings to match the sizes of the original fan housings. To accomplish this and also meet the targeted power usage reduction, the Clarage engineering team had to first construct a scale model to simulate how the new impeller would behave. Clarage used this knowledge to design the blade specifically to handle the required fan performance as well as resist the effects of erosion, and sticky particulate.

Clarage provided four backward curved rotors and their housings. The rotors and housings were lined with chromium carbide to help prevent erosion. Chromium carbide is a strong material that successfully handles sliding abrasion versus impingement abrasion.

Results:

After Clarage installed the new rotors, the fans were tested to confirm they achieved the required system performance. The primary goal for replacing the rotors was to increase efficiency, not performance. Fan efficiencies are now between 70% and 75% and damper operation is 90% open.

The new impellers produced approximately the same static pressure and air flow using considerably less energy. The Clarage solution is expected to save the iron ore mining company around $376,024 annually, with an energy reduction of more than 4,500 MWh/year.

Because of the smaller impeller, the fan system is more efficient, and, therefore consumes less energy. The wider damper opening reduces housing vibrations. And the chromium carbide on the impellers and housings reduce blade wear.

When possible, Clarage uses as much from existing systems as possible to ensure that solutions are cost-effective, which goes well beyond merely replacing fans.

Clarage

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