

# Clarage Services



**Clarage**

*Custom, Tough and Proven*

## REPAIR AND REBUILD CAPABILITIES

### Fans

Rotor Replacement

New Wear Plates

Shafts and Bearings

Housings

Inlet Cones

Ductwork

### Dust Collectors

Replacement Tubes

Vanes and Discharge Boots

New Tubesheets

Replacement Hoppers & Valves

The first shipment of 22 rotors leaving the Birmingham plant. Clarage fabricated new rotors for each fan to provide horsepower savings.



Rebuilt rotor assembly at the Birmingham plant.

#### REPAIR AND REBUILD

Not all fan applications make it easy for a fan to provide 20 years of operational life. The effects of corrosion, erosion, temperature and infrequent maintenance on a fan all work to degrade its structural integrity, balance and aerodynamic performance.

Fans applied in industrial applications will require periodic repair depending on the severity of the application. Clarage, without limitation for the original fan manufacturer, materials of construction or design, can provide quick response to return a fan to service.

The vast majority of fan failures are rotating assemblies. Fan repair and rebuild periodically involves other components of the fan. Fan housings can require field repair or shop rebuild. The rebuilding of fan housings receives the same meticulous care as new construction. Dimensions and materials can be changed as required.

Because today's economics demand long term system operation, maintenance driven Repair or Rebuild is a significant part of the budgeting process. Confidence and reliability in the company doing the work is paramount. Clarage has been in business since 1874, dedicated to the manufacture of fans since 1912 and dust collectors since 1940.



# Repair and Rebuild

## REPAIR AND REBUILD REGARDLESS OF THE ORIGINAL MANUFACTURER

Clarage is not limited to only providing replacement parts or assemblies for its own equipment. Clarage has a long history of repair, replacement and service on other manufacturers' fan and collector products. As a result Clarage has developed an extensive library of competitive designs that it can reference. Our many years of fan engineering experience enable us to adjust the construction when it is required.



When our library does not have sufficient information on which to base a proposal or repair order, or when records of change have not been maintained, Clarage will send an engineer to the site to confirm the construction and take critical dimensions. Our willingness to provide this service insures that the job will be done right.

## FAST SERVICE

Clarage offers a service hotline at 800-598-9234, open 24 hours a day, 365 days a year. Experienced fan engineers and field technicians are available for dispatch to your facility. In-house rebuild and 24-hour emergency service are also available.

Clarage maintains a large inventory of materials and parts required for fan repair and rebuild, including carbon, stainless and alloy steel for corrosive, abrasive and high temperature applications. Collector inlet tubes, guide vanes and discharge boots are available for rush shipment when collectors are off line or to meet an outage.

**QUICK TURN  
AROUND**

**QUALITY  
ASSURANCE  
SYSTEM  
REGISTERED PER  
ISO 9001**

**SERVICES  
AVAILABLE  
REGARDLESS  
OF ORIGINAL  
MANUFACTURER**

# Upgrade Engineering

UPGRADE ENGINEERING

## Performance

Capacity and pressure change

Wheel diameter change

Rotor change - wheel, shaft and bearings

New fan engineered to use existing foundation

## Material Construction

Material changes to suit higher stress levels in rotor

Material changes to permit operation at higher temperatures

Higher Brinell materials to improve wear resistance

Rotor with high Brinell chromium carbide overlay plates.



### ENGINEERING CAPABILITIES

Clarage has been engineering special fan applications for more than 125 years. We have maintained our engineering standards current for the day. The dynamic nature of fans, the greater acceptability of variable frequency drives and the variety of industrial applications into which the fans are placed gives engineering a significant role in determining the final quality and operational life of the product.

### AERODYNAMIC PERFORMANCE UPGRADE

To change the capacity or pressure developed by an existing fan Clarage must adjust the wheel diameter and/or change the operating speed.



Clarage designed a performance upgrade and replacement of an existing axial fan with a centrifugal fan. System effect was considered in the fan design given the available space and interface points. The demolition and installation was accomplished within the customer's limited time schedule.

### MATERIALS OF CONSTRUCTION

As fans are called on to handle higher operating temperatures or increased amounts of particulate matter the materials of construction must be made to handle the new condition. Clarage can engineer the appropriate material change and manufacture the new design so that new equipment and conforming ductwork does not have to be purchased.

When the fan handles dust and particulate matter erosion is an issue. Clarage can address this issue with various methods, one being the application of high Brinell chromium carbide overlay plates. Wear resistant plates can be applied to the wheel, housing or inlet cone as necessary to extend the service life.

# Quality Fabrication



Clarage airfoil rotor from a petrochemical company in East Asia. Clarage installed blade tips, providing the additional fan performance now required by the customer's system.

## QUALITY ASSURANCE

When applications require their use Clarage will apply Finite Element Analysis, Torsional Analysis, Transient Torsional Analysis and Bearing Analysis into the fan design.

With Finite Element Analysis Clarage will typically employ 40-50,000 elements to obtain a clear understanding of the stress levels in a rotor. We have used 100,000 elements to fine-tune a design.

Our stress level design criteria, unless made more rigorous by specification, is to design up to 60% of the material yield strength.



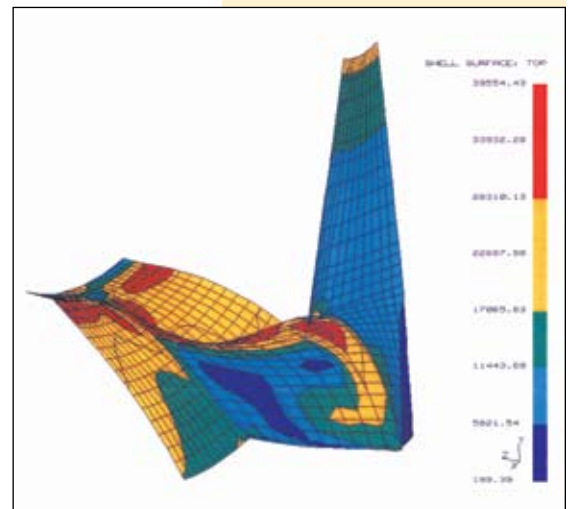
Technician performing a Non-Destructive Test.

## NON-DESTRUCTIVE TESTING

An important part of Quality Assurance is Non-Destructive Testing (NDT) of components during construction and of the completed weldment. NDT services include: magnetic particle testing, dye penetration testing, radiographic testing and ultrasonic testing.

**TROUBLE FREE  
OPERATION BEGINS  
WITH SOLID  
ENGINEERING**

**FABRICATION  
WELDED IN  
ACCORDANCE  
OF AWS D14.6  
AND AWS D1.1**



Finite element analysis for quality assurance.

# Field Service

## Field Service

- Erection Supervision
- Balance and Alignment
- Inspection
- Operational Training
- Performance Testing
- Vibration Analysis
- Domestic and International

## Turnkey Service

- Demolition
- Field Repair
- Installation and Commissioning
- Construction
- Foundation Design

DIDW 5150 AF fans in fabrication and quality control at the Birmingham, AL factory.



### FIELD SERVICE

Factory trained personnel, with state of the art balance and laser alignment equipment, are prepared to supervise the erection and start-up of fans and collectors. Clarage can also provide Service Engineers to inspect installed equipment, conduct performance tests or diagnose operational problems.

Clarage provided two FGD Booster fans, with a rotor over 12 feet in diameter, on a gas desulfurization project.

### MAINTENANCE

Routine maintenance is required to keep your fan operating properly. Often, an entire operation must be shut down when a fan malfunctions. In order to avoid this, the following major items should be checked as part of a regular maintenance program:

- Wheel
- Couplings
- Bearings
- Shaft
- Belts
- Dampers
- Mounting



# Turnkey Services



Clarage provided the fan for this steel plant and then worked with the system OEM to correct deficiencies in the existing foundation.

## TURNKEY SERVICE

Beyond the supply of fans and collectors Clarage has the capability of providing construction services when the opportunity or requirement exists. Clarage will combine its engineering and supervision experience with field labor to accomplish a wide variety

of construction work. This can be as routine as the field repair of a fan rotor, such as replacement of chrome carbide wear plates, or as challenging as the demolition of existing equipment and the reinstallation of new ductwork, concrete foundation and new fan equipment.

**ERECTION  
AND START-UP  
SUPERVISION**

**FIELD BALANCE  
AND REPAIR**

**FIELD SERVICE  
AVAILABLE  
FOR CLARAGE  
EQUIPMENT  
AS WELL AS  
ANY OTHER  
MANUFACTURER**

# Clarage

## PRODUCTS AND SERVICES

### STANDARD CENTRIFUGAL FANS

Backward Curved  
Backward Inclined  
Pressure Blower  
Industrial Exhauster — Radial/  
Paddle Wheel  
Cast Iron Exhauster

### CUSTOM CENTRIFUGAL FANS

Airfoil  
Backward Curved  
Backward Inclined  
Radial Tip  
Straight Radial  
Forward Curved  
Hi-Boost — 2-Stage  
Pressure Blowers  
All Drive Arrangements  
SWSI and DWDI Selections  
Inlet Boxes  
Sleeve or Anti-friction Bearings  
Volume Control Dampers  
High Temperature Fans  
Special Materials

### AXIAL FANS

Jet Fans  
Tubeaxial  
Vaneaxial  
Fixed Pitch  
Adjustable Pitch — In Motion  
Adjustable Pitch — At Rest

### MULTI-CYCLONE DUST COLLECTORS

6", 9" and 11.5" Tube  
Availability  
Standard (STD) and Totally (TA)  
Accessible Design

### SERVICES

Repair and Rebuild  
Field Service  
Upgrade Engineering

- Performance
- Material Upgrade

Quality Fabrication  
Erection and Start-up Supervision  
Testing Services  
Turnkey Services

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