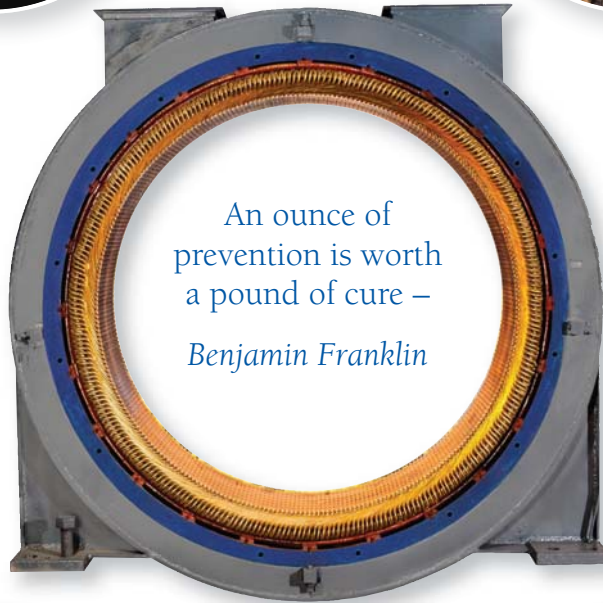
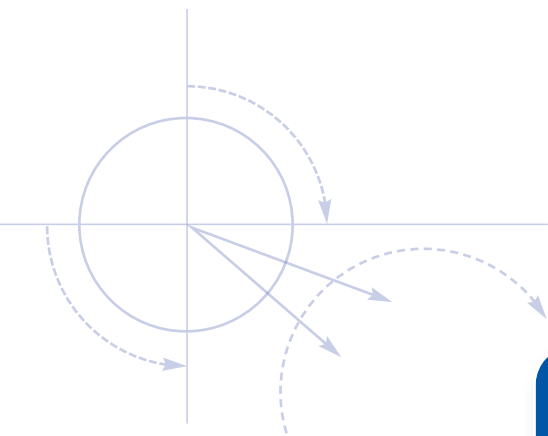


The Heart of your Chip Mill



Would you trust the Heart of Your Chip Mill to a generalist?

Not all motor applications are equal, and neither are the required repairs. Chipper Duty Motors are a different animal, and work harder than any other motor. We are committed to chipper duty applications, and even stock 1000 and 1500 horsepower cores for emergency sourcing.



Our specialized chipper motor services will keep you running for less.

- Six month check-up service
- Annual maintenance service
- Chipper duty repair service
- Sourcing



Our People provide **Specialized Services** that make a difference



Fulghum Fibres, Dillwyn VA – 8/11/2010

The arc flash was clearly visible when the main drive motor of the chip mill failed. There was no spare to be found, putting the entire mill down with a yard full of logs. The situation was critical.

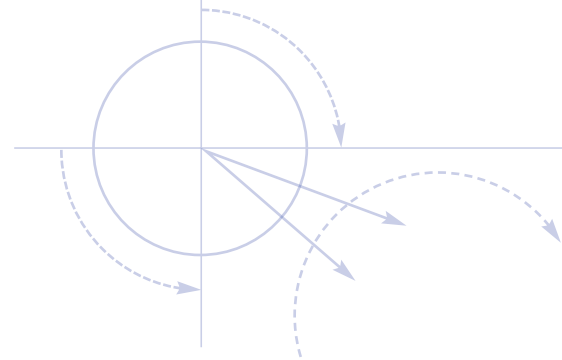
Tommy Oglesby, Mill Manager and 18 year veteran of Fulghum Fibres, contacted Industrial Motor Services. Over the next several days, exhaustive tests would be taken on the 1285 horsepower, 450 RPM unit. Work was scheduled around the clock to complete the rewind. Though the

motor was indeed an emergency rush, every step of the strict IMS Chipper specification had to be adhered to.

Mr. Oglesby later described his sense of relief. "I was so glad to see it back. That motor was our bread and butter. I cannot say enough about the people of Industrial Motor Services. Everyone with IMS was there to help. They have the best attitude, and it means everything."

Tommy Oglesby

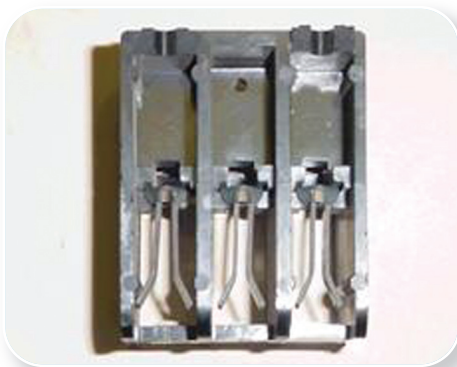
Specialized Testing and Field Services



During a semi-annual check-up, test equipment showed high current and phase to phase imbalances.



The motor was pulled from service (scheduled outage) and sent to the shop. The equipment had found the burning coil above, and the motor was rewound.



After testing the complete motor circuit, this fuse clip was found to be loose. Changes in phase to phase resistance identified the problem.



We can catch major failures months before they occur through our diagnostic testing services.

- High resistance connections in the junction box, starter, or at the coil group connections in the winding itself.
- Secondary control cycling problems, including resistor failure.
- Air gap eccentricity, which left unchecked can lead to the torque imbalances and even worse, the rotor dragging the stator.
- A 3% voltage imbalance reduces rated output by 10% and can decrease life by well over 50%.
- Insulation failure far in advance of a short to ground.

Test Date	8/13/2001	08/28/2001
Test Time	10:32:23 A.M.	09:54:54 A.M.
	Baseline	
Frequency	1200	1200
Mohm Ph1 to Gnd		
Charge Time	60	60
Voltage	1000	1000
Motor Temp	29	28
Measured Mohm	0.0	5000.0
Corrected Mohm	0.0	2200.00
pF Ph 1 to Gnd	> 1000000	61250
ohm Ph1 to 2	0.45250	0.23800
ohm Ph1 to 3	0.44850	0.23850
ohm Ph2 to 3	0.44850	0.23850
mH Ph 1 to 2	6.490	6.155
mH Ph 1 to 3	6.335	6.145
mH Ph 2 to 3	6.360	6.140
Avg. Inductance	6.395	6.147
% Res. Imbalance	0.59	0.14
% Ind. Imbalance	1.49	0.14
\$ Power Loss	126.56	15.82
Test Location	T-Leads	Motor Leads
MCE#	030389HV	030389HV
User		
Notes	No	No

Changes in test data in multiple parameters can help us identify developing problems long before they become emergencies.

Six Month Checkups

provide an excellent means of preventive maintenance. This service typically takes 12 hours to complete, including machine startup.

- The motor is cleaned to remove dust and other debris.
- Surfaces, base, and shrouds are inspected for damage or wear.
- Components such as lightning arrestors and capacitors are inspected for damage or leaks.
- Before and after electrical testing is conducted on the stator and rotor windings, as well as the brush assembly. We use Baker AWA and PdMA equipment for testing.
- Brush spring tension is tested with calibrated gauges. Rings are inspected and polished.
- Oil is changed and samples are collected for analysis. Borescopes are used to inspect flushed cavities.
- Air gap is recorded and compared to previous readings.
- Secondary controls are cycled to ensure accurate operation of components such as timers. Resistors and connections are inspected.
- Shaft alignment is provided with Ludeca and CSI equipment.
- Connections and leads, in motor junction box and secondary are inspected with Fluke infrared.
- Upon return to service after any required corrective action, final running vibration tests are conducted. Bearing temperatures are recorded and final documentation is submitted.



Annual Maintenance

extends the regular six month check-up, typically requiring a second, 12 hour day. This service provides dry ice cleaning to thoroughly clean the machine and remove pine resin buildup and other contaminants.

Chipper Duty Repair Services

Chip mills present a real challenge to the repair shop. Shock loads are much higher, and the instantaneous torque requirements are extreme. Many shops are not aware of the enhanced repair requirements of Chipper Duty Motors. When it comes to a chipper repair, call a specialist. We service chipper mills across the country and can help you get the most out of your next repair.

Testing and Inspection

Inspection is the critical portion of the job, and defines the entire scope of work. We use the best testing equipment from companies like Baker, PdMA, and CSI to thoroughly diagnose your motor to the best available standards. A failure assessment is conducted and suggested causes, including photos, are recorded.

Minimum Electrical Testing Includes:

1. Insulation Resistance, corrected to 40°C (per IEEE-43)
2. Winding Resistance Imbalance
3. Comparative Surge Testing (Per IEEE 522)
4. Step Voltage Test or DC Hi-pot, condition permitting (per IEEE 95)
5. Inter-laminar Insulation or Core Loss tests (Per IEEE 432 and EASA Tech Note 17) are performed on windings subject for rewind (unless otherwise specified by customer) before and after stripping.

Mechanical fits are thoroughly inspected per EASA AR-100. Bores are measured with 3 point bore gauges for accuracy.



Rotor and Stator Reconditioning

Rotor and stator core laminations are tested per EASA and IEEE specifications before and after stripping. Thermal imaging cameras are used to identify hot spots in excess of 10 C above the average temperature. Core lamination problems that cannot be cleared are brought to your attention immediately. In cases where economically feasible we can have the rotor or stator laminations completely replaced, or we can often source another motor frame to substitute.



High Pressure Water Coil Stripping

Cores this size can be economically and more safely water stripped. Controlled, high pressure water is a fast and safe alternative to high temperature burnout, and leaves the core much cleaner for coil installation.



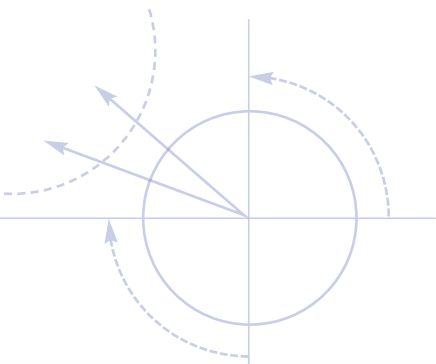
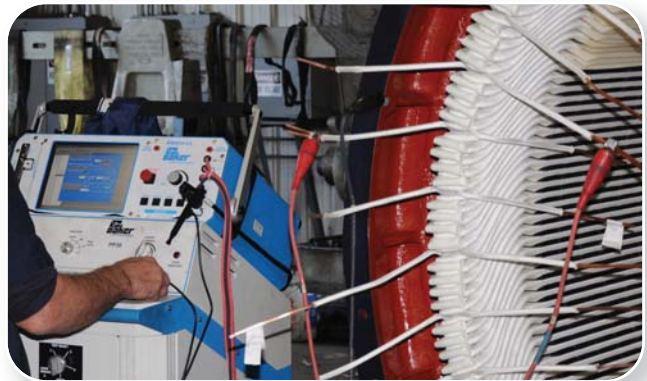
Rewind Requirements – Two Year Standard Warranty

We augment our standard rewind specification to provide for demands of a chipper duty application, requiring focus in areas of insulation materials, connections, and bracing.

Stator Winding

We anticipate more heat and movement in an application like this. Superior bracing on the end ring is critical to life, as chippers experience high and frequent shock loads. Our surge coil is braced at every knuckle throughout the winding. Extra insulation between each conductor turn at the end turn prevents development of turn to turn shorts.

- 2 layers of Nomex between the top and bottom coil layers
- G11 Melamine Wedges
- Reinforced connection clips
- 15% silver solder tig weld on connections



Rotor Winding

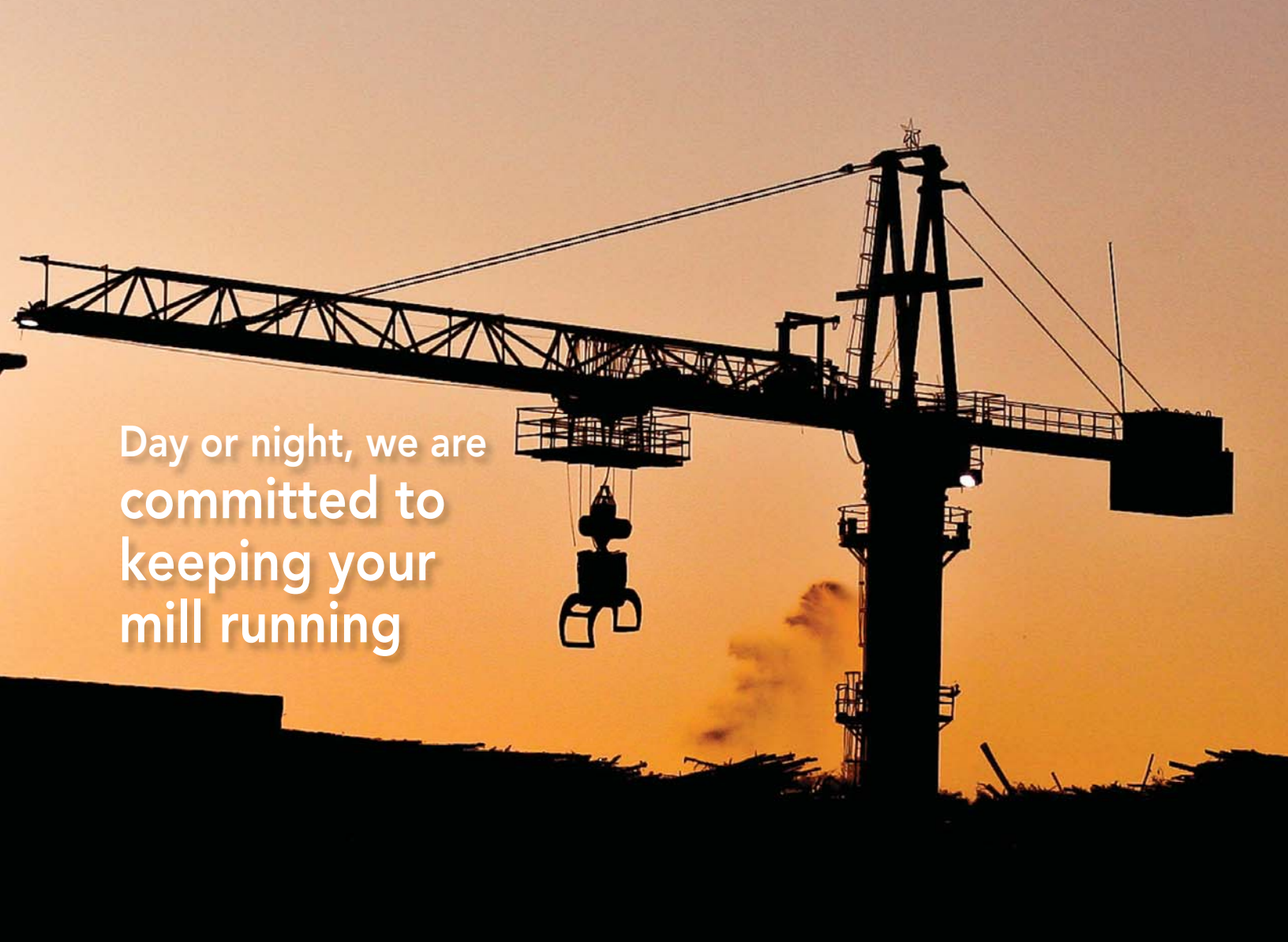
The key to a long lasting chipper rewind is extra duty ground wall insulation. We use .030" Nomex between each bar in the rotor slot. Connections are made with reinforced connection clips installed with 15% silver solder tig weld.



Ring Assembly

Each ring assembly will be completely refurbished and restored. Studs are welded for reliability, versus standard peen fit.





Day or night, we are
committed to
keeping your
mill running

What you should expect from us:

Failure Mode and Effects Analysis (FMEA)

With every motor failure comes an opportunity to improve. We will analyze the failed components, mode of the failures, stresses and resulting effects. This data is provided at the time of quote and on the repair report to assist you with your evaluation.

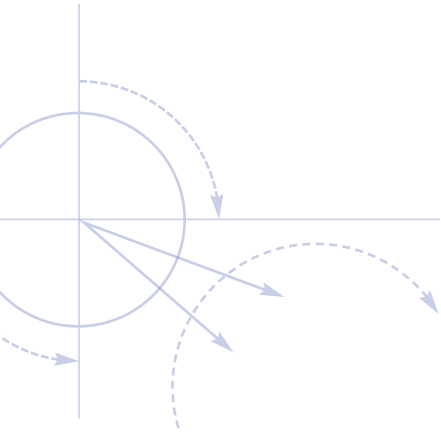
Standard Documentation

We will keep you informed throughout the repair. Our report will include pre and post repair data including mechanical fits, electrical testing, bearings, acceptance testing, and photos.

Specification Management

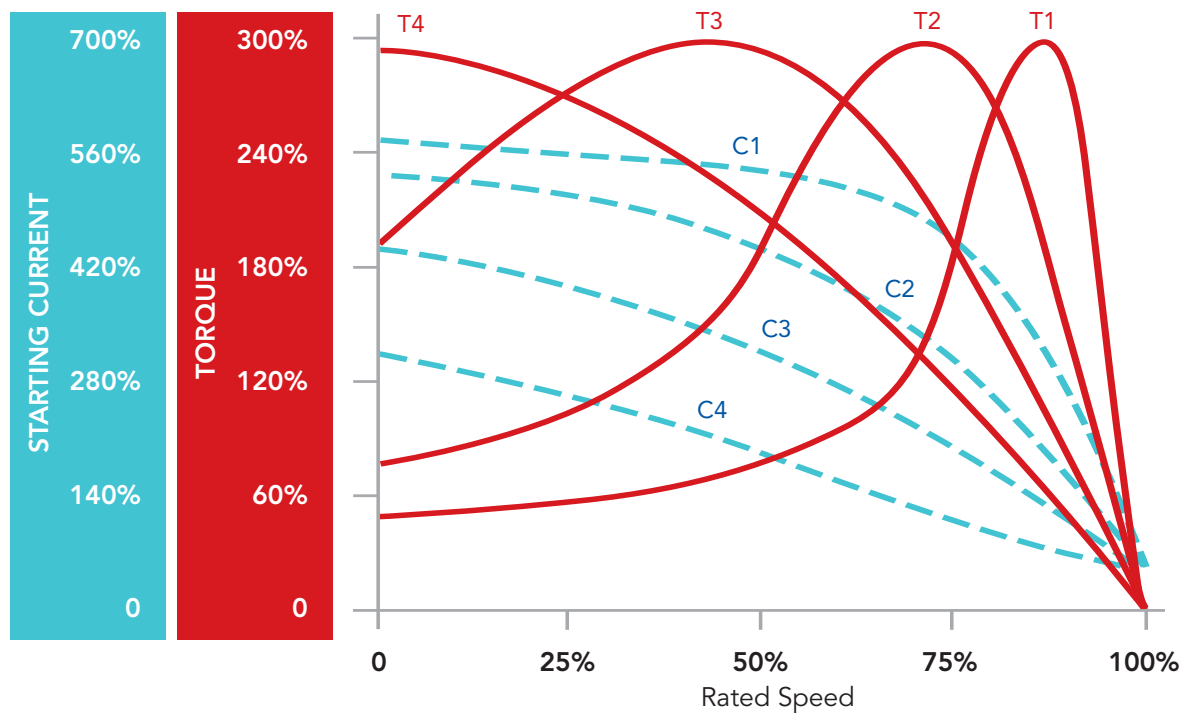
We will produce documentation of your repair traceable to governing standards from authorities such as EASA, IEEE, NEMA, ISO, and ABMA. Any custom specification provided by you will be documented on every report in the same manner.

What is a Wound Rotor Chipper Duty Motor?



Wound rotor motors are a variation of the AC induction motor and are excellent for Chipper applications, which often require 300% pullout or maximum torque. They can meet this high torque requirement throughout the speed range and while limiting starting current.

While an induction motor has a closed, squirrel cage rotor, a wound rotor has an accessible rotor circuit. By extending the rotor circuit through slip rings, we can adjust the resistance of the rotor and control where the motor will deliver maximum torque. Higher resistance decreases starting current and shifts the maximum torque point to lower speeds. Decreasing resistance shifts the maximum torque towards operating speed. This allows us to shift the point of maximum torque to exactly where we need it as the motor accelerates or decelerates. The wound rotor design lends itself to both torque and current control, each working in concert with the needs of your chipper application.



Typical Wound Rotor Motor Characteristics with Varying Resistances

T1/C1
Low Rotor Resistance/
Typical Starting Current

T2/C2
Moderate Rotor Resistance/
Moderate Starting Current

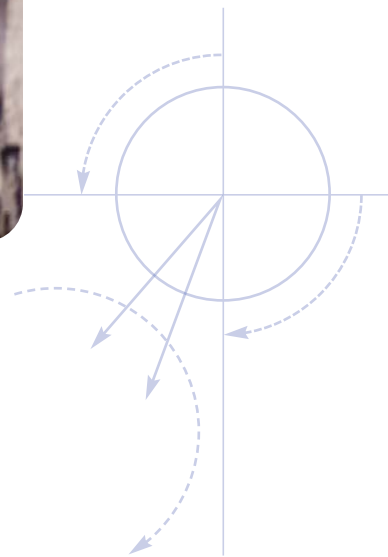
T3/C3
Moderately High Rotor Resistance/
Low Starting Current

T4/C4
High Rotor Resistance/
Low Low Starting Current

Got a **backup?**



Don't get caught
without a spare!



Sourcing Services

When you need a new chipper motor, a spare, or simply parts, we can help. We have people with 20-40 years experience in the Chip Mill market specifically. They have the network necessary to find used assets all over North America.

We can redesign motors to meet your evolving needs, from simple shaft and base modifications to more complex speed and torque modifications.

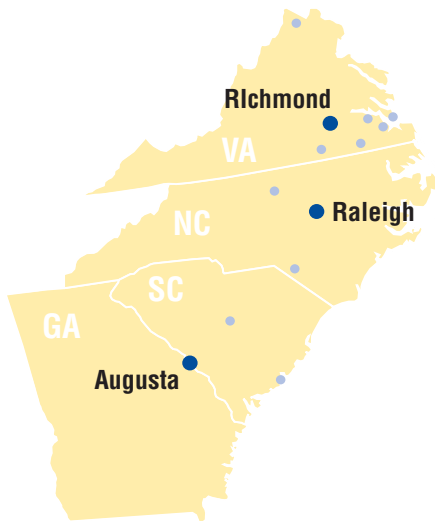


Electrical Equipment Company (EECO) provides both Industrial Motor Services and Electrical Supply Solutions for a customer base that ranges from the heavy industries of metals, mining, shipbuilding and forest products to precision manufacturers of food and consumer products, pharmaceuticals, semiconductors and automated machinery. EECO serves a large portion of the Southeast with 3 repair facilities and 13 supply locations in Virginia, North Carolina, South Carolina, and Georgia.

EECO was founded in 1926 largely to serve the Motor Repair needs of the Pulp and Paper industry in central North Carolina. The company is privately held and governed by a board of directors consisting of actual owners and several consultants with specific expertise. Ownership has remained within the same small group of families and associated board members since inception.



We have been a member of EASA since it was founded several decades ago. Our employees have served various roles as committee members, chapter officers, and international officers.



Our Evolution

- Mid 1940's-Electrical Supplies added.
- 1984 – Automation products added, serving industry and OEM's.
- 1997 – Procurement and Inventory Management Solutions Group
- 2008 – Motor repair business is formally recognized as Industrial Motor Services, a division of Electrical Equipment Company.

Today

- \$110 million in sales
- 13 supply locations
- 3 repair facilities
- 251,000 sq. ft. warehouse space
- Over \$11 million of inventory

**INDUSTRIAL
MOTOR SERVICES**
A Division of Electrical Equipment Company

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