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ReGENco Blood Drive

Another Successful Steam Path Repair

by Jeff Wenzel
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ReGENco recently completed another steam path repair project. These repairs were in support of a major outage on a 360MW GE unit owned and operated by a midwest utility. The repairs were all performed in ReGENco's shop on a 7 x 24 basis. The repaired components included the HP turbine rotor, IP turbine rotor, and IP diaphragms.

HP Rotor

Inspection of the HP rotor revealed the need for a first stage rotating bucket replacement and weld repair of three rows of HP stage tenons. The first row of buckets was replaced according to OEM specifications with parts supplied by the client. The tenon welding included removal of the existing bucket covers, preparation of the tenons for welding by machining, preheat, welding using 410 SS filler material, stress relief using a salt bath tank, and then final machining and grinding of the tenons. New bucket covers were manufactured, fit and riveted, and the covers were final machined. The HP Rotor also had some minor machining repairs performed in order to eliminate excessive runout of the coupling fits, and to machine out a series of surface cracks in the gland area.



HP & IP Rotors

Both the HP and IP rotors received boresonic inspections, condition assessments, and were high speed balanced in ReGENco's Balance and Overspeed Bunker.

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From The President

Overview of this Issues Articles

by John Bobrowich
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Well, it's the heart of the outage season again. Everyone at ReGENco is busy working around the clock. Our customer visitor center is busy, clients coming and going, checking on their work in our shop. It is very fulfilling knowing that we are all working together accomplishing the same goal. Our core value of "We'll Make A Difference", is what ReGENco is all about and we try to inspire our customers with this message.

In this edition of "The Difference," on page 2, we talk about our latest rewind of 3 large diagonal cooled air gap pick up style GE generator rotors. We have the experience at ReGENco to do the job effectively and efficiently on those larger generators.

In our "Ask the Expert" column this quarter, our engineers explain FEA, (Finite Element Analysis), and how effective it is for them. With millions of calculations in minutes, they can determine the strain and stress in parts.

In addition to the busy work schedule in our shop, ReGENco schedules Blood Drives every 2 months, open to all employees throughout our business area. These blood drives are very successful, and is one way ReGENco gives back to our community. To view our Blood Drive statistics, go to page 6.

On May 1-3, ReGENco will be exhibiting at the 9th Annual Electric Power Conference and Exhibition in Rosemont, Illinois at the Donald E. Stephens Convention Center, so if you need a break from the outage season, come visit us at booth #1934.

Rewind of Large GE Gap Pick Up Rotors

by William Akaishi
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ReGENco recently rewound 3 large GE diagonal cooled air gap pick up style generator rotors in our West Allis facility. As part of the rewind scope of work, ReGENco also modified the windings in order to address the "copper dusting" issue, replaced the main field leads, inspected the slot wedge dovetail grooves for radial-circumferential cracking, manufactured replacement aluminum wedges for the #1 coil slots, and performed high speed balance testing.

Typically, the coils from GE gap pick rotors are not badly distorted; however, one of these rotors showed severe distortion in the top 3 or 4 turns of the coil end turns. The distortion was serious enough to even cause some of the end turn blocks to crack and break.

ReGENco engineers and winders were able to successfully straighten and repair the turn distortion and repair and replace the end turn blocking.

On two of these rotors, we encountered excessive unbalance at the main coupling during the high speed balance testing. On these rotors, the rotor coupling unbalance was attributed to significant diametrical differences in the coupling bolt holes.

This issue normally will not cause unbalance when the generator is coupled to the turbine since fitted coupling bolts are used; however, for the stand alone balance of the generator rotor, the difference in weight had to be accounted for at the coupling. Unfortunately, no balance plane existed at the coupling for these rotors.

These projects reinforced our experience that large GE gap pick up rotors can be very sensitive to coupling unbalance and unbalance distribution.

ReGENco solved these problems and successfully balanced these rotors using a combination of hardware and software. We utilized one of our FEA models for these rotors to evaluate dynamic response and the sensitivity of the shaft/coupling extension beyond the bearing centerline. Monitoring the shaft overhangs with proximity probes and using drive tooling with balance weight provisions allow us to address flexible overhang response within our balance procedure and return the rotor to the plant, ready for installation.

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New Employee



Rusty Spence

Stephen "Rusty" Spence recently joined ReGENco as an on-site Project Manager/Technical Director. Rusty has 25 years experience in the Power Generation Industry, and the last 7 years as a contract employee to ReGENco, Siemens

Westinghouse, Lovegreen Turbine Services, and Mechanical Dynamics and Analysis. He worked as a Technical Director, Project Manager and Site Superintendent. Prior to this Rusty spent over 8 years with Siemens Power Corporation as a Technical Director/on-site Project Manager. He has experience with GE, Westinghouse and Siemens Steam Turbines and Generators. Rusty also has extensive experience with Primavera and other scheduling software. He lives with his wife and teenage daughter in East Texas and enjoys fishing and camping in his spare time.

New Position



Ahmad Renno

coordinating work through the CNC department, and programming. Most recently he was working as our 2nd shift CNC Programmer/Supervisor. Ahmad has a degree in Business Management with most of his credits in Engineering. He has had 25 years so far in mold making programs (2D & 3D). Ahmad has 3 grown children, and in his free time likes to run and bike. Ahmad will make a great asset to our 1st shift team.

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Ahmad is already hard at work in his new position as the 1st shift CNC Operations Manager. Ahmad's responsibilities are to manage work assignment staffing, scheduling,

"You will make all kinds of mistakes, but as long as you are generous and true and also fierce, you cannot hurt the world or even seriously distress her."
-Winston Churchill

Ask The Expert

by Alan Kleman & Don McCann



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Finite Element Analysis (FEA) at ReGENco

FEA is a computerized method of analysis, which enables engineers to calculate stresses and deflection in parts and assemblies. It began in the 1960's, and was used only on large mainframe computers through the 1980's. As the speed and memory of personal computers increased in the 1990's, FEA became a practical tool that thousands of engineers could use to analyze complex problems on their computers.

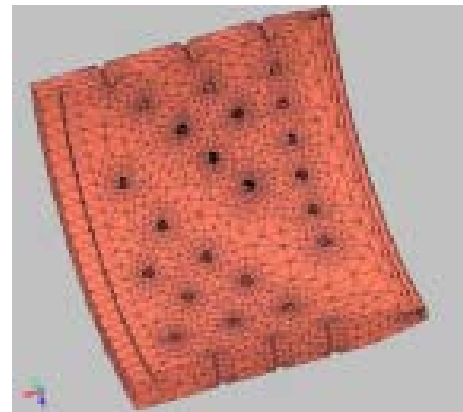
In FEA, a part is modeled using 3-D software such as SolidWorks. FEA software such as CosmosWorks breaks the part into thousands of elements. The engineer adds loads and restraints to the model. The computer performs millions of calculations in minutes and determines the deflection and various stresses in the parts. Complicated problems can take several hours to run.

The engineer can watch an animation of the part as it undergoes deformation to determine if the model is performing realistically. Seeing how a part actually twists and stretches helps the engineer to see where the weak points are. The engineer can then make appropriate modifications until the design is optimized.

Many calculations can be done without FEA using handbooks and experience. However, if the shape of the part is complicated, or the loads are complicated,

FEA is the only method that will produce accurate results. The shrink fit of retaining rings on generator rotors and the associate stresses developed on coil slot dovetail teeth is such an example. As a retaining ring is installed on a generator rotor, it cools and squeezes the teeth of the rotor; the ring has been stretched and high compressive stresses are developed on the tooth tops. As the rotor is brought up to running speed, centrifugal force from the coil end turns, expands the retaining ring and greatly increases the applied stress at mid-length of the ring. This stress, with safety factors applied, is used to determine the yield strength required for replacement rings. In addition, at running speed the shrink fit is reduced and tensile stresses develop on teeth from wedge and coil loads. This alternating stress from start-stop cycles can produce fatigue cracks in regions of high stress concentration such as the tooth radius. This is just one example of a complicated problem that is analyzed by FEA to reduce or eliminate the cracking of teeth through design modifications for our clients.

At ReGENco, FEA is used for many applications on turbo-generator components with the intent of increase the life of that component through design modifications and appropriate repairs.



FEA mesh of a Retaining Ring

Generating Laughs

A CEO throwing a party takes his executives on a tour of his opulent mansion. In the back of the property, the CEO has the largest swimming pool any of them has ever seen. The huge pool, however, is filled with hungry alligators. The CEO says to his executives "I think an executive should be measured by courage. Courage is what made me CEO. So this is my challenge to each of you: if anyone has enough courage to dive into the pool, swim through those alligators, and make it to the other side, I will give that person anything they desire. My job, my money, my house, anything!"

Everyone laughs at the outrageous offer and proceeds to follow the CEO on the tour of the estate. Suddenly, they hear a loud splash. Everyone turns around and sees the CFO (Chief Financial Officer) in the pool, swimming for his life. He dodges the alligators left and right and makes it to the edge of the pool with seconds to spare. He pulls himself out just as huge alligator snaps at his shoes.

The flabbergasted CEO approaches the CFO and says, "You are amazing. I've never seen anything like it in my life. You are brave beyond measure and anything I own is yours. Tell me what I can do for you."

The CFO, panting for breath, looks up and says, "You can tell me who the heck pushed me in the pool!!!"



President's Awards



**ReGENco's 5
Award Winners**



Five of ReGENco's employees were honored in an all employee ceremony where they received our company's highest award, the **ReGENco President's Award**. The award recognizes an extraordinary individual or group accomplishment, which have permanently improved our company and its ability to serve our customers. We will continue to honor our employees twice a year for their achievements that make our company a success.

Pictured:

Lee Hietpas, Greg Gerard, Milan Petrovic, Sharon Erchull

Not Pictured:

Ahmad Renno - Exceptional Achievement in Improving Productivity

Congratulations!



Greg Gerard

Exceptional Achievement in Outstanding Versatility



Lee Hietpas

Exceptional Achievement recognizing outstanding efforts in developing and selling ReGENco's First Long Term Service Agreement



Milan Petrovic

Exceptional Achievement in Improving Productivity



Sharon Erchull

Exceptional Achievement in Outstanding Versatility

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IP Diaphragms

The IP diaphragm (5 TE stages and 5 GE stages) received either major or minor repairs. All outer spill strips were replaced, some of which required weld repair of washed out groove areas. The inner spill strips required weld build up and remachining to size. Area checks were measured and calculated on all partition repairs.



ReGENco was awarded this work partially due to our ability to provide all the needed engineering and repairs within one facility, including blade replacement, tenon welding and stress relief, high speed balance, boresonic inspection, condition assessment, and diaphragm repairs. All welding was performed in accordance with qualified procedures and certified welders.

We'll Make a Difference![®]

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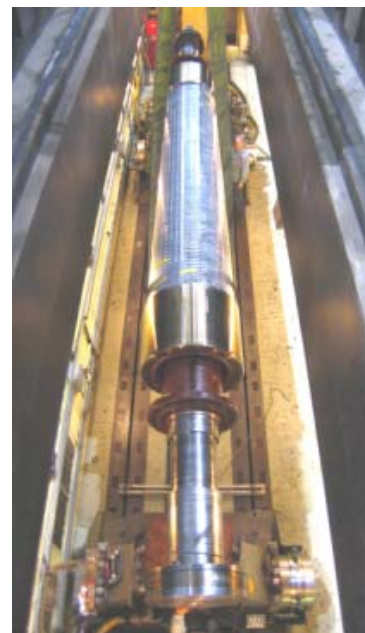


As-Found End Turn Distortion

Our balance and overspeed bunker has the capacity for rotors over 52 feet long and weighing up to 300,000 pounds. Along with our other tools, our dynamic analysis capability and balance experience reinforce our ability to rewind these large, flexible shaft gap pickup style rotors effectively and efficiently.



End turns and blocking after repair



ReGENco Blood Drive

Some ReGENco Stats

Throughout 2006 we held a total of 6 blood drives. In those drives we able to collect 204 pints of blood. Thanks to everyone who participated.

We received a nice note from Alice, our representative at the BloodCenter of Wisconsin:

“When the BloodCenter of Wisconsin called for O negs last June, your goal for 35 donors resulted in 55 donors responding. Terrific work! In that mix of those donors were four O negative donors. That’s actually 9% of your donor pool. Nationally, O negs are only 7% of the eligible donor population.”

Blood Facts

The average adult has about 10 -11 pints of blood. A unit of whole blood can save up to three people because it can be separated into three distinct products, each of which has a different function and can be used in concentrated doses depending on patient need. Red cells, platelets and plasma are all produced in bone marrow.

Red cells carry oxygen and can be needed by many different patients including those with sickle cell disease, premature babies or patients experiencing post-surgical complications. Red cells have a shelf life of 42 days after which they cannot be used. This necessitates a constant stream of donors to keep up with patient needs.



Larry Huber (ReGENco) donating blood during a sponsored blood drive

Platelets help blood clots and are needed by many different patients, including those undergoing having heart surgery, experiencing uncontrolled bleeding or undergoing chemotherapy. Chemotherapy can, as a side effect, destroy platelets. Platelets have a shelf life of 5 days.

Plasma impacts blood pressure and carries nutrients and cells throughout the body. Plasma can be needed by many different patients including burn victims, those with liver disease or hemophilia.

The Need

Every three seconds, someone in the United States needs blood. There is no substitute for human blood.

BloodCenter of Wisconsin strives to see 800 donors a day, 6 days a week, to collect the blood needed by patients in the 50+ hospitals with which we partner.

Donors and Blood Types

While 60% of the population is eligible to donate blood, less than 5% do so. Donors must be in good health, at least 17 years of age and 110 pounds. Whole blood may be donated every 56 days. There are four main blood types among donors: O, A, B and AB. There are also 2 Rh factors: positive and negative. AB is the universal recipient. O- is the universal donor.



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