

TORQUE REPORT

Getting Windy: TWMC Round Rock Facility to Manufacture Wind Turbine Components by 4th Quarter, 2007

On November 28, 2006, TECO-Westinghouse Motor Company and DeWind, a European wind turbine manufacturer, signed a Strategic Alliance. This Alliance designated that TWMC's Round Rock facility would be responsible for the assembly of DeWind's wind turbine design in North America.

DeWind's D8.2 wind turbine, a 2.0 megawatt wind turbine, poses a significant advancement in turbine capabilities. TWMC's President, Dr. H.C. Meng, explained, "For scale purposes, a 2.0 MW turbine is twice as large as serial production turbines manufactured just ten years ago. The blade diameter (80 meters) is larger than a Boeing 747 aircraft."

Dr. Meng added, "Although the D8.2 is new to the North American market, it has already attracted the attention of most major developers and users."



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New Demand Requires Drivers in the Desert

Recent studies have revealed population increases along the Southwestern part of the United States. According to U.S. Census Bureau figures, Arizona is the 2nd fastest growing state in the country with an estimated annual growth of 2.5% between the year 2000 and 2030.

Such population shifts have a considerable impact on the demand for everyday goods and services. Refined product capacity is essential as new vehicles, with lower mpg, are added to the streets along with heavy jet fuel consumption at airports. To meet this demand, Kinder Morgan added 66 miles of 12" pipeline in Arizona, from Tucson to Phoenix, along with 160 miles of looped 16" pipeline from El Paso, Texas to Tucson. These additions lead to capacity increases from 70% to 100% Mbbls/d.



These seven 2500 HP induction motors driving pipeline pumps provide additional refined product capacity to the southwestern part of the United States.

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USS Enterprise Admiral Commends TWMC Engineers

The *USS Enterprise* (CVN-65), first commissioned in 1961, is the world's first nuclear-powered aircraft carrier and longest naval vessel in the world. The *Enterprise*, or the "Big E," is the eighth naval vessel in history to bear its name and has an extensive military history, providing support in the Cuban Missile Crisis and the Vietnam War. Most recently, the *USS Enterprise* was instrumental in providing air support to Operation Iraqi Freedom.

In November of 2006, a coolant motor generator (#8) onboard the *Enterprise* began experiencing a reduced voltage output. Unable to be repaired, a replacement CMG was ordered and installed in December, and final testing and acceptance were scheduled for January 2007.

"Admiral" continued on Page 2



The *USS Enterprise* (CVN-65) is the eighth Navy ship to bear the *Enterprise* name and is the longest naval vessel in the world.

TWMC Acknowledged by US Navy

Admiral K.H. Donald

"Admiral" Continued from Page 1

Before this testing could begin, the space containing two coolant motor generators (#8 and #7) and an emergency diesel generator was inadvertently flooded. A TECO-Westinghouse Service Engineer was sent to conduct extensive visual and electrical inspections of both motor generators.

It was quickly determined that the recently replaced CMG #8 could be repaired, while CMG #7, an older unit, was too badly damaged and would need to be replaced. Given the "Big E's" deployment schedule, the need for rapid turnaround was considerable.

TWMC engineers had to think and act quickly. It was decided that the repairable unit (CMG #8) would be disassembled from its foundation and refurbished, as much as was practical, in the space. The induction motor, induction rotor, DC exciter, synchronous rotor and synchronous stator were "cleaned and baked." This CMG, once serviced, would replace CMG #7, while a reconditioned unit (shipped from the TWMC factory) would serve as the new CMG #8. Once CMG #7 was disassembled and removed from the space, the restored CMG #8 was installed in place and tested. When the second unit arrived, it was reassembled in the space under the direct supervision of the TWMC engineer. Both units tested satisfactorily in February 2006.

The Enterprise was once again returned to working order. In response to the quick and successful action taken by TWMC, Admiral K.H. Donald of the US Navy, sent the following letter of commendation to Richard Fesmire, Director of Operations, thanking all TWMC engineers and employees involved in the project:

Mr. Richard Fesmire,

Your recent assistance in returning the USS Enterprise (CVN 65) to sea is greatly appreciated. The emergent need to quickly replace one coolant motor generator (CMG) and repair another was daunting, but the can-do attitude and flexibility of TECO personnel made all the difference.

TECO's rapid acceleration of CMG inspection and refurbishment efforts, as well as expert on-site repair, in support of this unplanned work exemplifies the American spirit. The Nation is fortunate to have such dedicated employees supporting the Armed Forces. Please pass my thanks on to every TECO employee who contributed to this success.

As we say in the Navy, Bravo Zulu - Well done!!

*Sincerely,
Admiral K. H. Donald*

TECO

I Visually inspect all sleeve type bearings during routine motor service. The wear pattern between the shaft journal and bearing bore should measure at least 80% and there should be no pitting or rusting on these surfaces.

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New Longhorns Call TWMC Home

On May 4, 2007, TECO-Westinghouse Motor Company was pleased to welcome two new members to its Longhorn family. Willie and Winchester, both registered Texas Longhorn steers, arrived at their new home, in Round Rock, Texas, from the C&W Ranch in Lampasas.



Winchester, 18 month old Longhorn steer

They can be seen in the front pasture at the TECO-Westinghouse facility in Round Rock.



Willie, 7 year old Longhorn steer

Ethanol: A Growing Industry

TWMC distributor, Precision Drive and Control, supplies TECO motor spares to the Ethanol Industry.



Badger State Ethanol, a premier Ethanol processing plant in Wisconsin, receives TECO parts from Precision Drive and Control.

Editorial Statement: "Torque Report" is a periodical publication of TECO-Westinghouse Motor Company. Its editorial mission is to inform our readership in the areas of motor application industries, as well as business and world affairs that have an impact on our mutual concerns. Comments, inquiries and suggestions should be directed to: Torque Report, TECO-Westinghouse Motor Company, 5100 N. IH-35, Round Rock, TX 78681 USA. Phone: 1-800-451-8798. FAX: 512-244-5512. E-mail: torquereport@tecowestinghouse.com. Website: www.tecowestinghouse.com.

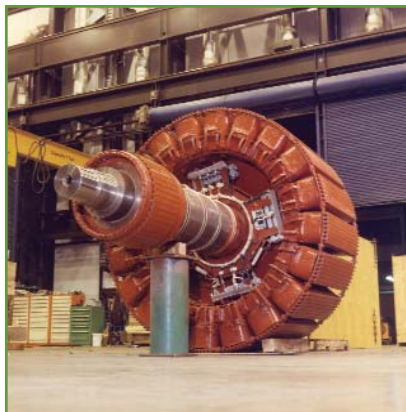
Round Rock Factory Ships OEM Order for Ball Mill Application

The Atacama Desert in Chile has one of the driest climates on Earth, experiencing an average rainfall of around 1 mm per year. As a result, the Atacama is rich in mineral deposits, including the world's largest natural supply of sodium nitrate. However, the desert's climate and extremely high altitude provide numerous hurdles for mining.

Given these conditions, especially with regard to the grinding technologies used in mining, motors employed must perform to very high standards. Of primary importance is the capability of the motor to consume less energy, adapt to high altitude, and maintain constant speeds. Synchronous motors have come to represent an effective means for controlling these factors, from managing currents to reducing slips and improving power factors in all mining applications. Large synchronous motors are now the flagship motors for the Mining Industry.

TECO-Westinghouse in Round Rock, Texas has recently completed production on two synchronous motors for a ball mill OEM, whose customer's large iron ore mine is located in the Atacama Desert. These 111 frame, slow-speed (200 RPM), synchronous motors arrived at the facility in February of 2007.

The two motors, both 5000 HP, represent the Round Rock facility's capability to manufacture large synchronous mill motors to support the mining industry.



TWMC Provides Local Semi-Conductor Facility with Power

Many industrial manufacturing facilities employ circulating water pumps to control indoor temperature. Due to its higher density, water can transmit heat over greater distances with much less volumetric flow than air. Likewise, water has a higher specific heat capacity and more thermal conductivity than air, both of which reduce the amount of energy needed to power such a system. Cooling towers are often used in conjunction with these circulating water pumps to cool and re-circulate water, while ejecting evaporated air into the atmosphere, reducing the facility's water and energy consumption.

In November of last year, TWMC supplied a number of Global-HD TEFC medium voltage motors and

Global-Plus TEFC NEMA Premium Efficiency motors to TWMC Distributor, Advanced Mechanical Systems (AMS) in San Antonio for use on their customer's circulating water pumps. Additionally, TWMC sold several Max-E2 NEMA Premium Efficiency motors, with modified space heaters, to Composite Cooling Solutions in Ft. Worth, Texas. All motors were then sold to the same end-user, a semiconductor manufacturer in Austin. The customer, an important contributor to Austin's technology sector, has recently expanded the size of its facility, which now houses many large cooling towers that support these circulating water pumps.



TWMC Product Spotlight

New Product Release:

TECO-Westinghouse has recently expanded its AC Drives Product Line to include the EV and the N3 series AC Drives.

The **EV AC Drive** is a din rail mountable micro drive that is perfect for OEM's that package individual or multiple lower HP AC drives in a common enclosure. The EV is available in 115V, 230V, and 460V ratings from .25-3 HP with dedicated single phase and three phase input models. In addition, the EV includes expanded features such as PID control, 8 preset speeds and a multi-function analog input/output.



The **N3 AC Drive** is a general purpose AC Drive designed to meet the requirements of most constant and variable torque applications. The PID control and sleep mode feature of the N3 makes this AC drive a perfect fit for fan and pump applications. Other features that make the N3 extremely flexible are the keypad mounted speed potentiometer, configurable multi-functional digital and analog input/outputs, and an optional LCD keypad that allows the user to view programming parameters in English. The N3 is available in 230V ratings from .5 - 40 HP and in 460V ratings from 1 - 75 HP.



Many additional options are available for both the EV and N3 series AC drives, including a removable parameter copy unit, RS232 and RS485 communication interfaces, and the TECO Link programming software tool that allows the users to configure programming parameters, record trends, and set up PID control via a personal computer.

New Director for TWMC Design Center

In April of 2007, TWMC announced that **David D. Parkinson** would be the company's Design Center Director.

David joins TWMC after a distinguished military and civilian career, holding positions from Senior Mechanical Engineer to Senior Vice President for leading companies in the rotating machinery industry. Additionally, David brings to TWMC added experience gained during his parallel 28 year career as a senior officer in the Army Corps of Engineers.

In a recent "All Hands" meeting at TWMC, David elaborated upon his vision for the Design Center and what his initial focus will be. He stated "The TWMC Design Center acts as a bridge between the front room (Sales and Marketing) and the back room (Operations and Sourcing). In professionally executing this function, the Design Center must be attentive, responsive, predictable, and globally-integrated as it supports both internal and external customers alike."

He further stated that "it's imperative that the Design Center provide the most competent and cost-effective solutions the first time, every time. This can only be accomplished by truly listening to the customer and then developing the internal discipline to efficiently meet customer needs."

Additionally, David asserts, "Our primary initial goals are to improve on-time delivery of services, minimizing errors, stan-

dardizing documentation and procedures, and expanding parametric design principles. The enablers of achieving and exceeding these goals will be the utilization of cross-functional teaming, the understanding and adoption of lean principles, and the empowerment of personnel through the use of continuous improvement methodology."

Long term, David envisions the TWMC Design Center leading the charge toward global standards for product design and sourcing within TECO. He believes that global incorporation of "best practices" when coupled with an integrated sourcing network is the key to cost effective design. David also sees an expanded role for the Design Center in the strategic planning process of TWMC as it continues to diversify and to grow.



Colonel (Ret.) David Parkinson brings grand vision for TWMC's future as new Design Center Director.

TWMC to Completely Refurbish Motors for Largest Man-Made Mine

TWMC recently completed repair on the first of seven 5500 HP, 180 RPM, 13,200 Volt synchronous motors for Kennecott Utah Copper Corporation, a mining, smelting, and refining company, whose Bingham Canyon Mine is considered the largest man-made excavation site in the world. All seven of these large, 40 pole motors were originally manufactured at the Round Rock plant in 1986. Each motor will be serviced using the manufacturer's original design schematics, reducing delivery time and ensuring the compatibility of the upgrade and repair.

Kennecott plans to have TWMC repair 1-2 motors per year, one at a time, until all seven motors are refurbished. The first of these motors shipped from Round Rock in April of this year. The next of these large synchronous motors is currently in house at TWMC.



This 40 pole synchronous motor is the first of seven large motors that will be repaired for the Bingham Canyon Mine, the largest man-made excavation site in the world.

TWMC Repairs Motor Generator Sets for Dragline Excavation Systems

For nearly 100 years, Bucyrus has been a leading manufacturer of dragline excavation equipment, introducing the first crawler mounted dragline, the "Class 14," in 1911. Today, Bucyrus continues to develop advanced excavation technologies and participate in some of the largest excavation projects around the world. In late 2006, TWMC performed a complete overhaul of two dragline motor generator sets for Bucyrus International.

The MG sets were built at the Round Rock facility in the mid-1980's and were in operation for nearly twenty years. Each motor generator set was composed of six DC generators and one synchronous motor. Each DC generator's armature was completely rebuilt with new commutators and windings by the team at TWMC. In addition, the synchronous motor units required both their respective stators and rotors be refurbished.

TWMC, as the original manufacturer of these MG sets, was in a unique position to provide timely, cost-effective service and repair. Once completed, a TWMC field service Engineer accompanied the MG sets to Turkey, overseeing the installation and startup of the equipment. The customer reports that both motor generator sets have been running without incident since their installation.



TWMC Provides More Horsepower for Steel

TWMC recently received a large order from TATA Steel for the upgrade of their Hot Strip Mill at the Jamshedpur, India works.

With the completion of the order, the main drive motors in the mill will produce a total of over 62,000 combined HP. These, and other, changes will allow the mill to efficiently roll out the latest materials at an increased production rate.

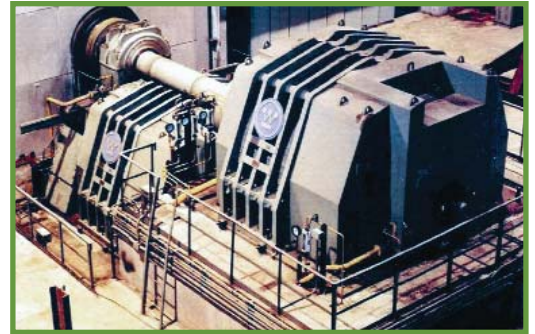
Tata Steel, the first private Iron and Steel Company in India, began production in Jamshedpur, India in 1907. This plant remains the largest in Jamshedpur and accounts for a significant portion of the company's annual steel production. Westinghouse Electric Corporation supplied the main drive motors for the original mill and TECO-Westinghouse has continued to provide main drive motors to new TATA Steel mills added over the years.

In the early 1990's, a new Hot Strip Mill was built at the complex in Jamshedpur, utilizing TECO-Westinghouse main drive motors built at the TWMC facility in Round Rock, Texas. The HSM was originally designed for one million tons/year of steel output.

Refinements were made in 1995 that included the addition of a sixth finishing stand and down coiler, as well as the upgrade of the automation system. These changes doubled steel coil production capabilities.

Additional upgrades to the automation system, motor cooling refinements, and better maintenance practices, among other things, resulted in the present production rate of three times the original mill design. All of these production gains were made while still utilizing the existing TWMC main drive DC motors.

Additionally, TWMC has continued to provide technical guidance over the years to help make the mill more productive.



Drivers in the Desert Meets Increased Demand

"Drivers" continued from Page 1

To move this product along, the pipeline pump stations with electric motors, are generally added every 30 to 60 miles. For this project, (7) 2500 HP, 3600 RPM, dual voltage, squirrel cage induction motors were selected by the client. These motors were unique because the user specified that the motors be designed to meet all present needs, as well as any future conditions. For example, although these motors were used in a constant speed application for this project, the client requested "stiff-shaft" rotors in the event variable frequency drives were ever added to the system in the future. Furthermore, the motors were designed to start the pumps with an open discharge valve while using a reduced auto-transformer starter with only 65% terminal voltage. This was specified because older lines and stations commonly used auto-transformers as a method for reducing the inrush current during starting. If the motors were relocated to an existing location, the new motors would be capable of starting the pump.



Additionally, the motors were designed to function despite environmental conditions. As a portion of the pipeline is located in Arizona, the motors were constructed to perform at 4000 feet ASL, which is 700 feet above standard elevation. Likewise, as the motors will be subjected to extreme changes in temperature, the design of the motors included specific features that make them suitable for many conditions.

Round Rock Facility to Manufacture Wind Turbine Components

"Windy" continued from Page 1

According to the terms of the Alliance, TWMC will manufacture both the nacelle and hub components for the D8.2. As the nacelle alone houses 90% of turbine components, the construction of both the nacelle and the hub at the Round Rock facility represents a significant portion of the manufacturing process.

Currently, the "D-Aisle" in TWMC's Round Rock factory is being modified to become a state-of-the-art cell-based assembly line, which can be configured to produce anywhere from one nacelle/hub per week to one nacelle/hub per day. "The ability to secure components (which we call supply-chain management) will drive production output," said TWMC President Dr. H.C. Meng. "Based on the *supply-chain* currently in place, the first

units will ship from the Round Rock factory in 4th Quarter, 2007."

Dr. Meng believes this alliance will change the future of the wind turbine landscape. "By combining DeWind's design, joint TWMC and DeWind R&D efforts, and a successful O&M joint venture," Dr. Meng stated, "we believe there is no limit to what can be accomplished."



TORQUE REPORT

OCTOBER 2007

Watch for the
TECO-Westinghouse Motor
Company Ethanol Ad in:

Ethanol Producer Magazine
and
Ethanol Today Magazine



Introducing Ethanol Duty™ Motors
Harvesting new capabilities to meet the needs of a growing industry.

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At TECO Westinghouse Motor Company, we believe that revolutionary changes require innovative ideas. Our Ethanol Duty™ product lines are designed to provide safe, reliable, and energy efficient products to support the ever-changing landscape of the Ethanol industry. Let us be your partner for growth and for change.

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EPRI Motor/Generator Rewind Seminar Reaches Record Attendance

The EPRI Motor/Generator Rewind Seminar, hosted by TECO-Westinghouse Motor Company, in conjunction with Electric Power Research Institute and Jarsco Engineering Corporation, was held, for the fourth consecutive year, at the TWMC facility in Round Rock, Texas. With fifty-four attendees, this year's three-and-a-half day seminar was the largest to date.



TWMC's David Briggs and Brian Kruse (top) take EPRI attendees on a tour of the TWMC Round Rock facility. (Bottom) A class photo includes all 54 attendees and three instructors.

Instructors Jim Oliver, Jim Michalec, Riccardo Covarrubias, and Elton Floyd led the seminar, covering many aspects of motor and generator repair and rewind, including induction motor design fundamentals, stator winding insulation systems, stator coil components, coil manufacturing, motor efficiency, and much more. Designed to provide extensive information regarding motor or generator repairs and rewinds, this seminar attracted representatives from companies across the globe, including Voith-Siemens Hydro, GenerationMayer Electric Supply, P&H Mine Pro Services, Tampa Armature Works, Georgia Power Company, FMC Corp, Generating Authority of Thailand, NRG Texas, Precision Electric Coil, and many others.

On Wednesday, TWMC employees led a guided tour of the 500,000 square foot motor and generator manufacturing and repair facility. Likewise, several TWMC engineers and technicians gave presentations and fielded technical questions from seminar attendees.

According to the instructors and attendees, this year's Motor/Generator Rewind Seminar was a tremendous success.

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